ORAL HEALTH INEQUALITIES & HEALTH SYSTEMS IN ASIA-PACIFIC
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Australian Research Centre for Population Oral Health (ARCPOH)
Adelaide Dental School
The University of Adelaide
Level 1, 122 Frome St
Adelaide SA 5005
Web: www.adelaide.edu.au/arcpoh

Nature India
Registered Office: 7th Floor, Vijaya Building,
17, Barakhamba Road, New Delhi - 110 001, India.
Email: npgindia@nature.com
Web: www.nature.com/nindia
As Asia-Pacific is home to about half the world’s population. It is a diverse region comprising 38 countries, including the World Health Organization’s Western Pacific and South-East Asian regions. Six countries (Australia, Brunei, Japan, New Zealand, South Korea and Singapore) are high-income; two are low-income (Nepal and North Korea), and rest are classified as middle-income. China, India, Malaysia, Thailand, Indonesia, and the Philippines are among the fastest growing economies in the world. Health is an intrinsic factor in economic development in the region, and central towards achieving global Sustainable Development Goals.

Oral health describes the health of the mouth and adjacent structures. Tooth decay, gum disease and tooth loss rank among the most common conditions in the world. They cause pain, infection, difficulty in eating, and can have a negative impact on quality of life and social functioning. Oral diseases are also linked with other systemic conditions, such as cardiovascular diseases. The cost of treating oral diseases account for a large proportion of overall expenditure on health. For example, direct treatment costs of oral diseases were estimated at US$298 billion a year globally, an average of 4.7% of the global health expenditure. Even though oral diseases are largely preventable, oral healthcare is a neglected area and given low priority in most systems.

**ORAL HEALTH INEQUALITIES AND HEALTH SYSTEMS**

In simple terms, oral health inequalities refer to the uneven distribution of oral health or oral health resources amongst the population. Oral diseases disproportionally affect the poor and socially disadvantaged, who are have greater exposure to risk factors and have inadequate access to necessary health services.

1Professor of Population Oral Health and Director of the Australian Research Centre for Population Oral Health (ARCPOH), Adelaide Dental School, University of Adelaide, Australia (marco.peres@adelaide.edu.au); 2Professor, ARCPOH, Adelaide Dental School, the University of Adelaide, Australia (david.brennan@adelaide.edu.au); 3Research Associate, ARCPOH, Adelaide Dental School, University of Adelaide, Australia; Honorary Associate, Discipline of Behavioural and Social Sciences in Health, Faculty of Health Sciences, University of Sydney (madhan.balasubramanian@adelaide.edu.au).
services. Denied or delayed access to dental care is influenced by factors such as the availability of practitioners and cost of dental services. Inequalities in oral health are seen both within and across several countries in the Asia-Pacific region. The global dental research community has consistently argued that these inequalities are both unfair and unjust and demand the immediate attention or policy-makers.

A health system comprises all organizations, people and actions whose aim is to promote, restore or maintain health. Strengthening these systems is fundamental to address oral health inequalities and this include efforts to influence determinants of health as well as more direct health-improving activities. The six building blocks of health systems include: workforce, service delivery, information; medical/dental products; technologies; financing; and leadership and governance.

The oral health workforce in the region is primarily made of dentists. Mid-level providers (such as nurses, hygienists and assistants), who could provide a range of preventive services and be more readily available in areas of need, have been neglected in many countries. An appropriate mix of dental personnel, together with improved teamwork and collaboration with other health professionals is necessary to address oral health inequalities. Further, dental service and health financing models may require revamping to be more effective at reaching the under-served. In general, health systems research has been minimal, and there is a lack of information and quality evidence from developing countries in the region. Strengthening leadership and governance is necessary to address many health systems challenges in the region.

**PURPOSE OF THE SPECIAL ISSUE**

This special issue is an effort to address key challenges facing oral health inequalities and health systems in the Asia-Pacific region. We have brought together a group of experts who strengthen the call for action in the region. All the authors are senior academic or policy personnel who have made a significant contribution to oral health research regionally and globally.

In the first section, we bring together four commentaries that focus on pertinent issues across several countries in the Asia-Pacific region. David Williams and Manu Mathur make a case for including oral disease prevention and control in the broader non-communicable disease framework. Ankur Singh presents an interesting case of social determinants of oral health inequalities while Jun Aida discusses broad challenges facing oral health inequalities in the region. Madhan Balasubramanian, Jennifer Gallagher, Stephanie Short and David Brennan, focus on dentist migration and workforce inequalities in the region.

The second section features country-specific commentaries focussing on seven countries: Australia (by Marco A. Peres & Liana Luzzi), Brunei (by Karen G. Peres, Malissa SY A. Sikun, Paulina KY Lim and Kaye Roberts-Thomson), China (by Edward C. M. Lo), India (Balaji S. Muthiah, Vijay P. Mathur, O. P. Kharbanda & Kunaal Dhingra), New Zealand (by W. Murray Thomson), Papua New Guinea (by Leonard A. Crocombe, Mahmood Siddiqi & Gilbert Kamae) and Vietnam (by Loc Giang Do & Diep Hong Ha). While these are not a complete representation, they represent a cross-section – geographically, culturally and economically – to reflect the region’s diversity.

**SIGNIFICANCE AND FUTURE IMPLICATIONS**

There is an urgent demand for collaboration among researchers, policymakers, public health practitioners, clinical teams and public, to improve oral health in the Asia-Pacific region. Based on the London Charter for Oral Health Inequalities, we stress the importance of advocacy on oral health inequalities in the region. We widen the agenda to strengthen essential aspects of health systems in the region, such as dental workforce, service delivery, organisation of care, health financing, governance and leadership.

This call for action aligns with the objectives of research groups, such as the International Association for Dental Research and Global Oral Health Inequalities Research Network and professional groups such as the FDI World Dental Federation. We also believe that the dental community needs to work more closely with the World Health Organization, so as to develop tangible solutions to address oral health inequalities and health systems strengthening in the region.

We hope that this issue will be informative for policy-makers, and useful for the dental industry, dental schools, health professionals and the general public throughout the Asia-Pacific region. We thank all the authors, Nature India and Nature Publishing Group for making this special issue a reality.

Oral health inequalities are the most prevalent non-communicable diseases (NCDs), affecting almost 4 billion people worldwide. They share social determinants and risk factors with the other NCDs and exhibit a similar social gradient in prevalence, resulting in global inequalities in oral health. Oral diseases create a major economic burden, through loss of productivity, so can be both a cause and consequence of relative poverty. Most dental diseases are preventable, and early dental treatment is cost-effective.

While many high-income countries have enjoyed considerable improvements in oral health in recent years, the same does not hold true for the Low and Middle Income Countries (LMICs) especially those from the Asia Pacific region. Oral health inequalities within and between countries of the region are wide and reflect unequal exposure to common risk factors, inequitable access to healthcare, as well as widening disparities in socioeconomic status.

The link between oral and general health and its impact on an individual’s quality of life, provides a strong conceptual basis for the integration of oral healthcare into general healthcare improvement approaches.

ORAL HEALTH & SUSTAINABLE DEVELOPMENT GOALS IN ASIA PACIFIC
Since the 2000 adoption of the Millennium Development Goals (MDGs), the Asia-Pacific region has witnessed multiple transitions such as rapid urbanization, changing demographic profiles (from a predominantly young to ageing populations), changing dietary patterns (towards a high-sugar western diet), increasingly sedentary lifestyles, environmental degradation, cultural changes and uneven economic growth. The compound effect of these, overlaid by uneven economic development, an under-resourced health system and inadequate multi-sectoral action on social determinants, are reflected in the oral health profile of the region.

Recognizing the need for a more sustainable, equitable and inclusive approach to development and health, the MDGs were replaced by Sustainable Development Goals (SDGs) in 2015 and these provide a framework for actions across multiple sectors for human development with the most sustainable use of resources. The emergence of NCDs, including oral diseases, as the major cause of morbidity and mortality was highlighted as a major challenge for sustainable development and included as a stand-alone target in the lone health SDG.

THE QUEST FOR UHC IN ASIA-PACIFIC
The SDGs also recognise Universal Health Coverage (UHC) as the foundation to achieve health and wellbeing at all ages. This is a state of health system performance, when all people receive the health services they need without suffering financial hardship. It is expected to provide equitable access to affordable, accountable, appropriate health services of assured quality to all people, including promotive, preventive, curative, palliative and rehabilitative services.

Many LMICs have made progress in achieving UHC in the past 15-20 years, but most only cover basic dental services. The inclusion of more pre-

Policy Recommendations
- Oral disease prevention must be included in the broader non-communicable diseases (NCD) framework.
- Targets and indicators must be within the global sustainable development agenda.
- Achieving Universal Health Coverage (UHC) will progress on oral health outcomes, inequalities and socio-economic impact.
- Links with other development sectors such as poverty reduction, agriculture and food, education, climate change and gender must be recognised.

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ventive, promotive and rehabilitative oral healthcare coverage is still rare especially in the Asia-Pacific region. Some countries, including the Philippines, Sri Lanka and Thailand have begun to include comprehensive oral health within their UHC model and to decompose the source of inequality in utilization. Further, to identify the determinants that effect to out-of-pocket payments for oral healthcare. Methods: Using the data of 32748, Thai adults aged 15 years and over from nationally representative Health and Welfare Survey and Socio-Economic Survey in 2006. This study employs concentration index (CI), demonstrating what can be achieved. It is now for others to follow their example.

