COMMUNITY-WIDE ORAL HEALTH PROMOTION IN THE PITKÄRANTA DISTRICT OF RUSSIAN KARELIA – A CASE STUDY

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ANNE HIIRI

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Academic dissertation to be presented, with the assent of the Faculty of Medicine of the University of Oulu, for public defence in Auditorium 1 of the Institute of Dentistry (Aapistie 3), on September 19th, 2008, at 12 noon

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Oulu, Finland

Abstract

The aim of this study was to describe the planning, implementation and evaluation of a community-wide programme of oral health promotion that begun in 1993 in the Pitkäranta district of Russian Karelia. Baseline analysis of the community included clinical dental examinations and questionnaire surveys which were carried out in the same way as in the Finnish reference areas, Kuopio and Jyväskylä, in 1992. In addition, interviews of stomatologists and dentists, observations at local shops, kiosks, schools and dental clinics, and determinations of fluoride levels in drinking water were carried out in the Pitkäranta district. Previous information on oral health and its determinants among children in the Republic of Karelia was sought in the literature, from local statistics and from patient documents in the Pitkäranta district.

Community analysis at baseline revealed that in the Pitkäranta district the occurrence of dental diseases was high. Behaviours related to oral health were generally unfavourable, and professional prevention at dental offices was practically non-existent. Therefore, the results of the baseline analysis of the community in 1993 called for an intervention with emphasis on enhancing healthy lifestyles, reorienting the methods of action of the system of oral health care towards health promotion and prevention of diseases, creating a supportive environment and empowering community actions as suggested in the Ottawa Charter. The goal was to achieve at least the same level of oral health as that found among children in the Finnish reference areas.

In the 2001 follow-up, community oral health was analysed with the methods used in 1993. The results of the follow-up community analysis were used to monitor the changes in 1993–2001 and to assess the strengths and weaknesses of the programme. The improvements in oral health and in oral health-related behaviours among children as well as other developments in the community were impressive. Some oral health-related behaviours, such as frequent use of sugary snacks, non-daily use of fluoridated toothpaste and increasing smoking among adolescents, called for further actions.

Keywords: adolescent, child, health promotion, oral health, Russia
To Peetu
Acknowledgements

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# Abbreviations

<table>
<thead>
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CDC</td>
<td>Centers for Disease Control</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>CPITN</td>
<td>Community Periodontal Index of Treatment Needs</td>
</tr>
<tr>
<td>DMFS</td>
<td>Number of decayed, missing or filled tooth surfaces in permanent teeth</td>
</tr>
<tr>
<td>dmfs</td>
<td>Number of decayed, missing or filled tooth surfaces in primary teeth</td>
</tr>
<tr>
<td>DMFT</td>
<td>Number of decayed, missing or filled permanent teeth</td>
</tr>
<tr>
<td>dmf</td>
<td>Number of decayed, missing or filled primary teeth</td>
</tr>
<tr>
<td>DS</td>
<td>Number of decayed tooth surfaces in permanent teeth</td>
</tr>
<tr>
<td>ds</td>
<td>Number of decayed tooth surfaces in primary teeth</td>
</tr>
<tr>
<td>FDI</td>
<td>Federation Dentaire Internationale</td>
</tr>
<tr>
<td>HBSC</td>
<td>Health Behaviour in School-aged Children</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
</tr>
<tr>
<td>HPS</td>
<td>Health-Promoting School</td>
</tr>
<tr>
<td>GRP</td>
<td>Gross Regional Product</td>
</tr>
<tr>
<td>KAB</td>
<td>Knowledge-Attitude-Behaviour</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
</tr>
<tr>
<td>PRECEDE</td>
<td>Predisposing, Reinforcing, and Enabling Constructs in Educational/Ecological Diagnosis and Evaluation</td>
</tr>
<tr>
<td>PROCEED</td>
<td>Policy, Regulatory, and Organisational Constructs in Educational and Environmental Development</td>
</tr>
<tr>
<td>SBU</td>
<td>Swedish Council on Technology Assessment in Health Care</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>USD</td>
<td>US dollar</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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1 Introduction

The breakup of the Soviet Union in 1992 led to social problems and difficulties in health care. In the beginning of the reformation process, medicine and equipment were difficult to obtain and the treatment needs of the population could not be satisfied (Ministry of Social Affairs and Health of Finland 1992). The gap between two neighbouring areas, the Republic of Karelia in North-West Russia and Finland, was huge in terms of the standard of living and the determinants of health.

As the nearest neighbour to North-West Russia, Finland is in a key position to develop collaboration with the health and social welfare authorities in the Russian Federation. Finland’s collaboration in social welfare and health care in its neighbouring areas started in the early 1990’s. After the mid–1990’s, the non-governmental organisations working in the fields of social welfare and health in Finland also launched collaboration in order to advance their activities in Russia¹.

Following recommendations of the Ministry of Social Affairs and Health, the National Public Health Institute of Finland started collaboration in the former Soviet region, including Pitkäranta, where the National Public Health Institute in cooperation with local health authorities surveyed the risk factors of chronic diseases among adults (Laatikainen et al. 1996, Laatikainen 2000). Due to the concern of local authorities about the oral health situation among children in the Pitkäranta district, the Finnish National Public Health Institute proposed that oral health promotion be included in the collaboration.

In 1993, local authorities from the Pitkäranta district of Russian Karelia, together with the Department of Community Dentistry, University of Kuopio, Finland, started a programme of oral health promotion in the Pitkäranta district. The aim of this programme was to promote the oral health of children and adolescents. Already in the 1970’s, the Department of Community Dentistry had experience in collaboration with colleges in the Soviet Union (Nyyssönen 1984), and the collaboration continued until education of dentists at the University of Kuopio ended in 1998. After that, the Department of Community Dentistry moved to the University of Oulu and continued its collaboration with the Pitkäranta district from there.

2 Review of the literature

The collapse of the Soviet Union at the end of 1991 initiated a socio-political transformation in the country. After the collapse, economic growth in Russia was slow and faced several difficulties in the beginning of the transition to a market economy (University of Joensuu, Karelian Science Centre 2000).

In the various regions of north-western Russian, including the Republic of Karelia, the economic situation resulted in growing unemployment and decreasing income for households throughout the 1990’s (Helsinki School of Economics and Business Administration 2000). In 1992, the real disposable personal income was 47% and in 1993 59% of the 1991 level. In 1993, the mean yearly family income in Russian Karelia was 1,552,884 Roubles (about 1,245 USD)\(^2\), of which 84% consisted of wages and salaries, 9% of pensions and awards and 7% of other income (State Committee for Statistics, Republic of Karelia 1994). The Gross Regional Product (GRP) per capita declined steadily during the 1990’s and in 1998 the GRP per capita was only 45% of the 1990 level (University of Joensuu, Karelian Science Centre 2000). The inflation rate was very high during 1992 and 1993 and gradually stabilised in 1994–1997. This period of transition also had serious effects on public health and on the functioning of the health care system.

2.1 Health and the health care system in the Soviet Union and the Russian Federation before and in the beginning of the 1990’s

2.1.1 Mortality and morbidity

In the beginning of the 1990’s, the health status in Russia was poor. The mortality and morbidity rates of non-communicable diseases had increased steadily since the 1960’s, and this increase accelerated during the first years after the breakup of the Soviet Union (Bobak & Marmot 1996, Tulchinsky & Varavikova 1996, Notzon \textit{et al.} 1998). In international comparisons at the end of the 1980’s, the age-adjusted mortality rate for coronary heart diseases and stroke, as well as for infections, were significantly higher in Russia than in western Europe (Bobak &


By the mid-1990’s, Russia's mortality rate reached the highest peacetime level in the twentieth century. Between 1960 and 1992, the total mortality rate in the former Soviet Union and in the Russian Federation increased from 739 to 1,216 per 100,000, which corresponds to a 65% increase from the rate in 1960 (Tulchinsky & Varavikova 1996). The greatest increases in mortality rate were found in mortality due to cardiovascular disease (an increase of 148%), mortality due to trauma (an increase of 101%) and mortality due to cancer (an increase of 46%). It was estimated that about 80% of all deaths were caused by the above-mentioned non-communicable diseases (Levintova & Novotny 2004). In the 5-year period between 1990 and 1994, the total age-adjusted mortality rate rose by 33% (Notzon et al. 1998). During that period, the mortality rate increased 100% or more for alcohol-related causes, pneumonia and influenza, and homicide. Sharp increases were still noted for cardiovascular diseases (20–40%). The mortality rate rose sharply for both genders and for every age group, but the greatest increases were found among 35- to 44-year-olds.

The mortality trends were similar in all parts of the Russian Federation (Men et al. 2003). In Russian Karelia, Puska (1995) found that the age-adjusted total rate of mortality among 35- to 64-year-olds was twice as high as in Finland and that the total mortality rate in Estonia, a former Soviet country, was almost as high as in Russian Karelia. Mortality rates in all three countries were highest for cardiovascular diseases, cancer and violent deaths, and these were significantly higher among men than among women.

Already before the 1990’s, the rate of infant mortality was three to six times higher in Russia than in other industrialised countries (Tulchinsky & Varavikova 1996). A similar trend was found for maternal mortality, which was 4–17 times higher in Russia. Between 1990 and 1994, the rate of infant mortality showed no increase (Notzon et al. 1998), whereas the rate of maternal mortality did increase (Tulchinsky & Varavikova 1996). Simultaneously, the annual birth rate declined; and combined with increasing mortality, population growth in Russia became negative for the first time since such records have been kept.

The high rate of mortality in Russia affected life expectancy at birth. In 1990, life expectancy among Russian men was at or below the life expectancy rate of the 1960’s (Tulchinsky & Varavikova 1996, Notzon et al. 1998). Between 1990 and 1994, the life expectancy for Russian men declined from 64 years to 58 years (Notzon et al. 1998). For Russian women, on the other hand, life expectancy rose
between 1959 and 1990 (Tulchinsky & Varavikova 1996) but declined between 1990 and 1994 from 74 years to 71 years (Notzon et al. 1998). In Russian Karelia in 1993, the life expectancy was almost the same as that in the whole of Russia: 56 years for men and 71 years for women (Goskomstat of Russia 1995).

Published data on morbidity in the Russian Federation in the 1990’s are scarce but are in line with that on mortality and life expectancy. In the beginning of the 1990’s, in Russia the incidence of non-communicable diseases, such as cardiovascular diseases, were high (Tunstall-Pedoe et al. 1994); and after a decrease in the late 1980’s, the incidence of communicable diseases (tuberculosis, brucellosis, diphtheria and syphilis) again increased significantly (Tulchinsky & Varavikova 1996, Viljanen et al. 1998, Netesov & Condrad 2001). In addition, in the 1990’s the incidence of HIV began to increase (Netesov & Condrad 2001).

2.1.2 Occurrence of dental caries and periodontal diseases among children

Dental caries and periodontal diseases are common oral diseases that affect most people at some stage of life. Both diseases cause impaired quality of life with pain and discomfort, functional disorders and/or social embarrassment. Both dental caries and periodontal diseases are basically infectious diseases; and when dental infection progresses into nearby tissues, it may also affect general health and the management of chronic diseases like diabetes and cardiovascular disease (Grossi & Genco 1998, Kollveit & Eriksen 2001, Karhunen et al. 2006, Ylöstalo et al. 2006, Ylöstalo 2008). Thus, oral health is an integral part of general health.

Before the year 1993, it was difficult to get a clear picture of the level of oral health and its determinants in the Soviet Union and in the Russian Federation from the scarce literature. Most epidemiological studies were published in the main Russian dental journal, Stomatologiya. The 14 studies published in international journals dealt with children’s oral health and its determinants in Russia or in the former Soviet areas. One study dealt with experiences of dental caries among adults in Russian Karelia (Honkala et al. 1996). However, the Russian Federation is a large country where living conditions, culture and oral health status vary greatly between areas and information cannot be generalised to the whole country. Therefore, this review will concentrate on studies from the north-western part of the Russian Federation and from the Baltic countries Estonia, Latvia and Lithuania, which were part of the former Soviet Union. No
studies have been published concerning oral health and its determinants among children and adolescents in Russian Karelia.

**Dental caries**

In the 1960’s and 1970’s, dental decay affected most children and adolescents in industrialised countries. From the 1970’s to the 1990’s, the occurrence of caries in permanent teeth declined among 12-year-olds (Marthaler et al. 1996)\(^3\). The age of 12 is especially important, as it is generally the age at which children leave primary school, and thus in most countries, is the last age at which a representative sample of children can be obtained easily through the school system. For this reason, 12 years has been chosen as the global monitoring age for caries in international comparisons and for monitoring of disease trends.

In the 1990’s, caries continued to decline in most European countries, but in the Nordic countries (Finland, Sweden, Norway and Denmark) the trend levelled off (von der Fehr 1994, Poulsen & Scheutz 1999, Nordblad et al. 2004). Since then, the mean DMFT (number of decayed, missing or filled teeth) for 12-year-olds in these countries has remained at about one. At the same time, the occurrence of caries among children was still increasing in some Eastern European countries, including the Russian Federation and the Baltic States (Künzel 1996, Marthaler et al. 1996, Nihtilä et al. 1998)\(^3\). In these countries, the global target of less than three decayed teeth at the age of 12 by the year 2000 seemed difficult to reach, except in an area in Moscow where in 1993 the mean DMFT among 12-year-olds was 2.5 (Kuzmina et al. 1995). In addition, in these countries most of the dmft/DMFT or dmfs/DMFS (number of decayed, missing or filled tooth surfaces) consisted of untreated caries lesions (ds/DS or dt/DT) (Bjerner et al. 1992, Hardwick et al. 1993). Data published on the occurrence of dental caries in permanent teeth among the 12-year-olds in the Russian Federation (former Soviet Union), in the Baltic States and Finland between 1983 and 1994 are shown in Table 1 and among 15-year-olds in Table 2.

---

Table 1. Mean DMFT among 12-year-olds in Russia, Baltic States and Finland according to studies conducted in 1985–1994.

<table>
<thead>
<tr>
<th>Country</th>
<th>Area</th>
<th>Year</th>
<th>n</th>
<th>DMFT</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>Moscow</td>
<td>1985</td>
<td>300</td>
<td>3.2</td>
<td>Kolmakow et al. 1988, Kolmakow 1989</td>
</tr>
<tr>
<td></td>
<td>Moscow</td>
<td>1992</td>
<td>*</td>
<td>3.7</td>
<td>Marthaler et al. 1996</td>
</tr>
<tr>
<td></td>
<td>Moscow</td>
<td>1993</td>
<td>100</td>
<td>2.5</td>
<td>Kuzmina et al. 1995</td>
</tr>
<tr>
<td>Estonia</td>
<td>Viljandi</td>
<td>1991</td>
<td>370</td>
<td>4.6</td>
<td>Bjerner et al. 1992</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1992</td>
<td>*</td>
<td>4.1</td>
<td>Marthaler et al. 1996</td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td>1992</td>
<td>*</td>
<td>7.7</td>
<td>Marthaler et al. 1996</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1993</td>
<td>*</td>
<td>5.8</td>
<td><a href="http://www.whocollab.od.mah.se/countriesalphab.html">http://www.whocollab.od.mah.se/countriesalphab.html</a></td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td>1986</td>
<td>*</td>
<td>3.6</td>
<td>Marthaler et al. 1996</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1992</td>
<td>*</td>
<td>3.9</td>
<td>Marthaler et al. 1996</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1993–94</td>
<td>733</td>
<td>4.9</td>
<td>Aleksejuniene et al. 1996</td>
</tr>
<tr>
<td>Finland</td>
<td></td>
<td>1985</td>
<td>*</td>
<td>2.8</td>
<td>Norblabd et al. 2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1991</td>
<td>*</td>
<td>1.2</td>
<td>Norblabd et al. 2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1994</td>
<td>*</td>
<td>1.2</td>
<td>Norblabd et al. 2004</td>
</tr>
</tbody>
</table>

* No information on number of subjects.

Table 2. Mean DMFT among 14- to 15-year-olds in Russia, Baltic States and Finland according to studies conducted in 1983–1994.

<table>
<thead>
<tr>
<th>Country</th>
<th>Area</th>
<th>Year</th>
<th>n</th>
<th>DMFT</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>Moscow</td>
<td>1993</td>
<td>100</td>
<td>3.5</td>
<td>Kuzmina et al. 1995</td>
</tr>
<tr>
<td>Estonia</td>
<td>Tallinn</td>
<td>1993</td>
<td>195</td>
<td>6.8</td>
<td>Wolf et al. 1996</td>
</tr>
<tr>
<td></td>
<td>Tartu</td>
<td>1993</td>
<td>197</td>
<td>3.4</td>
<td>Wolf et al. 1996</td>
</tr>
<tr>
<td>Latvia</td>
<td></td>
<td>1993</td>
<td>506</td>
<td>8.1</td>
<td>Bjarnason et al. 1995a</td>
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<tr>
<td>Lithuania</td>
<td></td>
<td>1983</td>
<td>*</td>
<td>6.4</td>
<td>Marthaler et al. 1996</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1986</td>
<td>*</td>
<td>6.2</td>
<td>Marthaler et al. 1996</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1993</td>
<td>1010</td>
<td>5.6</td>
<td>Marthaler et al. 1996</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1993–94</td>
<td>515</td>
<td>7.0</td>
<td>Aleksejuniene et al. 1996</td>
</tr>
<tr>
<td>Finland</td>
<td></td>
<td>1985</td>
<td>*</td>
<td>6.2</td>
<td>Norblabd et al. 2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1991</td>
<td>*</td>
<td>3.1</td>
<td>Norblabd et al. 2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1994</td>
<td>*</td>
<td>2.8</td>
<td>Norblabd et al. 2004</td>
</tr>
</tbody>
</table>

* No information on number of subjects.
Even though among children in most western European countries caries occurrence in permanent teeth has declined between the 1970’s and the 1990’s, for primary teeth the decline has not been as rapid. Studies of pre-school children in the Nordic countries have shown no important changes in caries occurrence since the 1980’s or 1990’s (Poulsen & Scheutz 1999, Stecksen-Blicks & Borssen 1999, Seppä et al. 2000, Nordblad et al. 2004), and an increasing trend has even been reported (Haugejorden & Birkeland 2002). Since then, in these countries the mean dmfs among 5- to 6-year-olds has been about two and the mean dmft about 1.5. In Russia and the Baltic States, in the 1980’s and 1990’s the occurrence of caries in primary teeth was much higher than in the Nordic countries (Table 3).

Table 3. Mean dmft among 3- to 6-year-olds and percentage of children with dmft=0 in Russia, Baltic States and Finland according to studies conducted in 1983–1994.

<table>
<thead>
<tr>
<th>Country</th>
<th>Area</th>
<th>Year</th>
<th>Age (years)</th>
<th>n</th>
<th>dmft</th>
<th>% of children with dmft=0</th>
<th>Reference</th>
</tr>
</thead>
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<tr>
<td>Russia</td>
<td>Moscow</td>
<td>1993</td>
<td>6</td>
<td>99</td>
<td>5.6</td>
<td>9</td>
<td>Kuzmina et al. 1995</td>
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<tr>
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<td>1993</td>
<td>3</td>
<td>225</td>
<td>2.2</td>
<td>48</td>
<td>Bjaarnason et al. 1995b</td>
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<td></td>
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<td>1993</td>
<td>4</td>
<td>406</td>
<td>3.8</td>
<td>26</td>
<td>Bjaarnason et al. 1995b</td>
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<tr>
<td>Lithuania</td>
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<td>1983</td>
<td>5–6</td>
<td>700</td>
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<td>18</td>
<td>Marthaler et al. 1996</td>
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<td>Finland</td>
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<td>1985</td>
<td>5</td>
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<td>2.1</td>
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<td>Norblad et al. 2004</td>
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<td></td>
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<td>1991</td>
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<td>Norblad et al. 2004</td>
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<td>1994</td>
<td>5</td>
<td>*</td>
<td>1.1</td>
<td>65</td>
<td>Norblad et al. 2004</td>
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* No information on number of subjects.

**Periodontal diseases**

The number of studies dealing with periodontal diseases among Russian children is even fewer than those dealing with the occurrence of caries. According to five available studies, in the 1980’s and early 1990’s the prevalence of periodontal diseases among Russian and Baltic adolescents was high.

In 1984, an epidemiological study of periodontal diseases among 15-year-olds (n=1835) was carried out in 20 Soviet towns (Miyazaki et al. 1991). In this
study, 5% of the children had no signs of periodontal diseases, the mean number of totally healthy sextants in the dentition being 3.3. Seventeen percent of these children had bleeding on probing and 78% had calculus. No pocketing or bone loss was found. In 1986, the survey was repeated and at that time 12% of the 15-year-olds had healthy periodontal tissue but 6% of them had 4–5 mm deep gingival pockets. In Lithuania and Estonia, the periodontal health was as poor as it had been in the Soviet Union in the 1980’s (Miyazaki et al. 1991).

In 1991, Hardwick et al. (1993) collected data on periodontal diseases among children aged 12 (n=122) and 15 years (n=123) in Madagan Oblast in the Russian Far East. In this area the prevalence of periodontal diseases, as measured by the community periodontal index of treatment needs (CPITN), was very high. None of the 12-year-olds was completely free of periodontal disease. Children of this age had, on average, only one healthy sextant and 77% of them had calculus. Among the 15-year-olds, 80% had calculus and 10% had signs of pocketing or bone loss.

In a study that surveyed the presence of plaque and gingival status among children (n=498) in Moscow in 1993 the prevalence of plaque was high (Kuzmina et al. 1995). None of these children was plaque-free, and most had thick plaque covering one or more teeth. The study revealed that erupting occlusal surfaces accumulated more plaque than did occlusal surfaces in full occlusion. Prevalence of moderate inflammation in one or two sites of the gingiva was also rather common (between 41% and 83%) in this population. Similarly, in 1993 bleeding on probing was common among adolescents in the Baltic countries, Estonia (Wolf et al. 1996) and Latvia (Bjarnason et al. 1995a).

### 2.1.3 Possible explanations for the poor health situation in Russia

Several reasons for the rise in mortality rate and decline in life expectancy in Russia have been suggested. These reasons may be roughly divided in the same way as the World Health Organization, WHO (1998a) has defined the determinants of health: “the range of personal, social, economic and environmental factors which determine the health status of individuals or populations”. However, the factors that influence health are multiple and interactive, and causation between determinants and health is difficult to show.
**Personal determinants of health**

Age and gender are related to health; men and women suffer from different types of diseases at different ages. In Russia, in the 1990’s the life expectancy at birth was significantly lower (Bobak & Marmot 1996) and the mortality rate correspondingly higher among males than among females (Bobak & Marmot 1996, Sans et al. 1997, Notzon et al. 1998, Men et al. 2003). In addition, personal behaviours, such as consumption of alcohol, smoking, diet and physical activity, are related to several non-communicable diseases. In Russia, consumption of alcohol has been among the highest in the world and has risen significantly in the 1990’s, particularly among males (Notzon et al. 1998). In Pitkäranta, Russian Karelia, 56% of the men and 26% of the women reported consuming alcohol weekly (Laatikainen et al. 2002). Consumption of alcohol was highest among 25- to 34-year-olds.

