



The Secrets of Jönköping: Why Do Most 80-Year-Olds Have More Than 20 Remaining Teeth, and Why Are There Very Few Edentulous?

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Abstract

Repeated epidemiological studies have been performed in the city of Jönköping, Sweden, every 10 years since 1973. The studies were initiated in order to describe the changes in oral health in the population. Basic preventive dental care and supplementary programs were extensively performed in the population, especially among children and adolescents. In this population, the percentage of individuals with sound teeth (no caries or restorations) continuously increased each decade. The main finding regarding periodontitis is the significant increase in individuals having no or minimal periodontitis experience. In 2013, 20–60-year-olds had nearly complete dentitions (28 teeth), and the individuals in age groups 70 and 80 years had a mean number of teeth of 23 and 21, respectively. Edentulous

individuals having complete dentures in the age groups 40–70 years decreased from approximately every sixth individual in 1973 to none in 2013. The continuous improvement in oral health and the reduced need for restorative treatment will have an impact on dental health-care and dental delivery systems in the near future.

11.1 Introduction

Poor oral health has a major impact on public health and well-being worldwide. Oral diseases cause suffering and, in the worst cases, can be lethal. In addition, they are among the most prevalent chronic diseases [1]. Taken together this led to high costs for both the individual and society. In the early 1970s, the oral health situation in Sweden was poor with extensive caries, periodontitis, and tooth loss, and edentulousness was widespread [2]. Most available resources were used for restorative treatment, not for prevention of caries and periodontitis.

In 1974, a new dental act was introduced, which made Swedish counties responsible for providing full dental services free of charge for all children and adolescents up to the age of 20 years. In addition, the 1974 National Dental Health Insurance Act instituted an insurance system for the adult population. Swedish dental care

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is provided by general dental practitioners, who are either employed by the public dental service or work in private practices. Publicly employed dentists treat children and adults, while most private practitioners mainly provide dental care for adults.

Jönköping is one of the ten largest cities in Sweden. The city is expanding and has increased from 110,000 inhabitants in 1973 to 136,000 inhabitants in 2013. Jönköping is situated in southern Sweden and characterized as the administrative center of the region as well as a center for industry, commerce, transportation, and education. The population is somewhat younger (mean age 40.3) than the Swedish population as a whole. About 13% of the inhabitants in Jönköping are born abroad, the majority in Iraq, Syria, in former Yugoslavia, and in other Nordic countries. Repeated epidemiological studies with a random design have been performed in Jönköping since 1973 [3]. The studies were initiated in order to describe the changes in oral health in the population. In addition to clinical and radiographic examinations, questionnaires on diets and dental care habits and attitudes have been used.

11.2 Oral Health Development

11.2.1 Caries and Restorations

A significant oral health improvement can be seen over the 40-year period, reflected in a decreasing number of carious lesions and restorations [4]. This dramatic reduction in caries may be exemplified by the number of decayed (sum of initial and manifest caries) and filled surfaces (DFS) in 15- and 20-year-olds, who in 1973 had 28 and 35 DFS and in 2013 had 3 and 6 DFS, respectively. This is a very clear improvement. The number of DFS decreased decade by decade in all age groups but for the 70- and 80-year-olds. The latter can be explained by the increasing number of existing teeth. The most obvious change was the decrease in number of filled surfaces (FS). Among 15-year-olds, 18 FS were registered in 1973 compared to 1 in 2013. In the 40-year-olds, the corresponding figures were 51 and 13, respectively. The percentage of individuals with sound teeth (no caries or restorations) also increased through the years and was 43% for the 15-year-olds in 2013 (Fig. 11.1). Regarding

Caries-free individuals (%)