THE WAY FORWARD

UHC, delivered through an adequately-resourced and well-governed health system with a strong prevention component, is the most likely approach to address oral health challenges. UHC will also have positive externalities for development, gender empowerment and social solidarity. Within the health sector, primary healthcare should be ranked as of the highest importance, because of its ability to provide maximum health benefits to all sections of society and ensure sustainable oral healthcare expenditure levels.

Inclusion of oral health into the broader NCD and UHC framework will in turn prove beneficial for all Asia-Pacific countries, as the focus on health promotion, prevention, multi-sectoral action and addressing social determinants (which are more defined for oral health) will help identify support pathways for other NCDs. The attainment of UHC will only be possible when oral disease prevention and control is prioritized. Achieving UHC, will in turn provide a robust launching pad to foster progress on oral health outcomes, inequalities and socio-economic impact.

ORAL HEALTH IN ALL POLICIES

It is becoming recognised that, like general health, the critical determinants of oral health lie outside the health sector. Oral health is also influenced by policies and programmes in other development domains, such as poverty reduction, agriculture and food, education, climate change and gender 1-8. It is essential that the post-2015 development agenda and resulting policies recognise these linkages. When designing policies to achieve future development goals, the impact of oral health across multiple sectors should be taken into account. Responding to the challenges of global health transition and recognising the close links with other development sectors, oral health must be positioned centrally in the framework of sustainable development. The post-2015 development agenda must also promote synergies and partnerships that align actions for better oral health.

Societal determinants of oral health inequalities in Asia–Pacific

Ankur Singh

**Policy Recommendations**
- Policies to address oral health inequalities should identify underlying societal determinants.
- Surveillance and monitoring of oral health inequalities should be strengthened.
- Policy interventions should be based on plausible social and biological mechanisms.

**“If your only tool is a hammer, all your problems will be nails.”**

*Mark Twain*

Health inequalities are the systematic, avoidable, unjust and unfair differences in health status in populations according to social, ethnic and geographic groups. Differences in oral health status according to an individual’s social position and status reflect inequalities at the individual level within a population. Differences in average oral health status between population groups reflects oral health inequalities at the population level. Thus, oral health inequalities can be conceptualized both at the individual and population level.

The Asia-Pacific region comprises a diverse mix of countries in terms of economic development, socio-cultural diversity, power balance in global governance and trade relations, free market operations, geographical size, population density and political ideologies. This diversity across different social, political and geographic dimensions must be observed, especially when identifying policy solutions to address oral health inequalities. Ignoring this diversity may bring a false conclusion that a basic set of policy solutions may address oral health inequalities at the individual and population level.

Characteristics that form the social and physical environments in which people live and work, and determine distributions of population health, are recognized as the societal determinants of health, and several theoretical models (or explanations) exist to describe them. Galea provided a framework summarizing different characteristics relevant to population health at the global, national and community levels. At the global level these include global trade, income distribution, population movement, global governance, and communications and technology. At the national level, these include infrastructural resources, employment decisions, income growth, population density, governance/policies. Correspondingly, at the community level these are resource allocation, social services, physical environment, social environment and population heterogeneity.

Theoretical models are also specifically proposed to identify societal determinants pertinent to addressing health inequalities. According to Muntaner, Chung macro-level societal factors, including power relations between markets, government and civil societies; policies around labour market and welfare state, relationships between employment conditions, material deprivation, economic inequalities and health systems interact at different hierarchical levels to determine the degree of inequalities. Likewise, another theoretical model places ultimate importance on political context which, through its diffused effects on public health policies, influences multiple factors closely related to distribution of health. These factors include distribution and levels of income, power relationships, behaviours, cultural characteristics and health system characteristics. Evidence to assess the role of these determinants in the distribution of population oral health is scant compared to evidence available on general health both in the region, and globally.

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1 Research Scholar, Australian Research Centre for Population Oral Health, Adelaide Dental School, the University of Adelaide, Australia SA 5005 (ankur.singh@adelaide.edu.au).
Policy solutions to address oral health inequalities which do not account for underlying societal determinants can fail to achieve objectives, despite having correct intentions. Considering the diversity in societal and demographic differences within Asia-Pacific, tailoring policy solutions will require a better understanding of the contextual characteristics. This makes the need to understand ‘societal determinants of health’ a vital first step towards reducing oral health inequalities.

**DEBATE AROUND THE TRANS PACIFIC PARTNERSHIP TRADE AGREEMENT**

A current debate around the public health implications of the Trans Pacific Partnership (TPP) agreement involves several countries within the Asia-Pacific region including Singapore, Brunei, New Zealand, Australia, Vietnam, Malaysia and Japan. Some of the implications raised include intellectual property rights driving the prices of pharmaceuticals, food standards policies impacting food safety, investor state dispute settlements, which can delay implementation of protective policies, such as plain packaging and sugar tax (regulatory chill), and precarious employment conditions. None of these issues are exclusive to general health outcomes, and are very likely to impact levels and distribution of oral diseases within societies at multiple levels.

Recent reports from Vietnam show an increase in overall intake of sugar sweetened beverages, a known risk factor for dental caries, after removal of trade regulations in Vietnam. Under such macro-level socioeconomic changes, disadvantaged individuals are more vulnerable due to the lack of knowledge, money, power, prestige, and beneficial social connections. Subsequently, the oral health inequalities at the individual level within countries may further escalate. In light of achieving economic goals, and negotiating power held by countries in global market, changes to protective public and public health policies can highly impact oral disease levels and its distributions. Therefore, understanding societal determinants of oral health inequalities is of fundamental importance.

**THE WAY FORWARD**

Margaret Whitehead, a pioneer in health inequalities research summed up the issue of policy solutions for health inequalities: “If your only tool is a hammer, all your problems will be nails.”

The first step to address oral health inequalities within the Asia-Pacific region demands an understanding of the societal determinants that shape the distribution of oral health within and between countries. Surveillance and monitoring of oral health inequalities according to contextually relevant social groups will provide reliable evidence for creating evidence based policy solutions.

Different categories of policy solutions to address health inequalities include: strengthening individuals, strengthening communities, improving living and working conditions, and promoting healthy macro policies. Of these, the latter is most likely to have diffused effects and benefits, but depending on the context and problem, different combinations with other categories may be indicated. Overall, there is a need to better understand the problems that escalate oral health inequalities within and between countries in the region, to reach out for most effective policies.

Oral diseases are the most prevalent diseases worldwide, and their estimated annual treatment cost is US$298 billion. The resulting absenteeism from education and work increases the annual indirect cost of oral diseases to US$144 billion, comparable to the annual indirect cost of US$126 billion for lower respiratory infections, one of the 10 most frequent global causes of death.

There is a relationship between oral diseases and socioeconomic status called a social gradient of oral health; poor people have more oral diseases and rich people have healthier teeth and gums. These inequalities are observed between and within countries, and cannot be solely explained by inequalities in dental care provision. The global burden of oral diseases is different because of health inequalities; therefore, reducing oral health inequalities is important to reduce the burden.

ORAL HEALTH INEQUALITIES AND EFFECTS OF DIFFERENT TYPES OF INTERVENTIONS

Figure 1 shows the oral health inequalities (social gradient) and effects of different types of interventions. Studies reveal that human behavior and health are affected by various social circumstances; so approaches based on changing the environment are effective in preventing diseases and reducing oral health inequalities. Approaches relying on individual efforts do not improve the health of the disadvantaged population and sometimes increase health inequalities. Because there are inequalities in both the incidence and treatment of diseases, focusing only on treatment will not eliminate health inequalities.

Moreover, most oral diseases are preventable, and prevention is more cost-effective than treatment. Water fluoridation (changing the fluoride concentration of drinking water to 1 mg/L (similar to fluoride concentration in tea) is a notable example of a preventive public health policy to reduce health inequalities. This policy is effective regardless of socioeconomic status. Because of the lack of preventive dental behavior among poorer people, fluoridation of drinking water is more beneficial to them. Water fluoridation is established in several Asia-Pacific countries and has successfully reduced tooth decay and its inequalities. Other policy-based approaches include legislation for smoke-free spaces and the raising of tobacco taxes, which would change the air quality of workplaces, restaurants, and/or bars, and therefore would change smoking habits and tobacco-related diseases and death. As smoking is a major risk factor for oral cancer and periodontal disease, tobacco control policies would reduce oral health inequalities.

School-level policies

Implementing policies to build an oral-health positive environment in school may also benefit children, regardless of the socioeconomic circumstances of their families. The Fit for School programme in the Philippines includes offering evidence-based general and oral health interventions such as fluoride toothpaste for brushing to students of public elementary schools. These cost-effective and sustainable interventions successfully reduce oral diseases. In Japan, the school-based fluoride mouthrinse programme is conducted in several areas and has reduced decay and its geographical inequalities. Pit and fissure sealant programmes at school may also reduce caries inequalities. Because good health during childhood is crucial later in life, school-based health promotion is an important policy option.

Policy Recommendations

- Improve the environment through water fluoridation, smoke-free legislation, and higher tobacco taxes.
- School-based programmes including fluoride application.
- Multiple policies aimed at reducing sugar consumption.
- Policies to encourage healthier products on the market.
- Incorporating dental treatment into a universal healthcare insurance system.

ORAL HEALTH INEQUALITIES & HEALTH SYSTEMS IN ASIA–PACIFIC

COMMENTARY

Challenges in reducing oral health inequalities in Asia–Pacific

Jun Aida

Policy Recommendations

1 Associate Professor, Department of International and Community Oral Health, Tohoku University Graduate School of Dentistry, Japan (j-aida@umin.ac.jp).