The smoking rate in Russia increased since 1985, particularly among women and teenagers. In the 1990’s, more than 60% of Russian men and nearly 10% of women were smokers (Notzon et al. 1998). In 1992 in Russian Karelia, 65% of the men and 11% of the women were smokers (Puska et al. 1993, Matilainen et al. 1994). Daily smoking was most common among 25- to 34-year-old men, of whom 77% smoked. Among women in Russian Karelia, the youngest women smoked significantly more often than older women did (20% of the 25- to 34-year-olds vs. 3% of the 55- to 64-year-olds) (Puska 1995).

In the beginning of the 1990’s, eating habits among Russian adults were also unfavourable. Consumption of vegetables was uncommon in Russia, except in rural areas where they were home-grown. In 1992 in Russian Karelia, butter was commonly used on bread, but fresh vegetables, fruits and berries were consumed less frequently than in Finnish Karelia (Matilainen et al. 1994). Only about 10% of the Russian Karelian adults reported eating fresh vegetables every day.

In the early 1990’s, the reported health behaviour among Russian adolescents was much better than that among adults. In 1993, the WHO surveyed health behaviour among Russian schoolchildren in St. Petersburg, a survey that was part of a cross-national “Health Behaviour in School-aged Children (HBSC)” study conducted in 24 countries, mainly in Europe. According to the results, 29% of the 11-year-old boys in Russia and 9% of the girls had experimented with smoking (King et al. 1996). Among 13-year-olds, the percentages were 51% and 29%, respectively, and among 15-year-olds 60% and 44%, respectively. The highest experimentation rate for smoking was found among boys at all ages in Finland.
and in the Baltic countries, which had been part of the Soviet just a few years before the survey. Fortunately, not all adolescents who have experimented with smoking continue the smoking habit later on. King et al. (1996) reported that very few Russian 11-year-olds smoked cigarettes once a week or more often. In 13- and 15-year-olds, the percentages of weekly smokers were 13% and 19%, respectively, among boys and 5% and 10%, respectively, among girls. For these Russian children the percentages of smokers were lower than the average in the countries surveyed. In Russian Karelia in 1994, daily smoking was rather common already at the age of 15: 29% of the boys and 7% of the girls were daily smokers. In addition, one-third of the non-smoking girls in Russian Karelia tended to experiment or to start smoking later (Kemppainen et al. 2002). The percentages of Russian adolescents having experimented and currently using alcohol were smaller than the average for other European countries (King et al. 1996). The percentages of Russian children who reported taking part in physical activity two or more times a week and who reported good eating habits were also better than the average for European countries (King et al. 1996).

In summary, health behaviour among the Russian population was poor, and this can partly explain the rising mortality and morbidity trends in Russia in the early 1990’s. However, it has been argued that the causative role of personal behaviour has been exaggerated (Sheiham & Fejerskov 2003) and that health behaviour is largely predisposed by social, economic and environmental factors (Bobak & Marmot 1996, Notzon et al. 1998, Men et al. 2003).

Economic and social determinants of health

Poor social and economic circumstances affect health by increasing the risks for serious illness and premature death (Syme & Balfour 1998, Wilkinson & Marmot 2003). Traditionally in health research, the most frequently used measures of economic and social factors have been education, occupation and income which have been studied separately or in different combinations to describe the socioeconomic status, social class or social gradient of people and populations. Recently, the various aspects of social determinants of health were listed in the WHO publication “Social determinants of health. The solid facts” (Wilkinson & Marmot 2003): social gradient, early life, social exclusion, work, unemployment, social support, addiction, food and transport.

Level of education is strongly related to health. In the 1980’s and the 1990’s Shkolnikov et al. (1998) and Plavinski et al. (2003) examined the association
between level of education and life expectancy and mortality among Russian adults. The studies showed that Russians with higher education had about the same life expectancy as their counterparts in western countries, while life expectancy in the shorter educational groups was much lower. Similar differences in mortality rate were seen among all educational groups. In the 1990’s, the differences in mortality rate increased a further 15–20% according to level of education.

The relationship between occupation and health indicators in Russia has been studied as the occupational risks to health. Occupation as a determinant of health might deal either with occupational categories or employment status (Wilkinson & Marmot 2003). Very few studies have been published on occupation as a determinant of health in Russia in the 1980’s and early 1990’s. Shkolnikov & Andreev (2000) found that mortality among unemployed Russian men was extremely high and that in 1988–1989 life expectancy among intellectual workers was almost three years longer than among manual workers. Among women the respective differences were smaller. Palosuo et al. (1998) observed similar differences in perceived health, morbidity, occurrence of symptoms and health problems according to occupation and gender.

The third measure of the social determinants of health is income. Economic and social instability in the beginning of the 1990’s led to a decline in the average per capita income by almost two thirds between 1990 and 1995 and to a rise in the percentage of families living in poverty from 2% in 1987 to 38% in 1993 (Notzon et al. 1998). However, the relationship between income and mortality or life expectancy is not unambiguous. There is strong evidence that for people living in countries where income inequalities are great, the life expectancy is shorter, while in wealthy countries, there is only weak relation between average income and life expectancy (Bobak & Marmot 1996, Marmot & Wilkinson 2001). The decline in life expectancy and mortality in Russia in the 1990’s cannot be explained simply by low income (Walberg et al. 1998) or by other economic and social circumstances (Marmot & Wilkinson 2001). Instead, socioeconomic factors may produce their effect through psychosocial factors that may play an important role in explaining the high rate of mortality in Russia (Walberg et al. 1998, Marmot & Bobak 2000, Laaksonen et al. 2001, Marmot & Wilkinson 2001).

Psychosocial factors include, among other things, control over life, stress, anxiety, insecurity and depression. These factors may act as mediators between socioeconomic inequality and health through the central nervous system which in turn, modulates the immune response (Syme & Balfour 1998, Marmot &
Wilkinson 2001). Brunner & Marmot (1999) created a model that describes the complex pathways between social factors and health (Fig. 1).

Walberg et al. (1998) surveyed aspects of socioeconomic change that were associated with the decline in life expectancy in Russia between 1990 and 1994. They concluded that the decline cannot be explained simply as being due to impoverishment but rather by the impact of social and economic transition that was worsened by the lack of social cohesion. In Russian Karelia, perceived stress and perceived control were highly associated with poor health (Laaksonen et al. 2001).

Fig. 1. Model of the social determinants of health showing complex pathways in a social context (by permission of Oxford University Press adopted from Brunner & Marmot 1999).

**Environmental determinants of health**

Environmental factors have been recognised as important components of health. The main reason for this has been awareness of the cost-effectiveness of health promotion and disease prevention on the environmental level instead of individual approaches, difficulties in getting individuals to change their behaviour and
observations that the rate of disease remains relatively constant over time even
though the structure of the population is constantly changing (Syme & Balfour
1998).

Studies and interpretations of the relationship between environment and
health depend on the definition of the term “environment”. Syme & Balfour
(1998) divided environment into human-made, natural, and social and cultural
aspects, all of which interact with each other. Prüss-Üstün & Corvalán (2006)
defined environment as “the physical, chemical and biological factors which are
external to the human host, and related behaviours, but excluding those natural
environments that cannot reasonably be modified”. Rose (1987) divided the
environment into microenvironment and macroenvironment from the perspective
of the individual and of the population, respectively.

Globally, it has been estimated that in 2004 almost 25% of the disease burden
(lost years of healthy life) and of all deaths (premature mortality) were
attributable to environmental factors (Prüss-Üstün & Corvalán 2006). In Russia,
studies on environmental determinants of health have concentrated mainly on the
health consequences of occupational exposures or pollution, especially after the
Chernobyl accident in the late 1980’s. Otherwise, before or during the early
1990’s, the number of studies on environment and health in Russia was small. No
studies examined the relation between physical, built environment and health; but
it has been reported that rate of death due to transport incidents declined between
1991 and 1994 (Men et al. 2003). One study in Russian Karelia surveyed the
social environment; among adolescents smoking by best friends and/or family
members predicted smoking (Kemppainen et al. 2006).

**Determinants of oral health**

Determinants of oral health are very much the same as the determinants of health:
personal, economic, social, psychosocial and environmental. Age and gender are
clearly associated with oral health even though the association may be indirect.
Girls usually have more favourable oral health-related behaviour (Kuusela et al.
1997, 1999), but this is not seen as better oral health among girls. Some risk ages
for oral diseases can be recognised and they are usually related to the eruption of
teeth because for a few years after eruption, the tooth enamel is susceptible to
decay, and removal of microbial biofilm from the surfaces of erupting teeth is
difficult. However, tooth eruption is similar all over the world and cannot explain
the differences in oral health between Russia and the rest of the world.
It is a well-established fact that oral health is dependent on individual behaviour. Regular and proper toothbrushing, daily use of topical fluoride products and restriction of sugars in the diet are all important for maintaining oral health; if one or more of these is neglected, the risk for dental decay increases. However, all these behavioural determinants are necessary but not sufficient causes for decay, which can be caused by combinations or series of causes (Scheutz & Poulsen 1999).

According to current knowledge, the presence of microbial biofilm is the only necessary biological determinant of dental caries and periodontal diseases. Therefore, it might be concluded that proper oral hygiene is essential for prevention of these diseases. Indeed, several studies have shown the association between toothbrushing and gingival inflammation; but currently there is no evidence that toothbrushing alone, without the use of fluoride, would prevent tooth decay (SBU 2002, Nyvad 2003). Use of fluoride toothpaste goes together with toothbrushing, at least in western industrialised countries; and most studies on toothbrushing include the use of fluorides. Therefore, it is difficult to examine the effectiveness of either procedure in prevention of dental caries separately.

Fluoride toothpastes came onto the market in the 1950’s. Already the first experimental studies found that frequency of toothbrushing with fluoride toothpaste was significantly associated with the onset of carious lesions. Those who brushed three or more times a day received greater benefits than those who brushed less frequently (Muhler et al. 1954, Muhler & Radike 1957, Peffley & Muhler 1960). In the mid-1990’s, experts believed that the use of fluoride products, especially fluoride toothpaste, played an important role in the decline of dental caries (Bratthall et al. 1996). In two systematic reviews, the caries-preventive effect of fluoride toothpastes compared to non-fluoride or placebo toothpastes in permanent dentition varied between 5–45%, in most studies being 20–30% (SBU 2002, Marinho et al. 2003). These reviews revealed that the effectiveness of fluoride toothpastes is dose dependent, the effectiveness being greater for high baseline levels of D(M)FS, when toothpaste is used more than once a day and when toothbrushing is supervised. However, it has been argued that the role of fluoride toothpastes in the decline of the occurrence of caries has been overrated (Haugejorden 1996).

Diet is the third major behavioural component in oral health. Epidemiological and experimental studies since the 1940’s have increased knowledge of the etiological role of sugars in dental caries (Green 1949, Gustafsson et al. 1954, Harris 1963, Fisher 1968, Scheinin et al. 1974). Many pioneering studies were
conducted before the widespread use of fluoride toothpastes, but in studies conducted in the 1970’s when fluoride toothpastes were used commonly, it was noticed that the association between diet and caries increment was not as clear as it had previously been (Bagramian 1974, Richardsson 1977). In the modern age of fluoride exposure, the association between sugar consumption and dental caries is weaker than it used to be (Burt & Satishchandra 2001). The best evidence available from epidemiological studies indicates that the level of dental caries is low in countries where consumption of free sugars is below 15–20 kg per person per year (Sheiham 1983, WHO 2003a). The WHO recommends that daily energy intake contain no more than 10% free sugars, that the frequency of consumption of foods or drinks containing free sugars be limited to a maximum of four times per day and that national fluoride programmes be promoted. These goals cannot be achieved quickly, and the interim goal of six intakes per day has been agreed as the guideline for nutrition and dental health (Armstrong et al. 2008). Current evidence for an association between diet and periodontal disease is weak, except for severe vitamin C deficiency (Pussinen et al. 2003).

In the Finnish-Russian joint study of 1985, the oral health behaviour of the Russian 7-, 9- and 12-year-old children was compared with that of Finnish children of the same age (Nyyssönen et al. 1991, Honkala et al. 1992). The Russian children consumed sweets and sugar-sweetened tea more often than the Finnish children did, while the Finnish children consumed more soft drinks and sugar-sweetened coffee than the Russian children did. A survey among school-aged adolescents in 1991/1992 revealed that oral health-related behaviour, such as regular toothbrushing, use of fluoridated toothpaste and appropriate use of sugary snacks, was also less favourable among Russian children compared to children in other European countries (Kuusela et al. 1997, 1999). In the Baltic States, the situation was even worse than in Russia (King et al. 1996).

Personal determinants alone cannot explain the occurrence of caries lesions and gingival disease in the population. There is a net of societal, contextual, individual, psychosocial and biological factors that are related to oral health (Holst et al. 2001, Watt 2002, Newton & Bower 2005). At the national level, the high correlations have been found between DMFT and public health expenditures, sugar consumption, urbanisation and level of deprivation, and these may explain the differences in dental health across developed and developing nations (Locker 2000a, Diehnelt & Kiyak 2001, Petersen 2005). Among children less than 12 years of age there is evidence for an inverse relationship between socioeconomic status and prevalence of caries; those children whose parents have low level of
education, low income and whose parental rearing style is negative and unsupportive, have higher prevalence of caries than other children (Reisine & Psotter 2001, Petersen 2005, Sanders & Spencer 2005).

2.1.4 Health care system in transition

Until 1991, the health care system in the Soviet Union was highly centralised and hierarchical (WHO 1998b). The Ministry of Health had the greatest responsibility for provision of health care in the country but delegated its responsibilities to the Ministries of Health in the 15 Soviet Socialist Republics. The structure of the Soviet system of health care was very hospital-oriented even though primary health care was a basic part of the system. This structure was partly supported according to the financing system that allocated money by the number of hospital beds and by the number of visits to the polyclinics (Farmer et al. 1993).

In 1991, the reform process of the health care system started aiming at decentralisation of health care. The state and republic ministries were merged into the new Ministry of Health and Medical Industry of the Russian Federation, and responsibility for the provision of health care and financing shifted to the local level. This made health care increasingly dependent on the economic resources in the surrounding area. In Russian Karelia, health care is led by the Ministry of Health of Russian Karelia, which functions under the Parliament of Karelia and the Ministry of Health and Pharmacy Industry. In addition, the Centre of Sanitation and Epidemiology controls the health of the population and develops the health care system. The centre controls, for example, ecological factors (such as quality of drinking water), work-related diseases and quality of medicines (Jylhä & Kataja 1994).

In the beginning, decentralisation of the health care system was not problem-free and there were signs of increasing inequality in health in the Russian Federation (WHO 1998b). Because the organisation of the Soviet health care system was highly centralised and hierarchical, it also remained rather intact after the breakup of the country (Farmer et al. 1993). Health services were still given by specialist doctors and primary care was practically non-existent. The health care system was underfunded, and health care expenditure was only 3% of the Gross National Product compared to 6–13% in Western countries (Sheiman 1995).

In 1990, in Russia there were over two million beds in the hospitals (138 beds per 10,000 inhabitants) and 695,000 physicians (one physician per 214 inhabitants), which was more than in most Western countries at the time (State
Committee for Statistics, Republic of Karelia 1994, Sheiman 1995, Tulchinsky & Varavikova 1996). Although the numbers of doctors, hospitals and hospital beds were high at the beginning of the 1990’s, the quality and efficiency of health care services were low. Doctors were badly paid, and many of them changed occupation (Tulchinsky & Varavikova 1996). In general, hospitals and polyclinics were old and lacked basic equipment, technology, and pharmaceuticals (CDC 1992). Even though everyone had the right to health care and medical assistance free of charge, patient information and appointment systems were poor and patients often had to wait a long time for access to a doctor or other medical personnel. In the beginning, the provision of private services was rare but increased during the 1990’s.

During 1990–1992, the difficulties in health care and low pay for health care personnel led to about a 5% decrease in the number of personnel and beds in hospitals. In Russian Karelia in 1993, the number of health care personnel was 3,805 physicians (one physician per 209 inhabitants) and 10,668 nurses (one nurse per 75 inhabitants). There were a total of 87 hospitals with 10,897 beds, five sanatoriums and 13 health clinics. In 1993 almost 14,000 patients were treated in the health clinics in Russian Karelia (State Committee for Statistics, Republic of Karelia 1994).

In the Soviet era and in the beginning of the 1990’s, in the Russian Federation oral health care was in a situation similar to that of health care in general. Even though the main aim in oral health services was prevention of dental diseases, in practice, oral health services were offered mostly for patients with acute need (toothache or dental decay). The reported reasons for this were lack of manpower resources for preventive work as well as lack of proper materials and equipment in dental offices 5.

Most oral health services were provided in polyclinics located near patient’s place of residence, school or work place. In the early 1990’s, the number of private dentists was low. The manpower in oral health care in Russia consisted of stomatologists, dentists and nurses. Stomatologists had the highest dental education in the Russian Federation, a five-year education as a medical doctor of stomatology. Stomatologists specialised in oral surgery, prosthetics, pedodontics and orthodontics. In Russia, most oral health care workers were dentists who had a lower education and were allowed to do basic dental procedures (e.g.

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5 Chief dental officer in Pitkäranta district, Svetlana Tsvetkova, personal communication in January 1993
examinations, fillings, extractions, periodontal treatment). In 1994, the dentist-
population ratio in Russia was one dentist per 2,273 inhabitants\(^6\). There was no
dental assistant education in the Russian Federation and the assisting nurses
usually had education as general nurse and on-the-job training.

In the early years of their independence, Estonia, Latvia and Lithuania
struggled with difficulties in oral health care that were similar to those in Russia.
In each Baltic country, there was a lack of dentists and dental assistants as well as
lack of proper dental equipment, instruments and materials (Lahtinen 1991,

In Russia, poor health status and health care system in the 1990’s called for
community-wide actions for health promotion. Experts around the world
recommended that, to promote health in Russia, disease prevention and health
education be built into the reformed health care system (Barr & Field 1996,
Tillinghast & Tchernjavskii 1996, Tulchinsky & Varavikova 1996, Wyon 1996,
(Article 41) provides a good basis for health promotion, because it emphasises
development of health care and promotion of health of the population by
developing physical culture and sport as well as ecology, sanitation and welfare\(^7\).

2.2 Health promotion

2.2.1 Definitions of health and health promotion

The World Health Organization, WHO recognises “enjoyment of the highest
attainable standard of health as one of the fundamental rights of every human
being without discrimination” (WHO 1946). However, health should not be the
objective but rather a resource for everyday life.

An understanding of the concept of health forms the basis for health
promotion. The concept of health has developed over time and the definition has
varied. Subjective health perceived by individuals brings an additional aspect to
the determination of health. In 1946 the WHO suggested perhaps the most often

Oral Health Manpower [cited 15 March 2008]. Available from:
http://whocollab.od.mah.se/euro/russian/russianmanpow.html

\(^{7}\) The Constitution of the Russian Federation [cited 15 March 2008]. Available from:
quoted definition of health: “a state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity” (WHO 1946, 1998a).

This definition of health by the WHO includes at least three aspects of health: positive and negative health, which may be seen as a continuum or as bipolar aspects of health, and functional health as the capability to cope in everyday life.

The traditional biomedical concept of health includes absence of illness, discomfort, disease, injury, handicap, disability or deformity. The biomedical concept is based on an ontological philosophy where disease is either absent or present, even though this discrimination between disease and health is sometimes shaky and ambiguous. The biomedical concept of health has also been called negative health because it is disease orientated. Therefore, the health promotion based on biomedical concept of health is concentrating on prevention of diseases and their risk factors, and is more focused on individuals than on populations, communities or environmental factors.

Although the concept of positive health has been used in some form since the 1940’s, there are still difficulties to define the term. Terms that have been connected with positive health include well-being, perfect health, above-normal health and superhealth (Locker & Gibson 2006). O’Donnell (1989) introduced the term “optimal health” as a balance between physical, emotional, social, spiritual and intellectual health. These descriptions of positive health have also been criticised as being impossible in real life where health balances between negative and positive states of health over time (Saracci 1997, Locker & Gibson 2006). Therefore, positive health may be seen more as a prospect which forms a basis for health promotion that emphasises environmental, social and economic determinants of health in communities and empowerment of communities and populations. There has also been much criticism against the adjective “complete” in the WHO definition according to which no one could be completely healthy.

The term “health promotion” was used already in the 1920’s (Winslow 1920), but use of the term became established in the 1980’s. Since then, health promotion has been defined in numerous ways. In 1986, the WHO defined health promotion as “the process of enabling people to increase control over, and to improve, their health” (WHO 1986). This definition included focus on positive health and was the starting point for other modified definitions of health promotion in the same spirit (Tones 1986, O’Donnell 1989, Ewless & Simnett 2003). In the 1990’s, some studies considered the positive health-oriented definition to be too narrow, and prevention of diseases was included in some definitions of health promotion (Whitehead & Tones 1990, Downie et al. 1996).
Some definitions of health promotion included operational aspects of health promotion. O’Donnell (1989) modified the five areas of actions outlined in the Ottawa Charter (WHO 1986, will be dealt with detail in Chapter 2.2.3) and highlighted lifestyle changes in health promotion through a combination of efforts to enhance awareness, change behaviour and create environments that support good health practices. Green & Kreuter (1990) stated that “health promotion is the combination of educational and environmental supports for actions and conditions of living conducive to health”. Baric (1991) followed the previous definition and stated that “health promotion is basically an activity in the health and social fields directed at manipulating the physical and social environment of the target population” by combining diverse, but contemporary, methods and approaches which aim at effective and concrete public participation.

All in all, the definitions of health promotion include similar elements: improvement of health, focus on the whole population, not only on individuals at risk, combinations of social, personal and environmental factors and the importance of individual lifestyles.

### 2.2.2 Origins of health promotion

In most industrialised countries, the time after the Second World War was a starting point for investing in health. Since then, most investments made in developing health services were assumed to lead to better health for people (Green & Kreuter 1990). In the 1970’s, it was noticed that health status of populations did not improve, even though access to health care improved. A new public health movement began around the world.

The WHO has been the leading organisation in raising health issues in international health forums. In 1977 the primary health care conferences were arranged on every continent before the global conference. In 1978, the WHO arranged an international conference on Primary Health Care in Alma-Ata, Soviet Union, and called “all governments, health and development workers, and the world community to protect and promote health of all people in the world”. The Declaration of Alma-Ata (WHO 1978) emphasised economic and social determinants as more important than medical care for the health of people. The Declaration also suggested that primary health care is the key to health for all. The following five principles of primary health care were crystallised in the conference: equity as creating equal opportunities for health and decreasing health differentials, increasing community involvement, focusing on prevention and
health promotion, using appropriate technology and implementing a multisectorial approach. All these principles are as important today as they were 30 years ago.

In 1979, the 32nd World Health Assembly introduced the Global Strategy for Health for All by the Year 2000, which was based on the Declaration of Alma-Ata. The WHO invited the member states to formulate national policies, strategies and plans of action for attaining these goals. Health for All by the year 2000 was adopted as the WHO policy by the 34th World Health Assembly in 1981 (WHO 1981). Health for All by the year 2000 set two universal targets: adding life to years and adding years to life. To achieve the goals, five principles and approaches were formulated: equity, empowerment, participation, emphasis on primary care and multidisciplinary interagency cooperation. Global and national goals were also set for different aspects of health. The global goals for oral health in childhood and adolescence by the year 2000 were that 50% of the 5- to 6-year-olds would be caries free (dmft=0), that the mean DMFT among 12-year-olds would be no more than 3, and that 85% of 18-year-olds would have full dentition (no teeth lost due to caries or periodontal disease) (FDI 1982, WHO 1991a).