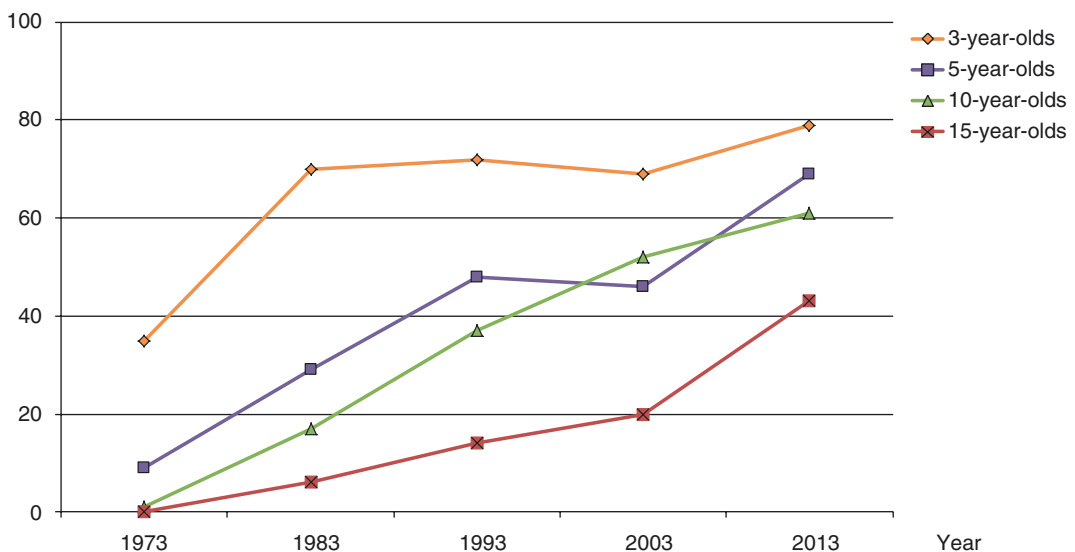


Fig. 11.1 Frequency (%) of children and adolescents without caries and restorations in 1973, 1983, 1993, 2003, and 2013

crowned teeth, the most significant change is the decrease in the number of crowned teeth in the age groups 40–60 years. The percentage of crowned teeth for the 50-year-olds was 25 in 1973 and 4 in 2013.

11.2.2 Periodontitis and Gingivitis

Between 1983 and 2013, there was a significant increase in the frequency of individuals 20–80-year-olds with no or minimal periodontitis experience—from 43% in 1983 to 60% in 2013 [5]. The number of individuals having pocket depth ≥ 6 mm also decreased in the total population between 1983 and 2013. There was a continuous decrease in the percentage of individuals classified with severe periodontitis from 16% to 11% between 1983 and 2013. In 1973, the prevalence of individuals in age groups 20–70 years with severe periodontitis experience was only 3%. This low number of individuals with severe periodontitis experience was due to a high number of edentulous subjects. In addition, 80-year-olds were not part of the study in 1973. An interesting finding was that among all periodontal

disease groups examined, the severe group is the only group showing an increase in the number of teeth between 2003 and 2013. The frequency of tooth sites with gingivitis was generally lower in the last 20 years compared with the years 1973–1993 (Fig. 11.2). In the 50-year-olds, the percentage of tooth surfaces with gingivitis was 39% in 1973 and 15% in 2013.

11.2.3 Teeth and Edentulousness

During the 40-year period since the first Jönköping study, the mean number of teeth increased at each examination in the age groups 30–80 years (Fig. 11.3). In 2013, 20–60-year-olds had complete dentitions, and the individuals in age groups 70 and 80 years had a mean number of teeth of 23 and 21, respectively. The increase in mean number of teeth among the age groups 60–80 years was mainly explained by an increase in premolars and molars.

Oral health in the examined population has improved extensively by the decreased prevalence of edentulousness and increased number of existing teeth. Edentulous individuals with

