



NATIONAL ADVISORY COMMITTEE  
ON HEALTH AND DISABILITY  
HUNGA KAITITIRO I TE HAUORA O TE TANGATA

**Incorporating the Public Health Advisory Committee  
Te Rōpū Tohutohu I Te Hauora Tūmatanui**

# **Improving Child Oral Health and Reducing Child Oral Health Inequalities**

*Report to the Minister of Health from the  
Public Health Advisory Committee*

**May 2003**

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Margaret Earle and Bronwyn Petrie provided the Public Health Advisory Committee secretariat support for this project.

## **Acknowledgements**

The members of the Public Health Advisory Committee wish to acknowledge the useful contribution a number of people gave to this project.

**ISBN (Document): 0-478-25309-5**

**ISBN (Internet): 0-478-25310-9**

**HP: 3630**

**National Advisory Committee on Health and Disability  
(National Health Committee)**

Wellington  
May 2003

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## Foreword

Oral health is about much more than having good teeth. It is critical to good health and wellbeing for children and in adulthood.

The Public Health Advisory Committee chose to look in detail at child oral health as an area where there are significant health inequalities. Child oral health provides a useful illustration of health inequalities as there are relatively good data and a number of recent New Zealand studies have examined the nature and causes of oral health inequalities.

Oral health was also chosen because it is often considered in isolation from other health issues and tends to be poorly integrated into health services. The Public Health Advisory Committee was also aware that the establishment of District Health Boards provides an opportunity to better integrate oral health into health planning and provision, both at local and national levels.

The following report, and attached background paper commissioned from a team at the University of Otago, detail inequalities in child oral health, examine factors that contribute to development of these inequalities, and identify areas for action.

The Public Health Advisory Committee hopes that this report will increase understanding about health inequalities and their causes, provide a platform to improve child oral health, and increase awareness of the inter-relationships between child oral health, health services and the wider determinants of health.



Kevin Hague  
**Chair**  
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## **Executive Summary**

Clear inequalities exist in the oral health of New Zealand children, especially among Māori and Pacific children and those from low socioeconomic status (SES) families. There is, however, enormous scope to reduce these inequalities, as most dental disease is preventable.

This report by the Public Health Advisory Committee (PHAC) includes the Committee's advice to the Minister of Health on how to improve child oral health and reduce inequalities in child oral health in New Zealand. At the beginning of this project, the PHAC commissioned a background paper on child oral health and inequalities from a team at the University of Otago. The paper provides detailed information about child oral health inequalities, and is attached at the end of this report.

By taking a lifecourse approach, which considers health and non-health influences throughout the life span and between generations, this PHAC report has identified a range of factors that contribute to oral health inequalities as well as potential areas for action.

Over recent decades, there have been gains made in child oral health in New Zealand, but these have levelled off more recently. The prevalence and severity of child dental caries varies considerably between District Health Board (DHB) regions. On average Māori and Pacific children have worse oral health than other New Zealand children. There is also substantial evidence of poorer child oral health in lower SES groups relative to their higher SES counterparts. Children in rural areas are at higher risk of poor oral health than their urban peers.

Socioeconomic differences in oral health reduce during school years when children generally have access to free dental care but these inequalities re-emerge in adulthood. This emphasises the impact and importance of access to free oral health services during school years.

Oral health data provide some understanding of how a range of health and non-health factors, from before birth and throughout life, influence health status. This lifecourse approach provides an opportunity to develop a better understanding of the complexity of factors that contribute to health inequalities. The data from the Dunedin Multidisciplinary Health and Development Study (DMHDS) suggests that as well as socioeconomic status and ethnicity, factors such as maternal oral health and maternal education levels influence child oral health. The data also suggest that adult oral health inequalities are strongly influenced by childhood experiences, such as knowledge of dental hygiene and access to services.

Actions to improve child oral health and reduce health inequalities need to occur both within the health sector and the wider policy arena. This is consistent with the principles of the Ottawa Charter for Health Promotion.

The PHAC has identified seven areas where it believes changes or improvements can be made:

1. Influencing socioeconomic determinants.
2. Improving Māori oral health.
3. Encouraging fluoridation.
4. Reorienting oral health services.
5. A responsive and skilled workforce.
6. Better information about child oral health and inequalities.
7. Using child oral health as an indicator of health inequalities.

Policy changes that improve socioeconomic status of families have the potential to benefit child oral health. There is evidence of substantial oral health inequities in New Zealand with Māori children and adolescents experiencing a high prevalence and severity of dental caries. Improving Māori health must be a priority. At the community level, fluoridation of water supplies is an effective action to prevent tooth decay with clear benefits for Māori, Pacific people and children from low socioeconomic groups, which contribute to reducing inequalities in oral health status.

Changes are also needed within the oral health services to ensure that all children have access to quality oral health services, particularly in their preschool years. Ensuring that all children learn oral hygiene skills is also a key component of reducing child oral health inequalities. A reorientation of oral health services is needed to ensure that all children can access appropriate services from preschool onwards. Reducing child oral health inequalities also has workforce implications.

The background paper suggests that child oral health has the potential to be an effective indicator of health inequalities in New Zealand, as data are routinely collected on dental caries (tooth decay) at age 5 and Year 8 (Form II). In order to achieve this and reduce inequalities in child oral health, there is a need to reconsider the collection of data on child oral health and to research priority areas.



## Summary of recommendations

### 1. Influencing socioeconomic determinants

A range of non-health factors across the lifespan influence child oral health inequalities. Changes to socioeconomic determinants of health are likely to have the greatest impact on reducing child oral health inequalities. However making changes at this level is challenging and hard to measure. One practical approach is to assess policy for its impact on health through health impact assessment. The Public Health Advisory Committee is currently developing tools to assist New Zealand policy makers to do this.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ invites her parliamentary colleagues to require policy makers to work collaboratively to improve child oral health
- ◆ recognises the value of health impact assessment tools in assessing the impact of social and economic policy proposals on child oral health and promotes Public Health Advisory Committee's health impact assessment tools widely among her parliamentary colleagues, once this work is completed.

### 2. Improving Māori oral health status

Urgent action is required to address oral health inequalities in New Zealand. *He Korowai Oranga* (the Māori Health Strategy) provides strong direction for improving the oral health of Māori children in New Zealand. Action and commitment are needed at the broad government level, within the health sector and the dental profession, and among Māori.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ directs the Ministry of Health to fund evaluation of current Māori oral health initiatives
- ◆ requires the Ministry of Health to continue to evaluate and monitor mainstream oral health services for their impact on Māori oral health
- ◆ encourages District Health Boards to make further funding available to improve Māori oral health status.

### 3. Fluoridation

Fluoridation of community drinking water is not only effective in reducing dental decay in children, but also contributes to reducing ethnic and socioeconomic inequalities in oral health status. The Sanitary Works Subsidy Scheme provides a new funding mechanism to help meet the costs of setting up fluoridation schemes. This will provide an opportunity to increase the number of communities with fluoridated water supplies. Alternatives to water fluoridation need to be considered in small communities where water fluoridation is not feasible.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ urges local authorities to fluoridate community water supplies and requires the Ministry of Health to continue to monitor the effectiveness of fluoridation in reducing oral health inequalities
- ◆ requests the Ministry of Health and District Health Boards to actively encourage non-fluoridated communities to make applications to the Sanitary Works Subsidy Scheme
- ◆ requests District Health Boards and local authorities to work collaboratively to promote fluoridation of community water supplies
- ◆ requires the Ministry of Health to promote research into the most cost-effective and appropriate alternatives to water fluoridation in communities where fluoridation is not feasible.

#### **4. Reorienting oral health services**

School dental services play a key role in the oral health of New Zealand children, but there are disparities in access to services. Māori, Pacific, rural and transient children and children from low socioeconomic families are less likely to use oral health services than their peers, particularly in preschool years. Reorientation of oral health services is needed to ensure that all children can access appropriate services from preschool onwards.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ asks the Ministry of Health to actively promote research into effective strategies for improving preschool uptake of dental services, especially among Māori, Pacific, rural, transient children and children from low socioeconomic groups
- ◆ requests the Ministry of Health to examine enhancing the national school-based dental service with linkages into preschool and adolescent settings
- ◆ requests the Oral Health Advisory Group to monitor the actions taken on the recommendations in this Public Health Advisory Committee report.

#### **5. A responsive and skilled workforce**

New Zealand needs a dental health workforce that can respond to changes within dental service provision and the country's demographic composition. At present there is a disparity between the ethnic composition of the dental workforce and New Zealand's population demographics. A focus on improving Māori child oral health will increase demand for a larger and skilled Māori dental workforce. Likewise there will be a need for more Pacific dental workers.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ asks the Oral Health Advisory Group to report on the progress that has been made on the directions for the dental health workforce as outlined in the 1998 report of the Dental Council of New Zealand
- ◆ asks the Oral Health Advisory Group to report on strategies to develop the Māori and Pacific oral health workforce.

## **6. Better information about child oral health and inequalities**

Data on 5-year-olds and Year 8 students is the only systematic collection of information about the oral health of New Zealand children. Further information and research is needed to gain a better understanding of appropriate strategies to reduce child oral health inequalities.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ requires the Ministry of Health and District Health Boards to systematically re-examine child oral health data collection in order to improve data collection
- ◆ urges the Ministry of Health and District Health Boards to collect data on child health at unit record level for 5-year-old and Year 8 children
- ◆ asks the Oral Health Advisory Group to prioritise information and research gaps identified in the background paper and propose a plan for actioning these.

## **7. Using child oral health as an indicator of health inequalities**

Child oral health has the potential to be an indicator of health inequalities, as dental caries is a disease where data are routinely collected at age 5 and at Year 8, and for which inequalities are readily observed. The Public Health Advisory Committee is of the view that dental caries data for 5-year-olds should be used in preference to Year 8 data, as inequalities are more pronounced during the preschool period.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ requests that the Ministry of Health use dental health data on 5-year-olds as an indicator of health inequalities.

## **1. SETTING THE SCENE**

### **1.1 About the Public Health Advisory Committee**

The Public Health Advisory Committee (PHAC/the Committee) was established as a sub-committee of the National Advisory Committee on Health and Disability (National Health Committee, NHC) in 2001 under the New Zealand Public Health and Disability Act 2000. The PHAC is required to provide advice to the Minister of Health on the following matters:

- a. public health issues, including the factors underlying the health of people and communities
- b. the promotion of public health
- c. the monitoring of public health
- d. any other matters the National Health Committee specifies by notice to the committee.

In 1998 the NHC published *'The Social, Cultural and Economic Determinants of Health in Zealand'* (the Determinants Report)<sup>1</sup> which highlights large inequalities in health across the country. A focus on reducing health inequalities continues to be a major component of the NHC's work. The PHAC is committed to providing ongoing and evidence-based advice on the best ways to reduce health inequalities in New Zealand.

### **1.2 About this report**

This report provides information and advice to the Minister of Health about improving child oral health status and reducing child oral health inequalities. It:

- ◆ explains the PHAC's reasons for examining child oral health
- ◆ details the PHAC's recommendations on how to improve child oral health and reduce health inequalities.

In 2001 the PHAC decided to undertake a project on child oral health as a case study of both health inequalities and the lifecourse approach.

It commissioned a background paper<sup>2</sup> from the University of Otago (hereafter referred to as 'the background paper'). The authors were: Murray Thomson, Associate Professor in Dental Public Health; Kathryn Ayers, Senior Lecturer in Dental Public Health; and John Broughton, Associate Professor (Department of Social and Preventive Medicine) and Director of the Ngai Tahu Māori Health Research Unit (Te Roopu Rangahau Hauora o Ngai Tahu). The background paper, *Child oral health inequalities in New Zealand: A background paper to the Public Health Advisory Committee*, was independently peer reviewed and is attached to this report.

On the basis of the evidence in the background paper, the PHAC formulated draft advice and recommendations to reduce child oral health inequalities in New Zealand. It discussed these with the authors of the paper and sought feedback from key stakeholders before finalising its advice to the Minister of Health.

### 1.3 Child oral health and inequalities

#### Child oral health in New Zealand

The most recent national dental survey showed that, in the 15 years to 1988, New Zealand went from having one of the highest levels of dental disease in the developed world to a very low level in children aged 12 and 13 years.<sup>15</sup> Caries rates in New Zealand children continued to decrease until the early 1990s, but have either remained static or increased slightly since. Data on caries severity and the percentage of caries-free children for the years 1990 to 1999 are presented in Figures 3 and 4 of the background paper (page 48).

The background paper prepared by the University of Otago suggests considerable regional variation in the prevalence and severity of tooth decay.

- ◆ Five-year-olds in the Wellington, Waitemata and Otago DHBs had the least tooth decay with the mean number of missing or filled teeth (mft)<sup>i</sup> being 1.1, 1.3, and 1.4 respectively.
- ◆ Five-year-olds in Northland, Tairāwhiti and the West Coast DHBs had the most tooth decay with mean mft scores of 3.3, 3.2 and 2.6 respectively. This equates to 65 percent of 5-year-olds in Northland and Tairāwhiti and 60 percent in the West Coast having dental caries.
- ◆ Year 8 data showed that Wairarapa, Waitemata Nelson-Marlborough and Wellington regions had the greatest proportion of caries-free children (49%, 50%, 50% and 56% respectively), with MFT<sup>ii</sup> scores of 1.2, 1.3, 1.3 and 1.0 respectively.
- ◆ The Year 8 data showed that the regions with the smallest proportion of caries-free children were the Bay of Plenty, Southland and Taranaki (29%, 29% and 34% respectively), with MFT scores of 2.4, 2.0 and 2.0.

Fluoridation of water supplies has an impact on reducing child oral health inequalities. Overall, the regions with the highest percentage of children receiving fluoridated water have the lowest overall rates of tooth decay. Generally, these regions also have lower socioeconomic and ethnic differences in dental health.

#### Inequalities in child oral health

The PHAC chose to focus on child oral health inequalities for a number of reasons.

- ◆ Oral health affects health status.
- ◆ The New Zealand Health Strategy<sup>3</sup> calls for inequalities in health to be addressed. It also calls for child health to be improved and oral health to be addressed.
- ◆ There is a need to address child health as part of the Child Health Strategy.<sup>4</sup>

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<sup>i</sup> missing or filled deciduous (baby) teeth.

<sup>ii</sup> Missing or Filled (permanent) Teeth.

- ◆ There is enormous scope for reducing inequalities in oral health, as most dental disease is preventable. Reducing inequalities in oral health is fair, as children have only limited control over the factors that determine their oral health. Reducing child oral health inequalities benefits wider society by potentially freeing up scarce health system resources and reducing the time parents/whānau spend away from more productive activity.<sup>2</sup>
- ◆ Diseases of the teeth and gums are among the most common health problems for all age groups.<sup>5</sup>
- ◆ There is increasing concern that an epidemic of dental decay in certain parts of New Zealand is impacting negatively on certain groups of New Zealanders, namely Māori and Pacific people, and people from low socioeconomic status (SES) groups. There is substantial evidence of poorer oral health in lower SES groups relative to their higher SES counterparts.

### **The lifecourse approach**

The PHAC considered it important to examine child oral health in the context of the lifecourse approach and not simply to outline the state of child oral health inequalities at a point in time. The lifecourse approach is a framework that has grown out of research on health inequalities. It provides a way of conceptualising how social, economic, cultural and environmental factors impact on health and contribute to health inequalities throughout the course of a person's life.

The lifecourse approach shows how adverse exposures can gradually accumulate during the course of an individual's life to create ill health episodes. The adverse exposures can for example be due to environmental factors (eg, poorly insulated houses which can lead to respiratory problems throughout life) or to behaviours, which increase the risk of chronic disease or mortality (eg, poor diet can lead to diabetes in later life).

The lifecourse approach also identifies some periods or phases in early life that are particularly critical in determining health status in adulthood and later years. It illustrates the intergenerational nature of health inequalities and provides a valuable way of viewing health inequalities over time.

## **2. PRIORITIES FOR ACTION**

In reviewing the findings of the background paper prepared by the Otago University research team and additional information gathered by the PHAC, the Committee identified seven areas for action:

1. Influencing socioeconomic determinants.
2. Improving Māori oral health.
3. Encouraging fluoridation.
4. Reorienting oral health services.
5. A responsive and skilled workforce.
6. Better information about child oral health and inequalities.
7. Using child oral health as an indicator of health inequalities.

The following section discusses these areas and presents the PHAC's recommendations to the Minister of Health.

### ***2.1. Influencing socioeconomic determinants***

The factors that determine child oral health do not lie only within the health sector. Intervention and action to influence socioeconomic determinants of health are likely to have the greatest impact on improving child oral health and reducing inequalities. Specifically, improving Māori social and economic status will lead to health gains for Māori including improved Māori oral health. Changes at this level are the most challenging and hard to measure and evaluate.

In considering child oral health inequalities, the PHAC has looked at how factors from before birth, during childhood and throughout life impact on people's health status. Most of these factors are outside the health sector.

The background paper on child oral health inequalities provides clear examples of factors that influence oral health. Data from the Dunedin Multi-disciplinary Health and Development Study (DMHDS) indicates that a major component of adult oral health inequalities originate in childhood.<sup>2</sup> It also highlights that children born to younger or less educated mothers, or who live in rural areas, may have increased risk of dental caries compared with other children. Poor maternal oral health has also been linked to poor child oral health.<sup>2</sup>

The background paper presents evidence to suggest that the structural "reforms" which took place between 1990 and 1992 resulted in an increase in the prevalence of poverty among New Zealanders. This may be associated with a worsening of the inequalities in the oral health of Māori and Pacific 5-year-olds relative to their non-Māori and non-Pacific counterparts (see Chapter 4 of the background paper for more detail).

## Creating healthy public policy

Social and economic policies impact on oral health. The background paper suggests the need for:

- ◆ close intersectoral scrutiny of any proposed policy changes which are likely to have health consequences (negative or positive)
- ◆ a reduction in the proportion of the population who are living in poverty
- ◆ improved education and income distribution
- ◆ an advancement of Māori oral health in a Treaty of Waitangi framework.<sup>2</sup>

A commitment is needed across government agencies to assess the potential health impacts of public policy. It is important to consider the negative and positive health impacts of social and economic policies on child oral health. Assessing potential policies for their impact on health was raised in the National Health Committee's 1998 Determinants Report.<sup>1</sup> The New Zealand Health Strategy also recognises the need "to assess public policies for their impact on health and health inequalities."<sup>3</sup>

The PHAC is currently undertaking work on Health Impact Assessment (HIA), a formal process to predict and assess the potential impacts of a policy on health. The HIA project aims to:

- a. advise the Minister of Health on ways of ensuring that health is considered in policy making across all sectors
- b. put health on the agenda of policy makers across sectors to ensure healthy public policy
- c. facilitate the Government's sustainable development approach to public policy by working cross-sectorally to influence the wider determinants
- d. develop a set of tools that can be used to assess the impacts of public policy on health and health inequalities in New Zealand.

The PHAC will provide advice to the Minister of Health on health impact assessment, including recommendations for its application in New Zealand, in mid-2003.

Building healthy public policy is one of the five strands of the Ottawa Charter for Health Promotion. The Ottawa Charter for Health Promotion provides a framework for recognising actions that need to occur at both a policy level and within communities.<sup>6</sup> This charter recognises the importance of tackling determinants outside the health sector as well as using policy to create environments that are supportive of healthy choices. Key policy initiatives that will assist in reducing oral health inequalities are equitable access to educational opportunities and adequate income for families.

A cohesive, collaborative and intersectoral approach to policy on oral health matters is required, specifically in addressing child oral health inequalities in New Zealand. Government agencies are acknowledging the value of working collaboratively. This is recognised in the State Services Commission's *Review of the Centre*, which emphasised a whole of government approach and recommended the need for integrated service delivery, tackling fragmentation and improving alignment between agencies.<sup>7</sup>



## Summary

A range of non-health factors across the lifespan influence child oral health inequalities. Changes to socioeconomic determinants of health are likely to have the greatest impact on reducing child oral health inequalities. However making changes at this level is challenging and hard to measure. One practical approach is to assess policy for its impact on health through health impact assessment. The PHAC is currently developing tools to assist New Zealand policy makers to do this.

### **The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ invites her parliamentary colleagues to require policy makers to work collaboratively to improve child oral health
- ◆ recognises the value of health impact assessment tools in assessing the impact of social and economic policy proposals on child oral health and promotes PHAC's health impact assessment tools widely among her parliamentary colleagues, once this work is completed.

## 2.2 Improving Māori oral health

There is evidence of substantial oral health inequalities in New Zealand with Māori children and adolescents experiencing a high prevalence and severity of dental caries. Urgent action is required to address these inequalities. Addressing Māori oral health is a high priority for Māori health, with significant potential health gains.

### **Māori oral health status**

Statistics and studies consistently show that Māori have worse oral health than non-Māori. For example, Māori children are three times more likely than other New Zealanders to have higher caries rates.<sup>24</sup> Data on the oral health status and service utilisation of Māori children clearly indicates higher oral health needs and major service gaps compared with non-Māori.<sup>8</sup>

Further, there is anecdotal evidence of very young Māori children needing teeth extracted because of decay<sup>9</sup> and of Māori children not having a toothbrush or toothpaste and not learning how to brush their teeth.

Effective brushing and other oral health messages must be appropriately delivered, and should not 'blame' parents or families of children with poor oral health. A Health Funding Authority report on Māori suggests that Oranga Niho and Oranga Hata, oral health services developed in Otago, provide good examples of effective oral health messages.<sup>10</sup>

The background paper outlines a number of specific health-related behavioural and environmental factors that may be linked to the poor dental health status of tamariki<sup>iii</sup> Māori, some of which are highlighted below.

- ◆ The perception of the "murder house" is still widespread among Māori, especially adults. This negative attitude may be transferred to the younger generation. Also parental oral care practices set important examples for their children, as oral health care is a learned behaviour.

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<sup>iii</sup> Children.

- ◆ Parents may be whakama<sup>iv</sup> about their own oral health, and as a consequence they may avoid taking their preschool children to the school dental clinic.
- ◆ Accessibility (distance needed to travel and a lack of adequate transport) may preclude the use of oral health services by many Māori. This is particularly important in rural or isolated areas, where, not only is the school dental clinic some distance away, but the dental therapist may be there for only a few weeks every year.
- ◆ Some Māori families are highly mobile, living in different parts of the country for varying periods of time, and it is not uncommon for some of these children to attend a number of schools over a two-year period. School dental services are also more mobile than in the past and so dental staff are unlikely to be aware of which children are missing out on dental care.
- ◆ For Māori, living in non-fluoridated rural areas, topical fluoride may be the only source of fluoride. If toothpaste is not purchased, the whānau miss out on the benefits fluoride.
- ◆ Māori cultural constructs may impact on health care beliefs and practices, for example, the concept of tapu<sup>v</sup> of the body is very important. To avoid causing offence, oral health professionals need to be culturally competent.

### Meeting Treaty obligations

The Treaty of Waitangi confers a special responsibility on the Crown to protect the health and wellbeing of Māori and places an obligation on the Crown to address inequalities in health, which includes oral health. The Treaty principles of partnership, participation and protection form the basis of the relationship between Māori and the Crown with respect to health and health services (including oral health and oral health services).

*He Korowai Oranga* (the Māori Health Strategy) outlines how these principles relate to health and health services:

- ◆ **Partnership** means working together with iwi, hapū, whānau and Māori communities to develop strategies for Māori health gain and appropriate health and disability services.
- ◆ **Participation** means involving Māori at all levels of the health sector in planning, development and delivery of health and disability services.
- ◆ **Protection** means ensuring Māori enjoy at least the same level of health as non-Māori and safeguarding Māori cultural concepts, values and practices.<sup>11</sup>

The fundamental aim of *He Korowai Oranga* is whānau ora: Māori families supported to achieve their maximum health and wellbeing. *He Korowai Oranga* sets a new direction for Māori health development over the next decade, while building on the gains made over the last 10 years. A separate Māori Health Action Plan, *Whakatātaka* accompanies *He Korowai Oranga*. This specifies the roles, responsibilities, performance expectations, measures and initiatives for achieving the strategy.

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<sup>iv</sup> A state of mind and the behaviour associated with it. There is no one word English translation for whakama but it encompasses such things as shame, embarrassment or shyness.

<sup>v</sup> Restricted; sacred.

The health needs of Māori are paramount under the Treaty of Waitangi and effort needs to be directed at improving Māori child oral health. *He Korowai Oranga* provides an effective framework for action to occur at all levels.

### **Action at a number of levels**

The background paper identifies that in order to reduce child oral health inequalities action is needed: at government level; within the health sector and dental profession; and among Māori themselves.<sup>2</sup>

### **Government**

The New Zealand Health Strategy identified oral health as one of 13 population health objectives.<sup>3</sup> Oranga niho<sup>vi</sup> is an important part of *He Korowai Oranga*. To achieve this resources are required to be available and targeted where they are most needed.