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Private companies and government support
Input by private companies and government regulation for these companies are also essential to change the environment. For example, fluoride toothpaste is an important preventer of caries in developed countries, and the efforts of private companies to include fluoride into their dentifrices have played a role in diffusing fluoride dentifrice into market. In countries where most of the toothpastes contain fluoride, people easily benefit by using it.

Sugar consumption
Reducing sugar consumption is a key public health agenda, especially for obesity and caries prevention. Nutrition labeling, regulation of marketing for sugary food and drinks, and policies promoting sugar-free products, are among measures in World Health Organization guidelines. To implement these measures, cooperation of the government and the private sector is necessary. Higher sugar consumption in developed countries and increasing sugar consumption in developing countries are a threat to health. However, sugar consumption in Japan is an exception; per capita sugar consumption in Japan had been falling since the 1970s and reached 16.7 kg/person/year, which was lower than that in Australia (47.3 kg/person/year) and India (20.0 kg/person/year), in 2012-14. Increasing the choice of sugar-free drinks and low sugar food products in the market would contribute to reduced sugar consumption. The availability of sugar-free medicine for children with chronic diseases could reduce their risk of decay. To promote healthier products in the market, evidence-based policy implementation is necessary.

These measures are related to prevention of oral diseases; but, once disease occurs, dental treatment is necessary. A universal healthcare insurance system reduces the economic burden on patients. Incorporating dental treatment into a universal healthcare insurance system is desirable for reducing oral health inequalities. In conclusion, reducing oral health inequalities in Asia-Pacific countries require multiple policy-based approaches to build an environment that makes healthy choices easier, regardless of the socioeconomic circumstances.

Dentist migration in Asia Pacific: Problems, priorities and policy recommendations

Madhan Balasubramanian¹, Jennifer E Gallagher², Stephanie D Short³ & David S Brennan⁴

Policy Recommendations

- Dentist migration is an emerging policy issue in the Asia-Pacific region.
- There is an urgent need to improve workforce surveillance and political advocacy about dentist migration.
- A regional hub to address dentist migration issues is recommended.

Dentist migration is an emerging policy issue in the Asia-Pacific Region (the region includes the WHO South-East Asian Region and Western Pacific Region). While migration is a human right¹, and considered essential for global development, it can also lead to brain drain in developing and poorer countries². To date, there is very little understanding of the dentist migration issue and analysis of its impact on oral health systems and dental workforce development in this region³. This commentary aims to provide an overview of the dentist migration issue in the Asia-Pacific Region.

WHY DO DENTISTS MIGRATE?

Oral health is integral to general health and dentists aim to maintain and improve it in accordance with the ethics of the profession and within the scope of their education, training, and experience. The choice of dentistry is an attractive career option for school leavers⁴, requiring at least five years of dental education and training before they can practise. The high educational investment and technical skill-sets possibly makes dentists an obvious candidate group for migration.

The reasons for dentist migration are complex⁵, and include the lure of better remuneration, professional development, career growth, better working and living conditions. Political and economic forces also influence the decision to migrate.

DENTAL WORKFORCE IN THE ASIA-PACIFIC

It is estimated there are about 1.5 million dentists globally⁶. The Asia-Pacific region is home to a quarter of these, India, Japan, China, and the Philippines contribute to about 80 percent of the dentist workforce in the region (see Table 1). Overall, there are about 10 dentists for every 100,000 people in the region. Some middle-income countries in the region have for many years

¹Research Associate, Australian Research Centre for Population Oral Health (ARCPOH), School of Dentistry, University of Adelaide, Australia; Honorary Associate, Discipline of Behavioural and Social Sciences in Health, Faculty of Health Sciences, University of Sydney (madhan.balasubramanian@adelaide.edu.au); ²Professor, Kings College London Dental Institute, Population and Patient Health Division, United Kingdom (jenny.gallagher@kcl.ac.uk); ³Professor, Discipline of Behavioural and Social Sciences in Health, Faculty of Health Sciences, University of Sydney, Australia (Stephanie.short@sydney.edu.au); ⁴Professor, ARCPOH, School of Dentistry, University of Adelaide, Australia (david.brennan@adelaide.edu.au).
deliberately trained more healthcare providers that can be absorbed into the
domestic healthcare system. For example, the number of private dental col-
leges in India increased from 55 in 1990 to 259 in 2013. Nevertheless, with
more than 20,000 dentists graduating every year, India still faces a scarcity of
dentists in the villages. Whilst similar issues exist for doctors and nurses, the
disparity is more marked for dentistry.

High-income countries such as Japan, Australia, New Zealand, Singapore
and Republic of Korea have more than 30 dentists for every 100,000 people.
However, many low- and middle-income countries in the region have less thanive dentists per 100,000 people. Pacific Island countries such as Papua New
Guinea, Kiribati and Vanuatu have some of the lowest dentists-to-population
ratios in the world. Geographic inequalities and maldistribution of dentists
(between urban and rural areas) is common in almost all countries in the re-
gion.

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Source: Global health observatory data from the World Health Organization.
Note: (a) Data points were not uniform and ranged from 2004 to 2012 (b) Percent is based on the overall dentist number (n=397,655 dentists) reported from all 38 Asia-Pacific countries. (c) Others included Cook Islands (n=4), Vanuatu (n=3), Niue (n=2), Tuvalu (n=2), Nauru (n=1). No data were available from Viet Nam and Tonga.

MIGRATION PATTERNS

The predominant migration pattern in the region is the movement of dentists
from middle- to high-income countries. Countries with shared historical and
cultural ties, such as being part of the Commonwealth of Nations, can influ-
ence migration. Dentists from India, Malaysia, Sri Lanka and Bangladesh
are more likely to migrate to high-income countries in the region also hav-
ing a Commonwealth connection (Australia, New Zealand, Singapore and
Brunei).

The existence of several bilateral agreements between countries (and
dental councils) influences the free movement of dental personnel. For ex-
ample, Australia and New Zealand have mutual recognition of dental quali-
fications; and an Indian dental degree is accepted for registration to practice
in Malaysia. Also trade liberalisation agreements may be agreed regionally,
possibly leading to improved migration flows among health professionals. A
good example is the Association of South East Asian Nations (ASEAN), following the creation of the ASEAN skills recognition framework\cite{ASEAN2015}. However, many of these regional agreements are at the very early stages, and national dental councils maintain strict protocols on the recognition and assessment of overseas qualifications.

**THE CASE FOR A REGIONAL HUB**

A major gap in understanding the dentist migration issue is the lack of reliable data to support policy decisions, highlighting the importance of workforce surveillance, research evidence and political advocacy on the migration of dentists\cite{WHO2010}. Many poorer and developing countries in the region lack suitable health/dental workforce surveillance systems, such as workforce censuses or surveys. There exists very little reliable information on key issues such as numbers, geographic distribution, and practice activity patterns. Most organizations involved in understanding migration issues focus on doctors and nurses, and dentistry is relatively neglected in research and development. Migration data are key to support policy analysis of health personnel migration\cite{Balasubramanian2015}. A minimum requirement is data on inflow, outflow and stock of dentists, reasons for migration, career plans, career history, job satisfaction and cultural adaptation issues are essential to better understand the influences on migration and for policy development.

A regional logistics record could improve research and data on dentist migration issues and broadly other dental workforce issues, so as to provide ideas and evidence to underpin policy decisions\cite{Short2013}. Such a hub could possibly be a part of an international dental workforce and/or oral health inequalities agenda. Research intensive university/academic structures that can provide a sustainable long-term solution to dental workforce research and capacity building in the Asia-Pacific Region offer a logical avenue to build the platform. There also exists a strong case for global organizations (such as FDI World Dental Federation, International Association for Dental Research and the World Health Organization) to incorporate dentist migration and dental workforce strengthening agenda as part of a broader vision of oral health inequalities and to enable them to play a more proactive role in the Asia-Pacific region.

10. ASEAN Economic Community (2015)
Australia is a high-income, multicultural country, ranked as having the second highest Human Development Index in 2015, and is the sixth largest country in by land size. However, it has a small population relative to its area, with nearly 24 million people, 89% concentrated in urban areas. Despite high levels of socio and economic development and the country experiencing a marked improvement in oral health indicators in the last decades, oral health inequalities exist and are persistent between sub-groups of the population and across geographic areas.

BURDEN OF ORAL DISEASES
The 2011 Australian Burden of Disease Study Report revealed that oral diseases have a considerable impact on non-fatal disease burden (4.4%) and are among the leading causes of total burden among females and males aged 5-14 years. Among non-fatal burden, tooth decay is the 4th highest among females and the 7th highest among males aged 5-14 years, and severe tooth loss is the 7th and 8th highest among females aged 65-74 years and 75-94 years respectively and the 10th highest among males aged 75-84 years.

It has been estimated that dental care comprises approximately 6% of national healthcare expenditures accounting for nearly AU$9 billion, with dental diseases constituting one of the four most expensive disease categories to treat.