The starting points for the health promotion in the WHO were the Declaration of Alma-Ata and the Health for All by the year 2000. In 1984, the WHO published a health promotion discussion document (WHO 1984) where the principles of primary health care and Health for All by the year 2000 were applied in health promotion. Two years later, the First International Conference on Health Promotion took place in Ottawa, Canada.

2.2.3 From the Ottawa Charter to the Bangkok Charter

The Ottawa Charter

The First International Conference on Health Promotion was a response to growing expectations for a new public health movement around the world (WHO 1986). Out of this conference came the Ottawa Charter for Health Promotion, a framework and a basic document for actions to achieve the goals of Health for All by the Year 2000. The five areas of actions for health promotion outlined in the Ottawa Charter were building of a healthy public policy, creating supportive environments, strengthening community actions, developing personal skills and reorienting health services (WHO 1986).
Governments and local decision-makers are responsible for their part for promoting well-being in communities. Building healthy public policy is a way for decision-makers— not only in health care but in all sectors of the society—to influence the environments in which people live and the way they behave. With laws and regulations a country may create a supportive environment and atmosphere for health promotion and remove barriers to good health. The most familiar examples of public policy actions in health promotion are related to smoking, alcohol and nutrition, where the government has guided individual behaviour through taxation and putting age limits on sale of some products which are risky for health. The government may influence health by allocating resources to structures and actions in the community that promote health.

Social and physical environment are closely related to the health and behaviour of people. The environment may affect behaviours in everyday life, work and leisure. Therefore health promotion interventions should include all sectors of the community.

Strengthening community actions and developing personal skills lead communities or individuals to control and take responsibility for their health. In communities this means setting priorities, making decisions, planning strategies and implementing these strategies in order to achieve better health with existing human and material resources. This involves strengthening social support as well as gaining full and continuous access to information and providing opportunities for learning about health. Information and education play important roles in developing personal skills and enhancing life skills. The members of the community may contribute significantly by bringing a layman’s view to the process of health promotion (Watt & Fuller 1997).

The fifth area of action for health promotion in the Ottawa Charter is reorienting health services towards health promotion. Even though health service is just one part that contributes to health promotion work, health care personnel play an essential role as experts in health issues and in providing correct health information for the public. This reorientation requires stronger attention to health research, changes in professional education and training, as well as change of attitude. Health professionals have a responsibility to advocate health, to create the essential conditions for health, to enable people to take control of their own health in order to achieve their fullest potential and to mediate between different interests in society in the pursuit of health (WHO 1986).

Advocacy for health implies a combination of individual and social actions designed to gain political commitment, policy support, social acceptance and
system support for a particular health goal or programme (WHO 1998b). Advocacy involves identifying the key decision-makers and influencing them. The local media play an important role in transmitting health information and are therefore a target for advocacy.

In the Health Promotion Glossary (WHO 1998a), enabling means “taking action in partnership with individuals or groups to empower them, through the mobilisation of human and material resources, to promote and protect their health”. Enabling requires transfer of responsibility for and control over health from health professionals to people. Health promotion attempts to strengthen people's health knowledge and the skills required to prevent diseases, and to enhance and protect healthy behaviour. This is achieved mainly through health education among individuals and in communities.

Health promotion should involve all sectors at all levels. This may, however, lead to conflicts between the different sectors and interests in a population. Mediation in health promotion is “a process through which the different interests (personal, social, economic) of individuals and communities, and different sectors (public and private) are reconciled in ways that promote and protect health” (WHO 1998a).

The five later international conferences on health promotion complement and build upon the values, principles and action strategies of health promotion established by the Ottawa Charter for Health Promotion.

**The Adelaide Recommendations**

The 2\textsuperscript{nd} International Conference on Health Promotion was arranged in Adelaide in 1988. This conference reaffirmed the commitment to a healthy public policy which, by creating a supportive environment, enables people to live healthy lives. The conference encouraged formation of new alliances for health promotion with partners such as corporations and businesses, trade unions, non-governmental organisations and community groups. At this conference four priority areas for healthy public policy were identified: improving the health of women, ensuring adequate amounts of healthy food and nutrition, taking immediate action on tobacco and alcohol, and creating supportive environments (WHO 1988).
Sundsvall Statement on supportive environments for health

The Third International Conference on Health Promotion was arranged in Sundsvall in 1991. This conference highlighted the link between health and the environment, which may be physical, social, economic or political (WHO 1991b). The conference recognised that everyone has a role to play in creating supportive environments. Again, advocacy, enabling and empowerment, building alliances and mediating were seen as essential actions for creating supportive environments for health.

The Declaration on leading health promotion into the 21st Century

Participants at the 4th International Conference on Health Promotion held in Jakarta in 1997 supported the Ottawa Charter approaches and areas of action. The conference participants prioritised five new forms of action for the 21st Century: promotion of social responsibility for health, increasing investments for health development, consolidation and expanse of partnerships for health, increasing community capacity and empowerment of the individual, and providing security of the infrastructure for health promotion (WHO 1997a).

Mexico City 2000

The Fifth Global Conference on Health Promotion was held in Mexico City in 2000. This conference had as its goal examination of the contribution made by health promotion strategies to improve the health and quality of life of people living in adverse circumstances. For the first time, the ministers of health from almost a hundred countries had their own programme; and during the conference, ministers of health or their representatives signed the Mexico Ministerial Statement for the Promotion of Health: From Ideas to Action. This was a clear sign of political commitment to health promotion (WHO 2000, Catford 2000).

The Bangkok Charter

The Sixth International Conference on Health Promotion was held in Bangkok in 2005. The Bangkok Charter identified the strategies and commitments required to address the determinants of health in a globalised world through health promotion (WHO 2005). The Charter stressed that the context for health promotion has
changed markedly since the development of the Ottawa Charter and that inequalities within and between countries have increased. Increasing globalisation has affected the patterns of consumption and communication, commercialisation, environmental degradation and urbanisation, which are some of the critical factors that influence health. However, globalisation may open up new opportunities for cooperation between governments to improve health and avoid transnational health risks.

2.2.4 Theories and models in health promotion

Theories and models systematically organise knowledge and explain the factors that influence a specific phenomenon. Several theories and models have been used in health promotion. Most of the theories come from the behavioural and social sciences but they also include aspects from psychology, business, management and marketing, among others. Even though the theories and models have been roughly divided to explain individual and community level changes, some of them have been applied at both levels. In health promotion, to achieve the goals of health promotion actions, it might be appropriate to combine different theories and models (Nutbeam & Harris 1998).

Many of the earliest theories have concentrated on changes in behaviour at the individual level. To explain and predict human behaviour in the 1970’s and 1980’s, numerous models were developed. In the first models, increasing knowledge was supposed to change the attitudes and behaviour of the target individuals or groups. Examples of these theories and models are the traditional knowledge-attitude-behaviour model (KAB), the health belief model (Rosenstock 1974), the theory of reasoned action (later the theory of planned behaviour) (Fishbein & Ajzen 1975, Ajzen 1985) and the social-cognitive theory (Bandura 1986). The transtheoretical model is a synthesis of previous theories and commonly used (Prochaska & DiClemente 1983). This model focuses on the discrete stages, the processes of change and the reasons why people move through these stages, typically relapsing and revisiting earlier stages before achieving success. Even though the above-mentioned theories and models have often been used, some critique about their effect on health behaviours has been expressed (Baranowski et al. 2003, Riemsma et al. 2003, Munro et al. 2007). Still, they may help us to understand the complexity of the determinants of the behaviour of an individual and contribute to the design of more effective interventions.
At the community level, theories concentrate on community organisation, development and action for health. Minkler (1997) defined community organisation as the "process through which communities are helped to identify common problems and goals, mobilise resources, and in other ways develop and implement strategies for reaching their goals they have collectively set". Among others, the terms “citizen” and “community participation”, “mobilisation” and “empowerment” have been used in connection with community organisation.

Of these theories at the community level, the diffusion of innovation theory attempts to explain the processes by which innovations are communicated and adopted in a community (Rogers 1983). A model for organisational change through four stages – awareness raising, adoption, implementation and institutionalisation - was introduced by Goodman et al. in 1997. They emphasised the importance of recognising all stages and designing and implementing relevant strategies to promote change at each stage. Organisational development theory (Porras & Hoffer 1986) and social learning theory (Bandura 1971) emphasised that supportive organisational and social conditions are important for behavioural changes and for adopting healthy lifestyles.

Social marketing theory (Manoff 1985) and the communication-behaviour change model (McGuire 1989) have been used to explain communication between the health promotion practitioner and the target of action. Social marketing theory is an application of commercial marketing techniques to those programmes that aim at changes in behaviour and improvement of welfare and health. Social marketing highlights voluntary behavioural change and consumer-oriented market research, segmentation and targeting of interventions. A recent systematic review found evidence that interventions which adopt social marketing principles can be effective in preventing youth from smoking and using alcohol and illicit drugs, at least in the short term (Stead et al. 2007). The systematic review confirmed the potential of social marketing interventions to change the behaviour of professionals, organisations and policymakers.

The communication-behaviour model was developed to design and guide mass communication campaigns designed to influence the attitudes and behaviour of the target group or community (McGuire 1989). The model included five communication inputs (source, message, channel, receiver and destination) and a 12-step sequence of output events from exposure to communication to long-term changes in behaviour.

In addition to the theories and models mentioned above, the following two models have been used as a framework for planning community-wide health
promotion interventions. One of the earliest models of health promotion activities was introduced by Tannahill (1985). This model includes seven domains in three overlapping spheres of activity: health education, disease prevention and health protection (Fig. 2). The seven domains in the model are preventive services (1), preventive health education (2), preventive health protection (3), health education for preventive health protection (4), positive health education (5), positive health protection (6) and health education aimed at positive health protection (7). The model demonstrates the wide range of possibilities for health promotion actions and includes both efforts to enhance positive health and to prevent diseases. However, this model has been criticised because health education and protection may include similar aspects and because the model is action-oriented.

![Fig. 2. A model of health promotion (by permission of Oxford University Press adopted from Downie et al. 1996).](image)

Perhaps the most frequently used model in planning and designing of health promotion programmes is the PRECEDE-PROCEED model, which was introduced by Green & Kreuter in 1991. The model is an outcome of about 15 to 20 years of development. The PRECEDE framework was outlined already in the 1970’s (Green 1974) and the PROCEED framework was added to the model in the 1980’s. The original model consisted of nine components that remained unchanged for many years. However, the model has been revised since its introduction. The latest model is presented in Figure 3.

The PRECEDE-PROCEED framework for planning is founded on the disciplines of epidemiology, the social, behavioural, and educational sciences and health administration. The goal of the PRECEDE-PROCEED model is to explain
multiple health-related behaviours and environments. In addition, the goal of the model is to design and evaluate the multidimensional or multisectorial, and participatory interventions needed to influence both the behaviours and the living conditions that influence health and health risks.

**PRECEDE**

*Fig. 3. The PRECEDE-PROCEED model for planning and evaluation of health promotion (by permission of McGraw & Hill adopted from Green & Kreuter 2005).*

It is recommended that the theories and models be used; they may ease the planning and evaluation of health promotion interventions, but they are still rarely used in community-wide interventions. Since the 1970’s, two or more theoretical frameworks were used in planning the first community-wide health promotion interventions, the Stanford Three-Community Study (Maccoby *et al.* 1977), the North Karelia Project in Finland (Puska *et al.* 1985), the Standford Five-City Project (Farquhar *et al.* 1990), the Pawtucket Heart Health Project (Lefebvre *et al.* 1987), the Minnesota Heart Health Programme (Luepker *et al.* 1994) and the
Community Intervention Trial for Smoking Cessation (COMMIT) (Lichtenstein et al. 1990–1991). The theories and models used in these interventions were usually the diffusion of innovation theory, the theory of reasoned action, community organising, communication-behaviour model, social marketing and social learning.

2.2.5 Ethics in health promotion

Health promotion always involves ethical aspects, whether they are considered consciously or not. The philosophical basis of health promotion is teleological utilitarian ethics, which means that the actions produce the greatest possible good for as many people as possible. But how to define the greatest possible good? Some have defined “the good” as a synonym for happiness, which in turn has been used as a synonym for health. However, when health is considered as a synonym for the greatest possible good, it conflicts with the basic idea of health promotion, where health is a resource, not an objective of everyday life (Miettinen 2005).

Health promotion practitioners should be aware of the values that underlie health promotion initiatives and identify possible ethical dilemmas that are included in their practice (Parker et al. 2007). Ethical dilemmas usually arise from conflicting values of individuals and health promotion practitioners, and may be involved in individual and community rights and responsibilities, autonomy and justice (Last 1998).

The WHO definition of health promotion as the process of enabling people to increase control over, and to improve, their health (WHO 1986) includes both the individual’s and the community’s responsibility for health. The definition stresses the terms “enabling” or “empowerment”, which in turn facilitates individual’s autonomous decision making. This can be reached, for example, by health education and by increasing people’s health literacy (Nutbeam 2000) in an environment where people are able to increase their control over health and make healthy choices (Callahan & Jennings 2002). The government might use incentives to promote good health but also to steer the behaviour of people by laws, regulations and taxation. But what are the appropriate limits of the government in regulating, restricting or prohibiting behaviours, without being guilty of paternalism, that lead to premature morbidity and mortality? Is it ethically justified to intervene in people’s lives and their choices and to bypass
their rights to autonomous decisions even though these decisions affect their health adversely?

Autonomy is one of the key principles in health promotion ethics. This concept includes aspects of self-determination, self-government, sense of responsibility and self-development (Downie et al. 1996). There are situations where the need to protect society has been recognised as higher than the rights of individual’s. An example of this might be restriction of communicable diseases by immunisation vaccinations.

Justice means social or distributive justice: fairness, equity and impartiality (Beauchamp & Childress 1994). When the utilitarian philosophy behind health promotion means producing the greatest possible good for as many people as possible, it also fulfils the preconditions of social and distributive justice. Still, there have been concerns that health promotion might even widen the gap between socioeconomic groups; not make it narrower as it is supposed to do (Last 1998, Sindall 2002).

### 2.3 Health promotion as a process

Major steps in health promotion actions are analysis of the needs in the community (community analysis), setting of goals and designing of strategies (planning phase), implementation and evaluation (Fig. 4). Each phase is important for the success of health promotion.
2.3.1 Community analysis

Successful implementation of a programme of health intervention requires prior information on and understanding of a community (Bracht 1988). Various terms have been used to describe this phase of the programme: community analysis, community health analysis, holistic analysis, community assessment, health assessment, community diagnosis and needs assessment (Haglund 1988, Dever 1991, Green & Kreuter 1991, Kemm & Close 1995, McKenzie & Smeltzer 2001). “Needs assessment”, which is the most commonly used term in connection with health promotion, means identifying the needs of the target population and determining whether these needs are being met. In this thesis, the concept “community analysis” will be used. Community analysis describes well the multi-
dimensional character of the information collection phase, where in addition to health needs, the other factors influencing health are considered.

Community analysis is a systematic way of collecting, analysing and identifying the health needs of a community, resources, capacities, opportunities, barriers, characteristic patterns of decision-making, leadership, power, and any other possible issues that may be involved in the successful initiation and development of community health programmes (Haglund 1988, Paronen & Oja 1998, Reese 1998). Community analysis is both a process and a product. It can be seen as the process that constitutes the basis for initiating community-wide health promotion (Haglund 1988). If it is necessary to stop the process temporarily to draw a community profile and develop programme plans, it is important to recognise that the process of collecting information should never end; and, whenever possible, new information should be integrated into programmes. The complex dynamics of community analysis is well described in the PRECEDE-PROCEED model (Green & Kreuter 2005) where the different elements of assessment are described in the first three phases of the health promotion process.

The product of community analysis is a community profile, combining quantitative health and illness statistics and demographic indicators with qualitative information (Haglund 1988). The results of this profile will be useful in making decisions about community readiness for health promotion actions, the actors who should be involved in intervention planning, the best model for organising the intervention, particular opportunities, resources, and circumstances that will foster effective intervention strategies tailored to the social, cultural, and political characteristics of the community.

The first step in analysing the community is to define the community. The community may be defined as a domain that is characterised by a sense of membership or belonging, common systems of symbols, shared values and norms, mutual influence, shared needs and commitment to meeting them or shared emotional connection, such as common history or experience (Israel et al. 1994). A community may have geographical boundaries, but not necessarily.

Community analysis involves gathering information about the community using various collection techniques. Examples of commonly used methods are the use of existing information and statistics, key informant interviews, focus groups, public meetings, surveys and observations. To collect the information needed, it is common to use more than one method. Selection of a method for community analysis is unique for each programme and depends on local needs, resources and
the targets of the programme. The only limitations to the selection of method for community analysis are creativity, funds, and legislative mandates.

To help construct community analysis, a great deal of information about the community is already available. The advantages of using existing information are that it is already collected and costs little or nothing to access and to use. Sources of demographic information come mainly from the state demographers who monitor population trends. Demographic data should show who lives in the community, what is the total population and how it breaks down into the categories of gender, age, level of education, income, and family and household composition. Information about health issues may be available from the state health department. Most health departments prepare basic vital statistics about the community they serve.

It is important for public health planners to identify those institutions, organisations and leaders, in other words those key informants, who need to be involved in a community-wide intervention to improve its chances for success. Key informants may include persons in positions of authority in government, business, non-profit organisations, health care, etc. Key informants have knowledge and experience with the community on many different issues and are excellent sources of information about how the community makes decisions, who are the people in authority and what are the major needs of the community.

A key informant survey is most useful for community analysis in situations where it is necessary to obtain qualitative information about the community. One opportunity for key informant interviews is to build acceptance and communication with important community leaders. Key informant interviews are a relatively simple method of data collection for community analysis. The advantages of such interviews are that they are relatively low in cost and flexible in format. Key informants can be interviewed in person, by phone or by using posted questionnaires.

Another way to obtain information from community residents is public meetings and forums. The goal of public health meetings is to raise community awareness and knowledge about specific problems and their solutions, to stimulate community participation and collaboration in confronting a public health problem and to provide planners with information about community perceptions, attitudes and knowledge. If properly promoted and organised, public meetings can be a way to meet these goals relatively cost-effectively. However, more than one meeting is probably required.
Surveys of the general public or specific target groups can be very helpful in making accurate assessments of community needs, perceptions, behaviour, and knowledge. However, expertise about representative sampling, question formulation, and analysis of the resulting data is needed for the surveys. Surveys allow standardised information to be gathered from a large number of people, which may then be generalised to the whole community or target group surveyed if proper sampling and analysis methods are followed. To observe change, surveys can be repeated.

Observations are necessary for gaining direct information about the community. Depending on the programme, field observations may include types of geographic features, such as climate and weather, and visits to places where the target group spends a major part of their day. It is important to maintain a record of what is observed on these visits. Photographs are a valuable resource that can be reviewed and shared with the others if necessary. During the visits copies of local newspapers and information about informal means of communication used in the community should be collected.

Community analysis is a time- and resource-consuming phase in health promotion, and health promoters and communities may skim over it and move into action too soon. When a community analysis has been done properly, however, it serves all the later phases of the programme. Once the community assessment is complete, planning and implementation of the programme can begin. At the same time, it is essential to mobilise the community, the community leaders in different sectors as well as health education and preventive services to support the programme.

2.3.2 Setting of goals and objectives, and designing of strategies

A planning phase follows the community analysis and this forms a solid foundation that guides the implementation and evaluation of the intervention. First, the data gathered during the community analysis are investigated, and the issues or health problems that the intervention will address are identified and prioritised. Using this information, the goals and objectives are set. The goals and objectives are not the same, even though they are used for similar purposes. Goals are more general and usually take longer to achieve than objectives. Goals are often expressed as improvement in health or health-related quality of life, or a decrease in incidence of disease. Objectives are smaller steps than goals, changes in the target population at a given point in time as a result of exposure to the
programme. Objectives should be measurable and include the following elements: outcome, condition under which the outcome will be observed, criteria for success in achieving the outcome and reaching the target population (McKenzie & Smeltzer 2001).

After the goals and objectives are set, the design of strategies begins. Identification of any possibilities for and threats to the intervention and assessment of available resources are part of the design of the strategies. Health-promotion strategies include a whole range of possibilities - from an individually focused brief intervention to development of a national health promoting policy. All strategies are potentially useful, but combinations of strategies are likely to produce the best results.

Rose (1985) introduced two types of preventive strategies: high-risk and population strategy. In the high-risk strategy, an attempt is made to identify potential high-risk individuals and to offer them individual protection against a disease. In the high-risk strategy, intervention might be appropriate for an individual who probably has a favourable attitude towards intervention. In turn, this might increase the motivation of physicians or health promotion practitioners. In the high-risk strategy limited resources might be used cost-effectively, which produces a more favourable ratio of benefits to risks to high-risk individuals than population strategy does. On the other hand, Rose presented quite a few disadvantages of the high-risk strategy (Rose 1985). Disadvantages included the difficulties and costs of screening. The high-risk strategy does not attempt to seek the underlying determinants of disease but to identify individuals who are susceptible to those determinants. Because there will always be such susceptibles in every generation, a high-risk approach should be sustained year after year and generation after generation. Therefore this strategy is only palliative and temporary.

Individual approaches to preventing oral disease and to promoting oral health have fascinated oral health researchers. In the prevention of dental decay, the high-risk strategy has prevailed even though it involves several shortages. First of all, identification of susceptible high-risk individuals, who are likely to develop many caries lesions is difficult; and the predictive validity of the many tests which have been proposed, remains low (Disney et al. 1992, Hausen 1997, Powell 1998, Hausen 2003). Secondly, targeting actions to high-risk individuals has not been very effective in prevention of caries lesions (Seppä et al. 1991, Hausen et al. 2000, Batchelor & Sheiham 2002, Watt 2005).
The population strategy focuses on determinants of health in the population as a whole (Rose 1985). Rose pointed out that small health gains for the whole population are often likely to be more efficient than larger gains in high-risk individuals. The population strategy is behaviourally appropriate, but this strategy also has disadvantages. It offers small benefits for each individual, which in turn may bring along with it poor motivation of subjects, physicians and health-promotion practitioners.

A few oral health promotion interventions have used the population strategy for prevention of caries lesions among children and adolescents. In many of these studies, the target of health promotion intervention has been pre-school children or their parents. In England, a national programme of oral health promotion was aimed at altering the underlying determinants of oral health among pre-school children (Watt et al. 2001b). A key focus of the programme was to create an environment that promotes oral health and to make the approach multidisciplinary. Child carers, parents of pre-school children and other relevant individuals and organisations were consulted and actively involved throughout development and implementation of the intervention. Special emphasis was given to healthy diet and to risk factors that were common for dental decay and other diseases. The programme was launched in 1999, but so far the outcomes of the programme have not been evaluated or published.