### **The health sector**

Consistent with the New Zealand Health Strategy and *He Korowai Oranga*, Māori oral health must be a focus for District Health Boards (DHB). Investing resources now in improving child oral health may prevent future costs.

In 1999, the New Zealand Dental Association report *New Zealand Oral Health Goals for the New Millennium*<sup>12</sup> identified Māori oral health as a key issue and set specific goals and targets for the profession to work towards in partnership with Māori. The objective was “to reduce the prevalence of dental caries among New Zealand children and adolescents”.

At a service provision level, dental providers under contract with DHBs are required to ensure that their services are accessible and appropriate to meet the oral health care needs of Māori. The National Service Specifications for child dental services specify that dental services must “contribute to Māori health gain objectives, in particular, targeting services to impact on Māori oral health”.<sup>13</sup>

Strong Māori participation is needed if strategies and services are to respond to and be effective for Māori.<sup>10</sup>

### **Māori initiatives**

There are a number of local Māori initiatives currently underway which seek to enhance local oral health services and improve Māori oral health. The background paper suggests that Māori dental provider services, operating under a kaupapa<sup>vii</sup> Māori approach, have significantly improved the health of Māori, and some currently have the capability and capacity to provide oranga niho services.<sup>2</sup> Examples of such services include:

- ◆ Tipu Ora, Tupohopu Health Centre, Ohinemutu, Rotorua
- ◆ Te Whare Kaitiaki, School of Dentistry, The University of Otago
- ◆ Te Atiawa Dental Service, New Plymouth.

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<sup>vi</sup> Oral health.

<sup>vii</sup> Strategy, theme.

Other Māori responses to improving child oral health include:

- ◆ the establishment of Te Ao Marama (the New Zealand Māori Dental Association) in 1996
- ◆ a number of Māori health promotion resources and approaches that have been successfully developed and used over the last three to four years.

Hauora Whanui, a Māori health service provider in Northland, has developed one example of a Māori oral health initiative. As part of the “brush in” programme Hauora Whanui provides toothbrushes, toothpaste and oral health information to every child in the Mid-Northland area, whose parents consent to the service. Throughout the region, oral health promotion workers visit all local primary schools and kohanga reo. Daily tooth brushing at school/kohanga is encouraged by Hauora Whanui, with the cooperation of the Board of Trustees and school principals. Children enjoy being involved in the “brush in” programmes and schools and kohanga reo appear happy to have Hauora Whanui staff deliver a service that is “proactive in reducing health problems in their schools and kohanga reo”.<sup>viii</sup>

While at a local level this type of initiative appears to have been successful, there has been little evaluation of the impact of specific initiatives on the oral health status of Māori children. A 2001 Ministry of Health review of publicly funded oral health care suggested there had been little or no systematic cost-effectiveness evaluation of some Māori services and programmes.<sup>8</sup>

The PHAC recommends the evaluation of Māori initiatives and services in order to provide information about their effectiveness. PHAC also considers a need for ongoing evaluation of mainstream services, for example the school dental service, for the impact of their services on Māori and how they could be improved.

### Summary

Urgent action is required to address oral health inequalities in New Zealand. *He Korowai Oranga* (the Māori Health Strategy) provides strong direction for improving the oral health of Māori children in New Zealand. Action and commitment are needed at the broad government level, within the health sector and the dental profession, and among Māori.

#### **The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ directs the Ministry of Health to fund evaluation of current Māori oral health initiatives
- ◆ requires the Ministry of Health to continue to evaluate and monitor mainstream oral health services for their impact on Māori oral health
- ◆ encourages District Health Boards to make further funding available to improve Māori oral health status.

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<sup>viii</sup> P Clarke, personal communication, February 2003.

## 2.3 Fluoridation

There is a wealth of evidence demonstrating the effectiveness of fluoride in preventing tooth decay.<sup>14</sup> Fluoride is one of the most important preventive measures available against tooth decay at both the individual and the population level.<sup>14</sup> Water fluoridation is an effective public health measure for dental health and can reduce dental decay in children by as much as 50 percent.<sup>15</sup> However, despite a number of reviews indicating the health and cost benefits, controversy still surrounds the fluoridation of community water supplies.

The PHAC considers that the evidence on the benefits of fluoridation far outweighs any evidence of risks associated with fluoridation. The Committee notes that there may be some minor risks associated with fluoridation, for example fluorosis.<sup>ix</sup>

One of the main concerns with water fluoridation relates to the individual's right to choose treatments, which opponents believe is compromised by mass fluoridation of water supplies. The PHAC is of the view that this concern has to be weighed against the rights of other individuals who wish to have fluoridated water supplies and the public health benefits of fluoridation.

Currently about half of the New Zealand population receive an optimally fluoridated water supply. *The Drinking Water Standards for New Zealand 2000* recommend the adjustment of water fluoride to between 0.7mg/l and 1.0mg/l for oral health reasons.<sup>16</sup>

Responsibility for decision-making and funding for fluoridation lies with local authorities. Territorial local authorities have responsibilities to provide for the health and wellbeing of the public and therefore have to consider public health when making any decision about fluoridation. District Health Boards (DHB) also have a role to play and the Oral Health Toolkit<sup>15</sup> emphasises the need for DHBs to work with communities and local authorities to support the introduction of fluoridated water.

### Evidence about fluoridation

The National Health Service Centre for Reviews and Dissemination at the University of York published a review of the epidemiological studies on water fluoridation and health (the York Report).<sup>17</sup> This report reviewed the safety and efficacy of fluoridating drinking water. In confirming the beneficial effect of water fluoridation on dental caries, the York Report also noted that little high quality research on the impacts of fluoridation exists.

In 1999 the Ministry of Health published a report on the cost-effectiveness of fluoridated water in New Zealand. This report found that fluoridation is cost saving (dental costs saved exceeding fluoridation costs) for communities numbering 1,000 people or more.<sup>18</sup> The report concluded that fluoridation is particularly cost-effective for communities with high proportions of children, Māori or people on low incomes.

Most studies show that water fluoridation provides benefits above and beyond those from other fluoride sources alone (eg, toothpastes, tablets).<sup>16</sup> Information has suggested that water

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<sup>ix</sup> Dental fluorosis is a mild defect of the tooth enamel caused by the ingestion of fluoride during the development of the tooth. Fluorosis does not cause health problems beyond cosmetic effects. The level of fluoride recommended by the *New Zealand Drinking Water Standards 2000* of 0.7 to 1.0 mg/litre is specifically designed to minimise the risk of dental fluorosis.<sup>16</sup>

fluoridation is effective throughout the lifespan, not just for children.<sup>16</sup> The lifetime benefit of exposure to water fluoridation is estimated to prevent a total of 2.4 to 12 decayed, missing or filled teeth for the average individual.<sup>19</sup> At a population level, it is estimated that water fluoridation prevents between 58,000 and 267,000 decayed, missing or filled teeth in New Zealand per year.<sup>19</sup>

### **Risks associated with fluoride**

A number of studies and reports have examined the potential for adverse risks associated with fluoride. The York Report examined whether fluoride has negative effects and concluded that there is no clear evidence of potential adverse effects on health, other than dental fluorosis.<sup>17</sup> With regard to fluorosis, it concluded that there is a strong association between water fluoride concentration and the proportion of the population with dental fluorosis. It is estimated that at one part per million (mg/l), one in 24 people would develop fluorosis that they could find aesthetically concerning. This is the upper limit for the standards for adding fluoride to drinking water supplies in New Zealand.<sup>17</sup>

In 2000, the Institute of Environmental Science and Research Ltd in New Zealand examined the epidemiological evidence associated with fluoridation. This report, along with the York Report found no clear evidence of harmful effects associated with the optimal fluoridation of community water supplies but did suggest the need for further research.<sup>20</sup>

In 2002, an Irish Report from the Forum of Fluoridation also considered the benefits and risks of water fluoridation and concluded that:

- ◆ Several ecological studies have found that rates of hip fracture are higher in communities with fluoridated drinking water compared with communities without fluoridation. However these studies did not control for several factors known to be associated with rates of fracture, including the use of oestrogen, smoking and body weight.
- ◆ Epidemiological studies have shown that long-term exposure to fluoridation does not have an adverse effect on bone density, bone mineral density or fracture incidence.<sup>21</sup>

In considering the risks associated with fluoridation of community water supplies, the PHAC concludes that these are not well established and require further high quality research. The Committee considers that the evidence for the benefits of fluoridation outweighs the risks of fluoridation.

### **Findings from the background paper on child oral health inequalities in New Zealand**

An important finding of the background paper was that children in regions with the highest provision of fluoridated water had the lowest prevalence and severity of tooth decay.

Variation in the prevalence and severity of tooth decay was more evident in regions with the lowest provision of fluoridated water. For example, in Nelson-Marlborough, no children receive an optimally fluoridated water supply, yet the caries-free percentage and mft scores of 5-year-olds are moderate (50% and 2.2 respectively) and even better at Year 8 (51% and 1.3). In contrast in Northland, where children also do not receive optimally fluoridated water, only 35 percent of 5-year-olds are caries-free, (mean mft is 3.3) and for 12- and 13-year-olds (Year 8) only 35 percent are caries-free (MFT is 1.8).

Data from the school dental service outlined in the background paper suggest that ethnic inequalities in child oral health status are more pronounced in areas that do not receive optimally fluoridated water.<sup>2</sup> The 1999 national-level data show that water fluoridation has clear benefits for Māori and Pacific children, and contributes to reducing ethnic inequalities in oral health status.<sup>2</sup>

The effectiveness of community water fluoridation and its role in reducing oral health inequalities should be monitored. In particular, there is a need to monitor and quantify the association between fluoridation and a reduction in demand for child dental care under general anaesthesia.<sup>2</sup>

### **Encouraging community water fluoridation**

The Ministry of Health actively encourages water fluoridation by a variety of approaches.

In May 2002, the Minister of Health announced government approval of a Sanitary Works Subsidy Scheme (SWSS). The scheme aims to improve sewage treatment, but also covers community water fluoridation schemes. Generally the funding will only be available for communities of more than 1,000 people. Communities with fewer than 1,000 people can still apply, but must be able to prove that fluoridation is cost-effective, or that their population is particularly disadvantaged.

The subsidies for water fluoridation will cover 50 percent of the cost of eligible capital works.<sup>x</sup> Funding for the Sanitary Works Subsidy Scheme will be available from 1 July 2003. Communities have been able to apply since January 2003. Already, a number of non-fluoridated communities have expressed interest in this scheme. The PHAC considers it essential that this scheme be well promoted to non-fluoridated communities.

### **Alternatives to community water fluoridation**

The PHAC recognises that where water fluoridation is not an option, alternative ways to access fluoride need to be considered. Potential alternatives include:

- ◆ Fluoridation of salt and milk

Several studies have shown caries reductions of up to 50 percent with salt fluoridation.<sup>22</sup> Milk has also been considered as a way of delivering fluoride, although only small-scale studies have been carried out. A possible milk fluoridation trial in Christchurch may see the provision and evaluation of fluoridated milk in primary schools in the region. The project is in its early stages, but will aim to improve dental health and will be targeted at low decile schools.

- ◆ Topical applications of fluoride

It is widely accepted that fluoride toothpaste has contributed to the decline in caries in most developed countries.<sup>22</sup> Fluoride gels and mouth rinses have also shown some effectiveness.<sup>22</sup> Available and affordable fluoride-containing toothpastes are considered a good population-based preventive strategy.

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<sup>x</sup> Expenditure on water fluoridation cannot exceed more than 10 percent of the total annual appropriation for the subsidy scheme. This is \$1.5 million out of a total annual budget of \$15 million.

### Previous National Health Committee recommendations on fluoridation

A 1997 report to the National Health Committee (NHC) on preventive dental strategies for older populations stressed the importance of water fluoridation.<sup>14</sup> This report made a number of recommendations about how to ensure older people have access to fluoride.

The NHC's 1998 Determinants report<sup>1</sup> made a clear recommendation about fluoridation. As a population-based service and environmental measure the NHC recommended that the Minister of Health: "Urge local authorities to ensure that when decisions are made about the fluoridation of water supplies, the needs of children and disadvantaged groups are the first priority".

The PHAC strongly supports these recommendations and reiterates the importance of fluoridation for the oral health of people of all ages. The NHC's recommendations still have currency and the PHAC considers that there should be a continuing commitment to their implementation.

### Summary

Fluoridation of community drinking water is not only effective in reducing dental decay in children, but also contributes to reducing ethnic and socioeconomic inequalities in oral health status. The Sanitary Works Subsidy Scheme provides a new funding mechanism to help meet the costs of setting up fluoridation schemes. This will provide an opportunity to increase the number of communities with fluoridated water supplies. Alternatives to water fluoridation need to be considered in small communities where water fluoridation is not feasible.

#### **The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ urges local authorities to fluoridate community water supplies and requires the Ministry of Health to continue to monitor the effectiveness of fluoridation in reducing oral health inequalities
- ◆ requests the Ministry of Health and District Health Boards to actively encourage non-fluoridated communities to make applications to the Sanitary Works Subsidy Scheme
- ◆ requests District Health Boards and local authorities to work collaboratively to promote fluoridation of community water supplies
- ◆ requires the Ministry of Health to promote research into the most cost-effective and appropriate alternatives to water fluoridation in communities where fluoridation is not feasible.



## **2.4 Reorienting oral health services**

Oral health services have an important role to play in improving oral health through treatment services and providing health promotion and education.

Over the past 30 years, child oral health status in New Zealand has improved dramatically because of preventive measures such as fluoridation. However, public dental services have been under pressure during the last decade.<sup>15</sup> Reorganisation has led to fragmentation and work pressures have meant some child and adolescent dental services have not been maintained at levels sufficient to ensure high levels of access and provision.<sup>15</sup>

Furthermore, oral health services tend to be overlooked and thus poorly integrated into public and primary health services. Oral health is often seen as secondary to general health and wellbeing.

### **Child oral health services in New Zealand**

A range of child oral health services are provided for New Zealand children, including care by dental therapists,<sup>xi</sup> private dental practitioners (under the Special or General Dental Benefit schemes), and specialist hospital departments.<sup>2</sup>

New Zealand's school dental service (SDS) provides basic preventive and restorative dental care for preschoolers, primary and intermediate school children. Dental therapists employed by District Health Boards (DHB) provide the dental care.<sup>2</sup>

The SDS aims to see children annually, although six-monthly visits are available to those at high risk of dental disease.<sup>2</sup> Children who require dental care that is beyond the scope of the SDS are referred to a general dental practitioner or, if they have extensive treatment needs, may be referred to hospital dental units for treatment under general anaesthetic.<sup>2</sup>

After Year 8 (Form II) and until the age of 18, adolescents are eligible for dental care under the General Dental Benefit system. Under this system, private dentists provide care under a contract with local DHBs.<sup>2</sup>

Child oral health services provided outside the SDS, for example, hospital departments and general dental practitioners tend to be under recognised and are often poorly funded.

The Dunedin Multidisciplinary Health Development Study (DMHDS) suggests that clear socioeconomic differences in dental caries existed in early childhood, but their magnitude was reduced during school years with universal access to free dental care.<sup>2</sup> Data suggests that by age 26 there had been a re-emergence of wide socioeconomic differences in caries occurrence, with more teeth being extracted (due to caries) in low socioeconomic status (SES) groups. These findings emphasise the impact of the universal school-based child dental health service.

The background paper suggests the amount of dental care received appears to be negatively associated with socioeconomic disadvantage. For example, by age 18 the time since the last dental visit was clearly associated with the level of socioeconomic disadvantage.<sup>2</sup>

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<sup>xi</sup> Dental therapists (formally school dental nurses) are health care providers who have undertaken two or three years training in primary oral health care. They work independently under indirect supervision by Principal Dental Officers.

## Access to oral health services

The PHAC believes access to services should be a high priority and a quality measure for effective health services. Access is the extent to which people are able to receive a service on the basis of need and irrespective of factors such as ethnicity, age, location, impairment or gender.<sup>23</sup> Reasons for not accessing dental services include perceptions of cost, lack of knowledge about the availability of services, and the acceptability or accessibility of services.

While the SDS has a very high uptake, with an estimated 95 percent of school-aged children enrolled, the uptake for preschool children is significantly less.<sup>2</sup> Although there is limited data on utilisation of dental services, the Oral Health Toolkit states that in the late 1980s 70 percent of preschool children (aged between two and a half and five years) were enrolled in the SDS, but by 1997 this was down to 56 percent.<sup>15</sup> The background paper from the University of Otago notes that the uptake of school dental services by preschool children is variable, and is considerably lower among Māori, Pacific children and those from lower SES groups.<sup>2</sup>

It is suggested in the background paper that historically there have been few inequities in access to care for primary school-aged children, due to the continuous presence of dental therapists in many primary schools. However, with most dental therapists now managing the oral health needs of several schools, there has been increasing difficulty for some groups in accessing care<sup>2</sup>, for example, Māori children and transient children. This points to a need to increase preschool uptake among these groups.<sup>2</sup> To achieve this, research is required on effective strategies to improve uptake followed by funding for implementation.

Access to care plays an important part in oral health ethnic inequalities during the lifecourse.<sup>2</sup> A study in 1993 indicated that Māori children were over three times less likely than non-Māori to be enrolled in the SDS as preschoolers.<sup>24</sup> Recent initiatives may have improved the uptake of dental services by preschool Māori children, but there is no strong evidence of this.<sup>2</sup>

Access to oral health services is also an issue for people from rural communities. Improving access for rural communities requires easily available service information, as well as accessible oral health services.

Access to oral health services for Pacific preschool children was one of the health issues Pacific communities in Auckland and Porirua identified during the Ministry of Pacific Island Affairs' Capacity Building process.<sup>xii</sup> In response, the Ministry of Health suggested that oral health be included as part of community health promotion programmes in these areas. These include programmes delivered to Pacific children through early childhood centres and churches.

The Ottawa Charter for Health Promotion emphasises reorienting health services. To reduce health inequalities, it is important that quality oral health services are accessible and appropriate for children from all socioeconomic backgrounds and ethnic groups, those living in rural communities, and children with disabilities or special health care needs.

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<sup>xii</sup> During 2000, Plans of Action were developed with Pacific communities in eight regions. As part of this process, communities identified actions to improve the wellbeing of Pacific peoples. These priorities were then considered by the relevant government agencies in terms of priority and available funding. More information is available on the Ministry of Pacific Island Affairs website: [www.minpac.govt.nz](http://www.minpac.govt.nz)

The oral health status of children with disabilities or special health care needs may vary according to both the type of disability and the level of dependence on others for oral hygiene and health care decisions.<sup>25</sup> These children may encounter substantial barriers which prevent them receiving adequate dental and general health care, for example:

- ◆ requiring anaesthesia before dental treatment can occur due to physical or behavioural issues
- ◆ having to travel to specialist dental care
- ◆ a tendency to neglect routine health and dental care and to focus on the main health or care concerns of the child.

A child's disability or health status may therefore adversely affect their oral health (for more detailed discussion of this see page 61 of the background paper).

The PHAC believes that there are a number of strategies that may improve oral health services for children with disabilities or special health care needs. These include:

- a. changing of attitudes about treating people with disabilities and recognising that children with disabilities should be able to access oral health services and receive oral health treatment, like anyone else
- b. an awareness of particular oral health issues for children with disabilities, for example knowledge about particular disorders and the impact on oral health status.

Improving access to services is one area in which the government can take action. This could occur by raising the awareness of the oral health services available, increasing linkage between the school dental service and preschool and adolescent services or by offering travel subsidies to those who cannot access oral health services because of transport barriers.

### **Action needed**

Child oral health services need to remain a high priority, as diseases of the teeth and gums are among the most common health problems and disproportionately affect Māori, Pacific children and people from low socioeconomic groups.<sup>5</sup> There is impetus currently on improving child oral health, for example, the Ministry of Health is reviewing the school dental service with the aim of developing a process to allocate extra funding to areas of high need, and increase the focus on disease prevention.

The Oral Health Advisory Group (OHAG) was established in 2001 to provide advice to the Minister of Health on the priorities and options for future directions in oral health and oral health services in New Zealand. Being broadly based with professional and consumer representation, OHAG could be well placed to assume accountability for monitoring that the recommendations in the PHAC's report are actioned.

## Summary

School dental services play a key role in the oral health of New Zealand children, but there are disparities in access to services. Māori, Pacific, rural and transient children and children from low socioeconomic families are less likely to use oral health services than their peers, particularly in preschool years. Reorientation of oral health services is needed to ensure that all children can access appropriate services from preschool onwards.

### **The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ asks the Ministry of Health to actively promote research into effective strategies for improving preschool uptake of dental services, especially among Māori, Pacific, rural, transient children and children from low socioeconomic groups
- ◆ requests the Ministry of Health to examine enhancing the national school-based dental service with linkages into preschool and adolescent settings
- ◆ requests the Oral Health Advisory Group to monitor the actions taken on the recommendations in this Public Health Advisory Committee report.

## **2.5 A responsive and skilled workforce**

A recent stocktake of the New Zealand health workforce by the Health Workforce Advisory Committee (HWAC) estimated that in 2000 there were 2,615 dental health workers in New Zealand (not including dental assistants).<sup>26</sup> This amounts to 69 dental workers per 100,000 people. The stocktake also highlighted a number of key issues for the dental health workforce including:

- ◆ the increasing future demand for dental services
- ◆ the need for integration of dental care and training
- ◆ recruitment and retention difficulties for dentists in rural and provincial areas.

The stocktake highlighted that the dental workforce does not match the ethnic make-up of the population. Māori make up 2.8 percent of the total dental health workforce, while Pacific people make up 0.8 percent. There has been some recognition by government of the need to increase the number of Māori and Pacific people entering the dental profession to reflect New Zealand's cultural and ethnic diversity.

There are increasing expectations by Māori consumers and communities for a multi-skilled, culturally competent, bilingual and technologically literate Māori health workforce.<sup>27</sup> The background paper from the University of Otago research team clearly outlines the need to continue to develop the Māori oral health workforce. The background paper also suggests that the collection of appropriate workforce monitoring data is essential when developing the Māori dental workforce.<sup>2</sup> As well as recruitment of Māori dental staff, there is a need for appropriate support and mentoring of trainees.

It is also important to ensure that New Zealand's oral health workforce is culturally competent. Many non-Māori dental staff work with Māori children. For two decades, Māori culture and health has been included at an education/training level, and is an important aspect of training in dentistry and dental therapy.<sup>2</sup> To ensure that all dental workers have the necessary cultural understanding, cultural competencies could be developed to guide staff on these issues.<sup>xiii</sup>

A report commissioned by the Dental Council of New Zealand in 1998, *New Zealand: Dentists, Dental Therapists and Dental Hygienists – Workforce Analysis*,<sup>28</sup> discussed a number of strategic workforce issues. The PHAC supports the recommendations made in this report as a path to enhancing child oral health services and reducing inequalities by providing better services to more people.

The report indicates that the dental provider workforce skill mix is a major issue now and will continue to be an issue in the future. It suggests that research is required to determine the proportions of dentists and other auxiliary providers necessary to deliver care.<sup>28</sup>

The report also highlights the retention of dentists and dental therapists as a major issue, with the high numbers of New Zealand graduate dentists leaving, especially in the first year after graduation. The report suggests there should be further research into the reasons why recently graduated dentists are not active in the New Zealand workforce, to help inform estimates of future dental workforce availability.

A report by Waitemata District Health Board suggests that the low number of dental therapists and high turnover in the younger age group indicates insufficient people, particularly school leavers, are entering the professions to meet the estimated workforce requirements and maintain an adequate workforce level over the next five years.<sup>29</sup> The report also recommends that urgent action be taken to attract (and retain) more people into the dental therapy profession, particularly school leavers.

Currently there is no active recruitment of dental therapists in New Zealand. One possible incentive to encourage people to train as dental therapists is to offer grants or scholarships.

The PHAC is of the view that further increasing the recruitment of health professionals, including dental therapists, hygienists and dental students is essential. The recruitment of oral health professionals to rural areas is a key workforce issue that needs to be addressed.

## Summary

New Zealand needs a dental health workforce that can respond to changes within dental service provision and the country's demographic composition. At present there is a disparity between the ethnic composition of the dental workforce and New Zealand's population demographics. A focus on improving Māori child oral health will increase demand for a larger and skilled Māori dental workforce. Likewise there will be a need for more Pacific dental workers.

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<sup>xiii</sup> These could be similar to the recovery competencies developed by the Mental Health Commission to guide mental health workers *Recovery Competencies for New Zealand Mental Health Workers*, Mental Health Commission, March 2001.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ asks the Oral Health Advisory Group to report on the progress that has been made on the directions for the dental health workforce as outlined in the 1998 report of the Dental Council of New Zealand
- ◆ asks the Oral Health Advisory Group to report to the Minister of Health on strategies to develop the Māori and Pacific oral health workforce.