AUSTRALIAN’S HEALTH SYSTEM
Medicare is Australia's universal health system, established to ensure all citizens have affordable access to healthcare. However, since its implementation routine dental care was excluded from the system based on a rationale beyond health reasons. Dental healthcare in Australia is delivered through a complex mix of service providers, including fee-for-service private practice, corporate dental practices, various forms of managed care (such as dental practices linked to private health dental insurers), staff-model dental clinics, run by insurers, and a public dental service in each state and territory, the latter particularly for children. Therefore, affordability is a key determinant of dental care use, which in turn is an indication of inequalities in oral health in the country. In the last decades, there has been some debate about the inclusion of dental services within Medicare and two main issues emerged: cost and willingness of the dental professional to be involved.

Epidemiological Evidence of Socioeconomic Inequalities in Oral Health
Australia has regular and rich sources of epidemiological data in oral health. The National Dental Telephone Interview Survey (NDTIS) is a source of nationally representative population data on dental health and use of dental services in Australia which has been conducted every 30 months since 1994. Since 1989 the ongoing Child Dental Health Survey (CDHS) is an annual, national time-series surveillance activity covering children attending public dental services. The first National Oral Health Survey Australia (NOHSA) was conducted in 1987-88, the second in 2004-06 (National Survey of Adult Oral Health (NSAOH)) and the third one, the National Study of Adult Oral Health (NSAOH) 2016-18, is underway. NSAOH 2016-18 includes a follow-up component of all examined participants from NSAOH 2004-06. The first national

Policy Recommendations
- Universal water fluoridation should be maintained as a key public health intervention to prevent dental caries and reduce its socioeconomic inequalities.
- Access to dental care should not be dependent only on an individual's capacity to pay.
- Improving availability of dental care in rural areas is needed to address the rural-urban gap.
- Population oral health research should continue to inform policy makers and health providers on the best way of delivering dental care.

Marco A Peres & Liana Luzzi

1Professor of Population Oral Health and Director of the Australian Research Centre for Population Oral Health (ARCPOH), Adelaide Dental School, University of Adelaide, Australia (marco.peres@adelaide.edu.au); 2Senior Research Fellow, Director of the Dental Statistics Research Unit and Deputy Director, ARCPOH, Adelaide Dental School, University of Adelaide (liana.luzzi@adelaide.edu.au).

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survey of child oral health was conducted in 1987-1988 (NOHSA) and a comprehensive nationwide population-based National Child Oral Health Survey (NCOHS) was carried out in 2012-14. These studies revealed:

- A remarkable decline in caries experience, both in primary and permanent teeth, between 1977 and 1983. For primary teeth, there was an increase between 1995 and 2001. In permanent teeth, there was a continued decline in caries experience until 2007.
- There was a gradient in dental caries experience in primary and permanent teeth across household income groups. Overall children from most disadvantaged socioeconomic areas have higher dental caries experience and prevalence than more affluent peers (NCOHS preliminary report, 2016).
- Indigenous have worse oral health and dental care indicators than non-indigenous in all age groups.
- Adults and children living in remote/very remote areas have higher rates of untreated dental caries than those in major cities.
- More adults without dental insurance had untreated decay than those with insurance.
- Prevalence of moderate and severe periodontitis was 22.9% in the Australian population in 2004-06. Among people of all ages those with less education had a higher prevalence than the more educated.
- Uninsured adults and those living outside major cities had a higher prevalence of periodontitis than uninsured and those living in major cities.
- There was a gradient in the average number of missing teeth across household income groups.
- Adults with dental insurance had fewer missing teeth than those without insurance.

WATER FLUORIDATION

Water fluoridation is considered to be a cost-effective, safe, and socially just public health intervention. Water fluoridation was first implemented in Australia in 1953 in Tasmania and was later expanded to almost all cities with the significant exception of the northeast state of Queensland. Following Queensland’s decision of mandating water fluoridation in 2008, the country is now almost completely covered by fluoridation. It is expected that this almost universal policy would reduce socioeconomic inequalities, by state, in dental caries.

DENTAL WORKFORCE

The supply of all registered dental professionals is unevenly distributed across geographic regions, with the distribution of the dental labour force in Australia heavily skewed in favour of metropolitan areas. The supply of dental practitioners is highest in major cities (63.1 per 100,000 people) and lower in all other areas. The pattern is similar for dental hygienists, but less pronounced for dental prosthetists and oral health therapists. The exception is dental therapists, where major cities have the lowest number per 100,000 people.

In addition to the geographic imbalance, there is an imbalance between the public and private sectors with public dental services unable to recruit and retain practitioners in proportion to the size of the eligible population.

According to population density (major cities, inner and outer regional, remote and very remote), adults who live in major cities are more likely to visit a dentist, visit for a check-up and visit a private practice than those in other areas. Overall, adults living in major city areas are more likely to have a favourable dental visiting pattern (usually visit at least once a year, usually visit for a check-up, and have a regular source of dental care), than in other areas.

Adults who live outside of major cities are less likely to have private dental insurance. The disadvantage in visiting for rural and remote adults is reflected in their oral health. Adults who live outside major cities are more likely (at all ages except the oldest) to have had all of their teeth extracted, and more likely to have insufficient teeth for good oral function. They are also more likely to have dental care needs unmet.

COUNTRY PROFILE

Challenges for Brunei Darussalam

Karen Peres¹, Mallisa SY A.Sikun², Paulina KY Lim³, Kaye Roberts-Thomson⁴

Brunei Darussalam, located on the north coast of Borneo in Southeast Asia, ranks second highest on the Human Development Index among south-east Asian nations and 31st worldwide. The population of Brunei exceeds 400,000 and, as in many countries, it has experienced a demographic shift due to an increase in its aged population in the last few decades, and a move from rural dwelling. In 2015 the estimated life expectancy was 78.8 years, with nearly 75% of the Brunei population living in urban areas¹.

In 2009, the Ministry of Health in Brunei Darussalam launched “Vision 2035 and Health Strategy”, a project aimed at identifying healthcare strategies, in order to achieve a comprehensive and sustainable healthcare system, a national healthy lifestyle and ensure effective health policies and regulations². In 2012, the Department of Dental Services, Ministry of Health, produced the Oral Health Agenda a five-year blueprint to promote oral health in Brunei Darussalam. The agenda included strategies to fulfil a mission to provide quality oral healthcare to citizens that is effective, equitable, affordable, accessible, safe and sustainable. Recently, the Oral Health Agenda was reviewed and efforts are being made to redesign services to align with the Ministry’s new strategic priorities³.

DENTAL CARE SYSTEM IN BRUNEI

Healthcare in Brunei, including oral healthcare, is heavily subsidised by the government. Despite this, only one third of the population use the dental services provided. The vast majority of the dental workforce (general dentists and specialists as well as complementary professionals) works in the public sector and provides services across the country. Facilities include four govern-

Policy Recommendations

- Promote breastfeeding nationally.
- Reduce tobacco use.
- Disseminate guidelines on food and drinks served or sold in workplaces.
- Guide oral health promotion and prevention of common risk approach.
- Provide high quality, cost-effective and efficient oral health services.

¹Director, Dental Practice Education and Research Unit, Associate Professor, Australian Research Centre for Population Oral Health, Adelaide Dental School, Adelaide, Australia (karen.peres@adelaide.edu.au); ²Medical Superintendent, Dental Services, Ministry of Health, Brunei Darussalam (malissa.abdullah@moh.gov.bn); ³Dentist, Oral Health Promotion, Dental Services, Ministry of Health, Brunei Darussalam (paulina9119@hotmail.com); ⁴Adjunct Professor, Australian Research Centre for Population Oral Health, Adelaide Dental School, Adelaide, Australia (kaye.robertsthomson@adelaide.edu.au)
dentists, and 18 government health centres/clinics, including maternal and child health clinics. Dental services in the private sector are available at two private institutions, as well as seven clinics. Additionally, flying dentist services cater to residents in areas inaccessible by land or water. Dental services are provided to primary school children in most public and some private schools. Dental therapists provide these services in 45 static schools comprising dental clinics and in 59 schools where portable equipment are used. Transport and labour issues for portable equipment have hindered the running of the service resulting in only 30% primary schoolchildren being seen.

**EPIDEMIOLOGY OF ORAL HEALTH IN BRUNEI**

The pattern of dental diseases in Brunei closely follows global trends. Dental caries, severe periodontitis and tooth loss constitute the major dental disease burden in the Brunei population. To meet needs and to promote oral health, efforts have been made on several fronts.

Dental Services conducted two National Oral Health Surveys in 1987 and 1999. These surveys showed that the percentage of 6-year old children that were free from caries increased from 3.0% to 11.3% and the mean number of decayed, missing and filled deciduous teeth (dmft) reduced from 9.5 to 7.1. However, no significant reduction in the mean number of decayed, missing and filled permanent teeth (DMFT) in the 12-year olds was observed.

The 1999 survey showed that 35-44 year olds had a DMFT of 14.4 and only 1.7% of them were caries-free. Prevalence of periodontal pockets equal or to over 6mm was 20% and none was considered healthy in regarding periodontal disease according to the Community Periodontal Index (CPI index). Neither survey recorded the socioeconomic status or ethnicity of the participants.

The third National Oral Health Survey started in 2015 comprising two phases. In phase 1, a survey of a representative sample (n = 2,591) of 5-15 year old children was conducted. Dental caries, periodontal disease, fluorosis, dental trauma, malocclusion and oral mucosal lesions were investigated. Preliminary findings showed that 25.9% of children were caries-free at 5-6 years of age and their DMFT was 5.1. Overall, children whose parents had tertiary education had lower DMFT scores than children of parents with less education. This was also seen among 7-8 year old children. Nearly 50% of adolescents aged 12 and 13-15 years were caries-free and remarkable decreases in the severity of dental caries (DMFT) from 4.8 to 0.9 and from 7.4 to 1.6 were found in children aged 10-12 years of age and adolescents (13-15 years-old), respectively, with no significant differences across family income groups. A second phase, the adult survey will commence in September 2016 and will allow comparison with previous data.