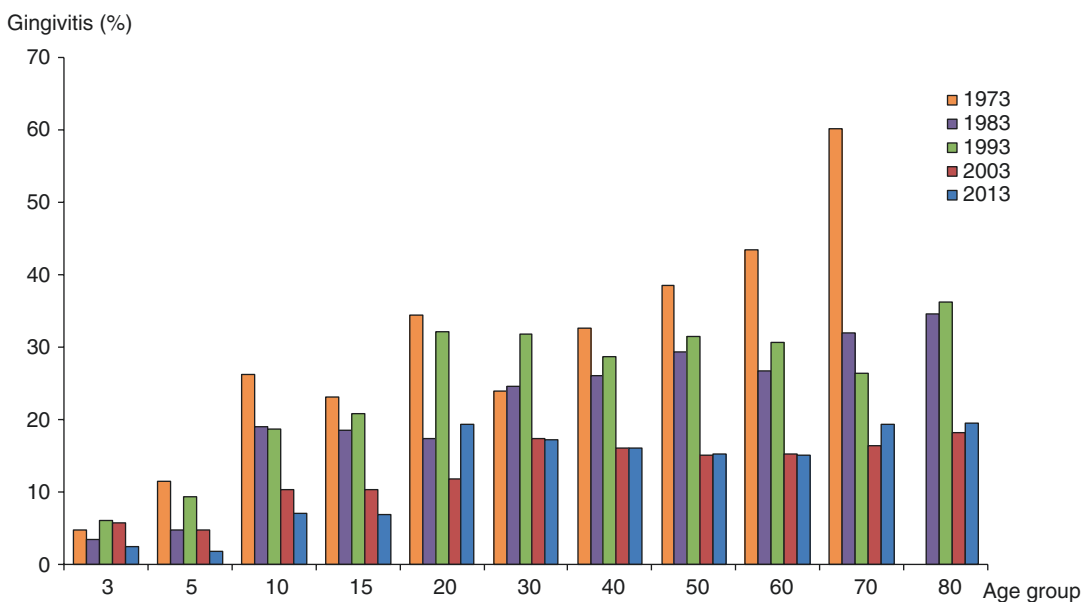


Fig. 11.2 Frequency (%) of total number of sites with gingivitis as a percentage of total number of existing sites. Means in the different age groups in 1973, 1983, 1993, 2003, and 2013

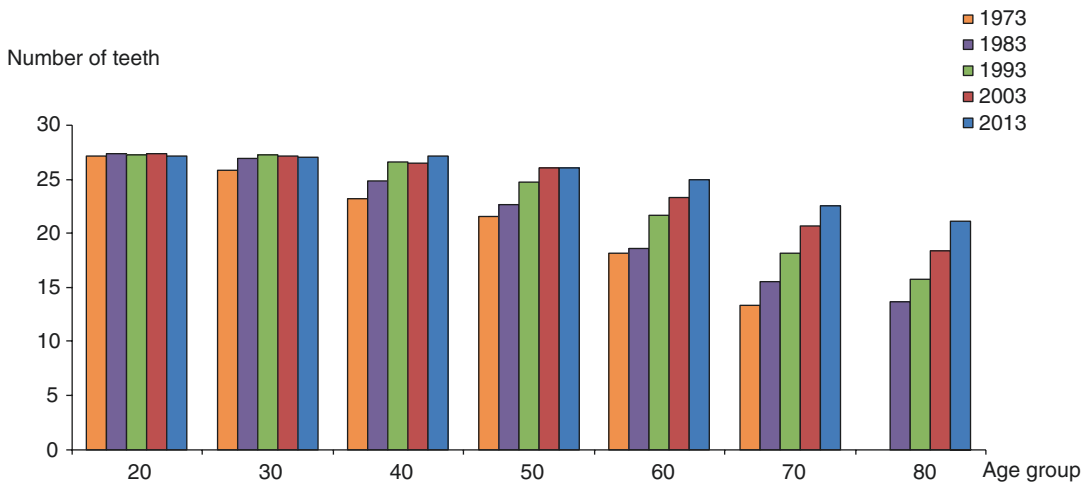


Fig. 11.3 Number of existing teeth (third molars and edentulous individuals excluded). Means in the different age groups in 1973, 1983, 1993, 2003, and 2013

complete dentures in the age groups 40–70 years decreased from approximately every sixth individual in 1973 to none in 2013. The few edentulous subjects among the age groups had been treated with implant-supported prostheses in one or both jaws. During the last decade, the number of existing teeth increased in the older age groups, 60–80 years, while only minor changes were seen among the younger age groups, where all individuals had almost complete dentitions. In the oldest age group, 80 years, the mean existing number of teeth reached one of the WHO goals, stipulating that more than half of all 80-year-olds should retain a minimum of 20 functional teeth [6].