Another population-wide programme of oral health promotion was carried out in Canada among an urban population of Vietnamese pre-school children (Harrison & Wong 2003). Also in this programme, the target population was involved already in the planning phase. The focus of the programme was one-on-one counselling supported by community-wide initiatives. Community-wide initiatives included videos and articles in Vietnamese, and children’s dental health booths at local festivals and health education brochures for nurses. Seven years after implementation of the programme, mothers who had more than one counselling visit reported significantly less use of sleeping time and daytime bottles for their children and their children had significantly fewer caries lesions than other children of the same age at baseline.

In Glasgow, Scotland, a community-wide programme of oral health promotion was launched in 1996 (Blair et al. 2004, 2006). The programme focused on the early lifestyle determinants of dental decay and aimed at improving dental health and reducing inequalities in children less than five years of age in two socio-economically deprived communities. Multidisciplinary collaborative networks were used in the programme, and several joint
interventions were planned and implemented with parents, kindergarten teachers, primary school staff, local authorities, care workers, administrators, pharmacists, dental and dietetic practitioners, and volunteers and media organisations. Four and eight years after implementation, improvements in occurrence of caries (lower mean dmft and larger proportion of children with dmft=0) were observed.

A different kind of population-wide project was carried out in Nepal between 1997 and 2002 (Yee et al. 2003). The aim of the project was to increase the availability and consumption of affordable, fluoridated toothpaste by a process of advocacy. Methods used for advocacy included the development of information kits, e-mail and letter writing, personal meetings with dentists and managers of local toothpaste manufacturing companies and presentations to large groups. In five years, the project succeeded in increasing knowledge of fluoridated toothpaste, which led to the manufacture of affordable, fluoridated toothpaste in Nepal. In addition, between 1997 and 2002 the market share of fluoridated toothpaste increased from almost 0% to 90%.

Due to the limited potential of an individual high-risk strategy for prevention of oral diseases, Sheiham (1992) proposed a broader Common Risk Factor Approach. The basis of this strategy is that many major chronic diseases have common risk factors such as diet, smoking and excessive alcohol consumption; therefore oral health promotion should be part of broader health promotion involving multi-disciplinary efforts (Sheiham 1992, Sheiham & Joffe 1992, Sheiham & Watt 2000). In addition, poor health behaviours seem to cluster around the same individuals (Rajala et al. 1980, Raitakari et al. 1995, Burke et al. 1997, Ma et al. 2000, Sanders et al. 2005). The potential benefits of the Common Risk Factor Approach are far greater than those of isolated interventions, both in terms of effectiveness and use of limited resources (Sheiham & Watt 2000). This strategy includes considerations of the socio-environmental determinants of health and a wide range of health promotion strategies such as health education, policy development, community action, and legislation.

To reach all segments of a community, programmes should employ a combination of both high-risk and population-wide strategies (Fejerskov 1995, Burt 1998). Such a mixed approach emphasises intensive interventions aimed at high-risk individuals as well as the messages and actions reaching across an entire community and attempts to change social norms, and policy-level efforts that help modify the social and political environments. This approach reminds us of the five areas of actions for health promotion suggested in the Ottawa Charter (WHO
1986), which also may serve as a strategy for achieving the goals and objectives of a health promotion intervention.

Schools provide an ideal setting for promoting oral health and for using different strategies. Over one billion children spend an important period from childhood to adolescence at school, which is the most influential time in their lives. The WHO Global School Initiative was launched in 1995 and aims to foster health-promoting schools (HPS) that strengthen their capacity as a healthy setting for living, learning and working (WHO 1998c). Health-promoting schools include a healthy school environment, school health education, school health services, nutrition and food services, physical exercise and leisure activities, ensure mental health and well-being, health promotion for school staff, and community relationships and collaboration (WHO 2003b, Kwan et al. 2005). Even though many oral health interventions that measure the effectiveness of a single method in prevention of dental decay among the schoolchildren have been launched, there are only a few examples of school-based programmes with a wider perspective on oral health promotion.

In Wuhan City, China, a school-based programme in the spirit of health-promoting schools (HPS) was carried out in 1998–2001 (Petersen et al. 2004). The programme of oral health education was aimed at a healthy environment and involvement of schoolteachers, who were engaged in the programme during yearly workshops. Mothers were encouraged to be present during oral hygiene instruction at schools. Monthly sessions of oral health education were part of the school curriculum and were arranged, on average, 30 times during the 3-year follow-up. The programme had positive effects on gingival bleeding and the oral health behaviour of children as well as on the oral health knowledge and attitudes of mothers and teachers. However, the programme had no positive effect on occurrence of caries.

In Finland, a mixed population and high-risk strategy were used in Pori among 11- to 12-year-old schoolchildren (Hausen et al. 2007). All children were exposed to community-level oral health promotion that was targeted to schoolchildren, their parents and teachers, and other people involved in the children’s everyday life. Community-level intervention included community analyses and school campaigns carried out by the children themselves. In addition, community-level oral health promotion involved cooperation with the members of the different communities at fairs, hobbies and sports and through the mass media. Those children who had at least one active initial caries lesion were invited to participate in a randomised controlled trial that investigated whether
DMFS increment can be decreased by oral hygiene and dietary counselling and by using non-invasive clinical measures of caries control. After 3.4 years, the results showed that by using the above-mentioned regimen, caries increment can be significantly reduced among caries-active children living in an area where the level of caries experience was low.

2.3.3 Implementation

After the goals and objectives are set and the strategies are designed, the programme must be implemented. Implementation includes all activities that are required to carry out an intervention, including funding of the activities. This includes monitoring of the progress of an intervention and dealing with problems that might arise during implementation. It is also important to document the intensity, progression and maintenance of the intervention for later evaluation of the process.

2.3.4 Evaluation

Evaluation is the systematic collection, analysis and interpretation of information on intervention. Evaluation can be used to assess how successful an intervention was in achieving the goals and objectives, and how this was achieved and what was the cost-effectiveness of the intervention. Therefore, a prerequisite for evaluation is the development of a programme plan with measurable processes, goals and objectives that are logically related to one another.

Effect evaluation, sometimes used as a synonym for summative evaluation, includes the assessment of goals (outcomes) and objectives (impacts) of the intervention. In health interventions, the outcomes are assessed as, for example, the changes in prevalence and/or incidence of diseases and the impacts are assessed as the changes in knowledge, attitudes, behaviour, or availability of services.

Nutbeam (1998) suggested a four-staged model for evaluation of the outcomes of health promotion. At the bottom stage of Nutbeam’s model are health promotion actions such as education, facilitation and advocacy that are the immediate outcomes of health promotion. At the next stage health promotion outcomes refer to those personal, social and environmental factors that are meant to improve people’s control over the determinants of health. These factors include health literacy, social influences on action and healthy public policy and
organisational practice. Furthermore, health promotion outcomes lead to changes in the intermediate health outcomes, which represent the determinants of health and the social outcomes, such as healthy lifestyles, environments and effective health services. At the top stage of the model are the health and social outcomes, such as quality of life, functional independence, equity, disease experience, and physical and mental health status.

Several experimental designs may be used in evaluation of the effects of health interventions. Rossi et al. (1999) classified the research designs for the impact assessment applicable in the partial- and full-coverage programmes. From the partial-coverage programmes, the randomised controlled trial is today assessed as a design that offers the least biased information on the effectiveness of the intervention in a certain study population during a certain period. This design has been widely used in clinical trials. In broad programmes of health promotion, however, the applicability of the randomised controlled trials may be limited because they include multiple interventions (Nutbeam 1998, Watt et al. 2001a, Petersen & Kwan 2004), sampling at community level is difficult, controlling is difficult and carrying out a wide randomised controlled trial increases the costs of the programme (Sanson-Fischer et al. 1996). In the broad programmes of health promotion, it is sometimes possible to use a quasi-experimental design, also called comparison trials, where two groups are compared: one receives the intervention and the other does not. The quasi-experimental design has been promoted as the best approach to evaluation of community-wide programmes (Nutbeam 1998). These designs include possible biases in evaluation of the effects because two groups may differ from each other, and confounding factors may influence the outcomes and the impacts. Both randomised controlled trials and quasi-experimental designs may involve ethical difficulties because health promotion intervention is denied to the control group(s).

For full-coverage programmes, Rossi et al. (1999) suggested simpler study designs: simple before-and-after, cross-sectional, panel and time-series studies. However, these study designs give only crude estimates of the effectiveness of the intervention, and causal interpretations can only be made very cautiously.

Process evaluation, also called formative evaluation, includes investigations of how the programme was implemented, what activities occurred under what conditions and by whom (Nutbeam 1998). In addition, it is important to investigate how the programme reached the target population, how it was accepted and whether the programme was implemented as planned. The process can be evaluated during and/or after implementation.
3 Starting point for the collaboration in oral health promotion in Pitkäranta district of Russian Karelia

In the beginning of the 1990’s, the state of health of population in Russia was poor. Among the Russian children and adolescents the occurrence of the most common oral diseases, dental decay and periodontal diseases, was also high. On the other hand, the quality and efficiency of oral health care services were low. To cope with the difficult situation, several joint ventures were started with foreign organisations. In 1993, local authorities from the Pitkäranta district, Republic of Karelia, Russia, together with kindergarten, school and health care personnel, launched a programme of oral health promotion in the area. In the Pitkäranta district stomatologist Svetlana Tsvetkova, MPH, participated in clinical examinations, planning and monitoring the programme of oral health promotion. Chief Medical Officer Mihail Uhanov was responsible for the local management of the programme.

The Russian authorities carried out the programme in collaboration with the Department of Community Dentistry at the University of Kuopio (in 1993-1998) and at the University of Oulu (1998-2001). The programme team in Finland was: Professor Hannu Hausen (the leader of the programme), docent Viljo Nyyssönen (consultation and contacts in Russian), Sakari Kärkkäinen, DDS, PhD (calibration training of the clinical examiners) and Anne Hiiri, DDS (clinical examinations, researcher and general management of the activities).

The programme of oral health promotion started with a comprehensive baseline analysis in the Pitkäranta district (Fig. 5). The results of this analysis were used to identify and to prioritise the major needs for oral health promotion in the area, as well as to identify the potentials for and barriers to the programme. Then, the goals of the programme were set and the strategies and methods were planned. Implementation of the programme began in 1994. The oral health situation was analysed again in 2001. The results of the follow-up analysis were used to monitor changes that had occurred between 1993 and 2001 and to evaluate the strengths and weaknesses of the programme. Each phase of this programme of oral health promotion will be described in detail in the following chapters.
3.1 Aim of the study

The aim of this study was to describe the planning, implementation and evaluation of a community-wide programme of oral health promotion that begun in 1993 in the Pitkäranta district of Russian Karelia.

3.2 Description of the study areas

3.2.1 The Pitkäranta district of Russian Karelia

The Republic of Karelia is an autonomous area in north-western Russia. In 1993, about 40% of its 800,000 inhabitants lived in the capital of the republic, the city of Petrozavodsk (State Committee for Statistics, Republic of Karelia 1994). The population consisted of different nationalities: 74% of the population were
Russian, 10% Karelian, 7% Byelorussian, 4% Ukrainian, 2% Finnish and 3% other nationalities (Kellera 1990).

The target area for the study was the Pitkäranta district (Fig. 6), located on the north-eastern coast of Lake Ladoga. The Pitkäranta district is one of the 17 territories of the republic, having a population of 27,000 inhabitants in 1993 (Varis 1993). In that year, the number of children aged 0 to 15 years was about 6,600, two-thirds of whom lived in or near the town of Pitkäranta (Kellera 1990).

### 3.2.2 Kuopio and Jyväskylä, the Finnish reference areas

The pooled data collected from two Finnish towns, Kuopio and Jyväskylä, were used as a point of reference for assessment of the situation in the Pitkäranta district. Kuopio is located in eastern Finland and Jyväskylä in central Finland (Fig. 6). In 1992, both Kuopio and Jyväskylä had about 80,000–85,000 inhabitants. Kuopio had fluoridated piped water (1.0 ppm) between 1959 and 1992. Since 1993, in both Kuopio and Jyväskylä the fluoride level has been 0.1 ppm (Seppä et al. 2000).
Fig. 6. Location of the target area, the Pitkäranta district in Russian Karelia and the Finnish reference areas, Kuopio and Jyväskylä.
4 Baseline community analysis in 1993

Because the availability of information on oral health and its determinants in Russian Karelia was limited, in 1993 a data set was collected to survey the situation and the needs in the Pitkäranta district. Different quantitative and qualitative methods were used to obtain a holistic profile of the community and the target population (Fig. 7).

![Diagram of Baseline Community Analysis in 1993]

**Fig. 7. Information collected for the baseline community analysis in the Pitkäranta district in 1993.**

4.1 Material

For the clinical examinations and questionnaire surveys, representative area-stratified samples of the 6-, 9-, 12- and 15-year-olds in the Pitkäranta district were selected. About 150 children were selected for each age group. The samples of children were drawn from the list of names gathered at schools, kindergartens and child health clinics. Since the number of children in rural areas was lower than that in the town, all rural children at the above-mentioned ages were selected for
the study. In the town, a systematic sampling method was used to select an equal number of children for the examinations. The overall rate of participation among children in the Pitkäranta district was 95% (n=587). The distribution of the subjects by age, gender and living area is shown in Table 4.

In the Finnish reference areas, independent random samples of 6-, 9-, 12- and 15-year-old children were selected from the population register. The sample sizes in 1992 were 200 children in each age group. The overall rate of participation was 69% (n=555) (Table 4).

Table 4. Distribution of subjects by age, gender and living area in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.

<table>
<thead>
<tr>
<th></th>
<th>Pitkäranta district</th>
<th>Finnish reference areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age (years)</td>
<td>Age (years)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>n=129</td>
<td>n=154</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girl</td>
<td>64</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>(50%)</td>
<td>(47%)</td>
</tr>
<tr>
<td>Boy</td>
<td>65</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>(50%)</td>
<td>(53%)</td>
</tr>
<tr>
<td>Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>52</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>(40%)</td>
<td>(36%)</td>
</tr>
<tr>
<td>Rural</td>
<td>77</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>(60%)</td>
<td>(64%)</td>
</tr>
</tbody>
</table>

4.2 Methods

The baseline community analysis included clinical dental examinations and questionnaire surveys for children. These were done in the same way as in 1992 in the Finnish reference areas, Kuopio and Jyväskylä (Seppä et al. 1998). In addition, questionnaire surveys for key authorities, interviews of stomatologists and dentists, observations at local shops, kiosks, schools and dental clinics, and determinations of fluoride levels in drinking water were carried out in the Pitkäranta district. Previous information on oral health and its determinants among the children in the Republic of Karelia was sought in the literature, from local statistics and from patient records in the Pitkäranta district.
4.2.1 Clinical examinations

The clinical examinations were carried out in Pitkäranta district between October and November 1993. In the Finnish areas, the examinations had been carried out in spring 1992. In the Pitkäranta district, two calibrated dentists (Anne Hiiri and Svetlana Tsvetkova) conducted all clinical examinations. In the Finnish reference areas, the dentists were not the same as in the Pitkäranta district, but they were trained by the same person (Sakari Kärkkäinen) and calibrated as in the Pitkäranta district.

The oral examination was done using a mirror, a probe and a periodontal probe. Before the examinations, teeth were blow dried. In the Pitkäranta district, the examinations were carried out at schools and kindergartens using a portable desk which ensured that the conditions for the examinations were consistent. This was necessary because the equipment of the local dental units in the area varied considerably. In the Finnish reference areas, the examinations were carried out in local dental offices. All examinations were recorded directly onto computer disks by a research assistant sitting next to the examiner.

Gingival status

Values for the modified CPITN-index (Ainamo et al. 1982) were registered for each child so that every component of the index could be analysed separately. The clinical examination started with registration of visible plaque. After gentle air blowing of teeth, the visible plaque and calculus were registered with either a score of 0 (no visible plaque or calculus) or 1 (visible plaque or calculus on some surface) from six index teeth (16, 11, 26, 36, 31 and 46, WHO 1997b). If the index tooth was not present, the corresponding primary tooth or adjacent primary or permanent tooth was examined. Each tooth was examined at six points: mesiobuccal, mid-buccal, disto-buccal, and the corresponding lingual sites. A ball-tipped periodontal probe was used to determine subgingival calculus and depth of gingival pockets. Gingival pockets that were over 4 mm deep were recorded among 15-year-olds.

Caries status

After determination of gingival status, the teeth were cleaned with cotton rolls, if needed, and examined with the visual-tactile method. All examinations began
from the last right upper molar and ended with the last right lower molar. The surfaces were examined in the following order: occlusal, mesial, buccal, distal and lingual surface.

First, the premolars and incisors were registered as primary or permanent teeth. Then, from every surface on every tooth, the presence of dental decay, fillings and pit and fissure sealants was registered. Caries lesions were registered according to a modification of the criteria of Möller and Poulsen (1973). The mean and median dmfs/DMFS were used to describe the occurrence of caries. Tooth surfaces with caries lesions reaching the dentin, tooth surfaces having a filling and (five surfaces of) teeth extracted for dental decay were counted into the dmfs/DMFS.

To assess inter-examiner and intra-examiner consistency for presence or absence of dmfs/DMFS, kappa values were calculated (Cohen 1960) and are presented in Table 5.

Table 5. Inter- and intra-examiner Cohen’s kappa values for presence or absence of dmfs/DMFS (n) in 1993.

<table>
<thead>
<tr>
<th>Consistency assessment</th>
<th>Pitkäranta district 1993</th>
<th>Finnish reference areas 1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-examiner 1</td>
<td>0.95 (18)</td>
<td>0.88 (25)</td>
</tr>
<tr>
<td>Intra-examiner 2</td>
<td>0.89 (20)</td>
<td>0.89 (19)</td>
</tr>
<tr>
<td>Inter-examiner</td>
<td>0.87 (47)</td>
<td>0.94 (29)</td>
</tr>
</tbody>
</table>

Mutans streptococci in saliva

Counts of salivary mutans streptococci in 12-year-olds were determined using the Dentocult® SM-STRIP MUTANS test strip (Orion Diagnostica). About two-thirds of the strip was inserted into the subject's mouth and rotated about ten times on the surface of the tongue. The strip was then removed from the mouth through slightly closed lips to remove excess saliva and placed into a culture vial containing bacitracin-broth; the culture was placed in an incubator at 37°C for three days. The results were scored into one of four classes according to the instructions of the manufacturer: 0 (no growth), 1 (less than 100,000 bacteria per millilitre of saliva), 2 (from 100,000 to 1,000,000 bacteria per millilitre of saliva) and 3 (over 1,000,000 bacteria per millilitre of saliva).
4.2.2 Questionnaire surveys

Personal, social and behavioural determinants of oral health among children

The age and gender of each subject were recorded during the clinical examinations, and the social and behavioural determinants of oral health were determined with questionnaires (Appendix 2). The questionnaires were pilot tested before the baseline surveys. Children or their parents filled in the questionnaires before the clinical examination. Social determinants of oral health were surveyed with questions about parents’ education, family income during one year preceding the study, the total number of family members and housing conditions.

Investigation of the behavioural determinants of oral health included questions about frequency of toothbrushing and frequency of using fluoridated toothpaste. Eating habits were surveyed with questions about eating a free warm lunch at school and frequency of consuming sugary snacks between meals. The subjects also responded to questions asking when they had last visited a dentist, reason for the visit and number of dental visits during the year preceding the survey.

Every 12- and 15-year-old child also responded to a questionnaire asking their experiences of smoking and their current smoking patterns (Appendix 3). Smoking habits were surveyed with questions about whether they had ever tried tobacco products, their age at the first trial, number of cigarettes smoked until now, number of cigarettes smoked last week, time since smoking the most recent cigarette, frequency of smoking and use of snuff.

Views of key local authorities and informants in the Pitkäranta district

Questionnaires were also given to local decision-makers, kindergarten, school and oral health care personnel in the Pitkäranta district. All of these questionnaires contained questions about how the key local authorities valued oral health compared with some other health factors, opinions about their own possibilities to prevent oral diseases, views about the oral health status of the children and about the quality of oral health services, oral health education and preventive activities in the district. They were also asked whom they considered to have primary
responsibility for promoting children’s oral health in the area. The response alternatives included parents, teachers, oral health care personnel and some others. All key authorities also were asked specific questions concerning their own profession. Decision-makers answered questions about possibilities to influence oral health in the area, economic aspects and administrative factors related to oral health care in the Pitkäranta district. Teachers and kindergarten personnel reported whether they had had any oral health education campaigns at schools or kindergartens. Oral health care personnel reported the numbers of different preventive procedures carried out in the dental offices during one week and how many of their child patients had received oral health education and preventive procedures. Oral health personnel also received questions concerning their views on the ideal way to organise oral health services, number and age of patients and treatment procedures performed at dental clinics.

4.2.3 Observations at shops, schools and dental clinics

Community analysis included observations of local shops and kiosks, schools and dental offices in the Pitkäranta district. In the shops and kiosks, the availability of toothbrushes, fluoridated toothpastes and other oral hygiene materials were surveyed. At schools the contents of lunches and afternoon snacks and possibilities to buy sweets near the school were noted. In the dental offices (n=14), the premises, instruments, equipment and materials used were listed. The numbers of patients treated and the different treatment procedures during a three-day period were also recorded.

4.2.4 Interviews of stomatologists and dentists

A Russian stomatologist interviewed all stomatologists and dentists (n=14) in the Pitkäranta district. The interview followed a structured form, but the subjects could also add their comments freely during the interview; the discussion was recorded on a form. Stomatologists and dentists were interviewed about their education, need for continuing education and about their patients and the treatment procedures carried out at dental clinics. The interviews were translated into Finnish.
4.2.5 Determination of fluoride content in drinking water and in toothpastes

For analysis of fluoride concentration, 30 water samples were gathered from the different drinking water sources around the Pitkäranta district in 1993. Samples were analysed in the laboratory of the University of Kuopio according to the methods of Singer & Armstrong (1965).

During the observations in local shops and stands, samples of all toothpastes were bought and their fluoride content was analysed in the laboratory of the University of Kuopio.

4.3 Statistical methods

The age- and gender-specific results in the Pitkäranta district and in the Finnish reference areas are presented as frequencies, percentages, means and medians. Ninety-five percent confidence intervals (CI) were calculated for the means and for the differences between baseline and follow-up results. Chi-square tests were used for testing the differences between genders, ages and countries. P-values lower than 0.05 were considered statistically significant.

Percentage distributions of children according to dmfs/DMFS were presented graphically. Differences in median dmfs/DMFS were tested with the Mann Whitney U tests. The polarisation of dmfs/DMFS was illustrated by Lorenz curves (Lorenz 1905). Here, a Lorenz curve is a graph where the cumulative percentage of children on the x-axis is plotted against a cumulative percentage of dmfs/DMFS in descending order on the y-axis. If the curve is close to or coincides with the diagonal from the left lower corner to the right upper corner, the dmfs/DMFS is evenly distributed in the population. The farther away from the diagonal the curve is, the more polarised is dmfs/DMFS.