**CHALLENGES FOR ORAL HEALTH PROMOTION IN BRUNEI**

Almost three-quarters of the population has been supplied with fluoridated water since 1987 and from 2000, community water fluoridation was made available nationwide. Fluoride levels have been monitored regularly and the optimum level has been consistently achieved only over the past few years.

Expectant mothers are referred from the Maternal and Child Health (MCH) clinic and priority is given to them to reduce their waiting times at the dental clinic. Constant effort is required to monitor and ensure that processes for referrals to dental clinics are being made. Oral health awareness and education are emphasized during visits and again during the Toddler Fluoride Rolling Toothpaste programme where children under 5 years are seen twice a year for oral health counselling and prevention measures.

Mothers are encouraged to breastfeed their babies up to the age of 2, a challenging message for parents as bottle feeding is a deep-seated practice in Brunei.

The Daily Fluoridated Tooth brushing (DFTB) programme provides students with toothbrushes and fluoridated toothpaste to brush their teeth daily at school. Uptake of this programme is low because of poor buy-in by the school teachers who give priority to other school programmes over tooth brushing during school hours.

School Canteen Guidelines and Health Promoting School Initiatives provide guidance on promoting a healthy environment for living and studying, including healthy eating at schools. Despite the guidelines, sweetened food and drinks are still readily available in some school eateries.

Children and young adults with special needs are screened and necessary intervention taken by the Paediatric Dental Services including treatment under general anaesthetic.

A Dental Hygiene and Therapy training programme, provided in conjunction with King’s College London, UK, has been completed by 44 dental hygienists and therapists.

A ‘Mukim Sihat’ (Healthy Sub-district) programme aims to empower the village councils to carry out health-related activities. Health screenings including dental examinations are also provided for villagers.

An activity Centre for the Elderly: aims to increase the awareness of the elderly population on healthy lifestyle through structured physical activities. Regular oral health examinations and demonstrations on care of dentures and stages of dentures construction are provided for attendees of the centre.

Regular lectures aim to increase public awareness of good oral health. These are often carried out during career carnivals, at schools, in programmes to promote healthy villages, community events, health conferences and road shows.

5. School of Dental Services, Department of Dental Services, Ministry of Health, Brunei Darussalam (2015)
9. Monthly chemical test reports from Department of Water Services, Ministry of Development and Department of Scientific Services, Ministry of Health, Brunei Darussalam, 2012-2016
10. Oral Health Promotion Unit, Department of Dental Services, Ministry of Health, Brunei Darussalam (2016)
12. Department of Dental Services, Ministry of Health, Brunei Darussalam (2016)
COUNTRY PROFILE

Oral healthcare delivery in China

Edward C. M. Lo

China’s population is more than 1.3 billion and approximately half of it is rural. Its mainland comprises 31 provinces, autonomous regions and municipalities directly under the central government in Beijing. Basic healthcare is provided according to a three-level network using a primary healthcare approach. The first of the three-level administrative units in China are the cities (in urban areas) and counties (in rural areas). In the second level are districts (in cities) and townships (in counties). At the lowest level are the streets (in city districts) and villages (under townships).

DENTAL CARE DELIVERY

General and dental healthcare services in China are predominantly provided in the public sector. Most dental clinics are established by the government in general hospitals and larger out-patient clinics in urban areas at the city and district levels, and in rural areas at the county and township levels. Dental clinics at the village level are not common. In the major general hospitals, there is usually a department of stomatology (dentistry) with in-patient facilities. Speciality stomatological (dental) hospitals with in-patient wards may be found in larger cities. Recently, the number of private dental clinics have been increasing, mostly in large cities.

DENTAL WORK FORCE

In 2013, there were 137,000 dentists in China, with a dentist to population ratio of approximately 1:10,000. Dentistry degree courses are offered by more than 80 universities and graduates can provide the full range of general dental care services independently. They can also specialize after postgraduate clinical training. As well as university-trained dentists, China has an equal number of assistant (mid-level) dentists. Diploma dentistry courses of three to four years are offered at around 100 training schools across the country. Assistant dentists can practise independently, and usually work in government dental clinics at the county and township levels. They can provide a range of services similar to that of university-trained dentists, but rarely perform maxillo-facial surgery. Assistant dentists are also required to register with the local health authority and national licensing examinations are held regularly. China does not have recognized auxiliary dental care operators, such as dental therapists or hygienists.

Full trained healthcare professionals such as dentists tend to stay in urban areas, especially large cities and this is likely to lead to inequality of access to care between geographic regions and among different socio-economic groups. The establishment of a category of assistant dentist is quite unique in China and was primarily to address demand for staff in the large number of dental clinics, especially in rural areas and at the lower administrative levels. Usually, assistant dentists are not supervised by more senior colleagues, because there are relatively very few dentists working in these clinics. Although they are only trained to provide common general care services, such as prevention, scaling, fillings, tooth extraction, and prosthesis (false teeth), they largely meet the needs of the people. Assistant dentists greatly improve accessibility of services in the disadvantaged areas and populations of China. This also helps reduce the cost of dental care services.

DENTAL EPIDEMIOLOGICAL DATA

Findings of the third Chinese National Oral Health Survey conducted in 2005 show that although there were differences in the level of dental caries (measured by the number of decayed, missing or filled teeth - DMFT) and proportion of untreated decay (measured by DT/DMFT) between urban and rural dwellers, the discrepancy was not large (Table 1). The proportion of untreated caries is lower in urban areas compared to rural areas.

Policy Recommendations

- Dental workforce should compose of different types of care providers.
- Appropriate mix of care providers in dental care service system.
- Enhancing dental care service in underserved areas and population groups.
dental caries was 20-40% in adults and over 80% in children, which may indicate that the provision of dental services was inadequate for the population, especially in children.

There is a need in China for more dental care programmes with a strong prevention element and simple treatments for school and preschool children. To reduce access barriers, these dental programmes could be implemented in kindergartens and schools, and should make good use of dental auxiliary personnel and other healthcare providers.

Besides tooth decay, periodontal (gum) diseases are prevalent among Chinese adults. In the 2005 National Oral Health Survey, more than 70% of 35-44 year-olds had bleeding gums and around half of the middle-aged had periodontal pockets. The periodontal health status in the 65-74 year olds was worse. Whether the two oral diseases prevalent in China — dental caries and periodontal diseases — can be managed by increasing the number of assistant dentists, or whether there is a need for other types of auxiliary personnel (such as therapists and hygienists) should be investigated.

A modern dental workforce should feature various types of care providers and an appropriate mix should be utilized in different situations. Attention should be paid to enhance the provision of dental care service to the underserved areas and population groups, so as to reduce oral health inequality and dental care access.

COUNTRY PROFILE

Dental practice, education and research in India

Balaji Subramoniam Muthiah1,2 & Vijay P Mathur3

Oral health, systemic health and well-being are highly connected. Good oral health is not only necessary to avoid pain and maintain function but also for a better social and productive life. In order to achieve acceptable levels of oral health in populations, countries strive to improve healthcare systems. One of the major challenges is delivering optimum oral healthcare encompassing the entire population.

Oral healthcare delivery means comprehensive care of teeth, gums and other oral and peri-oral structures. Historically, the separation of the mouth from the body has been built into the domains of medicine and dentistry, and perceived as separate entities across populations/ generations by separate training programmes, professional identities, payment structures, and delivery systems.

Discussion on improvement of oral healthcare delivery system has been continuing for almost half a century in many countries and at a global level. However, better outcomes are far from universal. Professor Bader, a noted researcher from North Carolina, USA termed method for improvement in oral care delivery as ‘ripe for development’ in his paper during a conference on Defining Quality in Oral Healthcare in 2009. There are five essential components to consider: strengthening dental school curricula to focus on patient care quality; engaging professional organisations to promote adoption and introduce diagnostic code usage; improving methods for changing practitioner behaviors; introducing and engaging purchasers of insurance plans; and conducting more outcome-driven research.

According to the last report of the Indian National Commission on Macroeconomics and health (about a decade back), the nation was estimated to suffer from a huge burden of oral diseases. The report estimated that at least 623.1 million Indian would be suffering from dental decay and 362.48 million people would have moderate/severe gum diseases.

India, since its independence in 1947, has achieved much in terms of an oral healthcare system. Today, it has about 300 dental schools, increasing research output and penetration of oral health services at all levels of society. But, not all the benefits of the past 70 years have reached all Indians. The huge burden of oral diseases and patchy distribution of oral healthcare means that deficiencies in Indian dental education and research need addressing. This commentary considers some of the major challenges for Indian oral care delivery and offers some solutions.

DENTAL PRACTICE

The economic reality of running a dental practice and a lack of adequate infrastructure and basic comforts in some parts of rural India has seen most dentists flock to urban areas. It is estimated that 85% of Indians, who reside in rural areas are served by 15% of all the country’s dentists. [Figure 1: Distribution of dentists in India] Conditions such as diabetics and hypertension, along

1Secretary General, International Association for Dental Research – Indian Division; 2Director, Balaji Dental and Craniofacial Hospital, Chennai, India (ombalaji@gmail.com); 3Additional Professor, Centre for Dental Education and Research; All India Institute of Medical Sciences, New Delhi, India (Vijaymathur7@gmail.com).
with deleterious oral habits, have implications on oral health and lead to oral diseases, which are most often suffered by marginalized adults and children who already have poor nutrition, inadequate oral hygiene measures and a lack of access to oral healthcare.