## **2.6 Better information about child oral health and inequalities**

The background paper, prepared by the University of Otago, highlighted a number of areas where information is lacking about child oral health and inequalities. The researchers identified a lack of data about oral disease in the New Zealand population.<sup>2</sup> This creates significant difficulties, for instance without appropriate epidemiological data it is difficult to evaluate the effectiveness of current public health programmes, or know how they should be modified.

### **Data collection**

The only systematically collected information on the oral health of children in New Zealand comes from data collected routinely by the school dental service (SDS) on dental caries prevalence and severity in 5-year-olds and in Year 8 children.<sup>2</sup>

This routinely collected data does not indicate the distribution of caries experience. Currently, regional data is combined to give weighted mean mft and MFT estimates for the entire country, as well as New Zealand-wide estimates of the caries-free proportions for each age group. These data are reported by ethnic group and by community water fluoridation status.<sup>2</sup>

The authors of the background paper suggest that the SDS dental caries data should be collected and collated at unit-record level by all DHBs. This would enable a national unit-record database to be assembled for all 5-year-olds and Year 8 children annually. This should also enable better monitoring of trends in inequalities in the distribution of dental caries among New Zealand children.

### **Other gaps in data**

The background paper also suggests that there is a paucity of data on the dental caries experience of preschool children, as well as information about other oral problems such as dental trauma, periodontal (gum) disease and enamel defects.<sup>2</sup>

Other gaps identified by the researchers include a lack of:

- ◆ monitoring of the demand for dental care under general anaesthesia
- ◆ data on dental care for children with intellectual disability.<sup>2</sup>

The background paper suggests a lack of up-to-date information on socioeconomic and ethnic inequalities in oral health among New Zealand children, although the SDS now collects data on ethnicity. In preparing the background paper, it was not possible for the authors to monitor

trends in ethnic inequalities and in the distribution of dental caries among New Zealand children, as it is only recently that the data have been collected in this way. Moves to standardise the collection of SDS data at unit-record level should enable better monitoring of the trends in distribution of ethnic inequalities of dental caries.

The background paper also suggests that ethnicity information on Pacific children should be collected in such a way that the data can be disaggregated and analysed according to individual Pacific ethnic groups, and that similar breakdowns should be possible for other ethnic groups such as Asian and new immigrant children. Furthermore, the accuracy and quality of SDS ethnicity data should be assessed, as well as the impact of recent moves to improve SDS data collection.<sup>2</sup>

As suggested above there needs to be a way to ensure that all SDS data on child oral health is collected and analysed. The PHAC suggests that all DHBs set up an electronic information system which will allow for SDS data collection and monitoring and also analysis.

### Effects of service changes

In the last decade a number of changes have been made to the provision of dental care for children and adolescents. In 2000, the general dental benefit (GDB) contracts that many private dentists now hold with the DHBs changed from fee-for-service to a capitation contract for the provision of routine care.<sup>2</sup> The background paper suggests that health services research should be conducted into how the new GDB contracts are affecting the care received by adolescents, and whether the changes have been advantageous for Māori and Pacific adolescents and low SES groups. Accordingly, appropriate ethnicity and SES (eg, NZDep96) data should be collected on GDB patients.

Over the past decade there has been increasing flexibility in the school dental service, with dental therapists no longer working only in school dental clinics. More dental therapists now work in the wider community, attempting to improve accessibility to dental care, by working in mobile vans, and taking the service to smaller rural communities. The PHAC suggests that the impact of and effectiveness of these arrangements should be evaluated.

### Further priorities for research

When consulting on this report, a number of research priorities were suggested. These include the need for research into:

- ◆ the causes of dental caries in New Zealand and the impact on the family of managing a child with severe dental caries
- ◆ whether there is appropriate and timely care available for children with severe dental caries
- ◆ whether appropriate care is available and funded for children who fall outside the school dental system because of medical, developmental, physical or behavioural disabilities
- ◆ other influences on child oral health, for example, family nutrition
- ◆ why young people are not taking up dental therapy as a career.

## Improving information about oral health

There is a continuing requirement for high quality research into child oral health and child oral health services. The PHAC considers that robust and accessible information is needed to determine the effectiveness of initiatives to improve child oral health.

The PHAC recommend that the Oral Health Advisory Committee be asked to advise the Minister of Health on the priorities for action, in the research and information gaps, identified in the background paper prepared for the PHAC.

## Summary

Data on 5-year-olds and Year 8 students is the only systematic collection of information about the oral health of New Zealand children. Further information and research is needed to gain a better understanding of appropriate strategies to reduce child oral health inequalities.

### **The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ requires the Ministry of Health and District Health Boards to systematically re-examine child oral health data collection in order to improve data collection
- ◆ urges the Ministry of Health and District Health Boards to collect data on child health at unit record level for 5-year-old and Year 8 children
- ◆ asks the Oral Health Advisory Group to prioritise information and research gaps identified in the background paper and propose a plan for actioning these.

## 2.7 Using child oral health as an indicator of health inequalities

The background paper suggests that child oral health has the potential to be used as a health inequality indicator,<sup>xiv</sup> using dental caries data routinely collected at age 5 and at the end of Year 8.

The background paper examines the suitability of dental caries as a health inequality indicator in the light of the indicators proposed by the Ministry of Health.<sup>xv</sup> It suggests that child dental caries has the potential to be an indicator of health inequalities, although there is room for further investigation of validity.

Year 8 data has already been included in an indicative list of health inequality indicators.<sup>30</sup> It is now clear, from data presented in the background paper, that the publicly funded dental care system reduces child oral health inequalities for Year 8 children and this is the period in the lifespan when oral health inequalities are least evident. Therefore, a more valid and

<sup>xiv</sup> An indicator is defined as a characteristic (or variable) that can be measured and which can be taken to represent another characteristic, which is the actual object of interest.

<sup>xv</sup> Selection criteria for health inequality indicators, proposed by the Ministry of Health, include: validity, reliability, responsiveness, modifiability, accountability, monitorability, predictiveness, acceptability and sustainability.



responsive indicator of child oral health inequalities would be dental caries at age 5. The background paper suggests that inequalities are likely to be greater at age 5 than at any time for a number of reasons, including:

- ◆ ethnic and socioeconomic differences in the uptake of preschool dental services mean that caries differentials are likely to be greatest
- ◆ oral health status at age 5 reflects household conditions and nutritional and self-care practices, and there is less confounding by actual dental treatment
- ◆ other factors being equal, the development and progression of dental caries in the deciduous dentition (baby teeth) is more rapid, meaning that (in theory, at least) there is less lag time between changes in determinants and the subsequent appearance or absence of disease.

### Summary

Child oral health has the potential to be an indicator of health inequalities, as dental caries is a disease where data are routinely collected at age 5 and at Year 8, and for which inequalities are readily observed. The PHAC recommends that dental caries data for 5-year-olds should be used in preference to Year 8 data, as inequalities are more pronounced during the preschool period.

**The Public Health Advisory Committee recommends that the Minister of Health:**

- ◆ requests that the Ministry of Health use dental health data from 5-year-olds as an indicator of health inequalities.

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NATIONAL ADVISORY COMMITTEE  
ON HEALTH AND DISABILITY

HUNGA KAITITIRO I TE HAUORA O TE TANGATA

**Incorporating the Public Health Advisory Committee  
Te Rōpū Tohutohu I Te Hauora Tūmatanui**

# **Child Oral Health Inequalities in New Zealand**

*A Background Paper to the  
Public Health Advisory Committee*

W. Murray Thomson  
Kathryn M. S. Ayers  
John R. Broughton

**May 2003**

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## Executive summary

### 1. Introduction

This background paper reviews child oral health inequalities in New Zealand, and was commissioned by the Public Health Advisory Committee as part of the *Reducing Inequalities in Health Programme*. Child oral health is used here to illustrate health inequalities using the life course approach, in which an individual's health in adult life is the outcome of the accumulation of disadvantage or advantage from childhood and the years which follow. Particular attention has been given to the recent international scientific literature, New Zealand literature, and routinely collected data on oral health.

The concept of oral health is difficult to define, and is usually measured in terms of the absence of disease. It is acknowledged that Māori and Pacific constructs of health are more holistic than may be apparent from the narrower focus of this background paper. Because dental caries is the most common oral disease in childhood, it is given the greatest emphasis in the background paper. The main population-level indicators of dental caries are prevalence (the proportion who have had dental caries) and severity (the average number of teeth or surfaces that have been affected). This is usually expressed as the DMFT value, which represents the number of Decayed, Missing or Filled Teeth due to dental caries. To further complicate the situation, the former is usually expressed as the caries-free percentage, equivalent to 100 minus the prevalence. Periodontal disease, dental trauma, enamel defects and malocclusion also contribute to dental morbidity in the New Zealand child population.

### 2. The state of child oral health in New Zealand

A range of child oral health services is provided for New Zealand children, including care provided by dental therapists, private dental practitioners (under the Special or General Dental Benefit schemes), or specialist hospital departments. The utilisation of the school dental services by school-age children is very high, but it is of concern that preschool uptake is variable, and considerably lower among Māori, Pacific people and those from groups of lower socioeconomic status (SES). The uptake of dental services by adolescents is considerably lower than is desirable.

#### Caries status by region

Recent routinely collected school dental service data indicate that, nationally, 53 percent of five-year-olds are caries-free, with a mean mft<sup>1</sup> of 1.8. At Year 8 (12–13 years), 42 percent are caries-free, with a mean MFT<sup>2</sup> of 1.6. The prevalence and severity of dental caries vary by region, with children in Wellington and Waitemata having the lowest caries prevalence, and disease being more prevalent and severe in areas such as Northland and the West Coast. Overall, regions with the highest percentage of children receiving fluoridated water have the lowest overall caries rates as well as lower socioeconomic and ethnic differentials in dental health. Caries rates in New Zealand children decreased steadily from 1980 to the early 1990s, but have either remained static or increased slightly since that time.

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<sup>1</sup> missing or filled deciduous (baby) teeth.

<sup>2</sup> Missing or Filled permanent (adult) Teeth.

### **3. Socio-demographic associations with child oral health**

Substantial ethnic inequalities in oral health are evident among New Zealand children, with Māori and Pacific children and adolescents having a higher prevalence and severity of dental caries. There is abundant evidence of poorer oral health being experienced by groups of lower SES relative to their higher-SES counterparts. Children born to younger or less educated mothers or who live in rural areas may have an increased risk of dental caries compared with other children. Poor maternal oral health has been linked to poor child oral health. The oral health of individuals with disabilities may be impaired. Barriers to accessing dental care are an important factor, particularly as a higher proportion of children with disabilities are poor and socially disadvantaged. Special diets and self-care difficulties may play a role in their greater caries experience.

### **4. Child oral health and its relation to adult oral health**

Adequately determining the relationship of oral health to adult health requires longitudinal observational research. Data from the Dunedin Multidisciplinary Health and Development Study (DMHDS) show that clear socioeconomic differentials in dental caries experience existed in early childhood, but their magnitude was reduced during the school years when there was universal access to free dental care. By age 26 (when most dental treatment is provided on a private basis), there had been a re-emergence of wide socioeconomic differences in caries occurrence, and with more teeth being extracted (due to caries) in low SES groups. These findings suggest that a major component of adult oral health inequalities is their childhood origin.

### **5. Child oral health and adult general health**

Evidence for the relationship between child oral health and adult general health is largely equivocal, although several hypotheses have been suggested and further investigation is warranted.

### **6. Effects on child oral health in New Zealand of recent social, economic and political changes**

The social, economic and political environment is inextricably linked to health. The structural “reforms” which took place between 1990 and 1992 resulted in an increase in the prevalence of poverty among New Zealanders. Evidence is presented to suggest that they were associated with a widening of the inequalities in the oral health of Māori and Pacific five-year-olds relative to their European counterparts. These inequalities are likely to remain with this cohort through to adulthood.

### **7. Child oral health as an indicator of health inequalities**

Child dental caries is a potentially useful indicator of health disparities more generally. Caries data for five-year-olds should be used in preference to Year 8 data, as inequalities are more pronounced during the preschool period.

## **8. Promoting good oral health outcomes: options for effective action**

Inequalities in oral health are reducible; whether they can be eliminated is another matter, but it is society's moral duty to work towards their elimination. Ideas for action are given at each of three identified intervention points:

- (i) socioeconomic determinants
- (ii) intermediary factors
- (iii) oral health services.

First, the basic socioeconomic determinants of oral health inequalities must be tackled through income distribution and support policies (including improving Māori socioeconomic circumstances through addressing Treaty claims).

Second, population preventive strategies must be directed at the more proximate causes of dental disease; a prime example of this is increasing the availability of topical fluoride through both extending community water fluoridation and increasing the availability of fluoride toothpastes for disadvantaged groups. Other strategies are required to complement these, such as moves to reduce the consumption of highly sugared soft drinks and increase the availability of healthier alternatives.

Third, at the oral health services level, much of the impact of poor oral health upon Māori and Pacific children comes from existing disease going untreated, and more so in rural areas. A key strategy is to develop oral health services which meet the needs of those children, both by developing new services (where feasible) and by making appropriate changes to existing services.

Improving child oral health among Māori requires attention at three levels:

- (1) Government
- (2) the health sector (including the dental profession)
- (3) Māori.

## **9. Gaps in child oral health inequalities information**

Broader oral health measures for use in the child population are lacking, and there is a need to develop measures which encompass Māori and Pacific concepts of health. There is a paucity of data on the dental caries experience of children at ages other than five years and Form II (such as preschoolers and nine-year-olds), and the current SDS data need to be collected at unit-record level. There is also a need for studies of other child oral problems, such as dental trauma, periodontal disease and enamel defects. Work on the effectiveness of water fluoridation should continue, particularly at the health services research level. Research is required on the impact of the new General Dental Benefit contracts on adolescent dental care, and on whether the changes have been advantageous for Māori and Pacific adolescents. Systematic evaluation is required of the impact of ongoing changes in the way in which the SDS delivers care to children. Finally, further longitudinal research is required on the impact of poor oral health in childhood on oral health in adulthood.



## **Acknowledgments**

The authors are grateful to Dr Richie Poulton (Dunedin Multidisciplinary Health and Development Research Unit, Department of Preventive and Social Medicine, Dunedin School of Medicine) and Mrs Sheila Williams (Department of Preventive and Social Medicine, Dunedin School of Medicine) for their input and advice as consultants to this project.

We also thank Mr Peter Hunter, of the Ministry of Health, for enabling access to child oral health data. Mr Barry Milne (Dunedin Multidisciplinary Health and Development Unit, Department of Preventive and Social Medicine, Dunedin School of Medicine) is thanked for his data analysis advice.

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## ***Glossary***

**Deciduous teeth** – the 20 “baby teeth”, which erupt sequentially between six and 30 months of age and are eventually succeeded by the permanent teeth.

**Dental caries** – also known as “tooth decay”, this is a disease in which the fermentation of sugars by oral bacteria produces weak acids which remove the mineral component of the dental hard tissues; if it occurs frequently and for long enough, it leads to the development of cavities (“holes”). See also: “Restorations” below.

**Dental hygienist** – an allied dental health professional whose prime responsibilities are the removal of deposits from the teeth and the application of solutions to the teeth for the purpose of preventing disease.

**Dental therapist** – previously known as “school dental nurses”, dental therapists’ prime responsibilities are the basic dental treatment of children and adolescents in the school dental services.

**DMF index** – the number of Decayed (D), Missing (M) and Filled (F) teeth (DMFT) or surfaces (DMFS), which gives an indication of the severity of past dental caries experience; that of the permanent dentition is represented in upper case (DMFT), while the lower case dmft represents caries severity in the deciduous dentition.

**Episodic use of dental services** – the use of dental services only when the individual is aware of a problem; by contrast, the routine use of services entails regular, asymptomatic check-ups.

**Longitudinal research** – a form of epidemiological research in which individuals are usually followed prospectively (forward in time) and measurements made on two or more occasions; this is a powerful design which allows researchers to examine which factors or exposures precede the development of disease.

**Orofacial trauma** – injury to the oral or facial region due to externally applied force.

**Periodontal disease** – a disease of the soft tissues and bone which support the teeth in the jaws; it can ultimately lead to teeth loosening so much that they fall out or have to be extracted.

**Permanent teeth** – the 32 “adult” teeth, for which eruption begins at about 6 years of age and finishes with the third molars (“wisdom teeth”) in late adolescence.

**Restorations** – also known as “fillings”, these are usually placed by the dentist (or dental therapist) to restore the form, function and aesthetics of the tooth once the caries (“decay”) has been surgically removed.

**Risk factor** – a behaviour or characteristic known to be associated with a particular disease or condition, and for which exposure has been shown to precede development of the condition.

## Chapter 1 : Introduction and definitions

### Introduction

Since the introduction of the School Dental Service (SDS) in 1921 (Hunter and Davis, 1982), New Zealand has prided itself on its dental care system for children and the resultant dental health outcomes. The SDS was a revolutionary innovation at the time; the school dental nurse became a New Zealand icon, and the dreaded “murder house” entered the national consciousness.

The unfortunate reality today is that New Zealand’s publicly funded dental care system for children and teenagers does not adequately meet the dental health needs of that entire population. Certain groups of children and adolescents not only have more dental disease than others, they suffer more discomfort, and they grow up to be adults with poor oral health. Those groups are highlighted in the New Zealand Health Strategy, which aims to reduce inequalities by ensuring accessible and appropriate services for:

- ◆ people from groups of lower socioeconomic status (SES)
- ◆ Māori
- ◆ Pacific peoples.

Data on the dental health of New Zealand children are collected and reported annually by the school dental services, at least for five-year-olds and Year 8 (Form II; usually 12–13 years of age) children. Information on the dental health of adolescents is far less comprehensive, because it is not routinely collected (there is even less information on adults, as the most recent national survey of adult oral health was in 1988). Despite the “patchy” nature of the information, it is possible to come to some conclusions about (1) the dental health of New Zealand’s young people, (2) where the existing disparities are and (3) to offer some explanations for these disparities. From such an analysis can come options for effective action for promoting good oral health among New Zealand children.

Compared to those who are better-off, more children from lower SES groups experience dental decay, and have more of it; those differences narrow as they pass through the publicly funded dental care schemes, then re-emerge in adulthood once the State has no further role in the provision of their dental care.<sup>3</sup>

Across all age groups, Māori do not enjoy the same oral health status as non-Māori (Broughton 1993, 1995), but the situation is particularly acute for children. In Northland, for example, the situation for Māori children has been described as “an epidemic of dental decay”.<sup>4</sup> Over the last decade, the Māori response to those poor oral health outcomes has been an increasing acknowledgement and recognition of *oranga niho* (oral health), and enormous gains in the development of both oral health services and oral health promotion. However, there is still a

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<sup>3</sup> See Chapter 5: Child oral health and its relation to adult oral health.

<sup>4</sup> Radio New Zealand: *Insight*, 3 December 2000.

long path to travel before Māori can enjoy the same oral health as non-Māori. For Māori, the principles of the Treaty of Waitangi (partnership, protection and participation) are central to addressing those oral health inequalities.

Apart from reports using school dental service data, there has been little, if any, documented discussion on the oral health of Pacific children, and their situation can only be gauged from anecdotal evidence, secondary sources, and by making inferences from studies of general health and hospital admissions (Tukuitonga *et al*, 2000). These indicate that the oral health of New Zealand Pacific children is poor.

The purpose of this background paper to the Public Health Advisory Committee is to describe the nature, extent and consequences of oral health inequalities among New Zealand children, and to suggest ways in which those inequalities may be reduced.

### ***Defining oral health***

There is no accepted definition of oral health, despite considerable progress having been made over the last 15 years in conceptualising and measuring oral health. A number of instruments have been developed to measure oral health-related quality of life, but these have been developed for use with older adults. At least one leading commentator has suggested that the concept of health is both elusive and abstract; being essentially subjective, multidimensional and dependent upon the social, cultural, political and practical context, it is extremely difficult to define (Locker, 1997).

This problem applies to oral health, which is usually defined in terms of the absence of disease (such as dental caries or periodontal disease), while the mouth remains the focus of attention at the expense of the person-level perspective (Locker, 1997). This overly mechanistic, narrow focus has some advantages. By concentrating (albeit separately) upon the manifestations of common oral diseases such as dental caries and periodontal disease, dentistry has developed measures which have served it reasonably well to date, albeit while ignoring measures such as those used by Māori, of which Te Whare Tapa Wha is one model. This represents four dimensions: te taha tinana (the physical dimension), te taha hinengaro (the mental dimension), te taha whanau (the family dimension) and te taha wairua (the spiritual aspect), which can be applied by Māori to oral (and other) disease. The current review must take the pragmatic course of using these measures for the simple reason that there are no other data available for the age groups on which the bulk of its scrutiny is concentrated. However, we concur with a recent review (Ministry of Health, 2001a) which does not deny the validity of other constructs of health and oral health (particularly the more holistic concepts of Māori and Pacific cultures).

Moreover, owing to the absence of routinely collected data on periodontal disease among New Zealand children, the bulk of the data presented in this review pertains to dental caries, which, in any case, is by far the greatest contributor to the burden of oral disease among New Zealand children. Orofacial trauma, another contributor to the oral burden in New Zealand, should also be considered, particularly as data are routinely collected by the ACC, but no reports have been published which examine socioeconomic or ethnic inequalities in its occurrence.

Dental caries is a chronic, progressive disease. Dental epidemiological information is atypical in that the data are collected from many observation sites per person, but the analysis and description of those data is done at the level of the individual. What is observed in an individual's mouth during a clinical examination is the accumulation of that person's disease experience to date; what is not known is whether it reflects their current disease pattern. For example, one individual with only four filled teeth may have had all four develop caries which required filling during the previous 12-month period, while another person with only four filled teeth may have had all four filled several years previously, with no further disease having occurred since.

In reporting dental caries data from population surveys or routine monitoring activities, two main indicators are used:

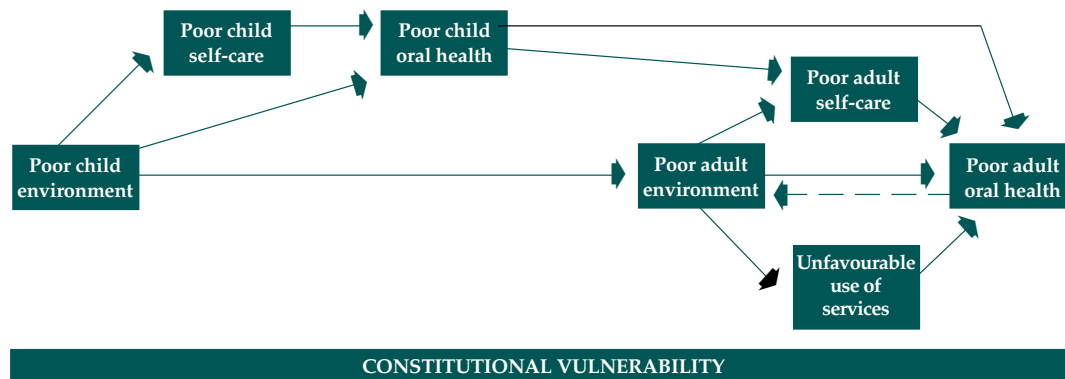
- (1) the *prevalence* of caries – the proportion (usually expressed as a percentage) of the population who have got the disease (that is, who have had caries experience)
- (2) the *severity* of caries experience – defined as the average number of teeth or surfaces which have been affected (usually expressed as the mean number of decayed, missing or filled teeth or surfaces; expressed as “DMFT” or “DMFS” for permanent teeth, and “dmft” or “dmfs” for deciduous teeth).

When reporting data on dental caries in child populations, it is common practice to refer to the “caries-free percentage”, which is equivalent to the disease prevalence subtracted from 100 per cent, and depicts the proportion of children who have not yet experienced dental caries (to the point that it becomes clinically apparent).

### ***The life course approach***

The basic tenet of the life course approach is that, throughout the course of an individual's life, adverse exposures gradually accumulate by way of ill health episodes, environmental factors or individual behaviours which increase the risk of chronic disease and mortality. In the context of chronic conditions such as dental caries or periodontal disease, the key notion for this paradigm is the accumulation of risk through a range of biological events and social experiences over time. Depending on the condition, this may occur gradually throughout the entire life course, or there may be certain critical or sensitive periods when adverse exposures are likely to be more detrimental. Through the resultant chain of risk, certain experiences or exposures in early life increase the likelihood of future events which, in turn, lead to greater or lower risk of adult disease (Kuh and Ben-Shlomo, 1997). Those chains of risk may be biological or social. With the former, exposures to causal factors through gestation, early childhood and early adulthood are part of long-term chains of risk which determine health in later adulthood. The latter begin with a socioeconomically compromised start to life and are linked to adult socioeconomic conditions which influence disease risk through later life exposures to causal factors. Of course, the context is not the only consideration; for a given socioeconomic setting, an individual's behaviour helps to shape not only his/her current circumstances, but also his/her future health trajectory.