4.4 Ethical issues

The study protocols were approved by the Ethics Committee of the University of Kuopio before the baseline surveys and by the Ethics Committee of the University Hospital of Oulu before the follow-up surveys. In addition, the local authorities of the Pitkäranta district approved the programme, and free and informed consent was obtained from the guardians of the children.
4.5 Results

4.5.1 Oral health

Occurrence of dental caries

In the Pitkäranta district, there were no statistically significant differences between girls and boys in the means and medians of dmfs/DMFS, and therefore the pooled distributions are presented for each age group. The dmfs was quite evenly distributed among 6-year-olds, while among the older children the distribution of subjects according to the dmfs/DMFS was skewed to the right (Fig. 8). On average, 6% of the children in the Pitkäranta district had dmfs/DMFS=0. The percentage was highest among 9-year-olds, of whom 30% had DMFS=0; the percentage was lowest among 6-year-olds of whom 3% had dmfs=0. Twelve percent of the 12-year-olds and 9% of the 15-year-olds had DMFS=0. In these age groups there were no statistically significant differences between girls and boys.

In the Pitkäranta district the percentage of ds/DS of the total dmfs/DMFS was high: 79% among 6-year-olds, 61% among 9-year-olds, 70% among 12-year-olds and 59% among 15-year-olds.

In Finland, the occurrence of caries was much lower than in the Pitkäranta district. The percentage of children having dmfs/DMFS=0 was 58% among 6-year-olds, 66% among 9-year-olds and 43% among 12-year-olds. In these age groups there were no statistically significant differences between girls and boys. Among 15-year-olds, 10% of the girls and 29% of the boys had DMFS=0 (p=0.01). In permanent dentition the percentage of ds/DS of the total dmfs/DMFS varied between 8% and 12%. In the primary dentition, among the 6-year-olds the corresponding percentage was 42%.
Fig. 8. Percentages of 6-, 9-, 12- and 15-year-olds according to dmfs/DMFS in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.

The Lorenz curves are shown in Figure 9. In the Pitkäranta district, the dmfs/DMFS was not as strongly polarised as in the Finnish reference areas. The 20% of the Russian children who had the highest scores accounted for 42–59% of all dmfs/DMFS. For the Finnish reference areas, the figures show strong polarisation of the dmfs/DMFS: 20% of the children with the highest dmfs/DMFS accounted for 56–82% of all dmfs/DMFS.
Gingival health

Both the Russian and the Finnish children had a considerable amount of visible plaque on the six index teeth (Figs. 10–11). The girls had less plaque on each index tooth than boys had, but among 9-year-olds was the difference statistically significant only for index tooth 26 (p=0.008) and among 12- and 15-year-olds for
index teeth 11 (p=0.003 and 0.000), 41 (p=0.006 and 0.017) and 46 (p=0.03 and 0.026).

Fig. 10. Percentages of 6-, 9-, 12- and 15-year-old girls having visible plaque on the six index teeth in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.

* p<0.05, ** p<0.01 and *** p<0.001 for the difference between Pitkäranta and Finnish reference areas

Fig. 10. Percentages of 6-, 9-, 12- and 15-year-old girls having visible plaque on the six index teeth in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.
In both countries, pre-school children had very little calculus. Among schoolchildren, the Finnish children had more calculus on at least one index tooth than the Russian children did. In the Pitkäranta district the percentage of those having calculus on at least one index tooth varied from 3% among 9-year-old girls to 35% among 15-year-old boys. In Finland, the corresponding percentage varied from 27% among 9-year-old girls to 55% among 15-year-old girls. The difference for children in the Pitkäranta district and in the Finnish reference areas was

* p<0.05 and ** p<0.01 for the difference between Pitkäranta and Finnish reference areas

Fig. 11. Percentages of 6-, 9-, 12- and 15-year-old boys having visible plaque on the six index teeth in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.
statistically significant among 9- and 15-year-old girls (p<0.001) and among 9-year-old boys (p<0.001). Calculus was found most often on the upper molars. None of the 15-year-olds had over 4 mm deep gingival pockets in either the Pitkäranta district or the Finnish reference areas.

*Mutans streptococci*

Scores for salivary mutans streptococci were surveyed among 12-year-olds in both countries. In neither the Pitkäranta district nor the Finnish reference areas were the distributions of subjects according to the level of mutans streptococci scores significantly different between girls and boys (p>0.05). Neither were the differences between girls or boys in the Pitkäranta district nor in the Finnish areas statistically significant at any cut-off points (Fig. 12).

Fig. 12. Percentages of 12-year-olds with different scores for salivary mutans streptococci in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.
4.5.2 Determinants of oral health

Social determinants in the Pitkäranta district

In the Pitkäranta district the level of annual family income and living conditions were modest. Even though the level of education of the parents was high (65% of the mothers and 61% of the fathers had secondary- or university-level education), the mean yearly income of these families was very low. Almost half (45%) of the children lived in a family whose annual income was below 720,000 roubles (about 720 USD)\(^8\), and 94% of the children lived in a family whose annual income was below 1,920,000 roubles (about 1,920 USD). On average, there were four family members (usually two adults and two children) per family. Five percent of the children lived in a single-parent family.

The mean number of rooms per home was 2.6 (95% CI 2.5, 2.7, range 0–5) and the mean number of family members per room was 1.7 (95% CI 1.6, 1.8, range 0.7–5). Almost all children reported that their family home had electricity and a kitchen, but other housing conditions varied: on average, 60% of the children had cold tap water, 29% hot tap water, 60% an inside toilet, 51% a bathroom and 53% central heating. The housing conditions were best in the town area and poorest in remote rural areas (Table 6).

Table 6. Percentage of children living in families with different housing conditions in the town and rural areas in the Pitkäranta district in 1993.

<table>
<thead>
<tr>
<th></th>
<th>Town area</th>
<th>Rural area</th>
<th>p-value for the difference between the areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>100.0</td>
<td>97.8</td>
<td>0.026</td>
</tr>
<tr>
<td>Kitchen or kitchenette</td>
<td>100.0</td>
<td>98.1</td>
<td>0.037</td>
</tr>
<tr>
<td>Inside toilet</td>
<td>85.2</td>
<td>44.2</td>
<td>0.000</td>
</tr>
<tr>
<td>Central heating</td>
<td>80.7</td>
<td>35.2</td>
<td>0.000</td>
</tr>
<tr>
<td>Bathroom inside the house</td>
<td>79.8</td>
<td>33.5</td>
<td>0.000</td>
</tr>
<tr>
<td>Cold tap water inside the house</td>
<td>81.2</td>
<td>55.5</td>
<td>0.000</td>
</tr>
<tr>
<td>Hot tap water inside the house</td>
<td>64.6</td>
<td>6.6</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Oral hygiene

In the Pitkäranta district, only a few children reported brushing their teeth twice a day or more often (Fig. 13). In general, girls brushed their teeth more often than boys did. None of the 12-year-old boys reported brushing their teeth twice a day or more often, and a relatively high percentage of children reported never brushing their teeth. Nine percent of the 6-year-olds, 11% of the 9-year-olds and 6% of the 12-year-olds reported never brushing their teeth. Among 15-year-olds the percentage of nonbrushers was 1.

In the Finnish reference areas, toothbrushing was more frequent than in the Pitkäranta district in all age groups, and Finnish girls brushed more often than Finnish boys did (Fig. 13). Still, in the Finnish reference areas less than one-third of the 6- and 9-year-olds, 36% of the 12-year-olds and 55% of the 15-year-olds brushed their teeth more than once a day. None of the Finnish children reported never brushing their teeth, but 6–10% of the children reported brushing their teeth less than once a day.

* p<0.05, ** p<0.01 and *** p<0.001 for the difference between girls and boys

Fig. 13. Percentages of 6-, 9-, 12- and 15-year-olds who reported brushing their teeth twice a day or more often in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.
In addition to toothbrushes, Russian Karelian children hardly ever used other oral hygiene measures like toothpicks and dental floss. Twenty-three percent of children had used toothpicks at least occasionally and they were used more often in the older than in the younger age groups. Most of the Russian children (98%) had never used or even heard of dental floss.

In the Finnish reference areas, 10% of the children had used dental floss twice a week or more often, 13% occasionally and 77% never. The use of toothpicks was not asked in the Finnish reference areas.

On average, 11% of the Russian children reported using fluoridated toothpaste daily (Fig. 14). Besides toothpaste, 6% of the Russian children used powder for toothbrushing at least once a week.

In the Finnish reference areas, 86% of the children reported using fluoridated toothpaste daily (Fig. 14). The Finnish children used many other fluoride products besides fluoridated toothpaste: 24% of the children had used fluoride tablets during the five days of the week preceding the survey and 6% had used fluoride rinses at least once a week.

![Graph showing percentages of 6-, 9-, 12- and 15-year-olds who reported using fluoridated toothpaste at least once a day in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.]

** p<0.01 and *** p<0.001 for the difference between girls and boys

Fig. 14. Percentages of 6-, 9-, 12- and 15-year-olds who reported using fluoridated toothpaste at least once a day in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.
Diet

In 1993, 93% of both the Russian and the Finnish children reported eating a hot meal at least twice during the school day. Eighty-six percent of the Russian children reported eating a hot lunch at school every day. Seven percent of the children substituted tea with sugar and a bun (offered in the afternoon at schools) for a hot school lunch. Six percent of the Russian children reported following a special diet, usually due to medical reasons. In Finland, 7% of the children did not eat school meals, and 11% reported following a special diet for medical reasons.

In the Pitkäranta district it was common to eat sugary snacks between (or instead of) meals. Most often the children reported drinking tea with sugar and eating cakes, biscuits and sweets (Fig. 15). In the Finnish reference areas, the children most frequently consumed juices or soft drinks with sugar.

In the Pitkäranta district there were generally no statistically significant differences between genders and age groups in the frequency of using sugary snacks, but there were a few exceptions: the 6-year-olds more often ate cakes and biscuits (p=0.012) and sweets (p=0.003) than did children in the older groups.

In the Pitkäranta district in 1993 xylitol products were rather unknown. Only 5% of the children knew or had heard of xylitol. In the Finnish reference areas, 24% of the children reported chewing xylitol gum every day.
Fig. 15. Percentages of 6-, 9-, 12- and 15-year-olds who reported consuming different sugary snacks daily in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.

**Smoking**

On average, 29% of the Russian 12- and 15-year-old children (n=296) had tried smoking at least once. In both age groups experimental smoking was more common among boys than among girls (p<0.001 for 12-year-olds and p=0.002 for 15-year-olds) (Fig 16). At the time of the study 4% of the 12- and 15-year-olds were daily smokers and 3% were casual smokers.

In the Finnish reference areas, on average, 47% of the subjects (n=266) had experiences of smoking. The 12-year-old boys had more often experimented with
smoking than girls had (p<0.001), but among 15-year-olds, the girls had experimented more than boys had. Also in the Finnish reference areas, 4% of the 12- and 15-year-olds were daily smokers, but 15% of the same age groups were casual smokers. The differences in smoking experimentation, ever having smoked more than one cigarette and in current smoking were statistically significant for 12-year-old girls and boys.

For the girls in both countries the median age at the first smoking experimentation was 13 years, for the Russian boys 12 years and for the Finnish boys 11 years. The use of snuff was uncommon in the Pitkäranta district and the Finnish reference areas, even though 4% of the Russian and 6% of the Finnish 12- and 15-year-olds had tried snuff at least once.

Fig. 16. Percentages of 12- and 15-year-olds with different smoking habits in the Pitkäranta district in 1993 and in the Finnish reference areas in 1992.

Use of oral health services in the Pitkäranta district

In 1993, 53% of the children in the Pitkäranta district reported having visited a dentist during the preceding 12 months, 43% within the last two to three years and 4% over three years ago. During the preceding 12 months, the girls had visited a dentist more frequently than the boys had (p=0.031), and children living in the town had visited a dentist more often than those living in rural areas (p=0.021). The mean number of the dental visits per child in 1993 was 1.3 (95% CI 1.2, 1.4). The most common reason for a dental visit was dental check up, but
toothache was also a common reason, especially among the youngest group (Fig. 17).

Fig. 17. Percentages of children according to reported reasons for the most recent dental visit in the Pitkäranta district in 1993.

4.5.3 Key informant surveys

The chief dental officer in the Pitkäranta district participated in the development of the programme from the beginning. She was the primary key informant about the situation in the area. She also had knowledge about other key persons who had essential information needed for the planning phase of the programme. On that basis, three decision-makers were interviewed in person, using a structured questionnaire to ensure that all the questions would be included. In autumn 1993, the opinions of the chief dental officer of the Republic of Karelia, the local chief medical officer and the mayor of the Pitkäranta district on the oral health of children and issues related to oral health promotion in the area were surveyed. In addition to the three decision-makers, the opinions of school and kindergarten personnel (n=54), the stomatologists (n=7) and dentists (n=7) were surveyed with a structured questionnaire which consisted of the same questions and additional specific questions for each profession.

All three decision-makers shared the same view of the poor oral health situation among the children in the Pitkäranta district. The chief dental officer of the Republic added that the situation was the same everywhere in the Republic of
Karelia. The opinions of school and kindergarten personnel were quite similar to those of the decision-makers. Three quarters of the teachers regarded the oral health situation among these children to be poor. Dentists had slightly more positive views about the oral health situation because six stomatologists/dentists (43%) considered the oral health situation among children to be poor and eight (57%) rated it as moderate.

Each key informant expressed his/her opinions about the sufficiency and quality of oral health services for children in the Pitkäranta district. Most of them shared the opinion that the oral health services were moderately available; but, as expected, the dentists rated the services more positively than the other informants did. A majority of the key informants also assessed the quality of oral health care as moderate.

Three of four teachers reported having implemented campaigns of oral health education at school or kindergarten. These were mostly oral hygiene instructions given at school. Both teachers and dentists considered the joint efforts of schools and the oral health services to be valuable for promoting oral health, and every third teacher reported that they had collaborated in oral health education with the providers of oral health care. Most teachers estimated that they could give health education at school at least once a month, especially if they could obtain more information about the oral health issues (52%), higher salary (50%) or the possibility to use more time for health education (44%).

The key informants were asked their opinions about the quality and content of dental health education given in the area (good, moderate, poor). The decision-makers assessed the quality of dental health education given in the area to be between moderate and poor, and the dentists agreed with them. The teachers were of the opinion that the effect of health education was poor (70%) and the content was not relevant (85%). The mayor added that previously children had been given more health education; but in the beginning of the 1990’s, it was decreased.

All key informants proposed methods for promoting oral health in the Pitkäranta district. All agreed on the importance of collaboration between home, school and oral health care professionals in promotion of oral health, even though the parents’ responsibility for the child’s oral health was considered to be the most important. Some key informants proposed an increase in health education as a way to improve oral health among children. Better availability of materials for oral hygiene and fluoridation of drinking water were also suggested. To obtain better oral health in children, the decision-makers and dentists would also have increased the number of dentists and dental units. This is closely related to the
teachers’ proposal that in order to improve the oral health of children in the area the availability of oral health services should be increased. Secondly, the teachers recommended a well-balanced diet for better oral health, but only 6% of them would have restricted sugar consumption among children.

Beliefs about possible difficulties in oral health promotion were directly or indirectly related to the economic situation in the Pitkäranta district. One key informant said that the difficult economic situation in the area and in the country may complicate the success of the programme of oral health promotion, because people (in oral health care) work only for to survive, and extra duties like health education could not be organised easily. Another key informant stated that another difficulty for oral health promotion is that people in health care do not have knowledge about the best practices in health education. The poor quality of equipment and dental filling materials was also suggested to be possible barrier to better oral health. All decision-makers agreed that despite all these barriers, they have to prioritise prophylactic work in the future. It can be concluded that the key informants were aware of the oral health situation in the target area and were willing to make efforts to improve it.

4.5.4 Arrangement of oral health care system in the Pitkäranta district

In 1993, in the Pitkäranta district there were 14 dental clinics, where seven stomatologists, seven dentists and ten nurses were working. In addition, in the town of Pitkäranta three other full-time employees (one cleaner, two technicians) and one half-time instrument cleaner worked in oral health care (Appendix 1, Table 13).

Every dental office in the area was visited in connection with this study; and during these visits the premises, instruments, equipment and materials used in each dental clinic were counted, listed and photographed. The situation differed considerably in the different dental offices (Appendix 1, Tables 13–15). Dental offices that had the best premises, instruments and equipment and the most versatile selection of dental materials were those owned by local industrial plants and offered oral health services for the employees. The worst situation was in the school dental offices of the rural area, where the equipment was often out of order.

The dentists reported numbers and distribution of patients by age, the different procedures carried out in the dental offices during the week and how many of their child patients received oral health education and preventive
procedures. The mean number of patients per stomatologists/dentist during one week before the questionnaire survey was 67.6 (95% CI 53.7, 81.5). Forty percent of the patients were adults of working age, 43% were schoolchildren and the rest were pre-school children and the elderly (Fig. 18). Sixty-one percent of the patients came to see a dentist without having an appointment (50% without acute need for care and 11% with acute need for care: toothache, etc.). The rest of the patients had made an appointment beforehand.

Fig. 18. Percentage of the oral health care patients by age in the Pitkäranta district in 1993.

The procedures carried out by one stomatologist/dentist during one week consisted mostly of fillings (mean number 47.4, 95% CI 35.9, 59.0), examinations (mean 28.1, 95% CI 16.5, 39.4) and tooth extractions (mean 14.2, 95% CI 9.9, 18.4). Periodontal treatments were rare, and no orthodontic treatments were given. In addition, the dentists reported having carried out an average of 4.3 preventive measures (sealants or topical fluoride applications, etc.) (95% CI 2.5, 6.1) and given health education to their patients an average of 9.0 times (95% CI 4.1, 13.9) during the previous week. Health education was most often dealt with oral hygiene and diet.

The chief dental officer of the Pitkäranta area collected for us some statistics on dental care for children in 1992. At that time the mean DMFT for 12-year-olds in the town of Pitkäranta was 2.5, of which 44% (1.1 teeth) consisted of untreated
cavities. In 1992, the total number of treated patients was 4,544, of whom 50% were children (under 16 years old). The treatment procedures for children were most often fillings (altogether 3,339 fillings, of which 51% were made in primary teeth) or tooth extractions (altogether 1,039, of which 1,006 were extractions of a primary tooth).

4.5.5 Observations at local shops and kiosks, and measurement of fluoride content

The community analysis also included field observations on the availability of toothbrushes, fluoridated toothpastes and other oral hygiene materials in local shops, kiosks and pharmacies. In 1993, proper toothbrushes, fluoridated toothpastes and other oral hygiene materials were available only in the town area and for a high price. The prices of the toothpastes and toothbrushes were between 500 and 1,500 roubles, which were about 5–30% of the average monthly family income. Only four of the ten toothpastes available included enough fluoride to prevent dental decay (between 950 and 1,100 ppm), and these toothpastes were most often imported from Bulgaria or from the United Kingdom.

The natural fluoride content of drinking water in the district varied between 0.1 and 2.2 ppm. According to the fluoride concentration of the drinking water, the Pitkäranta district could be divided into low- and high-fluoride areas. In the south-eastern rural area, the mean fluoride concentration was 1.0 ppm (range 0.1–2.1), in north-western rural area 0.6 ppm (range 0.1–2.2) and in the town of Pitkäranta 0.8 ppm (range 0.1–2.1). Figure 19 shows the distribution of the fluoride content of drinking water in urban and rural areas. The drinking water was taken from different sources, and the fluoride concentration varied greatly. Piped water was taken from Lake Ladoga and was used only in the town of Pitkäranta. The mean fluoride concentration of piped water was 0.4 ppm (95% CI 0.3, 1.2). In the town area, there were also two springs from which the people took drinking water. The fluoride concentration in those springs was 1.3 and 2.7 ppm. Both in the town and in the rural area, drinking water was also taken from wells (mean fluoride concentration 0.8 ppm, 95% CI 0.5, 1.1).
Fig. 19. Box plots describing distribution of the fluoride contents of drinking waters in 30 samples in urban and rural areas in Pitkäranta district in 1993.

Conditions in schools and kindergartens were also observed. In every school in the Pitkäranta district, a free lunch was offered to schoolchildren before noon and a small snack in the afternoon. Lunch was a hot meal with bread and milk. However, not all children used this opportunity; they ate their own food. The snack in the afternoon was usually a cup of tea with sugar and a bun or a roll. Half of the teachers in the key informant surveys also reported that children had opportunities to buy sweets or other sugary snacks during school time from nearby shops, kiosks or school canteens. At kindergartens, the children were given healthy meals regularly during the day.
5 Setting of goals and objectives, and designing of strategies

5.1 Identification and prioritisation of needs

The community analysis at baseline revealed that the occurrence of dental diseases in the Russian Karelian area was high. Behaviour related to oral health was generally unfavourable, and professional prevention at dental offices was practically non-existent. Therefore, the results of the baseline community analysis in 1993 called for an intervention with emphasis on promoting healthy lifestyles, reorienting the methods of action of the oral health care system towards oral health promotion and prevention of oral diseases, creating a supportive environment and empowering community actions.

5.2 Identification of potentials for and threats to the programme

The programme started in the beginning of great changes in the society, and the opportunities and threats to the implementation of the oral health programme were assessed in the community analysis and listed in Table 7. These issues and existing local human and material resources were taken into consideration when goals were set for the programme and strategies were planned.

<table>
<thead>
<tr>
<th>Potentials</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of the situation and the need for changes</td>
<td>Economic situation</td>
</tr>
<tr>
<td>Willingness to change the situation</td>
<td>Insufficient knowledge about effective methods</td>
</tr>
<tr>
<td>Support from the local and national authorities</td>
<td>Indifferent attitude towards disease prevention</td>
</tr>
<tr>
<td>An active and enthusiastic local coordinator</td>
<td>Insufficient materials for oral health care</td>
</tr>
<tr>
<td>Favourable reporting on the programme in local newspapers</td>
<td>Poor implementation of professional preventive measures at dental offices</td>
</tr>
<tr>
<td>Nearly optimal fluoride level in drinking water in south-eastern area</td>
<td>High prices and poor supply and quality of materials for oral self-care in local shops</td>
</tr>
<tr>
<td></td>
<td>Low fluoride level in drinking water in some parts of the district</td>
</tr>
</tbody>
</table>
5.3 Goals and objectives of the programme

The goal of the programme was to decrease the incidence of dental diseases and achieve at least the same level of oral health as among the children in the Finnish reference areas in 1992. The intermediate objectives were to improve self-care and reorientate the modes of action of the oral health care system. The aim of the programme was to deliver the knowledge and skills needed for children to maintain oral health and to make choices favourable to oral health in everyday life. Health education was especially aimed at increasing toothbrushing frequency and the use of fluoridated toothpaste and decreasing the use of sugary snacks between meals. The objective was to achieve the same levels as in the Finnish reference areas in 1992, except for smoking, which was more common in the Finnish reference areas than in the Pitkäranta district. The intervention also aimed at increased demand for and supply of proper toothbrushes and fluoridated toothpaste in local shops.

5.4 Planning the strategies and methods of the programme

Oral diseases and their determinants were so common that they affected most of the target population in the community. Therefore a community-wide approach that emphasised the responsibilities of individuals and communities for promoting oral health was chosen as well as collaboration between schools, kindergartens and the system of oral health care in accordance with the principles of primary health care (WHO 1978). One aim of the programme was to start the intervention already at the maternity clinics where gynaecologists and other doctors would inform pregnant mothers on issues related to the child’s oral health. However, because newly erupted teeth are known to be most susceptible to decay (Manji & Fejerskov 1996), the primary target of this intervention was pre-school children and schoolchildren. Therefore, schools and kindergartens were important locations for health education.