Solution
A short-term approach to oral health and dental practice disparities would be to offer dental education and improve dental infrastructure in rural areas. Programmes are needed to promote the use of available oral healthcare which should encompass preventive, diagnostic, treatment and rehabilitative services. A long-term solution would be to identify and eliminate barriers to oral healthcare, design better models of delivery where there are limited resources and develop preventive educational strategies to reduce risk. Offering oral healthcare delivery at all preventive health centres by sharing resources including dental personnel would also help disseminate oral healthcare delivery.

DENTAL EDUCATION
The number of dental colleges in India has increased significantly since the 1990’s, but their geographical distribution is not homogenous and there have been no concrete actions to address the issue. Besides the geographical distribution, the quality of dental education has been a cause of concern.

Solution
There is an urgent need for intervention in the Indian dental education system to introduce the latest concepts. The sector has shown positive signs with a significant number of dental colleges, both in government and non-government settings, adapting advanced curriculum and setting higher standards. Policy-makers need to ensure that this is accelerated and expanded to all Indian dental education settings. Advanced information technology can be used to expand the current system.

DENTAL RESEARCH
The gap in quantity and quality of Indian dental research has been described in detail elsewhere. There is a need to include more evidence-based research and research for clinical translation, along with increasing funding for such research. Further, recent reports point to an acute lacunae in proper ethical based research settings.

Solution:
Policy-makers must identify critical factors that impede structured oral health research in India. Investment is needed to identify priority areas, cost control methods, and measures for quality control. There must be a focus on developing thrust areas, backed by evidence based requirements, to mitigate the oral disease burden.

India needs to formulate a model of oral healthcare delivery on par with global standards in line with a regional-socio-cultural ethos and considering economical viabilities.

COUNTRY PROFILE

Oral health inequality in India: Perspectives and solutions

Om Prakash Kharbanda & Kunaal Dhingra

Policy Recommendations

- Oral health promotion through prevention.
- Establishment of a firm National Oral Health Policy and separate budget allocation for oral health.
- More funding for dental research by Government of India.
- Reduction of taxes on oral hygiene products and dental materials to make it more affordable to the public and the dentist.
- Integration of oral health promotion and preventive services with general healthcare system.

BARRIERS TO ORAL HEALTH CARE IN INDIA

There are several barriers to oral healthcare in India, identified by Singh et al. as: (i) a lack of acknowledgement of the importance of oral health among the population, which perceives it as independent from and secondary to general health; (ii) no access for many to an oral health provider due to geographic distance; (iii) dental treatment is unaffordable for many; and (iv) quality of dental treatment is varied.

In India, the dental health workforce to population ratio is low. There is an unequal distribution of dentists nationally, with most located in urban rich locations. There is also inequity in the number and distribution of dentists between the states, with Karnataka, Maharashtra, and Tamil Nadu over-supplied by dentists and Jharkhand, Rajasthan, and Uttarakhand having great shortages.

Singh et al. suggested various measures to address oral care inequality in India. For dental institutions: (i) setting up dental clinics in villages, schools, aged-care homes and orphanages; (ii) satellite centres to provide oral healthcare services to the people in remote and underprivileged areas; (iii) mobile vans to reach remote villages; (iv) using interns for oral health awareness and preventive programmes; and (v) training of health workers at public health centres along with school teachers to provide oral health education. For professional bodies in India: (i) the Dental Council of India could introduce competency-based, community-oriented training in internship; and (ii) the Indian Dental Association, local NGOs and corporations could work towards investing a nominated amount in oral health. Singh et al. also suggest that the Indian government (i) utilize the services of new dental graduates for rural areas;
(ii) establish of dental clinics at public health centre level; (iii) develop a firm national oral health policy and separate budget allocation for oral health; (iv) fund research into cheaper and good quality materials to be used in practice; (v) reduce taxes on toothpastes and dental materials to make them more affordable to the public and the dentist; (vi) support local manufacturing of dental products to provide employment and to reduce costs of these products; and (vii) integrate oral health into general health so that it becomes more acceptable to the community.

ORAL HEALTH POLICIES

In a one-off Indian Oral Health Survey, it was found that Indian dentists perceived the current state of oral health in India as ‘somewhat bad’. They identified the key challenges for the next five years as: periodontal diseases, dental caries, oral health awareness and the increasing rates of oral cancer. Dentists also felt a need to review and change the current state of dental education in India. In another article, Jawdekar suggested that the existing machinery of successful government health campaigns such as the ‘Pulse Polio’ and the ‘Mid-Day-Meals Scheme’ could be used for oral health promotion for children.

In 1995, an Oral Health Policy was accepted as part of a National Health Policy during the Fourth Conference of Central Council of Health & Family Welfare with nationwide goals such as: (i) oral health for all; (ii) to bring down the incidence of dental caries to less than 30% by 2012; (iii) to reduce the number of fluorosis cases in all age groups to less than 4% by 2012; (iv) to reduce high prevalence of periodontal diseases in 15+ age group to lower prevalence i.e. less than 35% by 2012; (v) at the age of 18 years, 85% should retain all their teeth; (vi) to achieve 50% reduction in toothlessness between the age of 35-44 years; (vii) to achieve 25% reduction in edentulousness at the age of 65 years and above; (viii) to bring down level of malocclusion and dento-facial deformities in the age group of 9-14 years to less than 25% by 2012; and (ix) to reduce the number of new cases of oral cancers and precancerous lesions to less than 0.02% by 2012.

There have been calls for a firmer and more resolute national oral health policy in India. Kothia et al. have summarized the need for National Oral Health Policy as: (i) for oral health promotion through prevention; (ii) to decrease the burden of oral diseases; (iii) to eradicate taboos, myths or misconceptions; (iv) to narrow the rural-urban gap in oral healthcare; (v) to organize a data recording system; (vi) for quality dental education; and (vii) definite budget allocation for oral health as seen in developed countries.

NODAL AGENCY FOR NATIONAL ORAL HEALTHCARE PROGRAMME IN INDIA

The Centre for Dental Education and Research (CDER), All India Institute of Medical Sciences (AIIMS), New Delhi, India has been declared a nodal agency for the national oral healthcare programme. The primary activities undertaken by CDER, AIIMS include: (i) formulation of implementation strategies; (ii) development of module for training of trainers (TOT); (iii) development of modules for training of health workers and school teachers in Oral health; and (iv) development of Information, Education and Communication (IEC) materials, in Hindi and English such as: a film on oral health entitled Kripaya Muskuraiye, training manuals for health workers and school teachers, oral health ready reference sheet for health workers and posters for community awareness.

A website (http://www.nohpindia.com) for National Oral Healthcare Program was also created by CDER, AIIMS in 2015 to collect information about this programme and generate activity. The Indian government had initiated the National Oral Health Program through CDER, AIIMS to provide integrated, comprehensive oral healthcare in existing facilities with various objectives: (i) to change the causes of poor oral health; (ii) to reduce morbidity from oral diseases; (iii) to integrate oral health promotion and preventive services with general healthcare system; and (iv) to encourage promotion of Public Private Partnerships (PPP) model for achieving better oral health.

In order to achieve these objectives, the federal government is assisting state governments to initiate provision of dental care along with other health programmes at various levels of the primary healthcare system. Funding has been made available through the State Project Implementation Plans (PIPs) for establishment of a dental unit (at district level or below). In line with this, orientation training was organized for the State Nodal Officers of the National Oral Health Program by the National Institute of Health and Family Welfare, New Delhi, India, in collaboration with CDER, AIIMS, New Delhi, India with support of the Ministry of Health and Family Welfare (MOHFW), Government of India, in February 2016 and again in January 2017.

Activist and humanitarian Martin Luther King Jr. told the Medical Committee for Human Rights in 1966: ‘Of all the forms of inequality, injustice in healthcare is the most shocking and inhumane.’ This remark is apt for the status of oral healthcare in a country with such a vast population and cultural diversity as India. Oral diseases are highly prevalent and affect general health and there is an urgent need to combat them.

Social and ethnic inequalities in the tooth decay experience have long been apparent in New Zealand (NZ) and elsewhere, noticeably among adults and preschool children. Having much in common with other chronic non-communicable diseases, decay can easily be labelled as a “wicked” health problem. Such complex problems are difficult to solve: they have a number of causes, are continually developing and changing, and there is no universal solution.

Dental caries is a multifactorial disease with several causes and influences. Earlier predictions of it disappearing as a public health problem are far from accurate. There is much evidence suggesting that it’s a lifelong, highly prevalent disease which has no single solution. At the individual level, there is now good longitudinal evidence that sustained, long-term plaque control is achievable, and topical fluorides such as fluoride toothpastes are effective. However, effective self-care needs to be sustained over the long term. At the community level, water fluoridation is effective, but it shifts the population disease distribution, rather than eliminating it. Sugar intake is the most important person-level risk factor for tooth decay, and the marketing and consumption of sugars is increasing.

There are three main challenges in reducing inequality in tooth decay in NZ: (1) the poor oral health of low-socio-economic status (SES) adults; (2) a rhetorical and policy focus on individual behaviour; and (3) individuals’ susceptibility to the marketing of high-sugar products and their lack of control over the cariogenic (and obesogenic) environment.