This is a useful paradigm with which to study oral health. A poor childhood environment can either directly or indirectly increase the likelihood of poor child oral health (Figure 1).



**Figure 1 :** Chains of oral health risk through the life course (adapted from Kuh and Ben-Shlomo, 1997).

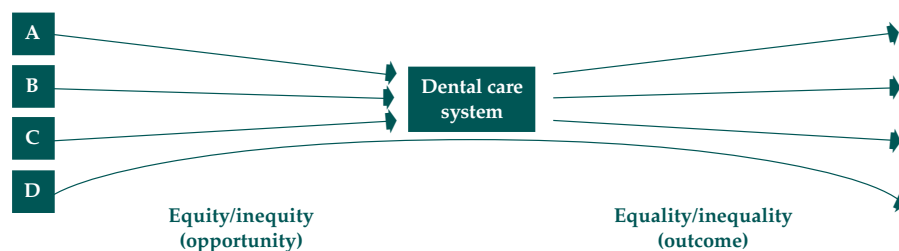
Where dental caries (and subsequent tooth loss) is concerned, an example of the direct environmental effect would be having lower access to health-promoting environmental exposures such as water fluoridation. The indirect effect could operate through having poorer or non-existent oral hygiene practices and an associated lower exposure to fluoride-containing toothpaste.

Also pertinent to the life course approach is the notion of constitutional vulnerability, represented in Figure 1 as an underlying determinant of the individual’s susceptibility to disease. Such a notion is probably more appropriate when considering a disease such as periodontal disease, where genetic susceptibility is thought to play a large role in the level of tissue destruction occasioned by the individual’s chronic inflammatory response to the bacterial challenge (Thomson *et al*, 2001).

Overall, the life course model identifies how early occurring events can be related to later outcomes, the multiple routes through which this can occur, and the linkages between biology and psychosocial factors.

### Equality and equity

For the purposes of this paper, a useful distinction can be made between the concepts of equity and equality (Figure 2).



**Figure 2 :** The concepts of equity and equality in relation to dental care.

**Equity** relates to fairness, or opportunity (Reading, 1993). In the case of the child oral health care system, it is concerned with ensuring that children have appropriate access, whether it be to dental care services, or to topical fluoride which is at a concentration and frequency sufficient to reduce their chances of developing dental caries.

**Equality** relates to oral health outcome, whether or not the child has been using the oral health care system. For example, a situation where there is equality of outcomes would see similar oral health among Māori and non-Māori children, and between those from low and high SES groups.

In Figure 2, children A, B and C all participate in the dental care system, but child D does not. When inequalities are measured, the oral health of child D must also be included, as the system must also be judged on its performance with respect to equity.

#### **Summary of main points – Chapter 1**

The concept of oral health is difficult to define, and it is usually measured in terms of the absence of disease. It is acknowledged that Māori and Pacific constructs of health are more holistic than this. Dental caries is the most common oral disease in childhood and is given the greatest emphasis in this paper. The main population-level indicators of dental caries are prevalence (the proportion who have had dental caries) and severity (the average number of teeth or surfaces that have been affected). To further complicate the situation, the former is usually expressed as the caries-free percentage, equivalent to 100 minus the prevalence. Periodontal disease, dental trauma, enamel defects and malocclusion also contribute to dental morbidity in the New Zealand child population. A life course approach acknowledges that events occurring early in life are related to later outcomes, and is an ideal paradigm in which to study oral health.

## Chapter 2 : The state of child oral health in New Zealand

### *Current child oral health services*

New Zealand's school dental services (SDS) provide basic preventive and restorative dental care for preschoolers, primary and intermediate school children. The care is provided by dental therapists employed by District Health Boards (DHB). Dental therapists (formerly school dental nurses) are health care providers who have undertaken two or three years' training in primary oral health care. They work independently under indirect supervision by Principal Dental Officers (Hannah, 1998).

A wide range of basic dental care is provided, including:

- ◆ oral examination and prophylaxis (tooth cleaning)
- ◆ fissure sealing where appropriate
- ◆ cavity preparation and placement of fillings
- ◆ extraction of deciduous teeth when required
- ◆ referral of patients as required.

School dental services aim to see children annually, unless six-monthly visits are indicated by a high risk of dental disease, usually determined on the basis of past disease experience.

Children are referred to a general dental practitioner for dental care that is beyond the scope of this service. This includes the provision of root canal treatment, management of dental trauma or the extraction of permanent teeth. Some children with extensive treatment needs, particularly if they are very young, may be referred to hospital dental units for dental treatment under general anaesthetic.

The school dental service has a very high uptake, with enrolment for school-age children estimated to be greater than 95 percent. Those who do not participate usually opt for dental care from general dental practitioners on a privately funded basis. The reasons for the service's high uptake include its accessibility and acceptability, and the fact that it is a New Zealand tradition. Dental treatment is provided either at the child's school or one nearby. Uptake levels for preschool children are less favourable: although data on utilisation are limited, it is estimated that 70 percent of preschool children between two and a half and five years of age were enrolled in the service in the late 1980s, while only 56 percent were enrolled in 1997.<sup>5</sup>

It has been the convention that dental therapists, as their name indicates, have always been based within primary or intermediate schools. In some Māori communities, however, the dental therapists could be more appropriately described as community dental therapists because they are based with a Māori health provider rather than in a school, for example. This move has occurred over the last decade, with the aim of increasing access to the service for preschool children in particular. For example, Tipu Ora (a mother and child wellness programme based at the Tunohopu Health Centre, Ohinemutu, Rotorua) has a dental clinic on site with the dental therapist still employed by the local school dental service, but co-

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<sup>5</sup> See <http://www.newhealth.govt.nz/toolkits/oralhealth/introduction>



located with the Māori health provider. Other models have been developed in different parts of the country, with considerable success and community acceptance.

Some parents prefer their children to receive dental care from a dentist or paediatric dentist rather than a dental therapist. Such care is provided on a private basis. Similarly, orthodontic treatment is usually performed by private practitioners, and, as a rule, is not funded by the State (except in special circumstances).<sup>6</sup>

After Year 8 (Form II), adolescents are eligible for dental care under the General Dental Benefit system until the age of 18.<sup>7</sup> This dental care is provided by private dentists working under a contract with the local District Health Board (DHB). The type of care routinely offered differs slightly among DHBs. Most now have a capitation contract covering annual examination and prophylaxis, intra-oral radiographs, basic restorative care and preventive care. More complicated (or expensive) dental work can be provided at the discretion of the Principal Dental Officer. In the late 1980s, over 80 percent of eligible teenagers were attending dentists for Dental Benefit care, while, in 1998, that proportion was estimated to be 68 percent (Hannah, 1998).

### **The collection of oral data by DHBs**

Dental caries data from two key age groups are collected annually by each DHB school dental service and reported to the Ministry of Health, enabling the collation of national-level statistics on the prevalence and severity of dental caries. The collection of data on caries in the permanent dentition of Year 8 (Form II) children has been underway for over two decades, while the gathering of data on caries of the deciduous dentition in five-year-olds commenced in 1988. The data are gathered for each child at the end of his/her first (for five-year-olds) and last (for Year 8) completed course of treatment in the school dental service. At the Ministry of Health, the regional data are then combined to give weighted mean mft and MFT estimates for the entire country, as well as New Zealand-wide estimates of the caries-free proportions for each age group. The data are reported by ethnic group and by community water fluoridation status.

A flaw of the current system is that there is no indication of the distribution of caries experience; aggregating means does not allow calculation of measures of dispersion (such as the standard deviation). Moves are underway to enable the reporting of individual-level data, so that:

- (a) the distribution of disease can be described and monitored
- (b) the disease characteristics of particular groups can be examined
- (c) multivariate techniques can be used in analysis so that the interpretation of patterns is more accurate, and the effects of potential confounders such as SES, water fluoride status and ethnicity can be controlled.

However, progress in this area has been slow.

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<sup>6</sup> In past decades, the orthodontic treatment of cleft palate cases has been provided by the State through hospital boards (and their various successors), and a number of needy orthodontic cases have also been treated; the provision of these services has been consistent neither by period nor by region. Information on this aspect of oral health care provision has been extremely difficult to obtain.

<sup>7</sup> The recent change in the GDB contracts system extended the upper limit for eligibility for this care from age 16 to 18. Previously, a 16- or 17-year-old individual had to be in a full-time education or training programme in order to qualify.

## ***Caries status (prevalence and severity) by region (DHB)***

Data are routinely collected by the school dental services for children at five years of age and in Year 8 (12–13 years). Dental caries among five-year-olds is reported annually by school dental services throughout New Zealand using two main indicators: the caries-free percentage (from which the prevalence of the disease is easily calculated, being 100 minus that estimate), and the mft index (which denotes the severity of past deciduous caries experience). For Year 8 children, the MFT index is used, as permanent teeth only are counted. The children are examined and the data routinely recorded by dental therapists. At national level to date, the practice has been to collate and report these data as weighted averages, with no measures of dispersion, thereby imposing severe limitations on their analysis and interpretation.

The prevalence and severity of dental caries in children vary by region. This overview used the provisional statistics for 2001 which were obtained from the Ministry of Health website (<http://www.moh.govt.nz>). At five years, the national mean percentage of caries-free children was 53 percent, with a mean mft of 1.8. At Year 8 (12–13 years), 42 percent were caries-free, and the mean MFT was 1.6<sup>8</sup> (Table 1).

For five-year-olds, the Wellington, Waitemata and Otago DHBs reported the greatest percentage of caries-free children (63%, 63%, and 60% respectively); their mean numbers of missing or filled teeth (mft) were 1.1, 1.3 and 1.4 respectively. The DHBs reporting the smallest proportion of caries-free children were Northland and Tairāwhiti, both with 35 percent caries-free, followed by the West Coast (40%), Waikato (41%), and Wanganui and Hawkes Bay (both 43%). Their mean mft scores were 3.3 for Northland, 3.2 for Tairāwhiti, 2.6 for the West Coast, 1.6 for Waikato, 3.0 for Wanganui and 2.4 for Hawkes Bay.

The Year 8 (Form II) data for the same year show a slightly different pattern. The Wellington, Nelson-Marlborough, Waitemata and Wairarapa regions have the greatest proportion of caries-free children (56%, 51%, 50% and 49% respectively), with MFT scores of 1.0, 1.3, 1.3 and 1.2. The regions with the smallest caries-free percentage were Bay of Plenty, Southland and Taranaki (29%, 29% and 34% respectively); their respective MFT scores were 2.4, 2.0 and 2.0.

About half of the New Zealand population receive an optimally fluoridated water supply. It is noteworthy that the regions with the highest percentage of children receiving fluoridated water (Wellington and Waitemata) have the highest percentage of caries-free children at both five and 12–13 years, and the lowest mft/MFT rates. That is, the lowest prevalence and severity of dental caries. In the regions with the lowest provision of fluoridated water, the prevalence and severity of dental caries are more variable. In Nelson-Marlborough, no children receive an optimally fluoridated water supply, yet the caries-free percentage and mft scores at five years are moderate (50% and 2.2 respectively) and are even better than average at age 12–13 (51% and 1.3). This is likely to be accounted for by the generally higher socioeconomic status of residents in this region, where only 11 percent of children are considered to be of low SES. Similarly, for Canterbury, only 4 percent of children receive optimally fluoridated water, but only 15 percent are low SES. Children in Canterbury have intermediate caries experience

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<sup>8</sup> It should be noted that dental caries is a disease continuum, ranging from preclinical demineralisation to gross infection and destruction of the tooth tissue. Many children who are classified as 'caries free' may have lesions which either have not yet been detected or are not advanced enough to require restorative treatment (Edward *et al* 1999). Thus, the true prevalence of dental caries is probably higher than reported in these routine data.

(49% of five-year-olds are caries free and mft is 1.8; 39 percent of Year 8 children are caries-free and MFT is 1.9). This contrasts with an area such as Northland, where children do not receive optimally fluoridated water, and almost half (49%) of the population is considered to be of low SES. In this region, only 35 percent of five-year-olds are caries-free, and the mean mft is 3.3. At Year 8, the difference is not as pronounced, but only 35 percent are caries-free and the MFT is 1.8.

Table 1 : 2001 SDS data by region, ranked by percentage of children caries-free at 5 years (Source: Ministry of Health website)							
DHB/Region	Percent identified as low SES	Percent receiving fluoridated water	Percent caries-free at 5 years	Mean mft at 5 years	Percent caries-free at Year 8	Mean MFT at Year 8	
Wellington	26	98	63	1.1	56	1.0	
Waitemata	43	87	63	1.3	50	1.3	
Otago	9	47	60	1.4	39	2.0	
Mid-Central	28	58	53	1.9	42	1.7	
Taranaki	18	62	50	2.1	34	2.0	
Nelson-Marlborough	11	0	50	2.2	51	1.3	
Canterbury	15	4	49	1.8	39	1.9	
Wairarapa	26	48	48	2.1	49	1.2	
Southland	24	41	48	2.3	29	2.0	
Bay of Plenty	55	19	44	2.6	29	2.4	
Wanganui	28	3	43	3.0	40	1.9	
Hawkes Bay	40	39	43	2.4	40	1.8	
Waikato	29	46	41	1.6	38	1.6	
West Coast	13	0	40	2.6	38	1.9	
Tairāwhiti	47	62	35	3.2	40	3.0	
Northland	49	0	35	3.3	35	1.8	
All of New Zealand	33	52	53	1.8	42	1.6	

Although reliant on an ecological measure of fluoridated water exposure (the fluoridation status of the local water supply), these data provide further confirmation of the observation that community water fluoridation acts to reduce socioeconomic differentials in dental caries status, although the data from Tairāwhiti indicate that the situation is not simply a fluoride-nonfluoride dichotomy at the regional level, given that a relatively high proportion (62%) of that area's child population (comprising Gisborne city) drinks fluoridated water, but their age-5 data compare poorly with other such areas.

It is of interest that the DHBs reporting the best and worst mft/MFT scores, and caries-free percentages differ for the two age groups. There are several possible explanations for this. At 12 years, many permanent teeth are newly erupted, so have had less opportunity to decay or to receive the benefits of fluoridation. The influence of having spent a number of years under SDS care is probably a factor; in addition, there are also likely to be operator-level differences, as the threshold for restoring teeth may vary between DHBs. The deployment of dental therapists varies greatly between DHBs. In 1998, it was reported that the therapist-to-enrolled-population ratio ranged from 1:806 in Tairāwhiti Healthcare Ltd to 1:1667 in Eastbay Health, with a nationwide average of 1:980, and there are differences among DHBs in the extent and use of dental assistants (Hannah, 1998). There may also be cohort or period effects operating differently among regions, with differences in relative poverty or prosperity also perhaps being reflected in the caries statistics (see Chapter 6 for further discussion of this particular issue).

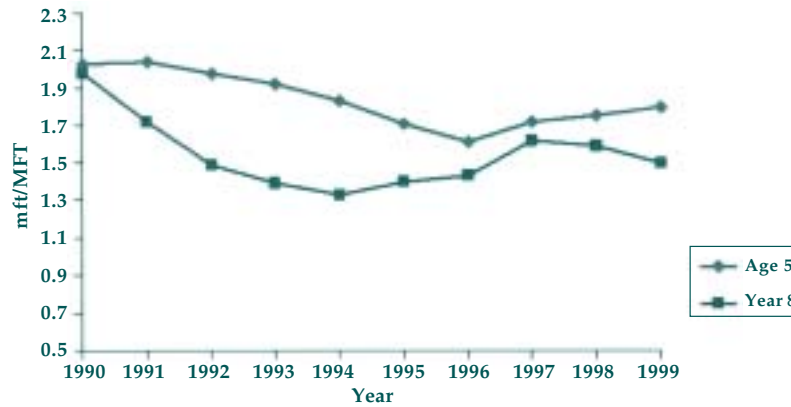
### ***Trends since 1990***

The most recent national dental survey showed that, in the 15 years up to 1988, New Zealanders went from having one of the highest levels of dental disease in the developed world to a very low level in children aged 12 and 13 years.<sup>9</sup> Data on caries severity and the percentage of caries-free children for the years 1990–1999 are presented in Figures 3 and 4. The mean mft scores for five-year-olds fell steadily from 1990 to 1996, and have been slowly rising since that time. A similar pattern is evident for 12-year-olds, who experienced a steady decline in caries severity from 1990 to 1994, followed by an increase until 1997, then a levelling off or slight decline over the next two years (Figure 3).

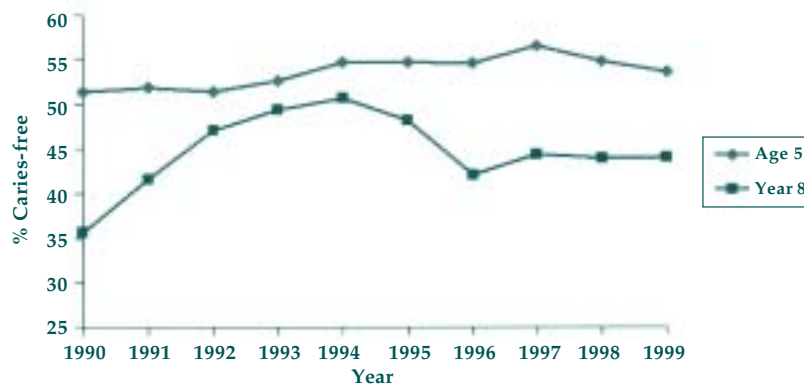
The percentage of caries-free five-year-olds has remained fairly constant during that period, at just over 50 percent. The percentage of caries-free Form II children has shown more variation, with an increase until 1994, a decline over the next two years, and a plateau since 1997 (Figure 4). An average eight percent annual decrease in MFT scores observed among Form II children from 1980 to 1994 had turned into a five percent increase between 1994 and 1995 (NZDA, 1999), and their mean MFT scores have remained relatively constant since then. Overall, the two decades since 1980 have seen a substantial fall in the prevalence and severity of dental caries.

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<sup>9</sup> <http://www.newhealth.govt.nz/toolkits/oralhealth/>



**Figure 3 :** Trends in dental caries severity among 5-year-olds and Year 8 children since 1990.



**Figure 4 :** Trends in dental caries prevalence among five-year-olds and Year 8 children since 1990.

Several explanations for these trends have been put forward. Radiography was introduced within the school dental service in the early 1990s. The increasing use of dental radiographs from the mid-1990s (enabling enhanced sensitivity in detecting dental caries) is likely to have contributed to the apparent increase in dental caries experience of 12-year-olds. It is less likely to have influenced the data for five-year-olds because radiographs are not usually taken for this age-group. An additional hypothesis proposed by Thomson (1997) is that increasing socioeconomic marginalisation of substantial sections of New Zealand society during the 1990s has resulted in higher levels of disease. In addition, recent immigration is thought to be having an impact on child dental caries in some areas. Many immigrant children present to the school dental services with a considerable amount of untreated disease (Edward *et al*, 1999).

It should be noted that the mean mft and MFT scores mask an increasing divide into a large group of children with low disease, and a smaller, but still substantial group with high disease (Whyman, 2000). Thus, examining the distribution of disease is of considerably more use than concentrating upon changes in measures of central tendency (such as means). Moreover, it has not been possible to monitor ethnic differences over time in the distribution of dental caries, as it is only in recent years that the data have been collected in that way. Current moves to standardise the collection of SDS data at unit-record level should enable better monitoring of trends in inequalities in the distribution of dental caries among New Zealand children.

### **Summary of main points – Chapter 2**

A range of child oral health services are provided for New Zealand children, including care provided by school and community dental therapists, private dental practitioners (under the Special or General Dental Benefit schemes), or specialist hospital departments. The utilisation of the school dental services by school-age children is very high, but it is of concern that preschool uptake is variable, and considerably lower among Maori, Pacific people and those from groups of lower SES. The uptake of dental services by adolescents is considerably less than optimal.

Recent routinely collected school dental service data indicate that, nationally, 53 percent of five-year-olds are caries-free, with a mean mft of 1.8. At Year 8 (12–13 years), 42 percent are caries-free, with a mean MFT of 1.6. The prevalence and severity of dental caries vary considerably by region. Overall, regions with the highest percentage of children receiving fluoridated water have the lowest overall caries rates as well as lower socioeconomic and ethnic differentials in dental health. Caries rates in New Zealand children decreased steadily from 1980 to the early 1990s, but have either remained static or increased slightly since that time.

## Chapter 3 : Socio-demographic associations with child oral health

This chapter examines the association between child oral health and the socio-demographic characteristics of ethnicity and culture, socioeconomic status and deprivation, housing, and disability status. As with earlier chapters, New Zealand data are used wherever possible.

### *Socioeconomic status (SES)*

#### **Measuring socioeconomic status**

The oral health inequalities literature provides plenty of evidence for the poorer oral health of groups of lower SES relative to their higher SES counterparts. The differences are apparent not only with different measures of oral health, but also with the various measures of social inequality that can be used (Locker, 1993). These can be divided into individual-level and area-level measures. These are briefly described below.

Individual-level measures represent a person's social rank based on one or more characteristics like occupation, income or education level, or, less commonly, home or car ownership.<sup>10</sup> They can, of course, also be used at the household level; for example, all members of a household can be allocated to an SES category based upon the **occupation** of the main breadwinner. Using occupation as the SES measure can have problems:

- (1) students, unemployed people and older people can be difficult to classify and must either be omitted from analyses or arbitrarily assigned to a particular SES level
- (2) the occupational classification which is used must be updated regularly
- (3) in the New Zealand context, such classifications are likely to reflect Pakeha values and norms, with little or no allowance for Māori values and concepts.

**Income level** is also not free of problems as a measure of SES, despite being easy to analyse (Locker, 1993). Accurate information can be difficult to collect, as questions which seek information on individual (or household) income level usually have the highest item refusal rate, and there may be doubts about the accuracy of the information which is collected. Income can also be unstable through the life course, with various life stages or events associated with income fluctuations. **Education level** is usually relatively easy to collect, tends to remain stable over time, and is strongly associated with people's values, health beliefs and practices. There are problems, however, as it may now be insufficiently discriminatory for use as a good explanatory measure. Locker (1993) pointed out that the increasing prevalence of tertiary education means that a university education now may not carry the same meaning for social rank that it did some decades ago.

Several area-level measures of deprivation have been developed to overcome some of the weaknesses of the conventional individual-level measures. Such measures incorporate the characteristics of the immediate area in which people live, dividing a population into

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<sup>10</sup> Neither of these would be sufficiently discriminatory for use as sound measures in New Zealand.



neighbourhoods of similar individuals and considering the level of deprivation in each area. Unfortunately, the literature lacks a universal definition of deprivation, or consensus about which variables should be considered. Measures may be restricted to a single item, such as telephone or car ownership, but more commonly include several variables. Most measures consider material rather than social deprivation (Locker, 2000). In New Zealand, the NZDep96 index (Crampton *et al*, 2000) assigned a deprivation score between 1 (least deprived) and 10 (most deprived) to each Census meshblock using data from the 1996 Census on nine characteristics.<sup>11</sup> A similar measure (which is commonly used by the school dental services) is the TFEA indicator (Ministry of Education, 1997), which was primarily designed to assist in targetting funding to schools in deprived areas. It assigns each school to a score between 1 (most deprived) and 10 (least deprived) based on school catchment and Census data on six characteristics.<sup>12</sup> Area-level measures can be very useful for descriptive epidemiological purposes, but their ecological nature<sup>13</sup> limits their utility for analytical epidemiology.

The sections which follow describe current knowledge of the relationship between oral health and SES using a range of individual- and area-level measures. New Zealand evidence is highlighted.

### Social class/socioeconomic status

An association between dental caries and family social rank in New Zealand children has long been recognised. The pattern is similar to that observed in other western industrialised countries, in that epidemiological studies have invariably shown a distinct socioeconomic gradient in the prevalence and severity of dental caries, with disadvantaged people having a higher caries experience than those who are less deprived (Cutress *et al*, 1976; Evans *et al*, 1984; Hunter *et al*, 1992; Provart and Carmichael, 1995; Fergusson and Horwood, 1986; Brown and Treasure, 1992; Evans *et al*, 1984; Schou and Uitenbroek, 1995). The disadvantaged socioeconomic position of Māori relative to Pakeha has long been noted (New Zealand Planning Council, 1987), and that difference is also reflected in oral disease differentials.

A large quantity of international literature has investigated the association between socioeconomic and socio-demographic factors and dental health. The influence of these factors appears to vary markedly, depending on cultural differences and the organisation of the dental care system (Bolin *et al*, 1997). Universally, an association exists between a population's level of socioeconomic development and dental caries. Dental caries occurrence has been found to be a good proxy measurement for socioeconomic development, with countries in the throes of socioeconomic transition having the highest DMFT scores (Lalloo *et al*, 1999). Socio-demographic factors also influence caries risk within populations, with children of higher social classes displaying lower caries levels than more disadvantaged children (Tinanoff, 1995; Elley and Langford, 1993). In a study involving 3200 five- and 12-year-old children from eight countries (Bolin *et al*, 1997), caries severity was lower if at least one parent belonged to a high social class. In the case of the father, this finding was significant for both ages, but, if only the mother belonged to a high social class, the association reached statistical

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<sup>11</sup> Telephone access, means-tested benefits, unemployed, low income, car access, single-parent households, educational qualifications, home ownership, and crowding.