Advocacy for health was an essential part of the programme. This was aimed at increased awareness of the programme and of the importance of health promotion actions for its success among the population, local leaders and the republic’s decision-makers and the school, kindergarten and dental personnel.
6 Implementation of the programme

The intervention began in autumn 1994 in the town of Pirkärenta. A local coordinator (Chief Dental Officer Svetlana Tsvetkova) took responsibility for the practical management of the various activities during the intervention. In the beginning of the intervention, five workshops on oral health problems, their causes and prevention were arranged for oral health care personnel and five workshops for the school and kindergarten personnel. The purpose of these workshops was to provide all sectors with sufficient information and to engage them in collaboration. As part of the training and engagement to the programme, a Finnish dentist and a dental nurse visited all kindergartens in the town area during a two-week period and gave teachers information on proper oral self care. The talks during these visits were translated from Finnish to Russian.

After that, the intervention was implemented in grades 1–3 in one school and in two kindergartens. During the school year health education for schoolchildren in the town of Pirkärenta consisted of six lessons on the causes and prevention of oral diseases. The lessons were planned and carried out by the teachers. Similar information, but suited to the age of the children was given at the kindergartens. A dental nurse attended parental meetings at schools and kindergartens and informed the parents about the proper self care and the progress of the programme of oral health promotion in the area. At kindergartens the children also practiced toothbrushing with fluoridated toothpaste every day after their nap. With the help of the parents, local industrial plants and local authorities, proper toothbrushes and fluoridated toothpastes were delivered to the kindergartens.

During each child’s dental visits, a dental nurse gave the same information on oral health that was given at school and instructed the child on the proper way to brush his/her teeth. She then checked the mouth, excavated the open cavities and filled them with temporary filling material and encouraged the child to see a dentist. In addition, dental nurse applied fluoride varnish twice a year during the dental visits and kept records of all preventive procedures conducted at the dental office.

The Ministry of Public Health and the Chief Dental Officer of the Republic of Karelia were informed regularly about the status of the programme from the beginning. They also participated in Finnish-Russian medical seminars, where the programme was discussed. The local TV-channel and newspaper provided information on the programme for the local population.
The preliminary experiences from feasibility of the intervention were promising, and in 1997 the intervention spread into other areas in the Pitkäranta district when teachers took oral health education as a part of school curriculum.
7 Evaluation of the programme

7.1 Material and methods of the follow-up community analysis in 2001

The community analysis was carried out in 2001 using the same methods as in 1993, with a few exceptions, which will be described below. The results of the follow-up community analysis were used to monitor the changes that occurred between the years 1993 and 2001, to assess the strengths and weaknesses of the programme and to plan future activities. A local coordinator (Chief Dental Officer Svetlana Tsvetkova) took responsibility for the practical management and evaluation of the various activities during the intervention.

Between 1993 and 2001 the number of inhabitants, the proportion of children and nationality distribution in the Pitkäranta district remained about the same. Sampling was carried out in the same way as in the baseline community analysis in 1993. The distribution of the subjects by age, gender and living area is shown in Table 8. Once again, the participation rate among children in the Pitkäranta district was high. Ninety percent of the original sample participated in the clinical and questionnaire surveys (n=581).

Table 8. Distribution of the subjects in the Pitkäranta district in 2001 by age, gender and living area.

<table>
<thead>
<tr>
<th>Gender and living area</th>
<th>6 years</th>
<th>9 years</th>
<th>12 years</th>
<th>15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=132</td>
<td>n=151</td>
<td>n=156</td>
<td>n=142</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girl</td>
<td>63</td>
<td>72</td>
<td>76</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>(48%)</td>
<td>(48%)</td>
<td>(49%)</td>
<td>(52%)</td>
</tr>
<tr>
<td>Boy</td>
<td>69</td>
<td>79</td>
<td>80</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>(52%)</td>
<td>(52%)</td>
<td>(51%)</td>
<td>(51%)</td>
</tr>
<tr>
<td>Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>85</td>
<td>64</td>
<td>63</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>(64%)</td>
<td>(42%)</td>
<td>(40%)</td>
<td>(49%)</td>
</tr>
<tr>
<td>Rural</td>
<td>47</td>
<td>87</td>
<td>93</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>(36%)</td>
<td>(58%)</td>
<td>(60%)</td>
<td>(51%)</td>
</tr>
</tbody>
</table>

Clinical examinations were done in the same way as in 1993 by Doctors Anne Hiiri and Svetlana Tsvetkova. The Cohen’s kappa values for intra- and inter-examiner examinations were again high (Table 9).
Table 9. Inter- and intra-examiner Cohen’s kappa values for presence or absence of dmfs/DMFS (n) in 2001.

<table>
<thead>
<tr>
<th>Consistency assessment</th>
<th>Cohen’s kappa (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-examiner 1</td>
<td>0.92 (30)</td>
</tr>
<tr>
<td>Intra-examiner 2</td>
<td>0.94 (20)</td>
</tr>
<tr>
<td>Inter-examiner</td>
<td>0.90 (32)</td>
</tr>
</tbody>
</table>

A few questions concerning attitudes and knowledge about oral health-related issues were added to the 2001 questionnaire for children. Children were asked whether they believe that they can prevent oral diseases by adopting healthy lifestyles. Children also reported their knowledge about the most common determinants of dental decay and where they had obtained this information. The fluoride content of drinking water was not determined in 2001.

7.2 Assessment of the impacts and outcomes

7.2.1 Changes between baseline and follow-up community analysis in the Pitkäranta district

Social determinants of oral health were at almost the same level as in the 1993 survey. The reported level of education of the parents was higher in 2001 than in 1993, because 77% of the mothers and 73% of the fathers had secondary- or university-level education (versus 65% and 61%, respectively, in 1993). Due to slow economic development, rapid inflation and the money reform, the mean yearly income of the families remained very low. Sixty-one percent of the children lived in a family whose yearly income was below 36,000 roubles (about 1,244 USD) and 94% of the children lived in a family whose yearly income was below 72,000 roubles (about 2,488 USD). Housing conditions were slightly better in 2001 than in 1993, but since this improvement had occurred mainly in the town, the gap between urban and rural areas had increased.

In 2001, the occurrence of caries was lower (Fig. 20, Table 10) and much more polarised (Fig. 21) than in 1993. In particular, the percentage of caries-free (DMFS=0) 12-year-old boys had increased significantly (p=0.004) (Table 10). On the other hand, the percentage of caries-free 15-year-old boys had decreased, even

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though their mean DMFS had decreased since the 1993 survey. Among children in all age groups the presence of visible plaque had decreased (Table 10).

Fig. 20. Percentages of 6-, 9-, 12- and 15-year-olds according to dmfs/DMFS in the Pitkäranta district in 1993 and in 2001.
Two-thirds of the children believed that they are able to prevent oral diseases by their own behaviour; and their behaviour had also become more favourable, except for the reported use of sugary snacks, soft drinks and experimentation with smoking (Tables 11-12). The majority of the children had been satisfactorily informed about the most common determinants of dental decay. Children knew that frequent use of sugary snacks is related to dental decay (88% of the subjects) and that dental decay can be prevented with regular toothbrushing (70%) and the
use of fluoride products (52%). This information had been obtained mainly at home or at school.

Positive changes were also seen in the attitudes of the key local authorities: decision-makers, teachers and oral health care personnel. In 2001, 53% of the key informants regarded the oral health situation among children to be good or satisfactory (versus 37% in 1993). The quality of dental health education given in the area was assessed as moderate or good by 82% of the authorities (versus 41% in 1993), and the content of health education was assessed as being relevant (76% in 2001 versus 26% in 1993). The positive changes were seen not only in attitudes, but also in the implementation of oral health education at schools and kindergartens. In 2001, 87% (n=78) of the teachers reported having implemented campaigns of oral health education, which was 17 percentage points more than in 1993 (n=54). Teachers and oral health care personnel considered the joint efforts of schools and oral health services to be valuable for promoting oral health. Both teachers and oral health personnel, however, still considered the role of the parents to be the most important.

Between 1993 and 2001, oral health services did not change their methods of action towards emphasising health promotion. The only exception was the mean number of fluoride varnish applications by professionals: the mean value during one week was 1.1 in 1993 and 2.5 in 2001. After 1993 two dental clinics had been closed and the personnel resources had decreased (Appendix 1, Table 16). Furthermore, equipment in dental clinics was still rather old, but the selection of instruments and materials was wider in 2001 than in 1993 (Appendix 1, Tables 16-18).

The supply of toothbrushes, fluoridated toothpastes and other oral hygiene materials was much more abundant in local shops and stands in 2001 than in 1993. In 1993, these were available only in the town for a high price, and few of the toothpastes included fluoride. In 2001, most of the toothpastes were fluoridated and were available throughout the Pitkäranta district.
Table 10. Differences in occurrence of caries and visible plaque between 1993 and 2001 among children in the Pitkäranta district. Differences (the value in 2001 minus the value in 1993) are presented as means or percentage points, and their 95% confidence intervals are shown in parenthesis.

<table>
<thead>
<tr>
<th>Indicators of oral health</th>
<th>6 years</th>
<th>9 years</th>
<th>12 years</th>
<th>15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of children with dmfs/DMFS=0</td>
<td>Girls n=63</td>
<td>Boys n=69</td>
<td>Girls n=72</td>
<td>Boys n=79</td>
</tr>
<tr>
<td>+0.3</td>
<td>6.6</td>
<td>+25.2</td>
<td>+23.2</td>
<td>+19.7</td>
</tr>
<tr>
<td>(-6.0, 6.7)</td>
<td>(-2.9, 14.3)</td>
<td>(9.4, 40.7)</td>
<td>(7.8, 37.6)</td>
<td>(7.3, 33.2)</td>
</tr>
<tr>
<td>Mean dmfs/DMFS</td>
<td>-3.7</td>
<td>-5.5</td>
<td>-0.6</td>
<td>-1.4</td>
</tr>
<tr>
<td>(-7.5, 0.05)</td>
<td>(-9.8, -1.2)</td>
<td>(-1.4, 0.2)</td>
<td>(-2.3, -0.5)</td>
<td>(-3.4, -0.4)</td>
</tr>
<tr>
<td>Percentage of children with no visible plaque on index teeth</td>
<td>Girls n=63</td>
<td>Boys n=69</td>
<td>Girls n=72</td>
<td>Boys n=79</td>
</tr>
<tr>
<td>+11.2</td>
<td>+14.1</td>
<td>-4.2</td>
<td>+2.7</td>
<td>+5.1</td>
</tr>
<tr>
<td>(-0.5, 23.0)</td>
<td>(3.0, 25.3)</td>
<td>(-10.1, 1.8)</td>
<td>(-3.3, 8.5)</td>
<td>(-4.5, 14.6)</td>
</tr>
</tbody>
</table>

Table 11. Differences in oral hygiene practices between 1993 and 2001 among children in the Pitkäranta district. Differences are presented as percentage points and their 95% confidence intervals are shown in parenthesis.

<table>
<thead>
<tr>
<th>Oral hygiene practices</th>
<th>6 years</th>
<th>9 years</th>
<th>12 years</th>
<th>15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls n=63</td>
<td>Boys n=69</td>
<td>Girls n=72</td>
<td>Boys n=79</td>
<td>Girls n=76</td>
</tr>
<tr>
<td>Toothbrushing twice a day or more often</td>
<td>+30.7</td>
<td>+36.9</td>
<td>+39.5</td>
<td>+30.6</td>
</tr>
<tr>
<td>(17.9, 43.6)</td>
<td>(24.7, 49.1)</td>
<td>(26.8, 52.2)</td>
<td>(19.1, 42.0)</td>
<td>(33.3, 57.1)</td>
</tr>
<tr>
<td>Daily use of fluoridated toothpaste</td>
<td>+14.2</td>
<td>+24.2</td>
<td>+25.6</td>
<td>+12.9</td>
</tr>
<tr>
<td>(1.8, 26.7)</td>
<td>(9.6, 38.9)</td>
<td>(11.4, 39.7)</td>
<td>(0.6, 25.2)</td>
<td>(6.7, 2.3)</td>
</tr>
</tbody>
</table>
Table 12. Differences in reported use of different sugary snacks daily and smoking experimentation between 1993 and 2001 among children in the Pitkäranta district. Differences are presented as percentage points, and their 95% confidence intervals are shown in parenthesis.

<table>
<thead>
<tr>
<th>Daily use of sugary snacks and smoking</th>
<th>6 years</th>
<th>9 years</th>
<th>12 years</th>
<th>15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Girls n=63</td>
<td>Boys n=69</td>
<td>Girls n=72</td>
<td>Boys n=79</td>
</tr>
<tr>
<td>Tea with sugar</td>
<td>-12.7 (-21.9, -3.6)</td>
<td>-15.9 (-25.3, -6.4)</td>
<td>0.0 (-9.0, 9.0)</td>
<td>-6.8 (-17.5, 4.1)</td>
</tr>
<tr>
<td>Cakes or biscuits</td>
<td>-28.8 (-44.2, -13.5)</td>
<td>-17.8 (-32.5, -3.0)</td>
<td>-5.6 (-19.7, 8.6)</td>
<td>-7.4 (-21.5, 6.8)</td>
</tr>
<tr>
<td>Sweets</td>
<td>-16.2 (-31.3, -1.0)</td>
<td>-7.3 (-22.5, 7.9)</td>
<td>-2.8 (-18.5, 12.9)</td>
<td>-0.5 (-16.0, 14.9)</td>
</tr>
<tr>
<td>Chewing gums with sugar</td>
<td>-18.5 (-33.2, -3.8)</td>
<td>-4.7 (-20.0, 10.6)</td>
<td>-15.3 (-30.0, -0.5)</td>
<td>-20.1 (-33.7, -6.4)</td>
</tr>
<tr>
<td>Juices or soft drinks</td>
<td>-2.6 (-18.8, 13.5)</td>
<td>+10.1 (-5.5, 25.7)</td>
<td>+5.6 (-9.5, 20.6)</td>
<td>+7.2 (-6.6, 21.1)</td>
</tr>
<tr>
<td>Coffee with sugar</td>
<td>-18.7 (-303, -7.0)</td>
<td>-2.2 (-12.9, 8.5)</td>
<td>-1.4 (-12.9, 10.1)</td>
<td>-10.6 (-21.9, 0.8)</td>
</tr>
<tr>
<td>Smoking experimentation</td>
<td>- (-2.4, 14.3)</td>
<td>- (-11.8, 18.6)</td>
<td>- (-15.4, 14.4)</td>
<td>- (-15.0, 22.7)</td>
</tr>
</tbody>
</table>
7.2.2 Were the goals and objectives achieved?

The goal of the programme was to achieve the same level of oral health and healthy lifestyles in the Pitkäranta district as in the Finnish reference areas in 1992. In terms of the occurrence of caries the goal was not completely reached; but among the schoolchildren the progress was very positive, while the occurrence of caries among 6-year-olds in the Pitkäranta district remained high (Fig. 22). Furthermore, in 2001 the proportion of untreated decayed surfaces was still high, which indicates the failure to improve the effectiveness of oral health services.

![Graphs showing percentages of 6-, 9-, 12- and 15-year-olds according to dmfs/DMFS in the Pitkäranta district in 2001 and in the Finnish reference areas in 1992.](image)

Fig. 22. Percentages of 6-, 9-, 12- and 15-year-olds according to dmfs/DMFS in the Pitkäranta district in 2001 and in the Finnish reference areas in 1992.
In the Pitkäranta district, in 2001 the occurrence of caries was clearly more polarised than it had been in 1993. Lorenz curves for 2001 were almost the same as in Finland in 1992, except for 6-year-olds (Fig. 23). The 20% of the Russian children who had the highest scores accounted for 51–77% of all dmfs/DMFS.

Fig. 23. Cumulative percentage distributions of dmfs/DMFS in descending order plotted against the cumulative distributions of 6-, 9-, 12- and 15-year-olds in the Pitkäranta district in 2001 and in the Finnish reference areas in 1992.

The percentages of Russian children having plaque on the index teeth in 2001 were almost equal to those for Finnish children in 1992 (Figs. 24–25).
Fig. 24. Percentages of 6-, 9-, 12- and 15-year-old girls having plaque on the index teeth in the Pitkäranta district in 2001 and in the Finnish reference areas in 1992.

* p<0.05, ** p<0.01 and *** p<0.001 for the difference between Pitkäranta and Finnish reference areas
Fig. 25. Percentages of 6-, 9-, 12- and 15-year-old boys having plaque on the index teeth in the Pitkäranta district in 2001 and in the Finnish reference areas in 1992.

Patterns of oral hygiene in terms of toothbrushing twice a day or more often and daily use of fluoridated toothpaste changed favourably in the Pitkäranta district. Toothbrushing twice a day or more often was even more common in Russia in 2001 than in the Finnish reference areas in 1992 (Fig. 26). However, the objective for daily use of fluoridated toothpastes was not reached (Fig. 27).

* p<0.05 and ** p<0.01 for the difference between Pitkäranta and Finnish reference areas
Fig. 26. Percentages of 6-, 9-, 12- and 15-year-olds who reported brushing their teeth at least twice a day in the Pitkäranta district in 2001 and in the Finnish reference areas in 1992.

* p<0.05 and *** p<0.001 for the difference between girls and boys

Fig. 27. Percentage distribution of 6-, 9-, 12- and 15-year-olds who reported using fluoridated toothpaste daily in the Pitkäranta district in 2001 and in the Finnish reference areas in 1992.

* p<0.05 and *** p<0.001 for the difference between girls and boys
Nor was the objective achieved for decreasing the daily consumption of sugary snacks (Fig. 28). In fact, among boys in the Pitkärinta district the daily consumption of soft drinks even increased between 1993 and 2001 (p=0.02).

![Graph showing consumption of sugary snacks](image)

**Fig. 28.** Percentages of 6-, 9-, 12- and 15-year-olds who reported consuming sugary snacks daily in the Pitkärinta district in 2001 and in the reference areas in Finland in 1992.
7.3 Evaluation of the process

The local coordinator (chief dental officer) was responsible for monitoring the implementation of the intervention in the target area. She reported the progress or possible difficulties of the intervention to the local and national decision-makers and to the Finnish partners.

The active and enthusiastic contribution and involvement of all participants, and especially the role of the local coordinator from the beginning, was essential for this programme. It made the programme both acceptable and applicable in the target area. The implementation of the intervention was successful at schools and kindergartens. However, the oral health services did not manage to change their methods of action towards emphasising health promotion. So far, the programme has also failed to develop collaboration with child and maternity welfare clinics. Therefore, an extra effort should be made to help all parties to see the problems, to aid them in understanding that something should be done and to provide tools they can use to change the situation. Considering the difficult situation in the Pitkäranta district and the fact that general health was getting worse, the intervention process succeeded rather well.
8 Discussion

A community-wide programme of oral health promotion began in 1993 in the Pitkäranta district of Russian Karelia. This description of the programme of oral health promotion highlights some components of success and failure and the strengths and weaknesses of the intervention.

8.1 Community analyses

The community analyses in the Pitkäranta district, Russian Karelia, included clinical dental examinations, questionnaire surveys, observations at local shops, kiosks, schools and dental clinics, interviews of stomatologists and dentists, and measurements of fluoride content in drinking water and in toothpastes. The purpose of these comprehensive community analyses was to draw a holistic picture of the situation in the Pitkäranta district and to identify the possibilities for and threats to the programme. Pooled data from the Finnish reference areas in 1992 were used to establish the Finnish levels of dental health and its determinants, which were used as a point of reference and goal for the programme of oral health promotion in the Pitkäranta district.

8.1.1 Subjects

For the clinical examinations and questionnaire surveys, representative area-stratified samples of 6-, 9-, 12- and 15-year-olds were selected in the Pitkäranta district, using name lists gathered at schools, kindergartens and child health clinics a few months before the survey. Because no population register was available for research purpose, this was the only way to carry out a probability sampling of children in the district. The lists of schoolchildren were up-to-date and migration of the population was low; therefore this can be considered suitable method for gathering a representative sample of schoolchildren. However, preschool children presented a minor problem. The only way to gather a list of 6-year-olds was to collect the names at kindergartens and at child health clinics. This leaves a slight possibility that children who were not at kindergartens or had not attended the child health clinic recently were omitted from the sampling frame.

The overall participation rates of children were high: 97% in 1993 and 90% in 2001. In 1993 and in 2001 the participation rates were 92% and 99%, respectively, among schoolchildren and 79% and 82%, respectively, among 6-
year-olds. The high participation rates suggest that the results can be generalised to the child population of the Pitkäranta district.

In the Finnish reference areas, the samples were drawn from the population register, which is a reliable method. However, the participation rate in Finland was lower (69%) than in the Pitkäranta district.

8.1.2 Methods

Community analyses were based on cross-sectional surveys in 1993 and 2001. Cross-sectional surveys are considered useful for monitoring trends in health and diseases, developing policy, providing visibility of dental issues, assessing needs and evaluating programmes (Burt 1997).

Clinical examinations

For clinical studies it is essential that diagnostic methods provide consistent and standardised expressions of the condition in question (Nyvad et al. 1999). The clinical criteria should be clearly defined, and examiners should be trained and standardised in interpretation of these criteria (Davies & Cadell 1963). In the present study, clinical examiners were calibrated before they made examinations, and caries status was recorded by using a modification of the criteria of Möller & Poulsen (1973). In calculating the dmfs/DMFS, caries reaching the dentine were considered. Replicate examinations were done for a random group of 14% of all children who were examined, and Cohen’s kappa values (Cohen 1960) were calculated for the presence or absence of dmfs/DMFS. Kappa values were high both in the Pitkäranta district in 1993 and 2001 and in the Finnish reference areas in 1992 (Kappa values varied from 0.86 to 0.94 for inter-examiner examinations and from 0.88 to 0.95 for intra-examiner examinations), which suggests that the clinical results were reliable.

Gingival status was recorded by using a modification of the CPITN criteria of Ainamo et al. (1982). The validity of CPITN criteria in measuring periodontal condition has been considered to be moderate (Gaengler et al. 1988, Holmgren & Corbet 1990, Lewis et al. 1994, Tomar 2007) and was therefore chosen for use in the present clinical examinations. However, bleeding on probing measurements seem to be very unreliable and have shown only weak kappa values (0.39–0.05) in a study which assessed agreement and association of gingival bleeding after repeated probing at different time intervals in subjects with gingivitis (Müller...
& Barrieshi-Nusair 2005). Therefore, even though bleeding on probing was measured in clinical examinations, due to possible systematic errors in measures, it was not reported.

**Questionnaire surveys**

The accuracy of a questionnaire survey is dependent on the internal validity of the questions, meaning that with high validity the questions measure what they are supposed to measure. Poorly designed questions can cause problems in internal validity. The use of existing questionnaires has been recommended because there might be previous information on their validity and reliability, and this saves time and costs (McKenzie & Smelzer 2001, Cottrell & McKenzie 2005). In the present study, questionnaire surveys were aimed at children who attended clinical examinations in the Pitkäranta district and in the Finnish reference areas, and at key decision-makers, school and kindergarten teachers, and oral health care personnel in the Pitkäranta district.