POOR ORAL HEALTH AMONG LOW-SES ADULTS
One of the striking findings of the most recent NZ national oral health survey was the nature and extent of adult oral health inequalities by deprivation level and ethnicity. Despite universal access to free oral healthcare from infancy to age 17, there is inequality in adults’ tooth decay experience. Adults pay for their own dental care (although treatment for orofacial and dental trauma is covered by a unique social insurance scheme, the Accident Compensation Corporation). So, the re-emergence of inequalities, after entitlement to State-provided care ends at age 18, is as steady as it is inevitable. By their late 30s, people who have been low SES all their lives have three times the experience of missing teeth due to decay than those who have remained high SES. Those differences are magnified in their impact upon sufferers’ day-to-day lives.

A FOCUS ON INDIVIDUAL BEHAVIOUR
The dominant discourse in oral health centres on individual behaviour and choices, ignoring wider influences. Those suffering from tooth decay are deemed to be at fault, implying that better attention to self-care and avoidance of cariogenic food and drinks could have averted their predicament. People are labelled “non-compliant” if they fail to follow dentists’ instructions, or if their way of using dental care is anything other than asymptomatic, routine visiting.

Policy Recommendations
- Continued limits on marketing of high-sugar foods.
- Use of objective data rather than ideology in health policy-making.
- Explore ways to reduce the cost of oral care and self-care.

1Professor, Sir John Walsh Research Institute, Faculty of Dentistry, The University of Otago, Dunedin, New Zealand (murray.thomson@otago.ac.nz).
LACK OF CONTROL OVER THE CARIOGENIC ENVIRONMENT

The current lack of control over the cariogenic environment is a result of social and economic policy decisions. Since the 1970s, neoliberalism has become the organising principle of modern society. The promotion of globalisation has led to a reduction in nations’ self-determination, with bodies such as the World Bank and the International Monetary Fund being major proponents. The over-riding agenda is facilitating the accumulation of global capital by transnational corporate interests in the absence of any legal obligation to ensure the welfare of citizens. Neoliberalism uses instruments such as changes to fiscal policy, reductions in public spending, tax reforms, trade liberalisation, privatisation of State enterprises and institutions, and deregulation. Most of these end up being injurious to public health and welfare. For example, three key social policy changes in New Zealand in the early 1990s were shown to have led to a rapid widening of ethnic inequalities in child oral health in the subsequent five years.

The health effects of social policy were recently highlighted in an analysis of the provenance and effects of mass consumption of an energy-dense and nutritionally compromised “industrial diet” -- highly processed and convenient “junk” food. Such food is high in sugar (much of which comes from high-fructose corn syrup), salt and fat, and has low nutritional value. Being cheap, readily available and requiring minimal preparation, it tends to be consumed by those on low and/or insecure incomes, whose numbers are steadily rising.

Sugar intake is known to be the most important dietary risk factor for dental caries, yet the marketing of sugar-laden food and drinks continues unabated, with the true sugar content unapparent to most consumers. An analysis of NZ supermarket shopping data a decade ago showed that some of the most popular supermarket products sold were less healthy, such as full-fat milk, white bread, sugary soft drinks, butter and sweet biscuits. Moreover, two of the 10 most purchased items were cola drinks. Soft drinks comprised six of the 30 most popular items. A replication of that study today would likely show no change. A recent review highlighted the effects of food marketing on children, summarising the findings of a number of systematic reviews of the issue and underlining the effectiveness of promoting low-nutrition foods beyond the narrow confines of the health sector, their failure to adequately tackle into account the wider structural and social determinants of oral health, their continued focus on individual behaviour, and an institutional reluctance to challenge the neoliberal assumptions behind contemporary government policy. The steady contraction of the NZ public sector and an associated decrease in its job security have further consolidated this.

Reducing inequalities in dental caries experience is a laudable objective, but the many influences and actors make it a “wicked” problem indeed. Making meaningful progress towards such a goal will require innovative and sustained actions at a number of levels ranging from the personal to the geopolitical. Whether the system has the capacity and the will remains to be seen.

The culture of Papua New Guinea (PNG) is complex. Many different cultural groups exist, and over 800 languages are spoken. Most (87%) people live in villages and access to healthcare is often difficult. The adult literacy rate at 58% making dissemination of health information difficult. The people of PNG are generally in poor health. Life expectancy at birth is 54 years and one child in 13 will die before the age of five. Preventable and treatable diseases, including malaria, pneumonia, diarrhoea, tuberculosis, HIV, and neonatal sepsis, are the most frequent causes of death. There is an increasing incidence of antibiotic resistant tuberculosis and HIV / tuberculosis co-infections. The level of violence against women is among the highest in the world. The PNG National Health Plan 2011-2020 paints a grim picture for the next two decades of healthcare due to a rapidly increasing population, a rapid rise in communicable diseases, and low per capita expenditure on healthcare.

Policy Recommendations

- Integration of population oral and general health promotion with anti-smoking & anti-betel quid chewing, newborn & infant oral health.
- Population oral health promotion to include salt fluoridation, affordable toothbrushes & toothpaste, school-based dental health education, dental screening & fissure sealant programme.
- Personal dental treatment care to focus on oral urgent treatment, atraumatic restorative treatment, routine dental care.
- Health workers should be trained in dental and oral cancer screening, oral health promotion, fluoride applications, glass ionomer sealants.
- Government monitoring of oral healthcare workers' numbers, size, composition and mix to ensure most appropriate workforce.

ORAL HEALTH ISSUES IN PNG

Oral health is low on the scale of priorities and not even mentioned in the National Health Plan. Although no epidemiological oral health surveys have been undertaken in PNG, anecdotal evidence suggests tooth decay is a problem, especially in children, and gum disease continues to be a major cause of tooth loss. There are high levels of trauma requiring complex oral surgery and an increasing number of patients with HIV-AIDS presenting with serious oral health issues. Oral cancer is the most common cancer in PNG due to smoking and the chewing of betel quid, made of areca nut, part of the Piper betel plant, and slaked lime or ‘buai’, as it is known locally, is a deeply entrenched practice.

A major component of the PNG policy approach has been to follow the biomedical model where care is delivered by health professionals, which leads...
to treatment growing more complex, healthcare costs spiralling6, and a lack of
disease prevention. The biomedical approach has seen an increase in dentist
numbers. While the need for dental care is great, the government has cannot
afford to employ all the graduating dentists. This has seen a boom in private
practice targeted at people who can afford dental care. At the same time, PNG
has a failing number of dental therapists (who treat children: At the time of
writing there were approximately 35), and only 20 technicians to make det-
tures. Specialists are desperately needed, especially oral surgeons, of which
there is only one in the whole country. There is also an urgent need for dental
chairside assistant/dental orderly training.

Much of the ageing dental equipment needs urgent replacement. The
dental school at the University of Papua New Guinea has ten dental chairs,
eight of which are largely functional, though the suction doesn’t work on some
of the chairs and the some won’t recline. Equipment maintenance is an on-
going problem. Next to the dental school clinic is the 12-chair PNG General
Hospital Dental Clinic, but that has been closed down because the equipment
is not fit for purpose. The reading resources and textbooks in the University
of PNG Medical Library are outdated and in short supply, and there is little
access to online resources.

It is not all doom and gloom. In all the areas of dental speciality and with
the need for dental chairside assistant/dental orderly training, PNG is investi-
gating associations with Australian dental schools. John McIntyre, a past dean
of the School of dentistry at the University of Adelaide, who has been visiting
and supporting PNG dentistry for more than 40 years, has arranged for dental
chairs to be shipped from the Adelaide Dental Hospital for use by potential
private sector dentists. It is hoped that a trickle-down effect for low income
residents will be achieved through government subsidies for private treat-
ment. The PNG hospital dental equipment is being replaced. Undergraduate
and graduate dental students are being encouraged to undertake research and
they have developed some innovative projects. The Australian Dental Asso-
ciation recently offered the University of PNG Dental School student access
to its online resources. In the area of health promotion, Rose Putupai, a PNG
dentist and Fulbright Scholar who is undertaking a masters in public health in
the United States, has arranged ‘No Betel Nut Chewing Days’ and Dental Pub-
lic Health Awareness Campaigns. The government has imposed a total ban on
the sale of betel quid in Port Moresby, Lae and Mt Hagen.

SO WHERE TO FROM HERE?
The answers for PNG’s oral health problems must be generated locally, in
particular from the dental professionals who understand the local cultures,
norms and oral health problems in PNG. These comments are suggestions for
consideration.

As the dental school was closed for 20 years prior to 2005, there is no
middle generation of dentists, and the few senior dental practitioners in PNG
are reaching retirement age. This means the younger generation will have to
step up.

Other than low fluoride exposure, the potential causes of poor oral health;
poor hygiene, poor diet, lack of access of healthcare, smoking and betel quid
chewing, are the same as causes of poor general health. In Timor Leste, a 2002
report suggested integrating oral and general health promotion and that it
should include anti-smoking and anti-betel quid chewing, pre- and post-natal
and infant oral health measure. Specifically public oral health promotion,
salt fluoridation, affordable toothbrushes and toothpaste, school-based dental
health education and a screening and fissure sealant program were recom-
mended. It is not feasible to fluoridate the water supplies across PNG because
the landscape is diverse with many hillary areas and isolated villages. Papua
New Guineans should not be encouraged to eat more salt, but the salt they do
eat should be fluoridated. Personal dentistry should include oral urgent treat-
ment, atraumatic restorative treatment, where demineralized and insensitive
outer carious dentin are removed with hand instruments, as part of a school-
based dental care program and routine dental care should be part of personal
treatment within a primary healthcare service. These recommendations are
similar to that found in other reports 8, 9, 10 and would be suitable for PNG.