<sup>12</sup> Household income, parents' occupation, household crowding, parents' educational qualifications, income support payments, and Māori or Pacific Island ethnicity.

<sup>13</sup> An ecological measure is one which assigns a characteristic measured at group level to an individual; for example, all persons living in an area rated '10' using the NZDep96 are assumed to be highly deprived.

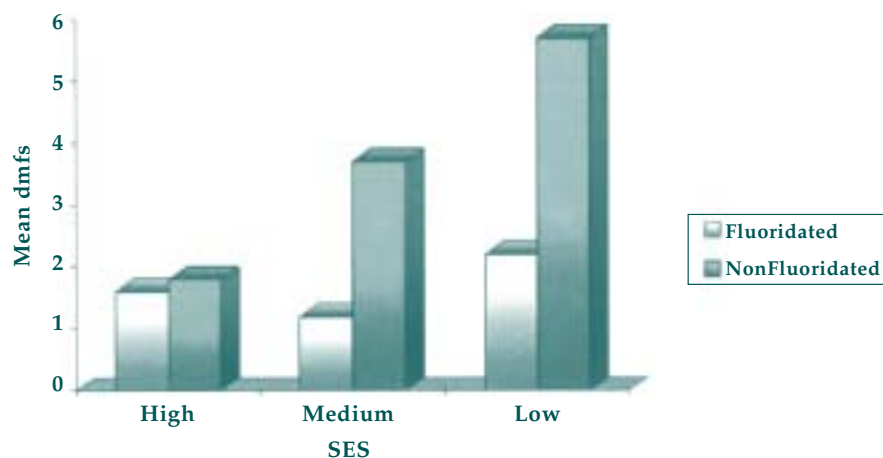
significance for five-year-olds only. When the social class of the whole family was considered, in both age-groups there was a difference not only in caries experience as a whole, but also with respect to how well the actual treatment need had been met. Children from families of low social class had higher treatment need (and received more treatment) than those from families of higher social class. This was true for all countries (except Irish 12-year-olds) despite both organisational and cultural differences.

### Modification by fluoridation

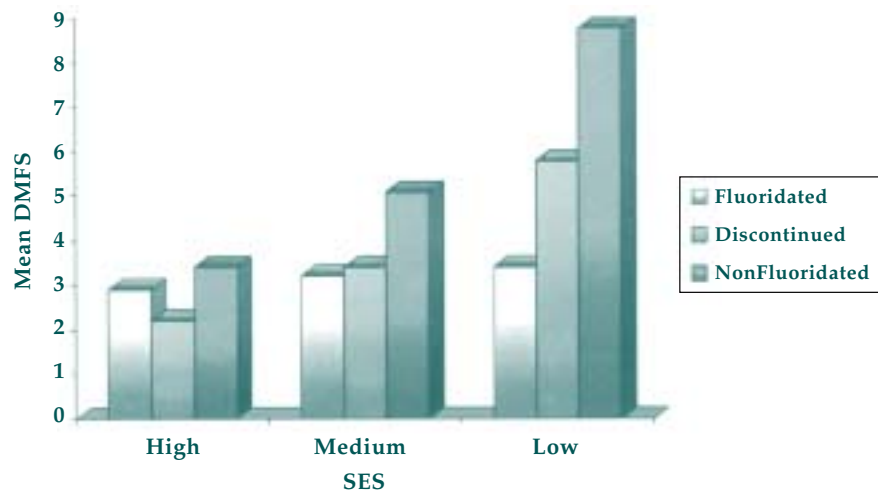
The association between caries experience and socioeconomic status is less marked among children living in fluoridated communities (Evans *et al*, 1984; Evans *et al*, 1980; Provar and Carmichael, 1995; Jones *et al*, 1997; Fergusson and Horwood, 1986; Treasure and Dever, 1991; Treasure and Dever, 1994; Slade *et al*, 1996). The first New Zealand evidence of this originated from the age-5 data in the Dunedin Multidisciplinary Health and Development Study (DMHDS), which showed that the observed social gradient in deciduous caries experience was greater among children living in areas without community water fluoridation (Evans *et al*, 1980; Evans *et al*, 1984).

The cross-sectional survey reports by Treasure and Dever (1992, 1994) provide more recent New Zealand data regarding the role of water fluoridation in reducing social inequalities in child oral health. In their study (Figure 5), caries severity among five-year-olds in the fluoridated sample was, on average, only one third of that among the non-fluoridated sample, and the SES gradient was much more apparent among the latter (Treasure and Dever, 1991).

Similar patterns were evident for 14-year-olds (Figure 6). Children who had always lived in a fluoridated community had significantly lower DMFS scores than continuous residents of the non-fluoridated community, and the scores occupied an intermediate position among children from the town which had discontinued water fluoridation five years earlier. Caries severity was greatest among the most socioeconomically disadvantaged children from the non-fluoridated community. In both the five- and 14-year age groups, the greatest SES gradient occurred in non-fluoridated communities. This suggests that community fluoridation contributes to reducing social inequalities in oral health among New Zealanders (Ministry of Health, 2001c). However, it would be useful to have some more current data, as those studies are now almost a decade old.



**Figure 5 :** Social class gradients in caries experience by water fluoridation status among five-year-olds (Treasure and Dever, 1992)



**Figure 6 :** Social class gradients in caries experience by water fluoridation status among 14-year-olds (Treasure and Dever, 1992).

International evidence confirms these observations of the effectiveness of water fluoridation in reducing oral health inequalities. In an investigation of 2751 five-year-old children in County Durham (Provar and Carmichael, 1995), caries experience varied according to the level of deprivation and fluoridation status. Mean dmft values ranged from 0.8 among children from a fluoridated, low-deprivation area to 2.1 among children from non-fluoridated, high-deprivation wards. Community water fluoridation significantly reduced (but did not eliminate) the variation in mean dmft caries prevalence between high- and low-deprivation groups. Fluoridation-associated reductions in caries experience were greater for the more deprived, higher caries group. In contrast, the investigation of United Kingdom 14-year-olds by Ellwood and O’Mullane (1995) found that the effect of water fluoridation in reducing decay was the same for different strata of deprivation. It has been suggested that the interaction of the effect of fluoridation with social factors in this age-group becomes less important or more difficult to demonstrate in areas with low caries levels, because absolute changes in dental caries become very similar for different social groups (Provar and Carmichael, 1995).

A cross-sectional study of more than 1300 children from two Australian states examined inequalities in dental caries experience by SES, and their association with community water fluoridation. In Queensland, the SES inequalities were lower among children exposed to fluoride: dmfs ratios between low and high income groups ranged from 1.5 to 3.6 for children with no exposure to fluoride, and from 0.8 to 2.1 for children with lifetime exposure to fluoride. However, multiplicative interactions were not statistically significant in South Australia or when the caries experience of the permanent dentition was considered (Slade *et al*, 1996).

### Maternal education level

The association between child oral health status and the educational level obtained by the parents (usually the mother) has been investigated in a number of studies. Educational level can be considered to be a proxy for social class, and is frequently used because it is easy to measure. Maternal educational level has been found to be a risk indicator for dental caries in both the primary and the permanent dentition (Verrips *et al*, 1993).

In a longitudinal study of 193 preschoolers observed over a three-year period (Roeters *et al*, 1995), a significant negative correlation existed between the level of education of the mother and the children's (a) frequency of eating, (b) number of sugar-containing food ingestions, and (c) dmfs score. As the children got older, the correlation got stronger. A longitudinal study of 828 Finnish children followed from before birth until five years of age (Mattila *et al*, 2000), found that the higher the mother's basic educational level, the more likely that her child would be caries-free at five years ( $P < 0.001$ ). Similarly, an Irish study of 294 preschool children found that maternal education level was significantly associated with child dental health (Kinirons and McCabe, 1995). Grindejford *et al* (1995) reported that maternal education was significantly associated with dental caries at three and a half years of age in a cohort of 786 children. More recently, a cross-sectional study of 4315 children aged three to 15 years (Hjern *et al*, 2001) found that the odds of ever having had dental caries were higher for children whose parents had low levels of education. However, this study was based on interview data and self-reported caries status, rather than clinical examinations.

Maternal education has also been found to influence a child's dental attendance. Thomas and Startup (1991) reported that 70 percent of 405 mothers with A-levels, but only 39 percent of less educated mothers, had taken their child to a dentist before the age of three years. Kinirons and McCabe (1995) also found that children of highly educated mothers visited the dentist more frequently than children of less educated mothers. Parental education levels also appear to influence the adoption of good dental behaviours. The latter study found that children of well educated mothers brushed their teeth more often, and this was independently associated with a lower child dmfs. Conversely, the frequency of sweets consumption was not related to caries severity. Ethnicity and maternal education level were found to be independently associated with caries risk (Kinirons and McCabe, 1995).

One possible (behavioural or social learning) explanation for the association between the caries experience of the child and the education of the parents is that more highly educated people have more favourable dental health behaviours, such as lower sweet consumption, more frequent brushing, and a routine (rather than episodic) dental visiting pattern. Thus, positive parental modelling exerts its effect. It has been suggested that the educational level does not influence knowledge about dental caries prevention, but influences an individual's ability to put this knowledge into practice (Roeters *et al*, 1995). Contrary to this view, Thomas and Startup (1991) reported an association between a mother's educational level and her knowledge of fluoride supplements. This could be influenced by better educated mothers having earlier and more frequent contacts with dental services. Interventions to improve the educational status may improve the oral health and general well-being of children (Verrips *et al*, 1993).

### **Deprivation: area-based approaches**

Measures of deprivation show a variable sensitivity to differences in oral health in children. For example, in a recent study, the proportion of the mean DMFT explained by deprivation indices ranged from 4.2 to 62.9 percent (Morgan and Treasure, 2001). Most composite deprivation indices are able to demonstrate the relatively poor health experience of individuals living in deprived areas, and show some evidence of differences in oral health behaviours among affluent and deprived groups. Interestingly, in some cases, a single indicator, such as the percentage unemployed, can be as reliable as the more sophisticated measures. If the link between deprivation and disease exists, irrespective of which measure of health or

socioeconomic status is used, we can be confident that a true relationship exists (Locker, 2000).

Provat and Carmichael (1999) examined the Townsend index of material deprivation and its relationship to the prevalence of dental caries in five-year-old children. They showed a correlation between the level of material deprivation and the level of dental caries, with mean dmft values increasing from 1.1 in the most advantaged group to 1.9 in the most deprived group. Active, untreated caries comprised the greatest component of dmft, with the levels of restorative dentistry similar in each deprivation group, regardless of fluoridation status.

Gratrix and Holloway (1994) used an ecological approach to compare levels of deprivation among English communities with high or low caries experience (mean dmft) in five-year-olds. Communities with greater caries severity were found to have lower proportions of babies of normal birth weight and children living in two-parent families. They also had lower levels of home and car ownership, and fewer households in the highest social classes. High-caries areas had higher Townsend mean deprivation Z scores. Parents in high-caries communities were reported to have more social and financial problems. It was concluded that social deprivation may be an indicator of dental caries in communities of preschool children. The findings should be interpreted with caution, however, as the significance level was set at 0.25 'to reduce the risk of rejecting any potential indicator of caries', but thereby increasing the risk of drawing a false positive conclusion (Type 1 error).

The level of disadvantage appears to influence the amount of dental care received. By age 18 in the Dunedin Multidisciplinary Health and Development Study (DMHDS), the time since the last dental visit was clearly associated with the level of disadvantage: among the least disadvantaged individuals, the mean period since last attendance was 9.6 months, whereas it was 31.6 months for those most disadvantaged. The use of orthodontic services was lower among the most disadvantaged individuals (Brown and Treasure, 1992). Similarly, a high prevalence of untreated dental injuries has been reported in a deprived English population compared to the average UK estimates (Marcenes and Murray, 2001).

## **Ethnicity**

A recent review (Ministry of Health, 2001a) stated that ethnic inequalities in oral health cannot be considered in isolation from other ways in which social stratification occurs in New Zealand, because ethnicity is a marker of both socioeconomic situation and identity. It went on to point out that underlying those respective structural and cultural dimensions of health is the experience of discrimination, defined as institutional and personal racism, which can act directly through psychological pathways to adversely affect health. The observed health inequalities are brought about by the interaction of structure (socioeconomic situation), identity and discrimination, together with age, sex and social class. Thus, implicit in the following discussion on ethnic inequalities in oral health is the acknowledgment that characteristics such as SES are also involved and may, in a pure epidemiological sense, be confounding the association by contributing to the observed disparities. This should, of course, be tempered by the fact that (a) SES measures are far from perfect (especially when used across different ethnic/cultural groups), and (b) non-Europeans are disproportionately represented among groups of lower SES.<sup>14</sup>

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<sup>14</sup> The policy implications of this are discussed further in Chapter 8.

It should also be remembered that the oral health system's routinely-collected ethnicity data are not without potential problems. The school dental services use the ethnicity information entered on each child's school record by school staff using the Ministry of Education's categories ('Māori', 'Pacific' or 'Other'), and the validity of that information is currently unclear.

Health disparities between Māori and non-Māori were recently highlighted in reports released by the Minister of Māori Affairs in 1998 (Te Puni Kokiri, 1998; Te Puni Kokiri, 2000). While dental health was not mentioned specifically due to the lack of any recent reliable data on adult Māori dental health, the concern was discussed in the Ministry of Health Report *Well Being of Whanau* (Ministry of Health, 1998), which noted that the oral health of adult Māori was, on average, poorer than that of non-Māori.

Substantial ethnic inequalities in oral health status are evident among New Zealand children, with Māori (and Pacific) children and adolescents having a higher prevalence and severity of dental caries than other New Zealand children. For example, an analysis of 1992 school dental service data on 3,283 five-year-olds in the Manawatu-Wanganui area showed that non-Māori children were three times more likely than Māori children to be caries-free upon completion of their first dental treatment (Thomson, 1993). Māori children were three times more likely than non-Māori children to have had high caries experience (that is, a mft score greater than 4). The dental health indicators for Pacific children were positioned between those for Māori and European children. Although the Manawatu-Wanganui data were collected a decade ago, evidence from national and regional SDS data suggests that those ethnic inequalities in oral health are likely to have persisted. For example, a 1997 dental survey of 26 Northland primary schools showed that the caries-free proportion was 49 percent among non-Māori five-year-old children, but only 17 percent among five-year-old Māori children.<sup>15</sup> In the Eastern Bay of Plenty region, the difference between Māori and non-Māori in their proportion of caries-free five-year-olds was undiminished through the mid-1990s,<sup>16</sup> with only one in four Māori (but 6 out of 10 non-Māori) five-year-olds being unaffected by caries.

Approximately three percent of five-year-olds had dental decay severe enough to require dental treatment under general anaesthetic, with the rate being twice as high among Māori children (Thomson, 1993). This may be due to a combination of factors; the higher caries experience of Māori children, the fact that they are less likely to be enrolled in the school dental service as preschoolers, (meaning that the disease is more advanced at presentation), or that the clinical environment or the approach to treatment may have been seen by Māori as inappropriate for their children. It may also reflect decisions made by dental health care providers, who may promote general anaesthetic as a 'one-stop shop' for high-risk children. The higher need for dental care provided under general anaesthetic for Māori children is of concern, as it places them at a higher risk within the dental care system. In 1997, Koopu noted that 66 percent of children referred to the Dental Unit of Capital Coast Health for dental treatment under general anaesthesia were Māori or Pacific children.<sup>17</sup> Evidence is accumulating of an increasing demand and escalating waiting times for this form of care (Thomson, 1994). This suggests that inequalities in dental health between Māori and non-

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<sup>15</sup> K Prime, personal communication.

<sup>16</sup> Eastbay Health school dental service data.

<sup>17</sup> Personal communication.

Māori young children may be increasing, and that more young children are experiencing advanced dental disease. Alternatively, it may suggest a lower threshold for provision of care by this method, given that each dental therapist now manages a considerably larger patient group (typically spread over a number of clinics) than a decade ago (Hannah, 1998).

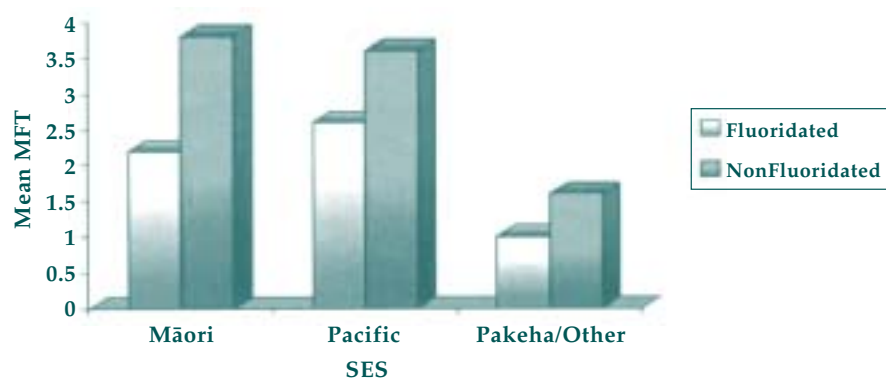
Despite a largely free dental care system for children, access to care plays a substantial role in ethnic inequalities in health care, and manifests in different ways through the life course. These inequalities are most evident in the preschool population, least evident in primary school aged children, and increase again in adolescence. In the above mentioned study by Thomson (1993), Māori children were over three times more likely than non-Māori not to have been enrolled in the school dental service as preschoolers. Recent initiatives may have improved the uptake of dental services by preschool children but we do not yet have any evidence of this. Historically, there have been few inequities in access to care for primary school-aged children owing to the presence of dental therapists at the primary schools. However, concern has been expressed that, with most (if not all) dental therapists now managing the oral health needs of several schools, there has been increasing difficulty in accessing care for some groups. This is particularly true for Māori children, whose families may also be mobile, meaning that children can attend several schools in one year (Broughton, 2000).

Under-utilisation by some groups of adolescents is a concern. A 1980s cohort study of 1045 New Zealand adolescents reported that 72 percent received care under the General Dental benefit until 16 years. The mean DMFT score for the children who did not enrol for Dental Benefit care was higher than those who continued to receive dental treatment. There were large differences in utilisation by Europeans and non-Europeans (predominantly Māori), at 78 and 45 percent respectively (de Liefde, 1988). Seven years later, the Midlands Regional Health Authority reported that only 50 percent of Māori adolescents were accessing dental care (Te Puni Kokiri, 1998). It is acknowledged that, for many Māori and Pacific people, the use of health care tends to be symptom-related rather than preventive in orientation. This is of concern, as the insidious and chronic nature of most oral conditions means that oral pain usually suggests advanced disease (Brown and Treasure, 1992). Although GDB care at age 15 does not predict greater routine use of dentistry (or better health outcomes), episodic users have been shown to experience poorer dental health, with more teeth extracted due to caries, and a higher overall caries experience (Thomson, 2001). Adolescents who fail to access dental care may present with substantial dental problems in adulthood.<sup>18</sup> Anecdotal evidence also suggests high prevalence and severity of dental caries among immigrant children, with many from countries such as Croatia, Bosnia, Serbia and various Asian countries enrolling in the school dental services with considerable untreated disease (Edward *et al*, 1999). However, data on dental caries rates among children in those other ethnic groups are lacking.

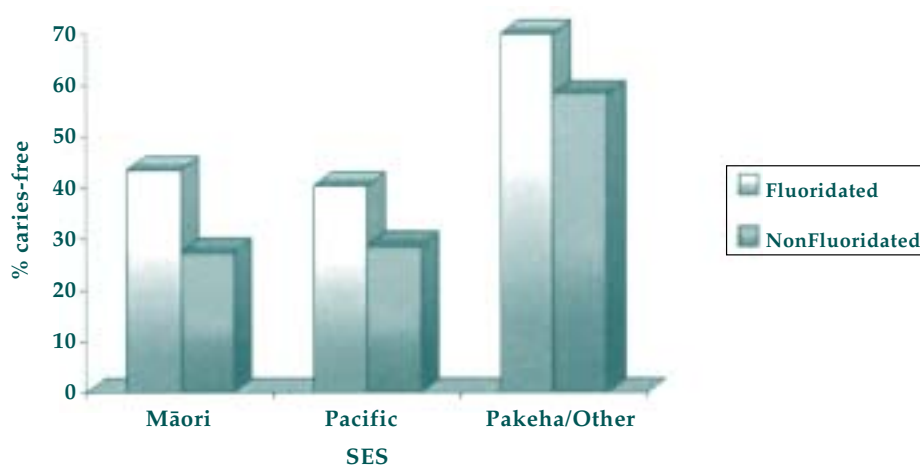
New Zealand school dental service data suggest that ethnic inequalities in child oral health status are more pronounced in areas that do not receive optimally fluoridated water. The 1999 national data in Figures 7 and 8 show that water fluoridation has clear benefits for different ethnic groups, and contributes to reducing ethnic inequalities in oral health status (Ministry of Health, 2001c).

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<sup>18</sup> See the next section “Issues for tamariki Māori and their whanau” for discussion of the possible reasons for this.



**Figure 7 :** Caries severity among New Zealand five-year-olds in 1999, by ethnicity and water fluoridation status



**Figure 8 :** The percentage caries-free among New Zealand five-year-olds in 1999, by ethnicity and water fluoridation status

### Some issues for tamariki Māori and their whanau

A number of specific health-related behavioural and environmental factors are linked to the poor dental health status of tamariki Māori. These are listed below and briefly discussed.

1. The perception of the “Murder House” is still very widespread among Māori, especially adults, and this negative attitude is transferred to the younger generation. Earlier generations’ view of the school dental nurse as the “Great White Starched Taniwha” may lead to some Māori parents avoiding contact with the school dental service, meaning that their children are also denied access.
2. Parents may be whakama<sup>19</sup> about their own oral health, and consequently avoid taking their preschool children to the school dental clinic.
3. Distance and a lack of adequate transport may preclude the use of oral health services by many Māori people, particularly in rural or isolated areas, where, not only is the

<sup>19</sup> Whakama is a state of mind and the behaviour associated with it. Whakama does not have a one-word English translation but encompasses such things as shame, embarrassment or shyness.



school dental clinic some distance away, but the dental therapist may only be there for a few weeks every year. For example, the dental therapist in the Hokianga<sup>20</sup> reported that, while there had been a high enrolment of preschool Māori children in the area (due to enrolment programmes), there had been a very poor subsequent attendance for dental care. This was attributed largely to a lack of transport to the clinic.

4. The more recent phenomenon of mobility, by both whanau and dental therapist, is also responsible for a lower uptake of dental care among Māori preschool and school-age children. Many Māori families are mobile, living in different parts of the country for varying periods of time, and it is not uncommon for some children to attend a number of schools over a two-year period. Where the service side is concerned, the number of practising dental therapists has almost halved since 1990. As a consequence, many dental therapists are required to take charge of three or more school dental clinics, meaning that there is only limited time spent in a given clinic. With both therapist and client being mobile in this way, the chances of some children missing out altogether on dental care are greater.
5. Today's ready accessibility to and heavy television marketing of junk foods, and the direct marketing of soft-drinks as loss-leading supermarket specials<sup>21</sup>, has made high sugar content diets relatively common. By volume, milk is considerably more expensive than the leading soft drinks.
6. Access to topical fluoride may be lower for many Māori. Fluoridated public water supplies are seen only in larger communities, and many Māori live in non-fluoridated rural areas. If toothpaste is not purchased, the whanau miss out on the most effective alternative means of delivering topical fluoride.
7. Parental oral care practices set important examples for their children, as oral health behaviour is learned behaviour.
8. Māori cultural constructs may impact upon health care beliefs and practices; for example, the concept of the tapu of the body is a very important factor (the head in particular). Oral health professionals should be conversant with the health beliefs, attitudes and practices of the diverse ethnic groups which they treat.<sup>22</sup>

Recently, there have been positive developments in Māori oral health services, Māori oral health promotion resources, and the Māori oral health workforce which are addressing the above points (see Chapter 8 for more details).

### **Housing and household composition**

There is a paucity of data available concerning the association between oral health and housing standard or crowding. The past decade has seen a number of investigations of health and housing in New Zealand (Isaacs and Donn, 1993; Howden-Chapman *et al*, 2000; Howden-

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<sup>20</sup> Margaret Tahere, personal communication.

<sup>21</sup> It is worth noting that the highest selling supermarket grocery item in New Zealand, determined by the number of units sold, is the 1.5L bottle of a well known cola-flavoured soft drink.