The questionnaires for children were first pre-tested and used in the Finnish reference areas in 1992 (Seppä *et al.* 1998, 2000). For the Pitkäranta district, the questionnaires were translated into Russian, pre-tested and modified in some respects to fit Russian society better. Then the questionnaires were again translated into Finnish in order to check whether the questions retained their original content. The schoolchildren or parents of pre-school children filled in the questionnaires at home. In order to obtain honest answers about smoking, a topic that might be sensitive for adolescents, the questionnaires regarding smoking trials and current use among 12- and 15-year-olds were filled in at school. Teachers were not involved in filling in the questionnaires.

Questionnaires for decision-makers, for school and kindergarten teachers, and for oral health care personnel in the Pitkäranta district were developed from the beginning and not pre-tested. The aims of these questionnaires were to survey the opinions of these key informants about health and health-promotion issues and to investigate the possibilities for and threats to the forthcoming programme of health promotion from their points of view.

A prerequisite for the external validity of a questionnaire survey is high response rate (Locker 2000b, Parashos *et al.* 2005). If the response rates are low, the results might be biased because the answers of non-respondents might differ from those of the respondents. It is important to investigate the non-respondents, at least in sociodemographic terms (Parashos *et al.* 2005). In the Pitkäranta
district, the response rates for the questionnaire surveys were high (93% and 90%); thus the particulars of the non-respondents were not analysed.

Observations and interviews

Local shops and kiosks were observed by the author using simple bookkeeping on sale of toothbrushes, toothpastes, other oral hygiene equipment, candies and groceries, the use of which is related to oral health. This information was important because it described the situation in which the programme of oral health promotion began and was carried out. For example, in 1993 there were many candies available at the shops and kiosks, while the availability of proper toothbrushes and fluoridated toothpastes was extremely limited. This posed a challenge with regard to changing oral health-related behaviour among children.

The interviews of dental staff were carried out in Russian by a Russian stomatologist (Dr. Svetlana Tsvetkova) using a structured interview form. The quantitative results of these interviews were obtained mainly from these structured questions. The additional conversations were registered in Russian and translated into Finnish, and issues that came up frequently were described in the results.

Statistical methods

The age- and gender-stratified results were presented either as percentages or as mean dmfs/DMFS. Stratification is a method for managing age and gender as potential factors that may cause confounding on the results and/or act as effect modifiers.

Distributions of subjects by dmfs/DMFS in the Pitkäranta district were presented graphically. The figures showed that distributions were slightly skewed already in 1993 but by the year 2001 the skewness increased, which means that the percentages of caries-free children and children with low dmfs/DMFS increased in the Pitkäranta district. This in turn increased the polarisation of cumulative dmfs/DMFS in the Pitkäranta district, which is an inevitable result of lower occurrence of caries (Batchelor & Sheiham 2002). Increased polarisation was also seen in the Lorenz curves, which have been evaluated as being a useful tool in analysing data on dental decay and in determining high-risk population (Poulsen et al. 2001, Tickle 2002, Macek et al. 2004).
8.2 Intervention

8.2.1 Design

In the present study, a one-group before-after design was used to survey changes in oral health and its determinants in the Pitkäranta district in 1993 and 2001. Before-after study design has been recommended by Rossi et al. (1999) for full-coverage programmes. However, this study design has several limitations for estimating the effects of intervention. As will be discussed in the next chapter, there was a significant improvement in oral health and in the behavioural determinants of oral health in the area between 1993 and 2001. During this period, improvement had also occurred in such parts of Russian Karelia and Russian Federation where no interventions had been conducted. Therefore, comparison to a control area using a quasi-experimental or case-control study design would have produced more evidence of the effects of intervention in the study area.

However, quasi-experimental designs in community health promotion were rarely used or reported in the beginning of the 1990’s when planning of this oral health promotion intervention began, and this kind of design would also have been very expensive to use (Cook & Campbell 1979, Thompson et al. 2003). Therefore, choosing a control area in Russian Karelia and carrying out community analyses there without intervention would have been the only choice for obtaining some information on the effectiveness of the programme. After all, our primary aim was not to conduct health promotion research in the Pitkäranta district but rather to improve the oral health situation there. Therefore, more complex study designs were not even considered.

8.2.2 Setting of goals and objectives

Setting the oral health situation in Finland in 1992 as a goal for the Pitkäranta district was challenging. In the beginning of the 1990’s, the mean DMFT among 12-year-olds was at the lowest level achieved in Finland by the year 2000 (Nordblad et al. 2004). However, the improvement in Finland was achieved over a 20-year period; and abundant resources and efforts in oral health care were used, while the Pitkäranta district was struggling with a difficult economic situation throughout the 1990’s. Even though there is evidence that at that time generally used professional measures at dental clinics (like sealing and topical fluoride applications) were no longer effective in prevention of dental decay in Finland.
(Hausen et al. 2000, Seppä et al. 2000), they might be still effective in areas like Russia, where the prevalence of dental decay is higher (Ekstrand et al. 2000). Therefore one objective of the programme was reorienting the methods of action of the oral health care towards prevention of oral diseases by increasing the use of such professional measures. In addition, the frequency of reported daily use of different sugary snacks among Finnish children in 1992 was a good objective for the Pitkäranta district, while low toothbrushing frequency and frequent smoking among adolescents in Finland were not acceptable objectives.

One weakness in the planning phase was that no exact time limits were set for when the goals and objectives were to be achieved. Many studies have shown that it is possible to reach intermediate objectives like a decrease in the presence of plaque and gingival bleeding, better oral health-related knowledge, attitudes and behaviour in programmes of oral health promotion in a reasonably short time (Kay & Locker 1997, Watt & Marinho 2005). The ultimate goals of the health promotion programme in terms of improvement in oral health are more difficult or even impossible to achieve, at least over a short period (Guldans 1996, Thompson et al. 2003).

8.2.3 Strategies

Selecting a community-wide approach for promoting oral health among children in the Pitkäranta district was justified. First, the prevalence of dental decay was so high and unfavourable habits related to onset of decay were so common that they concerned most of the target population in the community. Secondly, limited resources in oral health care forced us to concentrate on empowering the children’s own capability to promote their oral health and to prevent oral diseases in their everyday environment through health education (Israel et al. 1994, Wallerstein & Bernstein 1994, Freudenberg & Eng 1995).

Traditionally, health education has been aimed at individual changes in knowledge, attitudes and behaviour. The role of a health educator is to be an empowering agent who helps people to change their health behaviour and provides them with knowledge and skills. A health educator may also be an initiator of the process and enable other participants to plan and implement change (Labonte 1994, Freudenberg & Eng 1995).

In the Pitkäranta district, teachers at schools and kindergartens were the primary health educators for the children in the area. In common workshops the teachers received information on oral health issues and were empowered to use
health education at their schools and kindergartens. The teachers then implemented health education at their work places and integrated the oral health lectures into the curricula at schools. A similar approach was used in a programme of oral health promotion in China (Petersen et al. 2004). However, the targets of the health education in the Pitkäranta district were the children at schools, and therefore they should have been actively involved in the planning and implementation of oral health education lectures as was done in a Finnish trial programme (Hausen et al. 2007).

Mass media have been used as a means of spreading information to the general population. Using the mass media in health promotion has both strengths and weaknesses. The mass media put issues on the public agenda and raise consciousness about health issues (Wellings & Macdowall 2000). The mass media may also reach groups in the population that would not be reached by other community approaches. On the other hand, the mass media have been reported to be less effective than face-to-face methods (Kay & Locker 1996). Few studies have explored the effect of mass media on knowledge of people about and attitudes towards oral health, but the mass media have been shown to have only a limited effect on sustaining good oral health behaviour (Sprod et al. 1996, Kay & Locker 1996, 1997). In the Pitkäranta district, the local newspaper and TV-channel published information on the programme for the local people; this was utilised as a complementary channel in addition to health education at schools and kindergartens.

During the last years, community-wide programmes of health promotion have provoked many discussions because they have shown only modest impacts (Guldan 1996, Nilsen 1996, Mertzel & D’Afflitti 2003, Thompson et al. 2003, Wanderman & Florin 2003). Still, community-wide health promotion has many advantages and is needed. Therefore, community-wide health promotion calls for further improvements, including application of theoretical frameworks, increasing the sensitivity of measures, using different methods or designs and methods of evaluation.

In the ideal situation a good theory guides practical health promotion work and should lead to improved health through interventions. However, in health promotion actions, the principles and the practice do not always coincide, and health promotion practitioners often ignore published theory and also fail to utilise the most effective and efficacious intervention techniques. Health education theories have been criticised for not being applicable to practitioners.
and for emphasising the role of health educators instead of the role of individuals and the community in defining the goals and methods for achieving them.

In Australia, Jones & Donovan (2004) carried out a survey among health promotion practitioners, studying to what extent these practitioners were aware of, understood and utilised the major theories and models of health promotion derived from research. The authors concluded that about half of the health promotion practitioners had used at least one theory in their work. The most used models were the PRECEDE-PROCEED model (Green & Kreuter 1999) and the transtheoretical model (Prochaska & DiClemente 1983). The practitioners found the models and theories helpful, especially in the planning phase.

Evaluation of the impacts of changes in society is very difficult. Therefore the evaluation of community-wide interventions is also difficult because they are closely connected to the surrounding society. The description of the process and evaluation of the intermediate outcomes might be the only outcomes that can be reliably evaluated.

8.2.4 Implementation

The difficult times in Pitkäranta forced us to adjust the implementation of the intervention to the existing situation. The implementation started as a pilot study in the town area according to the original plan, but the diffusion of intervention into other areas in the Pitkäranta district was delayed until 1997.

The current programme was carried out with existing resources, and no extra investments were made. This can be interpreted as a strength of the programme. The active and enthusiastic contribution and involvement of all participants, and especially the role of the local coordinator from the beginning, was the other strength of this programme, which also made it both acceptable and applicable in the target area.

8.3 Evaluation of the programme

The purpose of evaluation is to judge and to improve planning, monitoring, effectiveness, efficiency and acceptability of programmes. Initially, quantitative methods and experimental designs were regarded as the best methods for programme evaluation (Suchman 1967) but later qualitative methods were proposed as an alternative (Chen 1990). Because there is no single best method for all evaluation needs, different evaluations require the use of different or
multiple methods which depends on the questions to be answered, the research situation and the nature of the programme (Chen 1990). Evaluation of programmes of health promotion includes assessment of measurable processes, goals and objectives that are logically related to one another.

### 8.3.1 Changes in oral health

The community-wide programme of oral health promotion in the Pitkäranta district aimed at improving the oral health among children and adolescents using a priori knowledge derived from the scientific research about the utility of preventive procedures (Hausen 1987). In the beginning of the programme the gap between the baseline situation and the goal seemed huge. The occurrence of caries and visible plaque on index teeth among children decreased between 1993 and 2001 in the Pitkäranta district. Even though the goal was not reached completely, the improvement was very impressive.

Because no comparison population in Russian Karelia was used in the present study, there is no exact information telling us to what extent the community-wide intervention influenced the positive trend. However, there is some unpublished information on oral health in Russia and published data from the Baltic States.

In the early 21st century, in Nadvoicy, Russian Karelia the mean dmft was 2.9 among 6-year-olds and the mean DMFT was 2.6 among 12-year-olds. At the same time, in Sortavala, Russian Karelia the scores were 2.5 and 3.0, respectively. By comparison, the global weighted mean DMFT among 12-year-olds was 1.7 in 2001.

There is some previous information that in Sortavala in 1991 the mean dmft was 6.0 among 6-year-olds and 2.4 among 2-year-olds. Based on this information it might be concluded that in Sortavala in ten years the occurrence of caries has decreased by 58% among 6-year-olds and increased by 25% among 12-year-olds. However, there is no information about how this information was gathered in 1991 and in the early 21st century and whether the figures are even comparable.

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10 Dr. Edith Kouzmina, WHO Collaborating Centre for Innovation in Education & Training of Oral Health Personnel, Moscow, personal communication in May 2007


12 Kasaeva OA, Hurskainen K, Kolmakow S & Sainio P. Collaborative work in caries prophylaxis between dentists in two neighbouring communities in Karelia (not published)
Therefore no exact conclusions can be drawn from the changes in occurrence of caries in Russian Karelia.

In the Baltic States, caries status among pre-school and schoolchildren was reported to be better in the 21st century than in the beginning of the 1990’s (Aleksejuniene et al. 2004, Olak et al. 2006, Narbutaite et al. 2007). The mean DMFT among 12- and 15-year-olds in Lithuania was about 30% lower in 2001 than in 1993 (Aleksejuniene et al. 2004).

In the Pitkäranta district, the mean dmfs among 6-year-olds decreased by 29% from 1993 to 2001. Among 9-year-olds the reduction in mean DMFS was 44%, among 12-year-olds 43% and among 15-year-olds 40%. Based on this, the oral health situation among pre-school children in the Pitkäranta district did not improve as much as in the Baltic States, but the improvement was greater among schoolchildren.

8.3.2 Changes in determinants of oral health

The changes in behavioural patterns related to oral health were as encouraging as those for oral health. For toothbrushing frequency the objective was reached and even exceeded. However, the objective was not very high because in 1991/1992 the percentage of Finnish children brushing their teeth at least once a day was among the lowest in Europe (King et al. 1996, Kuusela et al. 1997, 1999). In the 2001/2002 Health Behaviour in School-Aged Children (HBSC) study, the percentage of Russian 11-, 13- and 15-year-old children brushing their teeth at least once a day was near the average for all HBSC-countries (Maes et al. 2004). Finland remained among the three worst countries in percentages of daily toothbrushers in all age groups.

The daily frequency for intake of sugary snacks remained virtually unchanged among children and adolescents in the Pitkäranta district. The information about the benefits of decreasing the frequency of sugary snacks among children was not accepted by the parents and teachers. This resistance was explained as being due to the hard economic times in the 1990’s. The parents wanted to compensate for the discomfort due to deprivation by giving children ample sweets. In the HBSC study in 2001/2002, the percentages of Russian adolescents reporting daily use of sweets and soft drinks were much lower than in the Pitkäranta district (Vereecken et al. 2004). The authors concluded that measuring food habits among children and adolescents is difficult due to
differences in cultures and advised that the results of the HBSC study be viewed with caution.

Experimentation with smoking before the age of 12 increased alarmingly between 1993 and 2001, which is a serious challenge for health promotion activities. A similar trend was reported in the HBSC study (Godeau et al. 2004).

8.3.3 Other changes in the social and physical environment

During the whole of the 1990’s, enormous changes took place in the Russian Federation, which brings more challenges for evaluating the effect of the intervention. The economy in Russia experienced great transitional difficulties throughout the 1990’s (WHO 1999). An economic crisis broke out in 1998, and real income fell by 40% from the 1997 levels. After that, during 2000–2001, the economy finally started to recover (OECD 2002). Health problems and the poor economic situation in the country strained the health care system, which was in the midst of a reform process.

In the Pitkäranta district, oral health services did not manage to change their ways of action towards emphasising health promotion. In 2001, fluoride varnishes were applied more often than in 1993. However, even in 2001, the number of fluoride-varnish applications was too low to have had a significant effect on the level of caries occurrence in the community. So far, the programme has also failed to develop collaboration with the child- and maternity welfare clinics. On the other hand, decision-makers and school teachers have even more positive attitudes towards the programme of oral health in the area than at baseline. This positive attitude and commitment were valuable resources for implementation of the intervention.

8.3.4 Process evaluation

Valid outcome evaluation is hard to perform and it is sometimes more important to understand how the changes were achieved, what was the coverage of the programme, and what was the feasibility and acceptability of the intervention among the target population and the programme personnel (Hausen 1987). Process evaluation deals with activities which are planned to occur during intervention and include monitoring results during a programme and can serve as an early indicator of programme outcome (Hausen 1987). In this programme of oral health promotion in the Pitkäranta district of Russian Karelia, evaluation of
the process was maybe the weakest part of the programme. Eventhough the teachers were well educated and empowered for health education, we did not have exact information about the content, intensity or ways how health education was carried out at schools and kindergartens. Neither had we information about the true coverage of the programme at different schools and kindergartens in the district.

In the Pitkäranta district, oral health services did not manage to change their ways of action towards emphasising health promotion and the programme also failed to develop collaboration with the child- and maternity welfare clinics. It would have been important to find out the reasons for the failure either in ways how we tried to involve them in the programme, in feasibility and acceptability of the programme or in attitudes of the health care workers.

8.4 Conclusion

In the beginning of the 1990’s, in the Pitkäranta district the need for promotion of oral health was urgent. At the same time, the whole of Russia was struggling with huge problems in public health and health care. In such a situation, oral health often receives low priority. Nevertheless, promotion of oral health is part of general health promotion and should be valued similarly to other aspects of health.

Implementing the programme in the district was challenging because in Russia the political and economic transition occurred simultaneously. Without the enthusiastic involvement of local authorities and different sectors of society, this study would not have been possible. This programme of oral health promotion succeeded rather well in putting the principles of health promotion into practice; improvements in oral health and in oral health-related behaviours among children as well as other developments in the community were impressive. Still, more work for promoting oral health is needed to decrease the frequent use of sugary snacks and soft drinks, to increase use of fluoridated toothpaste and to decrease smoking among adolescents in the Pitkäranta district.

8.5 Recommendations

This description of the strengths and weaknesses of the programme of oral health promotion, which has been carried out in the Pitkäranta district since 1993, provides recommendations for implementing community-wide programmes of oral health promotion and for future research.
8.5.1 Recommendations for implementation of community-wide oral health promotion programmes

1. It is well-established that the most common oral diseases, like other non-communicable diseases, are dependent on individual patterns of behaviour. Therefore, promoting healthy lifestyles should be a primary aim of this type of interventions.
2. The factors in the surrounding environment that influence adoption of healthy lifestyles should be identified.
3. A successful community-wide programme of health intervention demands support and commitment at all levels of the community (Freudenberg & Eng 1995, Nissinen et al. 2001). Collaboration between different sectors is necessary, but integrating other sectors than health sector into health promotion is often difficult. Therefore, extra efforts should be made to help all parties see the problems, to aid them in understanding that something should be done and to provide tools they can use to change the situation.
4. A successful intervention does not always mean increased costs for the health care system but rather emphasises the possibility of changing the situation with existing human and material resources.

8.5.2 Recommendations for research

1. Before the 21st century there were few studies on oral health and its determinants in Russia. So far, no studies have been published concerning oral health in the Russian Federation in the 21st century. More epidemiological research is needed on the level of oral health and its determinants in Russia.
2. More research is also needed on the effectiveness of community-wide programmes of oral health promotion. The programmes should include application of firm theoretical frameworks, increasing sensitivity of measures, use of different methods and/or designs, and different methods and processes for evaluation.
9 Укрепление здоровья полости рта в пределах местного сообщества в одном из районов Республики Карелия – ситуационное исследование (резюме на русском языке)

9.1 Цель

Цель настоящего исследования заключалась в описании планирования, проведения и оценки программы укрепления здоровья полости рта, которая началась в 1993 году в Питкярантском районе Республики Карелия.

9.2 Материал и методы

Для клинических и анкетных обследований в Питкярантском районе были сделаны стратифицированные выборки детей и подростков в возрасте 6, 9, 12 и 15 лет. Для каждой возрастной группы было отобрано по 150 детей. Общая доля участия детей в Питкярантском районе составляла 95% (n=587). Распределение субъектов по возрасту, полу и району проживания показано в Таблице 4.

Сводные данные по двум финским городам – Куопио и Ювяскюла – использовалась как исходные контрольные данные при оценке ситуации в Питкярантском районе. В контрольных районах Финляндии размер выборки составлял 200 детей для каждой возрастной группы в 1992 году. Доля участия среди финских детей составляла 69% (n=555) (Таблица 4).

9.3 Базовый анализ местного сообщества в 1993 году

Поскольку доступность литературы или статистики о здоровье полости рта в Республике Карелия была ограниченою до начала программы, то для обзора ситуации и потребностей в Питкярантском районе в 1993 году была собран набор данных. Были использованы различные количественные и качественные методы для получения целостного набора параметров местного сообщества и целевой группы населения (График 7).

Базовый анализ местного сообщества включал в себя клинические стоматологические обследования, анкетные обследования и подсчет mutans
streptococci. Они проводились таким же образом, как и в контрольных районах Финляндии – Куопио и Ювяскюла (Seppä et al. 1998). Кроме того, в Питкярантском районе были проведены интервью со стоматологами и дентистами, сделаны наблюдения в местных магазинах, киосках, школах и стоматологических клиниках и измерены концентрации фторидов в питьевой воде. По литературе, местной статистике и документации на пациентов в Питкярантском районе был проведен поиск предыдущей информации о здоровье полости рта и его детерминантах среди детей в Республике Карелия.

Базовый анализ местного сообщества обнаружил, что в российской части Карелли наблюдается высокая частота болезней зубов. Поведение в области здоровья полости рта обычно было неприемлемым, а профессиональная практика в стоматологических кабинетах практически отсутствовала. Оптимальная концентрация фторидов в питьевой воде была обнаружена только в сельской местности на юго-востоке. Поэтому результаты базового анализа местного сообщества 1993 года требовали вмешательства с упором на содействие здоровому образу жизни, переориентацию методов работы системы стоматологического лечения на укрепление здоровья и профилактику заболеваний, создание поддерживающей среды и оказание поддержки для действий на уровне местного сообщества в соответствии с предложениями Оттавской хартии.

9.4 Вмешательство с целью укрепления здоровья полости рта

Цель программы состояла в том, чтобы снизить уровень болезней зубов и достичь как минимум такого же уровня здоровья полости рта, какой наблюдается среди детей в контрольных районах Финляндии. Промежуточные цели состояли в том, чтобы улучшить самостоятельный уход за собой и переориентировать методы работы системы стоматологического лечения. Программа была направлена на предоставление детям необходимых знаний и навыков для поддержания здоровья полости рта и совершения в повседневной жизни выборов, благоприятных с точки зрения здоровья полости рта. Медико-санитарное просвещение было особенно направлено на то, чтобы повысить частоту чистки зубов, использовать зубные пасты с фтором и снизить употребление сладких закусок в период между приемами пищи. Цель состояла в достижении тех же уровней, которые наблюдались в контрольных районах.
Финляндии в 1992 году, за исключением курения, которое в данных районах Финляндии было более распространено по сравнению с Питкярантским районом. Одна из целей вмешательства также заключалась в том, чтобы увеличить спрос и предложение правильных зубных щеток и зубной пасты с фтором в местных магазинах.

Вмешательство подчеркивало ответственность отдельных людей и местных сообществ за укрепление здоровья полости рта и за сотрудничество между школами, детскими садами и системой стоматологического лечения в соответствии с принципами первичной медико-санитарной помощи (ВОЗ 1978). Одна из целей программы заключалась в том, чтобы начать вмешательство уже в родильных домах, в которых гинекологи и другие врачи информировали бы беременных матерей о вопросах, касающихся здоровья полости рта их ребенка. Тем не менее, главной целью данного вмешательства были дети дошкольного и школьного возраста, поскольку известно, что недавно выросшие зубы наиболее подвержены кариесу (Manji & Fejerskov 1996). Поэтому школы и детские сады были важными местами для проведения медико-санитарного просвещения.