Midwives, general nurses, health promotion teachers and health workers
in dental and oral cancer screening could be trained in oral health promotion
and fluoride applications including the tooth decay arresting agent silver di-
amine fluoride and glass ionomer sealants. If necessary, they should have a
referral pathway for further professional dental treatment. Research would be
needed after an oral cancer screening programme was implemented to eval-
uate its effectiveness. Similarly, the production of oral cancer pamphlets for
health workers that show early-stage oral cancer and the referral pathway for
health staff for people would help tackle oral cancer when it is treatable.

The PNG government should monitor dental workforce size and compo-
station. Student dentists are used to seeing patients for a problem rather than
for a check-up and this has led to a focus on the patient’s symptoms, when
they should also be looking for ways to improve longer-term health and oral
health outcomes.

They could consider improving the dental equipment, instruments and
materials; using portable dental chairs and equipment for outreach services;
buying uniform and reliable brands of dental equipment, instruments and ma-
terials in all surgeries so that they are easy to maintain; training workers how
to perform basic repairs on dental equipment as part of their undergraduate
programmes; teaching some local electricians more advanced dental equip-
ment repair.

There is a long way to go to improve oral health in PNG. Let’s hope the
Papua New Guineans find a way forward.

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**COUNTRY PROFILE**

**Oral health inequalities in an emerging economy – a case of Vietnam**

Loc Giang Do¹ & Diep Hong Ha²

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**VIETNAM**

Vietnam is an emerging economy in the Asia Pacific region¹. It is the world’s 14th most populous country with most people living in rural areas. Vietnam’s economy is predominantly dependent on agriculture and natural resources. It has recently diversified and has recorded one of the fastest growth rates in the world. Vietnam has transformed from one of the poorest countries in the world into one with lower middle income status. Living conditions of the Vietnamese population have significantly improved. There has been significant success in achieving some major Millennium Development Goals (MDG) including eradicating extreme poverty and hunger; universal primary education; promotion of gender equality in education; and reducing maternal mortality ratio and child mortality ratio.

**VIETNAM HEALTHCARE SYSTEM**

The total health expenditure of Vietnam in 2009 comprised over 7% of the GDP². The social health insurance scheme covers part of healthcare spending for the working population. Just over half of the healthcare expenditure was out-of-pocket spending. Such levels of user fees and lack of public healthcare facilities have created significant inequalities in healthcare use and population health.

Socioeconomic inequalities in child health have been reported for a number of conditions³. The low socioeconomic groups had higher rate of under-five mortality (Concentration Index (CI): -0.208) or diarrhoea (CI: -0.141) than the high socioeconomic groups. In adults, a number of conditions showed socioeconomic inequalities towards the poor (poor self-rated health (CI: -0.213)), but there was inequality in some other conditions in the non-poor (obesity among women (CI: 0.478)). Likewise, smoking and drinking rates were higher among the poor, but lack of physical activity was higher among the non-poor. There is evidence that socioeconomic conditions impact on general health status and behaviours of the Vietnamese population.

**VIETNAM DENTAL HEALTHCARE SYSTEM**

The dental healthcare system in Vietnam is relatively new. At the turn of the century, it was predominantly public dental care and a small number of under-regulated private care providers, but the system has grown quickly under the drive of the market economy. The private sector has increased multi-fold and the public sector has also expanded. Vietnam’s dental healthcare system is predominantly curative under a pay-for-service mechanism. There are significant variations in the dentist-to-population ratios, from 1:178,500 to 1:13,400³, with most dental health workers living in major cities.

Major shortcomings in the primary oral healthcare system were identified⁴. Water fluoridation is available only in Ho Chi Minh City and Cantho city in the South of Vietnam. A small salt fluoridation program has commenced in a northern remote province. Vietnam has developed and maintained a national school dental programmes to promote tooth brushing and mouth rinsing. Their success has not been scientifically documented.

**ORAL HEALTH INEQUALITIES IN VIETNAM**

The prevalence of oral diseases were high in the Vietnamese child and adult population⁵ as reported in the 2nd National Oral Health Survey of Vietnam.

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¹Associate Professor, Australian Research Centre for Population Oral Health (ARCPOH), Adelaide Dental School, The University of Adelaide, Australia (loc.do@adelaide.edu.au); ²Research Fellow, ARCPOH, Adelaide Dental School, The University of Adelaide, Australia (diep.ha@adelaide.edu.au).

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**Policy Recommendations**

- Focus research on identifying determinants of population oral health.
- More focus on preventive care; educational programmes to improve dental preventive behaviours.
- Integration of dental health programmes with multidisciplinary programmes in tackling common risk factors such as smoking and sugar intake.

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The severity of tooth decay was high in children and moderate in adults. Dental service use was sporadic and mostly symptom-based. More than a third of children commenced tooth brushing with paste after the age of 5 years and a half brushed less than twice a day. More than half of the adult population never sought professional dental care. There were significant gaps in oral health behaviours and status between rural and urban residents. Variations in oral health behaviours across socioeconomic groups (Table 1), also published elsewhere, indicate that poor oral health is associated with lower socioeconomic status. For example, children whose parental education was low had a significantly higher rate of tooth decay, while household income was not associated with dental caries in children. Rural dwelling was associated with a higher rate of tooth decay in children and a higher prevalence of deep periodontal pocket in adults, but with lower prevalence of tooth decay. It appeared that the fast changing socioeconomic environment in Vietnam altered the direction and magnitude of socioeconomic determinants of oral health. For example, global changes in dietary habits, which may lead to an increase in socioeconomic inequalities in oral health. There are opportunities to adopt and implement lessons learned from more developed countries in order to limit the widening of inequalities. Integration of dental and general health programmes in Vietnam will bring further benefit.

A number of factors in Vietnam lead to socioeconomic inequalities in oral health and potential further widening. Those factors include fast-growing gaps in the wealth of population groups, a high proportion of out-of-pocket healthcare spending, lack of preventive oral health programmes and the predominantly curative nature of the dental healthcare system. The same factors contributing to socioeconomic inequalities in general health conditions, can be expected to impact oral health.

Thorough population-based studies of Vietnamese oral health are scarce. The most comprehensive data collected in the NOHSV 1999-2000 reported variations in oral health status of both children and adults across socioeconomic groups (Table 1), also published elsewhere. The magnitude of socioeconomic inequalities varied between oral health conditions and age groups. Directions of inequalities also varied between measures of socioeconomic status. For example, children whose parental education was low had a significantly higher rate of tooth decay, while household income was not associated with dental caries in children. Rural dwelling was associated with a higher rate of tooth decay in children and a higher prevalence of deep periodontal pocket.

### Table 1: Socioeconomic variations in oral diseases among the Vietnamese child and adult population

<table>
<thead>
<tr>
<th>Variables</th>
<th>Children</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DMFS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residence</td>
<td>Rural</td>
<td>Residence</td>
</tr>
<tr>
<td>Rural</td>
<td>1.20 (1.00-1.45)</td>
<td>Rural</td>
</tr>
<tr>
<td>Urban</td>
<td>Ref</td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td>1.22 (1.13-1.33)</td>
<td>Adult</td>
</tr>
<tr>
<td><strong>Equivalised income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1 (lowest)</td>
<td>0.83 (0.66-1.05)</td>
<td>Low</td>
</tr>
<tr>
<td>Q2</td>
<td>0.87 (0.70-1.08)</td>
<td>Medium</td>
</tr>
<tr>
<td>Q3</td>
<td>0.86 (0.69-1.08)</td>
<td>High</td>
</tr>
<tr>
<td>Q4 (highest)</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>Parental education</td>
<td>Educational</td>
<td>Education</td>
</tr>
<tr>
<td>Low</td>
<td>1.49 (1.14-1.92)</td>
<td>Primary of lower</td>
</tr>
<tr>
<td>Medium</td>
<td>1.09 (0.91-1.32)</td>
<td>Secondary or higher</td>
</tr>
<tr>
<td>High</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>Last dental visit</td>
<td>Last dental visit</td>
<td>Last dental visit</td>
</tr>
<tr>
<td>Last 2 years</td>
<td>1.82 (1.38-2.41)</td>
<td>2+ years</td>
</tr>
<tr>
<td>2+ years</td>
<td>0.94 (0.71-1.23)</td>
<td>2+ years</td>
</tr>
<tr>
<td>Never</td>
<td>Ref</td>
<td>Never</td>
</tr>
<tr>
<td>Brushing frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2/day</td>
<td>1.21 (1.04-1.41)</td>
<td>Ref</td>
</tr>
<tr>
<td>2+/day</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>Sweets, sugar, soft drink intake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>1.28 (1.00-1.66)</td>
<td>Ref</td>
</tr>
<tr>
<td>Moderate</td>
<td>1.05 (0.84-1.19)</td>
<td>Ref</td>
</tr>
</tbody>
</table>

**Outcome measure:** Children: caries experience (DMFS) among 8–15 year old. Adult: caries experience (DMFT) and prevalence of periodontal pocket 4+mm.

**RR:** Rate ratios estimated in multivariable models with the listed variables and age and sex. **PR:** Prevalence rates estimated in multivariable models with the listed variables and age and sex.

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