<sup>22</sup> It is only in the last decade that this issue has been developed in the undergraduate education of dentists, and it has been part of the education of dental therapists for the last three years.

Chapman *et al*, 1996); the early 1990s introduction of “market rents” for State housing concentrated a great deal of research attention on housing and health, but this work has not included oral health.

A recent English cross-sectional study investigated clinical evidence of dental injuries in 2684 14-year-olds (Marcenes and Murray, 2001), and reported that living in an overcrowded household increased the risk of having a dental injury. Neither the overall Jarman Index scores, nor the individual components of the Jarman index were associated with the occurrence of dental injuries in the sample, but this may have been due to the small variation in the levels of deprivation in this area.

There is more information available concerning factors such as household composition, maternal age and a child’s birth order in relation to dental caries. In a large multicentre European study, children living with both parents had lower mean dmfs values than children living in other household types, but this only reached statistical significance for Italian children (Bolin *et al*, 1997). Conversely, Mattila *et al* found more recently that the prevalence of dental caries in five-year-olds was independently associated with parents’ cohabitation (OR 3.3; 95% CI 1.5-7.6). The prevalence of dental caries was lower among children of single mothers (11%) than those whose parents were married (25%) or cohabiting (50%). Children born to younger mothers were more likely to have experienced dental caries than those born to older mothers; caries prevalence among children whose mother was less than 20 years of age was 55 percent, whereas it was only 24 percent among those whose mother was over 25 years old at childbirth (Mattila *et al*, 2000).

A study of 340 randomly selected Irish children reported a statistically significant relationship between the dental caries experience of the child and its position in the family; the lowest caries experience occurring in the second and third born. First-born children were less likely to be caries-free, and those who were fourth or more were the least likely to be caries-free ( $P < 0.05$ ) (Kinirons and McCabe, 1995). This corroborates the findings of an earlier report, that children at greatest risk of caries were those whose birth rank was one or greater than three (Primosch, 1982). Suggested explanations for these findings include: the first born may be overindulged; improved parenting skills may benefit the dental health of the second- and third-born; and children of higher birth rank may receive less attention concerning preventive behaviours and control of dietary sugars.

### **Locality (rurality and region)**

Although New Zealand evidence is lacking, it has been reported that Australian children and adolescents living in rural areas experience higher rates of dental caries than in those living in metropolitan regions (Crowley *et al*, 2000). Tennant *et al* (2000) recently reported that, in Western Australia, a rural preschool child was more likely to be admitted to hospital with dental caries than a metropolitan preschool child, but the association was not a strong one, and there was no significant difference in the rates of hospitalisation for older children by place of residence. A lack of fluoridated water supplies is likely to be a major factor contributing to an increased prevalence and severity of dental caries in rural areas. Such a situation holds in New Zealand, where community water fluoridation is found in larger communities, and children in rural areas such as Northland, Eastern Bay of Plenty and Tairāwhiti do not have access to the benefits. Māori children are disproportionately affected by this, given their greater numbers in those areas.

In Finland, 38 percent of five-year-old children living in a rural environment had a dmft greater than 0, compared to only 26 percent of those living in an urban environment ( $p < 0.01$ ; Mattila *et al*, 2000). This observation had previously been observed for three-year-olds, and it was noted that rural children's teeth were brushed less frequently than those of urban children (Paunio, 1993a and b). It has been hypothesised that dental health may not be as positive and important a value for rural residents than for urban populations (Mattila *et al*, 2000).

### **Maternal oral health**

The mother is known to have a biological role in the first microbial colonisation of her child's teeth. In a recent study of five-year-olds, the father's dental caries history was also a significant contributor to a child's dental health (Mattila, 2000). In studies comparing salivary counts of *S. mutans*<sup>23</sup> in children with those of their parents, children whose mothers had low concentrations of salivary *S. mutans* rarely harboured these micro-organisms. Conversely, children whose mothers exhibited high salivary levels tended to be infected and those having the highest salivary levels tended to have the highest caries experience (Febres *et al*, 1997). In another study, the odds ratio for a child to develop caries was 4.3 times higher if the child was colonised by mutans streptococci at one year of age than in the children where *mutans* streptococci were not detected (Grindejord *et al*, 1995). A mother's dental attendance pattern and her anxiety about dental care may also be important factors affecting a child's dental care (Kinirons and McCabe, 1995).

### **Disability status**

Individuals with disabilities comprise a heterogeneous group: their disabilities may be physical, psychiatric, medical or developmental. Their oral health may vary according to both the type of disability and the level of dependence on others for oral hygiene and healthcare decisions (Persson *et al*, 2000). Children with special health care needs are disproportionately poor and socially disadvantaged, and many encounter substantial barriers which prevent them receiving adequate dental and general health care (Newacheck *et al*, 1998; Persson *et al*, 2000). A recent US study reported that significantly more individuals with disabilities (than those without) reported that oral health problems affected their general health (Persson *et al*, 2000).

There are many ways in which children's disability status may adversely affect their oral health.

- (a) Alterations in oral health status can be associated with the disability itself. An example is the rapid progression of periodontal disease seen in individuals with Down syndrome, and which is due to defective neutrophil chemotaxis (Izumi *et al*, 1989). Cleft lip or palate is invariably accompanied by dental anomalies and malocclusion (Vasan 1999).
- (b) The presence of a disability can adversely affect the child's ability to undertake oral self-care. Children with severe cerebral palsy or juvenile rheumatoid arthritis may be unable to clean their own teeth, and instead rely on carers for their daily oral hygiene procedures. Although caregivers can be trained to remove plaque effectively, some

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<sup>23</sup> *Streptococcus mutans* is the main bacterial pathogen involved in dental caries.

find this difficult or unpleasant. Individuals living in institutions are particularly likely to have high periodontal treatment needs (Shapira *et al*, 1989). Seizure medications (anticonvulsants) may further compromise gingival health by causing gingival hyperplasia (Waldman *et al*, 2000).

- (c) Some children with disabilities may consume a diet that compromises their oral health. For example, children undergoing chemotherapy treatment can experience dry mouth and painful oral ulceration which lead to altered taste and difficulty in eating. Because of this, they may favour a soft, high-carbohydrate diet, and may consume sweet, acidic drinks with increased frequency (Ayers and Colquhoun, 2000). In the absence of adequate oral hygiene measures, children are at higher risk of developing dental caries when undergoing chemotherapy. Another treatment that can impair oral health is sialodochoplasty (a surgical rerouting of the submandibular salivary ducts so that they drain into the pharynx), sometimes performed to control drooling in children with cerebral palsy. Such children have a greater risk of dental caries (particularly in the mandibular incisor and canine teeth) than those treated non-surgically, presumably due to alterations to the caries-protective role of saliva (Hallet *et al*, 1995).
- (d) Many syndromes are associated with dental anomalies such as enamel defects or missing teeth. Children and adolescents with special needs are more likely to have orthodontic malocclusions than the general population, because of their higher rates of craniofacial deformities, abnormal growth and development, and a higher incidence of abnormal tongue posture and orofacial muscular disturbances (Waldman *et al*, 2000). Malocclusions can predispose to periodontal disease and severe aesthetic problems which can compromise social relationships and potential employment opportunities for disabled individuals (Waldman, 2000). A higher incidence of traumatic injuries results from ambulatory difficulties and seizure activity. Tooth surface loss (either through physical wear or chemical erosion) is another problem often experienced by children with disabilities. This may be caused by excessive tooth grinding, or dysfunction of the major salivary glands (Young *et al*, 2001), and may be exacerbated by measures taken to relieve the latter (such as the consumption of acidic soft drinks).
- (e) Most disabled children can receive routine dental care in the usual setting, and such normalisation is desirable, provided that the child does receive high quality dental care (Welbury, 1997). With the current move to mainstream education, it is usually more convenient for children with minor to moderate disabilities to receive dental treatment within the school dental services. However, certain disabilities, such as severe developmental delay or bleeding disorders, may render a child unable to receive dental treatment from a dental therapist. Such cases are usually referred to the local hospital department or perhaps to a private dental practitioner. This can introduce the problem of access for some children, particularly those living in rural areas, as they need to travel to a larger centre to receive dental services. Some disabled children require general anaesthesia before dental care can be safely provided, and some individuals required this procedure several times during the life course, thus placing them at higher medical risk. Moreover, dental problems among disabled individuals may be relatively advanced by the time they are identified, because it may be impossible to obtain an accurate assessment of a disabled individual's oral health status without the use of sedation or general anaesthetic, or he/she may be unable to communicate about oral discomfort.

- (f) Medical conditions can influence the type of restorative dental care able to be provided to children. For example, pulp treatment is contraindicated in children with cardiac disease because of the risk of subsequent bacteraemia; teeth affected by deep dental caries would need to be extracted in children with significant heart disease (Cameron and Widmer, 1997). There are also consent issues, with some disabled children unable to take part in the consent/assent process.
- (g) There is some evidence to suggest that, although the caries experience of children with a disability and their peers is similar overall, they differ in the extent and type of treatment that they receive (Welbury, 1997). Children with disabilities are more likely to have unmet dental need than any other medical need (Newacheck *et al*, 2000). A recent US study found that, although children with a developmental disability were more likely to have had contact with a physician within the previous six months than their non-disabled peers, there was no such differential with respect to contact with a dentist. Proportionately fewer developmentally disabled children had received needed oral health care. The greatest disparity was seen among the poorest families, where children with developmental disabilities were more than twice as likely not to have received needed oral health care (Schultz *et al*, 2001). No association was observed between long-term illness and dmft scores in a recent study of 788 Finnish children, 192 of whom had a long-term illness (Mattila, 2000). An English study of 150 children with cerebral palsy and 191 controls found that the two groups' caries experience was similar, yet the former had more extracted and unrestored teeth, and fewer and poorer quality restorations. Their oral hygiene, gingival health and tooth wear were also worse (Pope and Curzon, 1991).

### ***International evidence on child oral health inequalities***

The patterns described above are not unique to New Zealand. Child oral health inequalities have been extensively documented in recent years in industrialised countries such as the United Kingdom (Pitts *et al*, 2002), the United States (Edelstein, 2002) and a number of others (Chen, 2002). Despite this descriptive activity, limited information is available regarding which policies and interventions are most effective in reducing or eliminating disparities in general or oral health (Ismail and Sohn, 2001).

#### **Summary of main points – Chapter 3**

Substantial ethnic inequalities in oral health are evident among New Zealand children, with Maori and Pacific children and adolescents having a higher prevalence and severity of dental caries. There is abundant evidence of poorer oral health being experienced by groups of lower SES relative to their higher SES counterparts. Children born to younger or less educated mothers or who live in rural areas may have an increased risk of dental caries compared to other children. Poor maternal oral health has been linked to poor child oral health. The oral health of individuals with disabilities may be impaired. Barriers to accessing dental care are an important factor, particularly as a higher proportion of children with disabilities are poor and socially disadvantaged. Special diets and self-care difficulties may play a role in their greater caries experience.

## **Chapter 4 : Effects on child oral health in New Zealand of recent social, economic and political changes**

Just as the oral health of a community cannot be satisfactorily considered without examining the nature and extent of any inequalities which exist, a satisfactory elucidation of those oral health inequalities cannot be obtained if their societal context is ignored. The social, economic and political environment is inextricably linked to health, and we are therefore concerned not only (a) with what individual socioeconomic circumstances are doing to oral health, but also (b) with what the wider socioeconomic structure is doing to those individual circumstances (Graham, 2001). It follows that social or economic changes which impact adversely upon the individual's life circumstances (thus exacerbating the "chain of adversity"; Kuh *et al*, 1997) will consequently have a negative effect on his/her oral health, given that the oral disease burden is largely chronic in nature. To date, there have been no reports from the dental literature on the oral health effects of social or economic policy changes, although there is an abundance of anecdotal evidence of the effects of those changes on the health of people – particularly children – in disadvantaged households.

By virtue of its rapid changes in social and economic policy in recent years, New Zealand offers a convenient case study for examining the effects of those changes on oral health, because a series of substantial structural "reforms" occurred between 1990 and 1992, which resulted in a sharp increase in the prevalence of poverty. Notable among those changes were the cutting of welfare benefits in 1990, increasing the cost of State housing from 1991, and the introduction of the Employment Contracts Act, also in 1991. Social Welfare benefits were cut by a mean \$25 per week, and these reductions had their greatest effect upon people who were already most disadvantaged. It has been estimated that people on benefits lost, on average, 20 percent of their disposable income, and that those who were most affected were benefit-dependent households with children (Stephens, 1999).

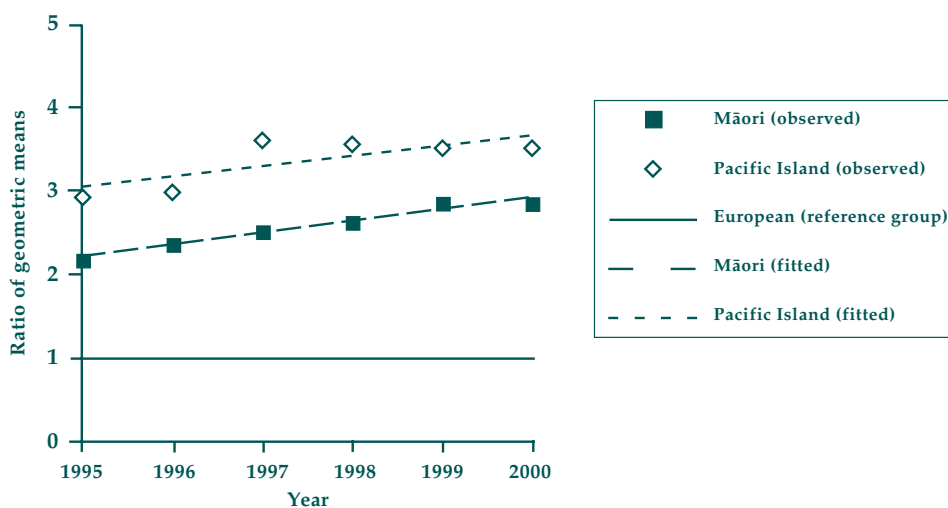
The structural changes to the State housing sector involved a move to "market rents" and increased private-sector involvement. That policy change resulted in the median weekly rent for State-owned housing rising from approximately half that of private-sector rental housing in 1991 to almost parity by 1996 (Walsh and Brosnan, 1999), and there were deficiencies in the implementation of an "Accommodation Supplement" intended to assist with the shortfall. Increases in housing costs can indirectly affect health by absorbing funds, which could have been spent on food, oral self-care commodities (such as toothbrushes and fluoride toothpaste) and the use of health services.

The Employment Contracts Act was designed to improve "labour market flexibility", with the introduction of individual employment contracts seeing a substantial power shift in favour of employers, a large drop in union membership, and the creation of a vulnerable underclass of workers (Walsh and Brosnan, 1999).

The combined outcome of these policy changes was an increase in poverty and a heightened sense of social exclusion and alienation among disadvantaged households, a sector of society which steadily increased in number through the 1990s (Boston, 1999). Māori and Pacific people have borne a disproportionate amount of the burden because of their being over-represented among more socioeconomically deprived households (Howden-Chapman and Tobias, 2000).

A secondary data analysis of a routinely collected, unit-record-level time-series of school dental service data on five-year-olds in the greater Wellington area during the latter half of the last decade tested the hypothesis that introduction of the social and economic policy changes in 1990–91 was associated with a subsequent increase in socioeconomic and ethnic inequalities in the dental caries experience of five-year-old children.<sup>24</sup> Multivariate models were developed for deciduous caries prevalence and severity using the following as independent variables: year, sex, fluoridation status, ethnicity, and SES (the latter using the Ministry of Education’s area-based TFEA indicator).<sup>25</sup>

The study showed that substantial ethnic and socioeconomic differences were apparent, and they persisted during the observation period. Māori or Pacific ethnicity was associated with considerably greater odds of having caries (and more of it) by age five. On average, children in the fluoridated area had less severe caries experience. Multivariate modelling showed that, during the five-year observation period, disease severity among Māori and Pacific children worsened relative to Europeans (Figure 9).



**Figure 9 :** Estimated ratio of geometric means for DMFT by ethnicity across the observation period (controlling for sex, dental therapist, and fluoride status)

Pacific children appeared to fare worse than Māori children during the observation period, but the differences did not reach statistical significance in the model. Similarly, the differences between children from low or medium SES areas relative to those in high SES areas did not reach statistical significance.<sup>26</sup>

Although the study has a number of weaknesses, being essentially an ecological analysis and circumstantial evidence at best, it does provide some evidence that the early 1990s structural

<sup>24</sup> Thomson WM, Williams SM, Dennison PJ, Peacock DW. Were New Zealand’s structural changes to the Welfare State in the early 1990s associated with a measurable increase in oral health inequalities among children? Under review.

<sup>25</sup> Ministry of Education Data Management and Analysis Section (1997). *Ministry of Education Socio-economic Indicator for Schools*. Wellington: Ministry of Education.

<sup>26</sup> Ethnicity and SES could not be included in the same models because of the substantial ethnic component to the SES variable (the TFEA decile rating).

“reforms” (reduced welfare benefits, increased rents for State housing, and the Employment Contracts Act) were detrimental to the health of non-European New Zealand children. It is also consistent with anecdotal evidence from a wide cross-section of health workers in New Zealand, and with the predictions that were made at the time of the changes by various observers.

The data are consistent with the hypothesis that the social and economic policy changes in the early 1990s contributed to an increase in oral health inequalities between Māori and Pacific preschool children and their counterparts in the greater Wellington population (although it is not possible to confirm the hypothesis because data collection did not include all possible factors which were likely to be relevant over that time). While the absence of systematically collected unit-record data on other, more general child health indicators from the same period means that it is not possible to state whether the same phenomenon would have been observed with general health, such an assertion would be intuitively sound, and consistent with our knowledge of the comorbidity which occurs with the diseases of poverty. Given current understanding of the accumulation of oral health disadvantage through the life course, it is likely that the effects of the changes will be felt among those children for many decades to come.

#### **Summary of main points – Chapter 4**

The social, economic and political environment is inextricably linked to health. The ‘structural reforms’ which took place between 1990 and 1992 resulted in an increase in the prevalence of poverty among New Zealanders. Evidence is presented to suggest that they were associated with a widening of the inequalities in the oral health of Maori and Pacific five-year-olds relative to their European counterparts. These inequalities are likely to remain with this cohort through to adulthood.



## Chapter 5 : Child oral health and its relation to adult oral health

It has long been suspected that children with poor oral health grow up to be adults with poor oral health. Anecdotal evidence offers some support for the notion; for example, Dr Tony Ruakere's observation that oral health problems were second in number only to respiratory problems among adult Māori presenting at the Te Atiawa Medical Centre in New Plymouth. (Broughton, 2000) suggests that at least some of the severity of those problems could be attributed to the poor oral health of those individuals as children. However, while every oral health professional can point to individual patients who bear this out, other individuals can be identified who contradict it.

Systematically conducted longitudinal observational research is the only satisfactory method for investigating the relationship of child oral health to adult oral health; that is, it is imperative that the same individuals are followed from childhood to adulthood. Key requirements for such research include: that the sample is both representative (using a probability-based population sample) and of adequate size; the length of follow-up is such that a clear picture of the association is able to be discerned; and that appropriate dental measures have been used in a prospective manner and for sufficiently long for the patterns to be identified. There are very few studies which can meet these criteria, and the longstanding Dunedin Multidisciplinary Health and Development Study (DMHDS) is the only study which is able to provide information on the relationship of child oral health to adult oral health among New Zealanders.

### *The Dunedin study*

The DMHDS is a longitudinal study of a birth cohort of children who were born at the Queen Mary Hospital, Dunedin, New Zealand during 1972–73. Periodic collections of health and developmental data have been undertaken since then (Silva and Stanton, 1996). Those eligible for the sample were all babies born at Queen Mary Hospital between 1 April 1972 and 31 March 1973, whose mothers lived within the Dunedin Metropolitan Health District boundaries. The initial sample was 1037 children (91% of the eligible sample) who were assessed within a month of their third birthdays.

Compared to the rest of the New Zealand population, the DMHDS sample is slightly advantaged socioeconomically (but has the full range of SES), and Māori and Pacific people are under-represented, together making up 8.5 percent. To date, dental examinations have been conducted at ages five, 15, 18 and 26.<sup>27</sup>

Over the course of the study, the sample has manifested a wide range of oral disease experience, with clear socioeconomic differentials in dental caries experience at ages five (Evans *et al*, 1984) 15 (Brown, 1996), 18 (Lee, 1999) and 26 (Thomson *et al*, 2000). An interesting finding has been profound socioeconomic differentials in tooth loss incidence in the cohort since the loss of entitlement to State-funded dental care at age 18 (Thomson *et al*, 2000). To date, no reports from the study have been published on poor child oral health as an antecedent

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<sup>27</sup> A description of the dental examination procedures is provided in any of the published DMHDS papers which have used dental data.

of poor adult oral health. The analyses which follow must be regarded as preliminary only, as they have not yet been subject to the scientific peer review process. The key explanatory variable for these analyses is the socioeconomic status of the parental breadwinner, measured using the Elley-Irving index (Elley and Irving, 1976), a classification which allocates individuals to a category from 1 (high) to 6 (low) based on their occupational status.

Dental examination data at ages five and 26 were available for 922 and 930 study members respectively. Of the 838 who were dentally examined at both ages, 738 (88.1%) could be assigned to an SES score at age five. The remaining 100 could not be classified because the parent was either a student, unemployed, or a home-maker. Subsequent analyses are limited to the 738 who were dentally examined and classifiable by SES.

Residential fluoride exposure to age five was computed as the percentage of those years spent living in a fluoridated area: 47.8 percent of the 738 study members had never lived in one, while 48.6 percent had spent all of their lives to date in one. The remaining 3.5 percent (N = 26) were distributed as follows: six had spent one year in a fluoridated area; three had spent two; eight had spent three; and nine had spent four years in one. For the purposes of the bivariate analyses which follow, residential fluoride exposure was dichotomised to distinguish those who had spent all five years in a fluoridated area from those who had not.

### ***SES differentials in oral health in the Dunedin study at age five***

Examination of the SES patterns in dental caries experience at age five (Table 2) shows that there were clear differentials in some important indicators. The prevalence of caries was lowest in the high SES group (in that it had the highest “caries-free” proportion). The severity of caries experience showed clear inequalities, being greatest in the low SES group and decreasing across ascending SES categories. The average number of untreated decayed surfaces showed a similar pattern. Residential fluoride exposure to age five was associated with the number of untreated decayed surfaces, but not with caries prevalence or severity.

Some insight into the structural nature of the differences at age five is offered by examining maternal oral health at that time: for the high, medium and low SES groups, the proportion of mothers rating their oral health as “excellent” or “fairly good” was 43.5 percent, 31.3 percent and 25.2 percent respectively, and the proportion without any teeth at all was 8.2 percent, 15.2 percent and 22.7 percent respectively.

### ***SES differentials in oral health in the Dunedin study by age 26***

Examination of the SES patterns in dental caries experience by age 26 (Table 3) reveals that the age-5 oral health inequalities tended to persist into adulthood. There were statistically significant SES gradients in age-26 DFS, the prevalence of teeth missing due to caries, and in the mean number of those teeth missing by age 26. However, there are a number of likely confounders of the association, and these should be controlled before making a definitive statement about the persistence of patterns of age-5 oral health equalities into adulthood. For example, it is possible that disease experience at age-5 could have confounded the relationship by being associated with both age-5 SES and disease experience by age 26. Another likely confounder of the association is the dental visiting pattern, whereby, consistent with

Table 2 : Dental caries experience by age 5 in the DMHDS by SES, sex and exposure to community water fluoridation						
	Number	Percent caries-free <sup>a</sup>	Mean dmfs <sup>b</sup> (sd)	Mean ds <sup>b</sup> (sd)	Percent missing 1 or more teeth <sup>c</sup>	
Sex						
Female	367	40.3	3.5 (5.5)	0.7 (5.5) <sup>b</sup>	5.7	
Male	371	40.2	3.9 (6.1)	0.9 (2.4)	5.9	
SES group at age 5						
High	184	47.8	2.4 (3.8)	0.4 (1.2)	2.7	
Medium	435	37.9	4.0 (6.1)	0.9 (2.3)	6.7	
Low	119	37.0	4.9 (6.9)	1.3 (3.1)	7.6	
Time spent living in fluoridated area						
0-4 years	379	39.1	3.8 (5.7)	0.9 (2.5) <sup>b</sup>	5.5	
5 years	359	41.5	3.7 (5.9)	0.7 (2.0)	6.1	
All combined	738	40.2	3.7 (5.8)	0.8 (2.3)	5.8	

<sup>a</sup> P = 0.05;  $\chi^2$  test.

<sup>b</sup> P<0.05; Kruskal-Wallis test.