11.3 Reasons for Improvement in Oral Health

From an analysis of the findings in the primary investigation, carried out in 1973, it was concluded that the efforts previously made had not managed to keep the two major oral diseases, caries, and periodontitis under control. It was decided that future dental health care should be based on a combination of cause-directed measures in connection with restorative treatment of high quality. To meet this aim, systematic con-

tinuous training of all dental care personnel in the county of Jönköping, within the public dental service as well as in private dental practices, was instituted in 1973 [7]. The current state of education and demand for continuous training was analyzed by means of questionnaires and interviews. From 1975 to 1979, a 5-year educational training program covering 1975–1979 was created. For dentists, three to seven courses and for dental assistants, five to seven courses were offered yearly.

From 1973 to 1979, integrated preventive dental care for children and adolescents in the county of Jönköping was developed. Aims, methods, target groups, organization, financing, and evolution of a preventive dental care organization gradually evolved for the age groups 0–16 years (4000 individuals in each age group). This was done through collaboration between dental health care and all primary schools. Basic preventive dental care programs and supplementary programs intended for individuals exhibiting a high prevalence of caries and gingivitis were presented. When implemented, these dental health-care programs brought about a remarkable improvement in oral health among children and adolescents in the county. Over a 5-year period, the number of caries-free preschool children increased considerably and the number of caries

lesions decreased. Oral hygiene improved, and the occurrence of gingivitis decreased. It was concluded that the introduction of the continuous training programs and the dental health programs each contributed to the improvement in oral health in the population. It was also stated that the results were promising for the future, not only because of the demonstrated effects in children and adolescents but also because the adult population could benefit from these programs as well. These programs have been continuously modified over the years according to new knowledge and changes in oral health in the population. When analyzing changes in oral health since 1973, it has to be understood that nearly all of the individuals up to 60 years of age have been exposed to dental preventive programs during at least the first 20 years of their lives.

The key areas for the caries preventive programs have included fluoride (toothpaste, rinsing, and varnish), diet counselling, oral hygiene improvement, mechanical and chemotherapeutic plaque-reducing methods for risk groups, and fissure sealants for molars. For example, in the age group of 20-year-olds, the mean number of DF occlusal surfaces was reduced from 12 to 2 between 1973 and 2013. This remarkable reduction in caries and restorations in a caries-prone tooth surface is most likely a result of the general fissure-sealing programs of all permanent molars in close relation to eruption [8]. Regarding diet, the frequency of snacking between meals among children and adolescents was lower in 2013 compared to 2003. The number of 3–20-year-old individuals regularly consuming soft drinks was also reduced in 2013 compared to 2003 [3]. This could be a reflection of the multidisciplinary work within dental and general health care concerning healthy dietary habits. It is a positive change in health-related behavior, since a high soft drink consumption pattern is regarded as an additional risk for the development of both dental caries and dental erosions. It is reasonable to believe that a constant decrease in caries lesions in the long run should have an effect on the number of crowned teeth and endodontically treated teeth. In the present study, the percentage of crowned teeth was reduced from 25% in 1973 to

4% in 2013 in the 50-year-old group. The corresponding figure for endodontically treated teeth in the same age group was 17% and 3%, respectively. The reduced caries prevalence clearly indicates that the need for advanced dental procedures will decrease in the future.

Over the period of 40 years since the first Jönköping study, an increase in the number of individuals with no marginal bone loss and a decrease in the number of individuals with moderate alveolar bone loss can be seen [5]. The frequency of sites with gingivitis in all age groups was also generally lower in the last 20 years compared to 1973–1993. This is an interesting finding since more teeth are remaining even in the older age groups. Better periodontal health in subjects in Jönköping in the last 40 years can be explained by three main phenomena: increased dental awareness in the population, increased number of dental hygienists performing professional periodontal treatment, and decreased number of smokers as well as number of smoked cigarettes. The enhanced dental awareness in the Jönköping population is expressed in more regular self-performed oral hygiene of better quality (Fig. 11.4). It should be noted that visible plaque was recorded without using a disclosing agent or a periodontal probe which may underestimate the real plaque score. However, even taking a possible underestimation of the mean plaque values into account, the important finding is the positive trend of better oral hygiene over the 40-year period. The majority of the population in Jönköping attends dental health care regularly, and there are an increasing number of dental hygienists performing professional periodontal treatment. According to the statistics from the Swedish National Board of Health and Welfare, there was a threefold increase of dental hygienists in the county of Jönköping from 52 in 1995 to 168 in 2014. Those numbers cover all dental hygienists within the public dental service as well as those in private dental practices. In Jönköping and in Sweden as a whole, a decrease in the number of smokers and number of smoked cigarettes can be seen. Smoking is a well-known risk factor for periodontitis as shown in