Вмешательство началось осенью 1994 года в районе города Питкяранта. В начале вмешательства было проведено пять семинаров для стоматологического персонала и пять семинаров для персонала школ и детских садов по проблемам, связанным со здоровьем полости рта, их причинам и профилактике. Цель семинаров состояла в том, чтобы предоставить всем секторам достаточную информацию и привлечь их к сотрудничеству.

После этого вмешательство проводилось в 1-3 классах в одной школе и двух детских садах. Медико-санитарное просвещение для школьников состояло из шести уроков, посвященных причинам и профилактике заболеваний полости рта и проведенных в течение учебного года в городе Питкяранта. Уроки планировались и проводились учителями. Аналогичная информация, адаптированная для соответствующего возраста, была предоставлена детям в детских садах. Медсестра-стоматолог посещала родительские собрания в школе и детских садах и информировала родителей о правильных методах самостоятельного ухода и о прогрессе программы укрепления здоровья полости рта в регионе. В детских садах дети также ежедневно упражнялись после тихого часа в чистке зубов содержащей фтор зубной пастой. При поддержке родителей, местных промышленных
предприятий и местных органов власти в детские сады были доставлены правильные зубные щетки и зубная паста с содержанием фтора. Во время посещений детьми стоматолога, медсестра-стоматолог предоставляла детям ту же информацию о здоровье полости рта, которая предоставлялась в школе, и показывала детям, как правильно чистить зубы.

9.5 Последующий анализ местного сообщества в 2001 году

При проведении анализа местного сообщества в 2001 году использовались те же методы, что и в 1993 году, за несколькиыми исключениями, которые будут описаны ниже. Результаты последующего анализа местного сообщества использовались для мониторинга изменений, происшедших между 1993 и 2001 гг., для оценки сильных и слабых сторон программы и для планирования будущих действий. Доля участия детей в Питкярантском районе была высокой. В общей сложности, 90% изначальной выборки участвовало в клинических и анкетных обследованиях (n=581).

В 2001 году в анкету для детей было добавлено несколько вопросов для выяснения отношения детей к здоровью полости рта и их знаний в этой области. Детям задавали вопрос о том, считают ли они возможным предотвратить заболевания полости рта, приобретая здоровые привычки. Дети также сообщили о своем знании наиболее общих детерминантах карисеа зубов и откуда они получили данную информацию.

Количество случаев карисеа в 2001 году было меньше, чем в 1993 году (График 20, Таблица 10), и стало заметно более поляризованным (График 21). В частности, заметно увеличился (p=0,004) процент не страдающих карисеем 12-летних мальчиков (индекс КПУ = 0) (Таблица 10). С другой стороны, понизился процент не страдающих карисеем 15-летних мальчиков, хотя среднее значение индекса КПУ у них снизилось после исследования 1993 года. Среди детей и подростков всех возрастных групп также снизилось присутствие видимого зубного налета (Таблица 10).

Два третьи детей считали, что они могут предотвратить заболевания полости рта своим собственным поведением; а их поведение также стало более благоприятным, за исключением сообщений об употреблении сладких закусок и экспериментов с курением (Таблицы 11-12). Большинство детей были удовлетворительно информированы о наиболее общих детерминантах карисеа зубов. Дети знали, что частое употребление сладких закусок приводит к карисе зубов (88% субъектов исследования) и что карис зубов
может быть предотвращен регулярной чисткой зубов (70%) и использованием продуктов, содержащих фтор (52%). Эта информация в основном была получена дома или в школе.

Положительные изменения также наблюдались в отношении ключевых местных властей: принимающих решения лиц, учителей и стоматологического персонала. В 2001 году 53% ключевых информантов считали ситуацию в области здоровья полости рта у детей хорошей или удовлетворительной (по сравнению с 37% в 1993 году). Качество медико-санитарного просвещения в области здоровья полости рта, предоставляемого в регионе, рассматривали как среднее или хорошее 82% властей (по сравнению с 41% в 1993 году), а содержание медико-санитарного просвещения оценивалось как адекватное (76% в 2001 году по сравнению с 26% в 1993 году). Позитивные сдвиги были отмечены не только в отношении к медико-санитарному просвещению, но и в его реализации в школах и детских садах. В 2001 году 87% (n=78) учителей сообщили о проведении кампаний по медико-санитарному просвещению в области здоровья полости рта, что на 17% превышает аналогичный показатель 1993 года (n=54). Учителя и стоматологический персонал считали совместные усилия школ и стоматологических служб ценным вкладом в укрепление здоровья полости рта. Тем не менее, как учителя, так и стоматологический персонал по-прежнему считали роль родителей наиболее важной. В период 1993-2001 гг. методика действий стоматологических служб не изменилась в сторону акцента на укрепление здоровья.

9.6 Рекомендации

Настоящее описание сильных и слабых сторон программы укрепления здоровья полости рта, которая проводилась в Питкярантском районе с 1993 года, выделило несколько компонентов успеха и неудач.

1. Был четко установлен тот факт, что наиболее распространенные болезни полости рта, аналогично другим незаразным заболеваниям, зависят от индивидуального поведения. Поэтому содействие здоровому образу жизни должно быть основной целью такого рода вмешательств.

2. Следует выделить факторы в окружающей среде, которые влияют на ведение здорового образа жизни.
3. Успешная программа вмешательства в здравоохранение на уровне местного сообщества требует поддержки и обязательств от всех уровней сообщества (Freudenberg & Eng 1995, Nissinen et al. 2001). Сотрудничество между различными секторами необходимо, но интеграция не относящихся к здравоохранению секторов часто сталкивается с трудностями. Поэтому следует приложить дополнительные усилия, чтобы помочь всем сторонам увидеть проблемы, помочь им понять необходимость принятия мер и предоставить им инструменты, с помощью которых они могут изменить ситуацию.

4. Успешное вмешательство не всегда означает повышение расходов на систему здравоохранения, а скорее указывает на возможность изменения ситуации с помощью имеющихся человеческих и материальных ресурсов.

9.7 Список таблиц


Таблица 3. Среднее значение индекса КПУ среди детей в возрасте 3-6 лет и процент детей с индексом КПУ=0 в России и странах Балтии согласно исследованиям, проведенными с 1983 по 1994 годы.

Таблица 4. Распределение субъектов по возрасту, полу и району проживания в Питкярантском районе в 1993 году и контрольных районах Финляндии в 1992 году.

Таблица 5. Значения каппы Коща внутреннего и внешнего исследователя по присутствию в сравнении с отсутствием КПУ в 1993 г.

Таблица 6. Процент детей, проживавших в семьях с разными жилищными условиями в городе и сельской местности в Питкярантском районе в 1993 г.
Таблица 7. Потенциал и угрозы деятельности по укреплению здоровья полости рта в Питкярантском районе в 1993 г.
Таблица 8. Распределение субъектов по возрасту, полу и району проживания в Питкярантском районе в 2001 г.
Таблица 9. Значения каппы Козна внутреннего и внешнего исследователя по присутствию в сравнении с отсутствием кпн/КПУ (n) в 2001 г.
Таблица 10. Отличия в частоте карIESа и заметного налета на зубах у детей Питкярантского района между 1993 и 2001 гг. Отличия (значение 2001 г. минус значение 1993 г.) приведены как среднее значение или процентное выражение, а их 95%-ные доверительные интервалы приведены в скобках.
Таблица 11. Отличия в практике гигиены полости рта у детей Питкярантского района между 1993 и 2001 гг. Отличия представлены в виде процентных пунктов, а их 95%-ные доверительные интервалы приведены в скобках.
Таблица 12. Отличия в сообщенном ежедневном употреблении различных сладких закусок и экспериментов с курением у детей Питкярантского района между 1993 и 2001 гг. Отличия представлены в виде процентных пунктов, а их 95%-ные доверительные интервалы приведены в скобках.
Таблица 13. Помещения и ресурсы персонала стоматологических клиник в Питкярантском районе в 1993 г.
Таблица 14. Оборудование и инструменты в стоматологических клиниках в Питкярантском районе в 1993 г.
Таблица 15. Материалы в стоматологических клиниках в Питкярантском районе в 1993 г.
Таблица 16. Помещения и ресурсы персонала стоматологических клиник в Питкярантском районе в 2001 г.
Таблица 17. Оборудование и инструменты в стоматологических клиниках в Питкярантском районе в 2001 г.
Таблица 18. Материалы в стоматологических клиниках в Питкярантском районе в 2001 г.
9.8 Список графиков

График 1. Модель социальных детерминант здоровья, показывающая сложные пути в социальном контексте (заимствована из Brunner & Marmot 1999 с разрешения издательства Oxford University Press).

График 2. Модель укрепления здоровья (заимствована из Downie et al. 1996 с разрешения издательства Oxford University Press).

График 3. Модель PRECEDE-PROCEED для планирования и оценки укрепления здоровья (Green & Kreuter 2005).

График 4. Укрепление здоровья как процесс.

График 5. Схема процесса программы укрепления здоровья полости рта в Республике Карелия.

График 6. Географическое положение целевого района (Питкярантский район Республики Карелия) и контрольных районов Финляндии (Куопио и Юваскюла).

График 7. Аспекты, изученные в базовом анализе местного сообщества в Питкярантском районе в 1993 г.

График 8. Процент детей и подростков в возрасте 6, 9, 12 и 15 лет согласно индексу кпу/КПУ в Питкярантском районе в 1993 г. и в контрольных районах Финляндии в 1992 г.

График 9. Процентное распределение значений индекса кпу/КПУ в убывающем порядке, сопоставленное на графике с распределением детей и подростков в возрасте 6, 9, 12 и 15 лет в Питкярантском районе в 1993 г. и в контрольных районах Финляндии в 1992 г.

График 10. Процент девочек в возрасте 6, 9, 12 и 15 лет с видимым налетом на шести индексных зубах в Питкярантском районе в 1993 году и в контрольных районах Финляндии в 1992 г.

График 11. Процент мальчиков в возрасте 6, 9, 12 и 15 лет с видимым налетом на шести индексных зубах в Питкярантском районе в 1993 году и в контрольных районах Финляндии в 1992 г.

График 12. Процент 12-летних детей с различными показателями mutans streptococci в слюне в Питкярантском районе в 1993 году и в контрольных районах Финляндии в 1992 г.
График 13. Процент детей и подростков в возрасте 6, 9, 12 и 15 лет, которые сообщили о том, что они чистят зубы два раза в день или чаще в Питкярантском районе в 1993 году и в контрольных районах Финляндии в 1992 г.

График 14. Процент детей и подростков в возрасте 6, 9, 12 и 15 лет, которые сообщили об использовании зубной пасты с фтором не реже одного раза в день в Питкярантском районе в 1993 году и в контрольных районах Финляндии в 1992 г.

График 15. Процент детей и подростков в возрасте 6, 9, 12 и 15 лет, которые сообщили о ежедневном употреблении сладких закусок в Питкярантском районе в 1993 году и в контрольных районах Финляндии в 1992 г.

График 16. Процент подростков в возрасте 12 и 15 лет с различными привычками к курению в Питкярантском районе в 1993 году и в контрольных районах Финляндии в 1992 г.

График 17. Процентные соотношения детей, сгруппированных по сообщенным причинам их последнего визита к зубному врачу в Питкярантском районе в 1993 г.

График 18. Процент пациентов стоматологической службы по возрастным группам в Питкярантском районе в 1993 г.

График 19. Ящищковые диаграммы, показывающие распределение содержания фтора в питьевой воде в городских и сельских районах в Питкярантском районе в 1993 г.

График 20. Процент детей и подростков в возрасте 6, 9, 12 и 15 лет согласно значениям индекса кпк/КПУ в Питкярантском районе в 1993 и 2001 гг.

График 21. Процентное распределение значений индекса кпк/КПУ в убывающем порядке, сопоставленное на графике с распределением детей и подростков в возрасте 6, 9, 12 и 15 лет в Питкярантском районе в 1993 и 2001 гг.

График 22. Процент детей и подростков в возрасте 6, 9, 12 и 15 лет согласно значениям индекса кпк/КПУ в Питкярантском районе в 2001 г. и в контрольных районах Финляндии в 1992 г.

График 23. Процентное распределение значений индекса кпк/КПУ в убывающем порядке, сопоставленное на графике с распределением детей и подростков в возрасте 6, 9, 12 и 15
лет в Питкярантском районе в 2001 г. и в контрольных районах Финляндии в 1992 г.
Прцент детей в России с налетом на индексных зубах практически соответствовал данному показателю в Финляндии в 1992 г. (Графики 24–25).
График 24. Процент девочек в возрасте 6, 9, 12 и 15 лет с налетом на индексных зубах в Питкярантском районе в 2001 г. и в контрольных районах Финляндии в 1992 г.
График 25. Процент мальчиков в возрасте 6, 9, 12 и 15 лет с налетом на индексных зубах в Питкярантском районе в 2001 г. и в контрольных районах Финляндии в 1992 г.
График 26. Процент детей и подростков в возрасте 6, 9, 12 и 15 лет, которые сообщили о том, что они чистят зубы не реже двух раз в день в Питкярантском районе в 2001 г. и в контрольных районах Финляндии в 1992 г.
График 27. Процентное распределение детей и подростков в возрасте 6, 9, 12 и 15 лет, которые сообщили о ежедневном использовании зубной пасты с фтором в Питкярантском районе в 2001 году и в контрольных районах Финляндии в 1992 г.
График 28. Процент детей и подростков в возрасте 6, 9, 12 и 15 лет, которые сообщили о ежедневном употреблении сладких закусок в Питкярантском районе в 2001 г. и в контрольных районах Финляндии в 1992 г.
References


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Appendix 1 Appendix tables

Numbers used for dental clinics in appendix tables 13–18.

1. Pitkäranta town, hospital, child health clinic
2. Pitkäranta town, health clinic
3. Pitkäranta town, school number 1 and school number 2, six months in both schools, same materials and instruments
4. Pitkäranta town, kindergarten
5. Pitkäranta town, paper mill
6. Pitkäranta town, prosthodontic clinic
7. Salmi, school
8. Salmi, health clinic
9. Räämälä, school
10. Läskelä, hospital
11. Impilahti, agriculture office
12. Hiidenselkä, paper mill health clinic
13. Rautalahti, kindergarten
14. Harlu, hospital
Table 13. Premises and personnel resources in dental clinics in the Pitkäranta district in 1993.

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<th>Dental clinic</th>
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<tr>
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<td>Premises</td>
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</tr>
<tr>
<td>Rooms</td>
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<td>Area (m²)</td>
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</tr>
<tr>
<td>Waiting room</td>
<td>+</td>
</tr>
<tr>
<td>Tap water</td>
<td>+</td>
</tr>
<tr>
<td>Hot water</td>
<td>-</td>
</tr>
<tr>
<td>Personnel</td>
<td></td>
</tr>
<tr>
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</tr>
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<td>Dentists</td>
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<tr>
<td>Nurses</td>
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<tr>
<td>Other</td>
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<tr>
<td>Use of the office</td>
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<td>Days per week</td>
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<tr>
<td>Hours per day</td>
<td>6</td>
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<td>Emergency duty</td>
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<td>329</td>
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1) Instrument cleaner, 2) Technician, 3) Cleaner, 4) Same dentist and assistant in Salmi and Räimälä, 5) Used six weeks in a year, 6) Occasionally in use
Table 14. Equipment and instruments in dental clinics in the Pitkäranta district in 1993.

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<td>Age of the unit (yrs)</td>
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<td>Air boost</td>
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</tr>
<tr>
<td>Water boost</td>
<td>x x / x²</td>
</tr>
<tr>
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<tr>
<td>Turbine</td>
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| * Two units, ² Russian ³Out of order
Table 15. Materials in the dental clinics in the Pitkäranta district in 1993.

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Table 16. Premises and personnel resources in dental clinics in the Pitkäranta district in 2001.

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0 Instrument cleaner, 1 Technician, 2 Cleaner, 3 Same dentist and assistant in Salmi and Räimälä, 4 Used 1.5 months in a year, 5 Occasionally in use
Table 17. Equipment and instruments in dental clinics in the Pitkäranta district in 2001.

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Appendix 2 Questionnaire form for children

1. How often do you brush your teeth?
   1. Twice a day or more often
   2. Once a day
   3. Less than once a day
   4. Once a week
   5. Never

2. Besides toothbrushing, do you use dental floss for cleaning your teeth?
   1. Twice a day or more often
   2. Once a day
   3. Less than once a day
   4. Once a week or less
   5. Never
   6. I don’t know what dental floss is

3. Besides toothbrushing, do you use toothpicks for cleaning your teeth?
   1. Twice a day or more often
   2. Once a day
   3. Less than once a day
   4. Once a week or less
   5. Never
   6. I don’t know what a toothpick is

4. What kind of drinking water is used in your home?
   1. Piped water
   2. Other (from a well, spring etc.)

5. Besides me, at my home lives
   1. ____________________ sisters
   2. ____________________ brothers
   3. mother
   4. father
   5. someone else, who _____________
   6. __________________________
   7. __________________________

6. How many rooms are there in your home?
   _______________ rooms and a kitchen or a kitchenette
7. Is there in your home (you may pick several choices)
   1. running cold water
   2. running hot water
   3. a bathroom or a shower
   4. an inside toilet
   5. central heating
   6. electrical lighting
   7. a kitchen

8. What is the name of the toothpaste or toothpowder or other dental hygiene materials, and how often you have used them during the last 30 days?

<table>
<thead>
<tr>
<th></th>
<th>Twice a day</th>
<th>Once a day</th>
<th>Less often, occasionally</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothpaste:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Tooth powder:</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

9. What is the education of your parents? (choose the highest level of education for each guardian)

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Someone else, who</th>
<th>Someone else, who</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive school</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Secondary or vocational level education</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>University level education</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

10. Who are the adults that live in your home and what do they do?

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th>Father</th>
<th>Some one else, who</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does not live at home</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2. Working</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3. Unemployed</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4. Retired</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
11. What is the main occupation or job of your guardians? Put the occupation as exactly as possible. For example mechanic, school teacher in comprehensive school, workman at a building site, typist. Avoid rough titles like workman or school teacher and degrees and titles like master of something, counsellor etc. If your guardian is retired or unemployed, write also their occupation or job (for example retired sheet metal worker, unemployed civil engineer).

1. Mother, vocation ____________________________
2. Father, vocation _____________________________
3. Other guardian, who? ________________ Vocation ___________________________
4. Other guardian, who? ________________ Vocation ___________________________

12. How big was the total income of your family in 1992/2000 without deducting the taxes?
   1. Less than 60 000 (1993) / 3 000 Roubles (2001)
   2. From 60 000 to 160 000 (1993) / 3 000 to 6 000 Roubles (2001)
   3. From 160 000 to 400 000 (1993) / 6 000 to 12 000 Roubles (2001)
   4. Over 400 000 (1993) / 12 000 Roubles (2001)

13. Do you follow any special diet for a disease, allergy, religion or other reasons?
   1. No
   2. Yes. What __________________________

14. How often do you eat a hot meal?
   1. More than twice a day
   2. Twice a day
   3. Once a day
   4. Less than once a day
   5. Never

15. Do you eat at school?
   1. Yes, a warm meal.
   2. Yes, a tea with a bun
   3. No

16. Are you familiar with any xylitol products?
   1. I don’t know what xylitol products are
   2. Yes and I have tasted them
17. Next, there is a list of sugary snacks. Assess as exactly as possible how often you have eaten them during the last 7 days. Remember to answer to every question.

<table>
<thead>
<tr>
<th></th>
<th>3 to 4 times a day</th>
<th>Twice a day</th>
<th>Once a day</th>
<th>2 or 3 times a week</th>
<th>Once a week</th>
<th>Less or never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefir with sugar</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Puddings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Dry fruits</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Ice cream</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Fresh juices</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Soft drinks</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Juices with sugar</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Hot chocolate</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Cakes, biscuits or buns</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Sweets</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Tea with sugar</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Coffee with sugar</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Chewing gum</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

18. When have you last visited a dentist (year)?

In ____________________

19. How many times have you visited a dentist during last 12 months?

______________ times

20. What was the reason for the latest dentist visit and what was done then?

1. Tooth pain
2. Check up
3. Tooth filling
4. Tooth extraction
5. Other, what _______________________

21. Do you think that you can prevent oral diseases yourself?

1. Yes
2. No
22. Do you know how frequent use of sugar products is related to dental caries?
   1. Yes
   2. No
   3. I am not sure

23. Do you know how frequent toothbrushing is related to dental caries and gingival inflammation?
   1. Yes
   2. No
   3. I am not sure

24. Do you know how fluoride affects on dental caries?
   1. Yes
   2. No
   3. I am not sure

25. Did you get information about the association between sugar products and dental caries?
   1. No
   2. I am not sure
   3. Yes, from (select the most important alternative)
      ○ my parents, brothers or sisters
      ○ my friends
      ○ school or kindergarten
      ○ dental clinic
      ○ TV
      ○ journals or other literature
      ○ elsewhere, from _________________________________

26. Did you get information about the association between fluorides and dental caries?
   1. No
   2. I am not sure
   3. Yes, from (select the most important alternative)
      ○ my parents, brothers or sisters
      ○ my friends
      ○ school or kindergarten
      ○ dental clinic
      ○ TV
      ○ journals or other literature
      ○ elsewhere, from _________________________________
27. Did you get information about toothbrushing?

1. No
2. I am not sure
3. Yes, from (select the most important alternative)
   - my parents, brothers or sisters
   - my friends
   - school or kindergarten
   - dental clinic
   - TV
   - journals or other literature
   - elsewhere, from _________________________________
Appendix 3 Questionnaire form for the 12- and 15-year-olds regarding smoking

1. Have you ever tried smoking?
   1. No (if you answered “no”, you may move to question 9).
   2. Yes

2. How old were you when you tried smoking for the first time?
   ____________________ years old

3. How many cigarettes, pipefuls or cigars you have smoked so far?
   1. None (You may move to question 9)
   2. Just one (You may move to question 9)
   3. Approximately 20–50
   4. Over 50

4. How many cigarettes, pipefuls or cigars you have smoked during the last seven days?
   1. None
   2. Approximately 1–10
   3. Over 10

5. When was the last time you smoked cigarettes, pipes or cigars?
   1. Yesterday or today
   2. 2–4 days ago
   3. Approximately week ago
   4. Between 2 weeks and 2 months ago
   5. Between 2–6 months ago
   6. Over 6 months ago (You may move to question 9)

6. Which of the following alternatives describes best your current smoking?
   1. I smoke once a day or more often
   2. I smoke once a week or more often, not daily
   3. I smoke less than once a week
   4. I have given up smoking
7. If you have given up smoking, how long this has continued?
   1. Less than a week
   2. Between a week and two months
   3. Between two and six months
   4. Over six months (You may move to question 9)

8. How much do you smoke currently or smoked before you gave up smoking?
   1. Factory-made cigarettes _________ per day
   2. Self-made cigarettes ________ per day
   3. Pipefuls, cigars ___________ per day

9. Have you ever tried snuff? How many times so far?
   1. I have not tried snuff
   2. I have tried once
   3. I have taken snuff 2–50 times
   4. I have taken snuff over 50 times

10. Do you take snuff currently?
    1. No
    2. Every now and then
    3. Once a day or more often
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