<sup>c</sup> P>0.05;  $\chi^2$  test.

the inverse care law (Tudor Hart, 1971), those who use dentistry routinely have less disease experience (as shown in Table 3), while those who only attend when they have a problem are more likely to experience tooth extraction when they do attend. The time spent living in fluoridated areas was not statistically associated with age-5 SES, but it is prudent to control for fluoride exposure (albeit using an ecological measure) when examining caries-associated outcomes.

Accordingly, linear regression modelling (using Stata Version 7) was used; first to estimate the effect of each of the characteristics of interest, and then to estimate adjusted means for (a) age-26 DFS and (b) the number of missing teeth by age 26, for each of the age-5 SES groups, in order to examine the persistence of the patterns of age-5 oral health equalities into adulthood. The outcomes of those procedures are depicted in Figures 10 and 11. While cumulative caries experience was greater among the medium and low SES groups (Figure 10), the gradient was not as strong as expected. This is largely accounted for by the more striking SES gradient in tooth loss (Figure 11), whereby study members of lower SES had, on average, greater numbers of teeth missing due to dental caries by age 26. When it is considered that, by age 18, only two study members had lost a permanent tooth due to caries (Thomson *et al*, 2001), the substantial socioeconomic differential in tooth loss appears to have developed in the eight years since age 18. Using logistic regression to model the prevalence of caries-associated tooth loss by age 26 shows that, after controlling for sex, age-5 caries and residential fluoride history, study members in the low SES group at age five had nearly four times the odds of losing a tooth by age 26 (Odds ratio = 3.97; 95% confidence interval 1.73, 9.11) compared to those in the high SES group. This suggests that the SES differential did not merely develop since 18, it essentially re-emerged once access to State-funded dental care disappeared.

The adjusted SES gradients at ages five, 15, 18 and 26 are presented in Figure 12. As might be expected, the gradient was greatest at age five, reflecting both the wide variation in uptake of dental services by the study members as preschoolers and the greater socio-demographic variation in disease experience which is usually observed in the deciduous dentition than in the permanent dentition in children. At ages 15 and 18, the gradients were much less pronounced, and even appeared to have slightly reversed by age 18. Together with the transition from parentally imposed choices to greater “dental self-determination” in their pattern of use of dental services, the loss of entitlement to state-funded dental care after age 18 was associated with an increase in the SES gradient in caries experience by age 26.

The Low:High SES ratios for caries severity at ages five, 15, 18 and 26 were 1.98, 1.06, 0.97 and 1.11 respectively. It should be noted that Figure 10 does not include the missing teeth presented in Figure 11.

SES inequalities were also apparent in periodontal disease among the study members, with only 11.5 percent of those in the high SES group at age five having periodontal disease<sup>28</sup> by age 26, compared with 17.9 percent of medium SES and 27.7 percent of those in the low SES group. When adjusted for sex, episodic use of dental services, smoking status and plaque score at age 26, the low SES group had 2.3 times the odds (compared to those of high SES) of having periodontal disease (95% CI 1.2, 4.3).

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<sup>28</sup> Defined as having one or more sites with 4 or more mm of attachment loss by age 26.

## **Summary of the observations from the Dunedin study**

The Dunedin study is unique; there are no comparable longitudinal dental data from any other study.<sup>29</sup> So what do the Dunedin study's data on oral health inequalities through the life course show us? The observations of SES inequalities in oral health through the life course (to date) can be summarised as follows:

- ◆ the profound inequalities in caries experience which were apparent at age five had developed during the preschool years
- ◆ their magnitude reduced during the years of universal access to State-provided or -funded dental care
- ◆ the late teens transition to the adult dental care system was associated with a widening of socioeconomic differences again, particularly where tooth loss was concerned
- ◆ SES inequalities in periodontal disease were also apparent by age 26.

These longitudinal data support the model (illustrated in Figure 1) which contends that adult oral health inequalities have their origin in childhood, and whereby the accumulation of risk through a range of biological events and social experiences over time manifests itself in the disparities observed by age 26. The next assessment in this singular study is planned for age 32, and will enable examination of the nature and scale of oral health inequalities into the fourth decade of life. Adults entering their middle years have been so rarely studied using the prospective longitudinal approach that there is a scarcity of sound information on which to base clinical and public health decisions or interventions which might be used to reduce oral health inequalities among adults.

### **Summary of main points – Chapter 5**

Adequately determining the relationship of oral health to adult health requires longitudinal observational research. Data from the Dunedin study show that clear socioeconomic differentials in dental caries experience existed in early childhood, but their magnitude was reduced during the school years when there was universal access to free dental care. By age 26 (when dental treatment has been provided on an almost exclusively private basis for eight years), there had been a re-emergence of wide socioeconomic differences in caries occurrence, and with more teeth being extracted (due to caries) in low SES groups. These findings suggest that poor child oral health leads to poor adult oral health.

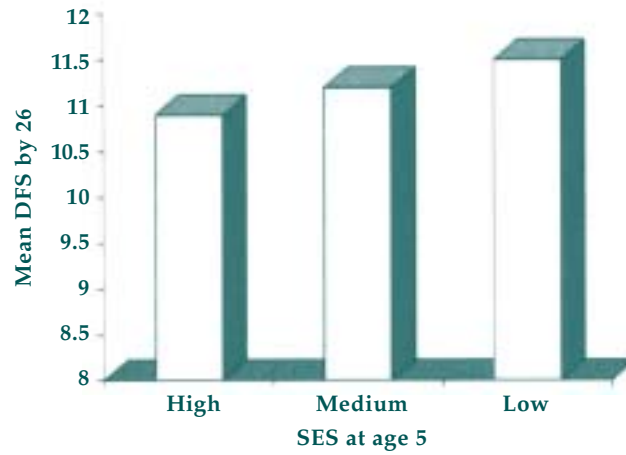
<sup>29</sup> There are main two issues pertaining to the generalisability of the Dunedin data. First, the sample has been shown to be largely representative of their South Island peers (Silva and Stanton, 1996); in terms of the New Zealand population, however, Māori are under-represented, with approximately 7% of Study members identifying as Māori at age 26. Thus, generalising from the Dunedin data to their New Zealand peers should be done with caution; however, Poulton, Milne, Wilson and Scott (in preparation) have recently compared the DMHDS participants with similar-aged participants in the 1996–97 NZ Health Survey and the National Nutrition Survey. Dunedin study members looked remarkably similar to the nationally representative studies in terms of measures of self-reported physical and mental health, weight, smoking, participation in physical activity, and use of health services. Second, cohort studies by their very nature are very much bounded by time and place; in the case of the Dunedin study, this means that there is a possibility that the very conditions which led to the observed patterns no longer hold. This is unlikely, however, given that the observed patterns are both consistent with expectations and intuitively sound.

Table 3 : Oral disease experience by age 26 in the DMHDS by SES, sex and exposure to community water fluoridation					
	Mean DFS (sd)	Net DFS increment from ages 18–26 (sd)	Percent with 1 or more missing teeth <sup>a</sup>	Mean number of missing teeth	
Sex					
Female	11.3 (10.2)	4.2 (6.1)	9.8	0.18 (0.63)	
Male	11.4 (9.5)	4.6 (5.5)	9.4	0.15 (0.58)	
SES group at age 5					
High	10.2 (10.1) <sup>b</sup>	4.0 (6.1)	4.9 <sup>c</sup>	0.07 (0.31) <sup>b</sup>	
Medium	11.6 (10.0)	4.4 (5.7)	9.4	0.16 (0.61)	
Low	12.4 (8.9)	5.1 (6.0)	17.6	0.33 (0.87)	
Time spent living in fluoridated area					
0–25 years	11.6 (9.7)	4.3 (5.9)	11.5 <sup>c</sup>	0.20 (0.68) <sup>b</sup>	
26 years	10.9 (10.1)	4.8 (5.7)	5.3	0.08 (0.40)	
Usual dental visiting pattern					
Routine	10.2 (9.0) <sup>b</sup>	4.1 (5.5)	3.4 <sup>c</sup>	0.06 (0.35) <sup>b</sup>	
Episodic	12.5 (10.5)	4.7 (6.0)	15.4	0.27 (0.76)	
All combined	11.4 (9.9)	4.4 (5.8)	9.6	0.17 (0.61)	

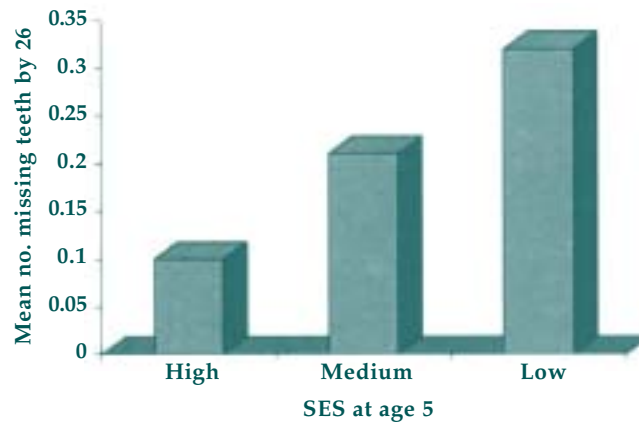
<sup>a</sup> Includes only teeth removed due to caries; excludes third molars and teeth removed for orthodontic purposes.

<sup>b</sup> P<0.01; Kruskal-Wallis test used for SES group; Mann-Whitney test used for fluoride exposure.

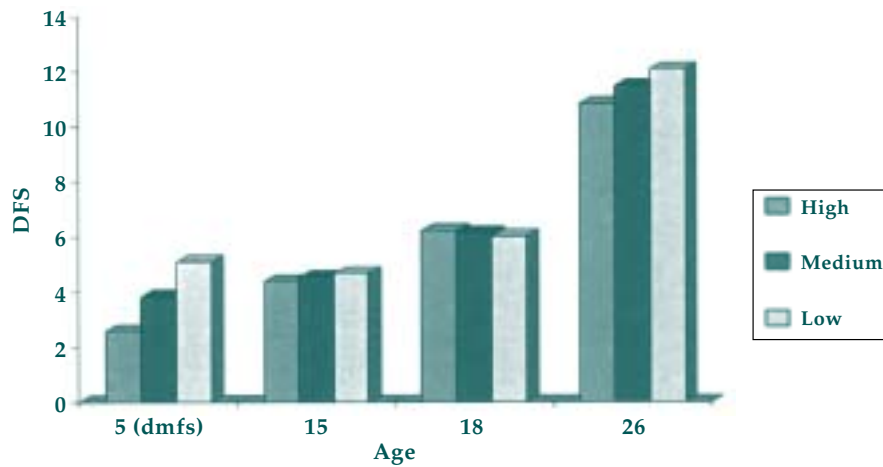
<sup>c</sup> P<0.01;  $\chi^2$  test.



**Figure 10 :** Average number of decayed or filled tooth surfaces at age 26 by age-5 SES.



**Figure 11 :** Average number of missing teeth at age 26 by age-5 SES.

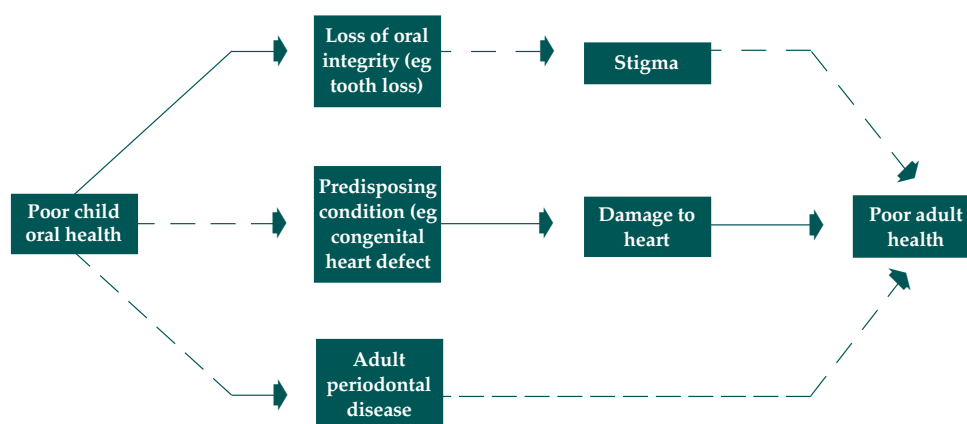


**Figure 12 :** SES gradients in the mean number of decayed or filled tooth surfaces at ages five, 15, 18 and 26, adjusted for sex and residential fluoride history (and age-5 disease status for ages 15, 18 and 26).

## Chapter 6 : Child oral health and adult general health

The relationship between oral and general health among adults has received increasing attention in the past decade. Almost all of this research has focused on the putative relationship between periodontal disease and systemic conditions such as cardiovascular disease (CVD), stroke and premature births (American Academy of Periodontology, 1998). However, the evidence remains largely equivocal, and a recent review of the strength and quality of the evidence for the association between periodontal disease and CVD concluded that the epidemiological research to date has been less than convincing, largely because of the use of inadequate exposure measures for periodontal disease. It has been suggested that molecular epidemiological approaches are required to fully explore the relationship (Beck and Offenbacher, 2001).<sup>30</sup>

In theory, child oral health can affect adult general health in a number of ways (Figure 13). It should be pointed out that adequate epidemiological evidence for most of these processes is lacking, either because of ethical (and other) difficulties in conducting appropriate research to demonstrate them, or because the research has been done but the evidence is equivocal.



**Figure 13 :** Hypothetical pathways by which poor child oral health might affect adult general health (solid lines indicate direct effects, dashed lines indirect effects); only the middle pathway has a sound evidence base.

What follows, then, is a consideration and discussion of possible/potential linkages that might exist between (a) oral health during childhood and (b) physical health in adulthood.

### **Possible pathways to poor adult health**

In the uppermost pathway, for example, a child with severe dental caries might either have unsightly restorations, untreated lesions or lose teeth early. Speech development and the ability to articulate certain speech sounds is partially dependent on the presence of the maxillary anterior teeth. It has been suggested that a degree of speech impairment, particularly in s and z sounds, may result from loss of the maxillary primary incisors (because of trauma

<sup>30</sup> Recent work on the association between maternal periodontal disease and low birthweight looks more promising. Such work is, of course, easier to conduct because of the considerably shorter time between exposure and outcome.



or extractions due to early childhood caries) prior to three years of age (Riekman and El Badrawy, 1985). Any of these dental conditions might be sufficient to socially stigmatise the child, affecting his/her social functioning to the point that life choices are made which increase the likelihood of poor health or compromised life chances as an adult.

In the middle pathway, a child with high dental caries experience and a congenital heart defect (or one acquired through untreated rheumatic fever) suffers an oral infection which results in a bacteraemia and subsequent infective endocarditis; this directly affects his/her cardiac functioning and health as an adult. The higher prevalence and severity of dental caries among low SES and non-European groups (Crump *et al*, 2001) means that, other factors being equal, orofacial infections will occur disproportionately among those groups. Together with their higher incidence of rheumatic fever<sup>31</sup>, this means that the longer term burden of the cardiac sequelae will also be experienced disproportionately by those groups.

The lower pathway is, of course, dependent upon the assumption that periodontal disease is a contributing factor in the aetiology of conditions like CVD or stroke. Whether poor periodontal health in childhood necessarily leads to poor periodontal health in adulthood is currently unclear, because no data have been reported on this aspect of the condition. While genetic make-up is a major determinant of periodontal disease experience (Page, 1999), smoking is a recognised risk factor (Gelskey, 1999), and the habit's disproportionate prevalence among low SES groups means that they may not only be at risk from the direct effects of smoking, but also from its indirect effects through the systemic effects of periodontal disease. That the age-26 SES inequalities in periodontitis in the Dunedin study cohort persist after controlling for smoking history suggests that low SES also exerts its effects in other, less obvious ways which nonetheless contribute to an accumulation of "periodontal disadvantage" through the life course. It is reasonable to assume that poor periodontal health in childhood predisposes to the same in adulthood, with the attendant risks of that condition.

Localised juvenile periodontitis (LJP) is a rapidly destructive, early form of periodontal disease which can manifest in early adolescence around the time of puberty. It has a predilection for the permanent central incisors and first molars (Jenkins and Papapanou, 2001). The prevalence of LJP is very low; one study reported an estimate of 0.4 percent, retrospectively diagnosed from a clinical sample of Saudis (Nassar *et al*, 1994), while a more recent review presented estimates ranging from 0.1 to 0.8 percent (Jenkins and Papapanou, 2001). None of the studies reviewed found a sufficient number of cases to allow analysis by socio-demographic characteristics. The Dunedin study data suggest that there were no cases among the cohort (Thomson *et al*, 2000). The lack of information from long-term follow-up studies means that the contribution of LJP to inequalities in oral health and in adult general health remains unknown.

#### **Summary of main points – Chapter 6**

Evidence for the relationship between child oral health and adult general health is largely equivocal, although several hypotheses have been suggested. The lack of a sound evidence base means that further investigation is warranted before any valid conclusions can be drawn.

<sup>31</sup> In 1998, the age-standardised rate for rheumatic fever hospitalisations was 7 per 100,000; for Māori, it was 13 per 100,000, and for Pacific peoples it was 47 per 100,000 (Ministry of Health, Progress on Health Outcome Targets 1999).

## **Chapter 7 : Child oral health as an indicator of health inequalities**

A recent review of health indicators outlined the characteristics of a sound indicator (Ministry of Health, 2001b). An indicator is defined as a characteristic (or variable) that can be measured and which can be taken to represent another characteristic (or latent variable) which is the actual object of interest. Thus, if the extent and nature of inequalities in child oral health were to be used as indicators of the extent and nature of inequalities in children's general health, the latter would be designated the latent variable.

Child oral health has both potential and face validity as a health inequality indicator, particularly with a disease such as dental caries, where data are routinely collected at age five and at the end of Form II, and for which inequalities are readily observed. Selection criteria for health inequality indicators which have been proposed include validity, reliability, responsiveness, modifiability, accountability, monitorability, predictiveness, acceptability and sustainability (Ministry of Health, 2001b). The suitability of dental caries as a health inequality indicator can be examined in the light of these criteria.

**Validity** requires that the indicator represents what it purports to measure; that is, that it either measures the inequality or an important component of it, and with high sensitivity and specificity. The latter two characteristics are crucial to the use of oral health inequality as an indicator for general health inequality: high sensitivity would be manifest if most of the children with severe dental caries were also those with other health problems; high specificity requires that most of those who were caries-free, or whose caries experience was less severe, did not have other health problems.

**Reliability** requires that the indicator be measurable accurately and precisely. In the case of dental caries, the reliability of the routinely collected school dental service data is unknown, as no formal examination of that aspect has been reported.

**Responsiveness** implies that the indicator is capable of showing measurable short- or medium-term change (over periods of 1–3 or 3–5 years respectively). In the case of dental caries, the Wellington data reported below (in Chapter 10) indicate that caries data routinely collected from five-year-olds are able to do that.

**Modifiability** requires that the occurrence of the indicator itself can be modified by (a) strategies which aim to improve it, or (b) other changes which may have detrimental changes to the indicator as an unintended side-effect.

**Accountability** means that a specific agency can be held accountable for implementing strategies which aim to modify the indicator condition or its determinants. This implies that the inequality indicator itself would be linked to performance measures for the agency involved. In the case of child dental caries, the school dental services are held accountable for reducing its prevalence and severity.

**Monitorability** requires the indicator to be measured at regular intervals. Dental caries among New Zealand children is measured and reported annually.

**Predictiveness** means that the indicator is future-oriented; that is, it can be used to predict future or potential need rather than accumulated health need. Where dental caries is concerned, the routinely collected data represent cumulative disease experience to date; the individual's current or future disease pattern is unknown, although past caries experience remains a strong predictor of future disease.

**Acceptability and sustainability** require that the indicator be understandable to policy-makers and other key interests, is acceptable to Māori, and is unlikely to fall victim to political changes. The two main dental indicators used are easily understood by lay people. The current system of collecting and reporting school dental service data is relatively robust, having withstood two decades of the most turbulent changes in the country's political and health systems.

Judged by these criteria, child dental caries appears to have potential as an indicator of health inequalities, although further investigation of its validity (including sensitivity and specificity) for this purpose is probably warranted. The Form II data have already been included in an indicative list of health inequality indicators (Ministry of Health, 2001b). However, it is apparent from the data presented in this report that, because their time in the publicly funded dental care system does reduce child oral health inequalities, a more valid and responsive indicator of child health inequalities would be dental caries at age five. Inequalities are likely to be greater at age five than at any time in the following two decades, for a number of reasons:

- ◆ ethnic and socioeconomic differences in the uptake of preschool dental services mean that caries differentials are likely to be maximised
- ◆ oral health status at age five largely reflects household conditions and nutritional and self-care practices, and there is less confounding by actual dental treatment
- ◆ other factors being equal, the development and progression of dental caries in the deciduous dentition is more rapid, meaning that (in theory, at least) there is less lag time between changes in determinants and the subsequent appearance of the disease.

The data are currently collected by school dental services, and are part of a wider national minimum dental data-set.<sup>32</sup> However, a challenge for those seeking to monitor health inequalities over time is that, while the caries and ethnicity data are collected for each individual, the only SES data collected in this way use an area-based measure. Thus, ethnic inequalities will be able to be monitored in rather more detail than SES inequalities, for whom monitoring will be limited to descriptive analyses only, because of the ecological measure used. Collection of parental SES data would be a useful development. Most importantly, the use of SDS data on dental caries as an indicator of child health inequalities requires that the data be collected, collated and analysed at unit-record level. As mentioned in Chapter 2, current moves in that direction are a positive development.

#### **Summary of main points – Chapter 7**

Child dental caries is a potentially useful indicator of more general health disparities. Caries data for five-year-olds should be used in preference to Year 8 data, as inequalities are more pronounced during the preschool period.

<sup>32</sup> See <http://www.newhealth.govt.nz/toolkits/oralhealth.htm>

## Chapter 8 : Promoting good oral health outcomes: options for effective action

### *Rationale and principles*

Should we be concerned about child oral health inequalities in New Zealand? Does it matter that particular groups and individuals have more disease and discomfort, and that those people are disproportionately found among Māori, Pacific people and groups of low SES?

A number of arguments have been offered in support of action to reduce health inequalities (National Advisory Committee on Health and Disability, 1998), and these are no less applicable to the oral health of children.

1. Inequalities in child oral health are reducible.
2. Reducing inequalities in oral health is fair, because children have only limited control over the (structural and other) factors which determine their oral ill-health.
3. Reducing child oral health inequalities benefits wider society by both freeing up scarce health system resources (an example would be enabling the hospital resources which are currently struggling to cope with child caries to be used for the treatment of other disorders and groups) and reducing the time spent by attending parents/whanau away from more productive activity.

However, while the moral imperative to eliminate oral health inequalities is clear, the ability of any society to do so completely is a matter for debate: whether it is achievable is unclear, and it may be that the best that can be hoped for is a reduction in inequalities, recognising that certain characteristics, practices and societal structures are less amenable to change. South Auckland represents a prime example of the scale of the problems which face us, containing “the largest concentration of urban poor, the largest Māori catchment in New Zealand, the largest Polynesian city in the world and it is characterised by a health status that is unacceptable in modern times. Diseases such as...rheumatic fever....should not occur at the rate that they do in South Auckland”.<sup>33</sup> If oral health inequalities in South Auckland can be reduced, then, by implication, the rest of New Zealand is likely to be less of a problem. In the final analysis, however, the reduction of oral health inequalities is an inexact science at best, and any reductions will be both hard-won and incremental; a longer-term focus is essential. The Hon. Annette King, Minister of Health, commented in 2000: “I believe the problems can be solved, but you won’t solve them overnight. But if you want to have a better society 30 years hence, we need to do something now”.<sup>34</sup> New Zealand society would be the poorer were we not to invest considerable energy and resources in an effort to reduce inequalities in oral health.

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<sup>33</sup> Excerpt from the South Auckland Health Annual Report, 1999, by Chief Executive Officer, David Clarke.

<sup>34</sup> Quoted in Johns G. Suffer the little children. *Metro*, April 2000, pp70–78.

## **Intervention points**

The 1998 National Advisory Committee on Health and Disability report listed a number of possible points for intervention to reduce health inequalities, and these are used as the framework for this chapter.<sup>35</sup> Implicit within such a framework is recognition that the health needs of Māori are paramount under the Treaty of Waitangi, and that particular effort to reduce child oral health inequalities should be directed at improving Māori oral health. The magnitude of the differences in oral health between Māori and non-Māori means that such a strategy is also likely to achieve the greatest gains in the reduction of child oral health inequalities.

The three intervention points for reducing inequalities in oral health are:

1. Basic socioeconomic determinants, such as reducing the prevalence of poverty and improving employment opportunities.
2. Intermediary factors between oral health and its socioeconomic determinants, such as increasing the availability of topical fluoride.
3. Developing oral health services which are more suitable, both by developing new services where appropriate, and by making appropriate changes to existing services.