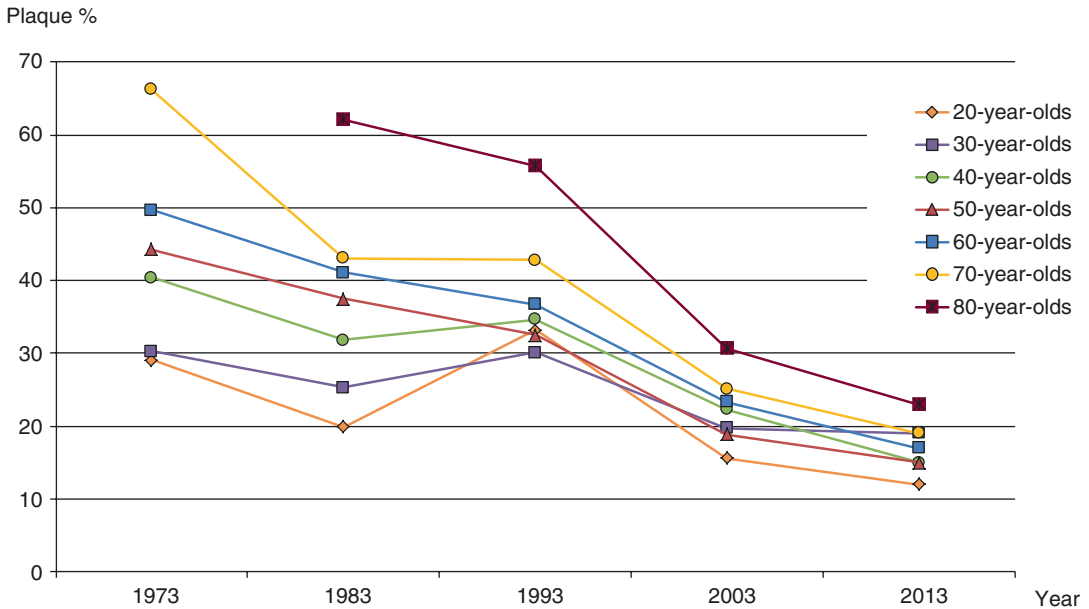


Fig. 11.4 Total number of tooth surfaces with plaque (%). Means in the different age groups in 1973, 1983, 1993, 2003, and 2013

numerous publications [9]. The Jönköping studies show that there was a reduction in smoking individuals from 16% to 8% over the last 10 years, 2003–2013. In individuals classified as having severe periodontitis experience, the number of smoking individuals was 36% and 20% in 2003 and 2013, respectively.

11.4 Conclusions and Future Challenges

The last 40 years have presented a great and continuous improvement of oral health and a decrease of dental treatment need in individuals in the city of Jönköping, Sweden. This has had an impact on most parts of the dental delivery system, such as the number of dental personnel, the dental insurance system, undergraduate and postgraduate dental education, and further research activities. It will be difficult for new dentists to get enough experience of advanced dental care in great enough volume. It is a demanding and serious

challenge for the dental profession. Over the next decades, the increasing amount of treatment needed in the age groups 70–80 years and older due to more remaining teeth and the larger number of restorations may constitute a problem. However, in all the younger age groups, a decreasing need for restorative treatment in the coming years can be predicted. This is already reflected now in a dramatic decrease in the number of crowned and endodontically treated teeth. This means that although we still have a number of patients with extensive treatment needs, resources will gradually be released. Another challenge is early detection and treatment of the remaining part of the population with severe periodontitis and multiple risk factors, i.e., genetics, smoking, general health, and psychosocial circumstances.

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