Each of these is discussed in turn, and each can be related to the mechanisms depicted in Figure 1 (page 12): tackling the basic socioeconomic determinants directly addresses the poor childhood and adulthood environments; the second strategy affects both environmental (such as diet and topical fluoride availability) and self-care factors; and the third strategy enables more favourable use of services.

An important set of underlying principles is embodied in the Ottawa Charter for health promotion (WHO, 1986), which recognises the need to take a broad, policy-based, community-focused approach to improving health. Watt and Sheiham (1999) pointed out that oral health inequalities will only be reduced through the implementation of effective and appropriate oral health promotion policies, as treatment services alone will not address the underlying causes of oral disease. Accordingly, a strategic oral health promotion approach is required. Interventions based upon dental health education have been shown to be ineffective at producing long-term sustainable changes in oral health behaviours, and have failed to address inequalities. Aiming to tackle the underlying social, political and environmental determinants of oral health is appropriate, and requires a multi-sectoral approach (Watt and Sheiham, 1999).

### **1. Basic socioeconomic determinants**

The data presented in Chapter 6 suggest that social and economic policies which force substantial sections of New Zealand society into poverty can indeed have a detrimental (and measurable) impact upon oral health. Thus, close intersectoral scrutiny is required for any proposed policy changes which are likely to have health consequences, whether negative or

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<sup>35</sup> We have, however, omitted the third of the areas suggested in that report, as it was felt that reverse causality did not apply to the situation of child oral health.

positive. A logical inference from that observation is that policies which are based on the principles of social justice and aim to reduce the proportion of New Zealanders who are living in poverty will also have positive oral health benefits, in that they are likely to be associated with improvements in oral health (and bring other benefits) in vulnerable groups. Education levels and the distribution of income are fundamental targets for such interventions (National Health Committee, 1998), in that currently disadvantaged whanau, households and individuals will be more likely to have the wherewithal to participate more fully in society. In this way, reductions in child oral health inequalities are likely to be observed.

However, a social justice approach alone is not sufficient; as outlined above, advancing Māori oral health in a Treaty of Waitangi framework is likely to have far-reaching effects in oral health inequalities in New Zealand. At the basic level of the socioeconomic determinants of health, upholding the principles of the Treaty of Waitangi (partnership, participation and protection) helps to address all four dimensions of Te Whare Tapa Wha.

While intervening at the socioeconomic determinants level is likely to have the greatest impact on oral health inequalities, it is politically the most difficult; moreover, the measurement and evaluation of such interventions is not easy.

## 2. Intermediary factors

Intervening at this level to reduce inequalities in oral health means using strategies which are aimed at the more proximate causes of oral disease. Where dental caries is concerned, only a small number of simple preventive strategies are needed:

- (1) increase the availability of topical fluoride;
- (2) ensure the regular removal of plaque; and
- (3) reduce the frequency and amount of fermentable sugars consumed.

Both the first and second can be achieved by promoting the availability and use of fluoride toothpastes, while community water fluoridation is also a key strategy.

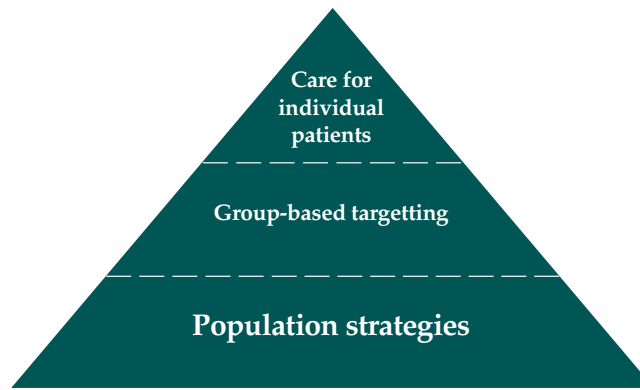
Two main approaches have been described in relation to preventive dental strategies for populations (Burt, 1998). The **high-risk approach** involves identifying those who have the greatest risk<sup>36</sup> of developing disease and then targetting them for intensive preventive intervention. By contrast, the **population approach** means allocating preventive resources and activities at everyone in the population, regardless of risk status.

The approaches can be further distinguished by thinking about them as part of a “prevention pyramid” (Figure 14), in which individual care and targetted programmes are built upon a base of population-level interventions.

At the base of the pyramid are strategies such as community water fluoridation, the use of fluoride toothpastes (which dominate the New Zealand market to such an extent that they are virtually universally used), and mass-media dental health education campaigns. The State is usually the agency responsible for this level.

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<sup>36</sup> Assuming that both the targetting process and the preventive intervention being targetted are effective (that is, they work) and efficient (that is, they are worth doing).



**Figure 14 :** The “prevention pyramid”.

The next level is that of group-based targetting, which is usually done on the basis of either geography, ethnicity or some other characteristic by which disease experience is seen to differ at the group level. As with the lower level, the State is usually the agency responsible for this level (most notably through school dental services), although this may be shared with community or other groups.

At the top of the pyramid is individual-based prevention, usually the responsibility of individual oral health practitioners (whether State-funded or not). From an economic perspective, the efficiency of the interventions reduces the further up the pyramid they are situated (Burt, 1998).

Population-based interventions hold the most potential for reducing inequalities in New Zealand. While community water fluoridation per se has not been the primary focus of the preceding chapters, a finding common to much of Chapters 2, 3 and 4 has been its demonstrated effectiveness at reducing both ethnic and socioeconomic inequalities in the occurrence of dental caries. Currently, 53 percent of the New Zealand population (who are on reticulated water supplies) drink water which has had its fluoride concentration adjusted upwards from approximately 0.3 parts per million (ppm) to between 0.7 and 1.0 ppm. There is clearly scope for that to be extended, given the recent demonstration of the cost-effectiveness of water fluoridation for communities as small as 1000 people (Wright *et al*, 2000).

Other strategies are appropriate at this “intermediary factors” level. For example, the situation where highly sugared, carbonated soft drinks are both (a) heavily promoted (through both advertising and ready availability), and (b) considerably cheaper than milk, is not one which is conducive to good oral health. A healthy public policy approach would be to rectify that situation by not only curbing the advertising of such beverages, but also changing their relative costs to the consumer, such as by either taxing sugar or subsidising milk (or a combination of both strategies).

### 3. Oral health services

One strategy that has been applied in several countries, including New Zealand, is to improve access to dental services. Improving access to dental care (by reducing or eliminating the cost factor) is seen as a way to improve oral health. The underlying assumption is that an inability to pay for dental treatment is a principal reason for the observed social inequalities in oral health. The National Health Service (NHS) was established in the United Kingdom

more than 50 years ago, and aimed to reduce the social gradient in oral health by enabling access to dental treatment independent of the ability to pay (Gelbier, 1998). However, child oral health data suggest that this scheme has not succeeded in eliminating the influence of SES on the caries experience of children, as profound SES gradients persist (O'Brien, 1993; Watt and Sheiham, 1999). Although there have been overall improvements in child oral health status, a substantial social class gradient in dental caries experience remains. This can be partially explained by the residual social gradient in service usage, suggesting that there are additional barriers to accessing care (Gelbier, 1998).

Recent US initiatives have focused on improving access to dental and other health care by low income children. Again, these initiatives are based on the assumption that if access to dental care for low income children improves, oral health inequalities will be reduced (Ismail and Sohn, 2001). This hypothesis is supported by the successful Rand Health Insurance Experiment, in which preschool children enrolled in a 'free' dental insurance programme had a significantly lower mean number of decayed teeth and were more likely to be caries-free than those enrolled in co-payment plans. Children from low income families benefited the most from having free access to dental care (Bailit *et al*, 1986). However, much experimental and routinely collected data does not support the assumption that improving access to dental care can reduce socioeconomic inequalities in oral health. Even when children have free access to diagnostic, preventive and basic restorative services, most dental caries experience remains clustered in children from poor or ethnic minority backgrounds (Ismail and Sohn, 2001; Moynihan and Holt, 1996; Evans *et al*, 1996).

Another recent report has suggested that the type of dental care system can significantly influence the oral health of a population. Standards of living are comparable in Denmark and Sweden, but the dental care systems are quite different. Adult oral health (measured by missing teeth and lack of prostheses) was found to be poorer in Denmark (where citizens are required to pay for their dental treatment personally) than in Sweden, where treatment is heavily subsidised by the State (Palmqvist *et al*, 2000).

School-based prevention programmes have been tried in a number of countries, including New Zealand. Children in deprived or rural areas constitute an important target group for the implementation of school-based dental prevention programmes. Questions remain about the efficacy of those programmes, however, as there is a shortage of adequate, systematic evaluation. A publicly funded dental prevention programme for adolescents from two non-fluoridated towns in Victoria (Australia) involved the provision of fissure sealants and fluoride mouth-rinsing. It proved to be efficacious and cost-effective over the three-year trial period. The authors of the study pointed out that such a programme is likely to have longer-term benefits as the interventions are likely to reduce future caries experience (Crowley *et al*, 2000). However, Hausen *et al* (2000) recently evaluated the high-risk preventive strategy with a population of 1465 12-year-olds. Children considered to be at high risk of dental caries were randomised into intervention and control groups. The intervention was an intensive preventive programme including counselling, fluoride varnish applications, fluoride lozenges, fissure sealants and chlorhexidine. The control group received the normal preventive care including counselling and fluoride varnish. After three years, there was no significant difference between the two groups in the DMFS increment, indicating that the intensive intervention was no more beneficial than the routinely offered preventive care. The outcome of this important study suggests that the cost-benefit ratio of intensive preventive programmes requires further investigation, particularly in populations with low overall caries experience. Until this is clarified, the place of the high-risk preventive strategy in reducing oral health inequalities remains unclear at best.



Reducing inequities in access to dental care is an important goal, but this will not necessarily reduce inequalities in oral health. Successful provision of professional dental care alone is unlikely to eliminate disparities in dental caries severity because treatment does not address the underlying causes of diseases (Watt and Sheiham, 1999).

While Māori oral health is the primary focus of the discussion which follows, it is recognised that improving oral health among Pacific children will require a number of similar strategies.

Much of the impact of poor oral health upon Māori children comes from existing disease going untreated, and more so in rural areas. Tamariki are disproportionately represented among those children who must be subjected to a general anaesthetic in hospital dental units in order to have their grossly decayed teeth treated to restore their smiles and enable them to eat properly. In the past, some aspects of the school dental services have been viewed as being alienating. A reasonable strategy is to develop oral health services which meet the needs of those children, both by developing new services (where feasible) and by making appropriate changes to existing services. Recent developments in school dental service delivery (such as involving extended whanau presence at clinical appointments) have been viewed positively. The principle of kaupapa Māori services (Broughton, 2000) is one which should be embodied in child oral health services wherever possible.

There is scant evidence in the literature for the effectiveness of preventive strategies which rely solely upon clinical interventions (as discussed above), but having appropriate oral (and other) health services is likely to bring health and community development benefits for Māori. Such an approach is consistent with three of the five tenets of the Ottawa Charter for health promotion.<sup>37</sup>

Improving child oral health among Māori requires attention at three levels:

- (1) Government
- (2) the health sector (including the dental profession)
- (3) Māori.

### **(1) Government**

The Government response has already commenced on a number of fronts. In October 1998, the Board of the Health Funding Authority (HFA) identified oral health as one of eight Māori health gain priority areas. The New Zealand Health Strategy indicated the intention to reduce health inequalities, and identified 13 population health objectives for immediate action, one of which was to improve oral health. Moreover, in *He Korowai Oranga: Māori Health Strategy* (April 2001), oranga niho was identified as a health priority for Māori.<sup>38</sup> The overall aim of Korowai Oranga is whanau ora; that is, healthy Maori families being supported to achieve their maximum health and well-being. Oranga niho (oral health) is an important part of Korowai Oranga, and this dimension is reflected in the overall aim, directions, endorsements and pathways of Korowai Oranga.

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<sup>37</sup> Create supportive environments; strengthen community action; reorient health services.

<sup>38</sup> *He Korowai Oranga. Maori Health Strategy Discussion Document*. Hon Annette King, Minister of Health, April 2001.

Where Government action at the oral health provision level is concerned, the 1999 Budget signalled a pilot project for integrated dental care for children and emergency care for low income adults. The contract for this pilot was awarded to Te Taiwhenua o Heretaunga in Hastings, and the service opened in 2001.

## **(2) The health sector (including the dental profession)**

The health sector/dental profession response includes a number of strategies. The New Zealand Dental Association report *Oral Health Goals for the New Millennium* (Edward *et al*, 1999) identified Māori oral health as a key issue, and set out goals and targets (for the year 2010) for the profession to work towards in partnership with Māori. Specific targets for tamariki included: ensuring that all Māori preschool tamariki enrol with and access treatment through the School Dental Service; reducing dental caries experience in the deciduous dentitions of Māori five-year olds to a level which is equal to that of non-Māori; and increasing the proportion of Māori five-year-olds with caries-free deciduous dentitions to be equal to that of non-Māori. At the service provision level, dental providers who are contractors with the DHB must ensure that the delivery of their service is appropriate for Māori. At the education/training level, Māori culture and health has been an important aspect of undergraduate education for dentistry for the last two decades, and is now also part of the programme in dental therapy.

## **(3) Māori initiatives**

The Māori community response has proceeded in a number of ways.

- (a) Te Ao Marama (the New Zealand Māori Dental Association) was formed in 1996, and has a wide membership which comprises not only dentists and dental therapists, but any other oral health workers with an interest in oranga niho. It has acted as an effective lobby group, being essentially responsible for the HFA Board's identification of oral health as a priority area for Māori health gain, and provides a voice for Māori oral health at various national dental health sector forums. Te Ao Marama also publishes a journal and holds an annual national hui.
- (b) Through a recent deprivation-based funding initiative,<sup>39</sup> the Māori dental health educator has evolved as a new Māori community health worker, and provides an important community-based link between whanau and dental services (essentially the school dental services): "The role of the community health worker is probably the most important person in dental health education of our people. Only through education and motivation can a behaviour change take place, and only then will we see our tamariki improve their oral health." (Betty, 1998). Most are employed either by a Māori provider or by the School Dental Service. A number of Māori health promotion resources and approaches have been successfully developed and used over the last three or four years by Māori providers. Examples include: "He Kete Oranga Niho" (Te Waka Hauora, HealthCare Otago; "He Kete Oranga Niho, Oranga Tinana, Oranga Whanau; Pacific Health, Bay of Plenty); and a resource developed by Te Whare Kaitiaki (School of Dentistry, Dunedin), which features Taine Randell as a positive oral health role model for tamariki.

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<sup>39</sup> \$3 million was made available over three years to improve access to oral health services for children from low income, Māori and Pacific groups, and from rurally isolated areas. The money was allocated to regions according to their proportion of Decile 1 ("most deprived") schools.

- (c) Māori dental provider services, operating under kaupapa Māori, have made substantial contributions to improving the health of Māori, and some currently have the capability and capacity to provide *oranga niho* services. Examples of such services are: Tipu Ora, Tunohopu Health Centre, Ohinemutu, Rotorua; Te Whare Kaitiaki, School of Dentistry, The University of Otago (now in its 12<sup>th</sup> year); Te Atiawa Dental Service, New Plymouth; Te Taiwhenua O Heretaunga, Hastings; Te Whanau O Waipareira Trust, West Auckland; Ngati-Hine Health Trust, Kawakawa; and Ngati Porou Hauora, Ruatoria.

Māori are participating at all levels of the oral health workforce (including those of management, statutory governance,<sup>40</sup> policy advice<sup>41</sup> and teaching<sup>42</sup>), and the current president<sup>43</sup> of the New Zealand Dental Therapists' Association is Māori. However, greater numbers are required in order for kaupapa Māori services to be adequately resourced and supported. A key issue is therefore the continued development of the Māori oral health workforce, which currently comprises community oral health workers, allied oral health professionals (dental hygienists, dental therapists, clinical dental technicians), dentists and dental specialists. Māori oral health provider issues are currently being investigated in a research project<sup>44</sup> which is funded by the Health Research Council of New Zealand. Essential to the process of developing the Māori dental workforce is the collection of appropriate workforce monitoring data. Such information is directly available for dentists, dental specialists and dental technicians as a result of their annual registration procedures, but reliable data are not currently available for dental therapists, dental hygienists or community oral health workers. Over the last few years, Te Ao Marama has had over 50 members who are dental therapists, but retirements have meant that it is not possible to say for sure how many Māori dental therapists there are in the workforce. Currently, only 2 percent of dental technicians identify as Māori, and attracting more Māori into the profession has been identified as a priority.<sup>45</sup> In 1994, there were four Māori dentists registered with the Dental Council of New Zealand; by 2001, there were 28, indicating that there has been considerable success in attracting Māori into the profession. The number of Māori dental students at the School of Dentistry is increasing, and bodes well for the future. Issues such as further increasing the proportion of Māori dentists, dental therapists, hygienists and dental students, and attracting dentists to rural areas are currently being examined by both the Health Workforce Advisory Committee and the dental profession.

Pacific health services are currently being developed, and it is anticipated that their development will be similar in scope and focus to those which have been developed by and for Māori.

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<sup>40</sup> Including two Māori members (Mrs C Rimene and Mr WR Sparks) on the New Zealand Dental Council, and Mrs Inez Kingi on the New Zealand Dental Technicians' Board.

<sup>41</sup> Including Mrs Vicki Kershaw, Dr Pauline Koopu and Associate Professor John Broughton on the Oral Health Advisory Group, and Associate Professor John Broughton on the New Zealand Health Strategy Sector Reference Group.

<sup>42</sup> Mrs Helen Tane is Dental Therapy Course Co-ordinator at the School of Dentistry.

<sup>43</sup> Mrs Vicki Kershaw of Taranaki.

<sup>44</sup> Associate Professor John Broughton, Ngai Tahu Māori Health Research Unit, Dunedin School of Medicine, University of Otago. *Oranga niho: A kaupapa Māori review of Māori dental health service provision.*

<sup>45</sup> Dental Technicians Board, personal communication.

### Summary of main points – Chapter 8

Inequalities in oral health are reducible; whether they can be eliminated is another matter, but it is society's moral duty to work towards that goal. Three intervention points are identified, and ideas are given for action at each of the points of (i) socioeconomic determinants, (ii) intermediary factors, and (iii) oral health services. First, the basic socioeconomic determinants of oral health inequalities must be tackled through income distribution and support policies (including improving Maori socioeconomic circumstances through addressing Treaty claims). Second, population preventive strategies must be directed at the more proximate causes of dental disease; a prime example of this is increasing the availability of topical fluoride through both extending community water fluoridation and increasing the availability of fluoride toothpastes for disadvantaged groups. Other strategies are required to complement these, such as moves to reduce the consumption of highly sugared soft drinks and increase the availability of healthier alternatives. Third, at the oral health services level, much of the impact of poor oral health upon Maori and Pacific children comes from existing disease going untreated, and more so in rural areas. A key strategy is to develop oral health services which are more suitable for those children, both by developing new services (where feasible) and by making appropriate changes to existing services. Improving child oral health among Maori requires attention at the three levels of (1) Government, (2) the health sector (including the dental profession), and (3) Maori.

## **Chapter 9 : Gaps in child oral health inequalities information**

In the course of this review, several areas have been identified where information in the literature is lacking. Some of these deficiencies in knowledge are relevant to all industrial countries, while others are specific to New Zealand. There is an urgent need for health services research with regard to inequalities in the oral health of New Zealand children.

First, as mentioned in Chapter 1, there is no universally accepted definition of oral health. Although instruments are available (and now being used in health services research) to measure oral health-related quality of life, these have been designed primarily for use with older adults. Measures for use in the child population are lacking. This is particularly true in the New Zealand context, where more holistic models must be considered in order to encompass Māori and Pacific concepts. The development of composite deprivation measures for use in the child population would be useful.

A major deficiency in our knowledge relates to a lack of data about oral disease in the New Zealand population. We cannot assess the effectiveness of our current public health programmes, or know how they should be modified, if we lack appropriate information about the epidemiology of dental disease in the population. The school dental service routinely collects data on dental caries prevalence and severity in children at five years of age and in Year 8 (Form II). These data provide almost the only systematically collected information we have of the oral health of children, and have been discussed in detail in this review. However, there is a paucity of data on the dental caries experience of children at other ages (such as preschoolers), as well as information about other oral problems such as dental trauma, periodontal disease and enamel defects.

Dental trauma data are routinely collected in New Zealand by ACC, but this material is under-utilised, and no reports have been published on inequalities in the occurrence of dental trauma.

Periodontal disease is known to be less common in children than dental caries, and data concerning the periodontal status of children are not routinely collected. Periodontal disease has a high prevalence in the adult population, particularly for Māori and Pacific people, but it is unclear when this disease develops, and hence when preventive intervention would be most timely.

Enamel defects have not been discussed in this review, as no work on this problem has been conducted since a group of studies in the 1980s, and those did not report on inequalities in the occurrence of enamel defects. A research project on this topic is currently being conducted in Southland. Some enamel defects can be related to a high exposure to fluoride and the prevalence of these defects should be monitored, along with ongoing work on the effectiveness of water fluoridation.

There are particular groups of New Zealand children who need to be considered in terms of inequalities in dental care. Groups of children who have been identified in this paper include those living in rural areas, children from deprived or single-parent families, and children with disabilities. A particular area that was not able to be addressed in this paper is the effect of mental disabilities on oral health. Do children with conditions such as attention deficit-

hyperactivity disorder or autism have higher treatment needs; are they accessing adequate care; what are the long-term consequences of poor oral health in childhood and adolescence for these children; or is their treatment simply more difficult?

There is a need for up-to-date information on socioeconomic and ethnic inequalities in oral health among New Zealand children. Although the school dental service does now collect data on ethnicity, there are still some issues to be addressed. It has not been possible to monitor ethnic differences over time in the distribution of dental caries, as it is only in recent years that the data have been collected in that way. Current moves to standardise the collection of SDS data at unit-record level should enable better monitoring of trends in ethnic inequalities in the distribution of dental caries among New Zealand children. Ethnicity information on Pacific children should be collected in such a way that the data can be disaggregated and analysed according to individual Pacific ethnic group. We also lack data on oral disease rates in other ethnic groups such as Asian and new immigrant children. There is a need for the accuracy and quality of ethnicity data to be assessed, as well as the impact of recent moves to improve SDS data collection. Needs analysis is required to enable effective planning and decision-making with respect to child oral health in all ethnic groups. There is also the need to continue to monitor the effectiveness of community water fluoridation and its role in reducing oral health inequalities, particularly at the health services research level in quantifying the fluoridation-association reduction in demand for child dental care under general anaesthesia.

There have been some major changes in the provision of dental care for New Zealand children and adolescents in the last decade. In 2000, the general dental benefit (GDB) contracts that private dentists hold with the DHBs changed from a fee-for-service arrangement to a capitation contract for the provision of routine care. It is not known whether this has resulted in an increase in the number of dentists holding contracts to provide care for adolescents. In addition, the upper limit for eligibility for care under this scheme has been raised from 16 to 18. Previously, 16- or 17-year-olds were only eligible if they were in full-time education or on a training scheme. There is currently no information regarding how the new GDB contracts are affecting the care received by adolescents, and on whether the changes have been advantageous for Māori and Pacific adolescents.

Another transition that has taken place over the past decade is the increasing flexibility of the school dental service. Therapists are no longer based only in schools, but have extended into the wider community, often working alongside other health professionals such as Māori health providers. Some therapists work in mobile vans, taking the service to smaller communities, improving the accessibility to dental care, particularly for rural and Māori preschool children. Evaluation of the success of these newer initiatives is required. Another (less well accepted) change, which has been taking place over several years, is a decrease in the number of dental therapists, meaning that many are now required to service several schools in a year. Anecdotal evidence suggests that this has adversely affected the accessibility of the service for some primary school-aged children, and it is of particular concern when a child has an acute problem and the therapist is difficult to locate.

Finally, further longitudinal research is required on the impact of poor oral health in childhood in relation to adult oral health, in order to (a) elucidate the mechanisms by which inequalities develop and persist, and (b) assist in identifying potential intervention points.

### **Summary of main points – Chapter 9**

Broader oral health measures for use in the child population are lacking, and there is a need to develop measures which encompass Maori and Pacific concepts of health. Other than for five-year-olds and Form II children, there is a paucity of data on the dental caries experience of children at other ages (such as preschoolers and nine-year-olds), and the current data need to be collected at unit-record level throughout the country. There is also a need for studies of other child oral problems, such as dental trauma, periodontal disease and enamel defects. Work on documenting the effectiveness of water fluoridation should continue, particularly at the health services research level. Research is required on the impact of the new General Dental Benefit contracts on adolescent dental care, and on whether the changes have been advantageous for Maori and Pacific adolescents. Systematic evaluation is required of the impact of ongoing changes in the way in which the SDS delivers care to children. Finally, further longitudinal research is required on the impact of poor oral health in childhood on oral health in adulthood.

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