

## Chapter 16

# Promoting Oral Health through Programs in Middle Childhood and Adolescence

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## INTRODUCTION

Oral diseases are among the most common diseases worldwide, particularly for school-age children and adolescents. They pose significant public health problems for all countries and entail substantial health, social, and economic impacts. Simple and effective interventions exist to prevent most oral diseases. The school setting, among others, plays an important role.

This chapter describes oral disease control priorities for school-age children and adolescents ages 5–19 years. Oral diseases and effective population-based interventions are highlighted in two other chapters in the *Disease Control Priorities* (third edition) series: chapter 10 in volume 1 (Niederman, Feres, and Ogunbodede 2015) and chapter 5 in volume 3 (Sankaranarayanan and others 2015). Definitions of age groupings and age-specific terminology used in this volume can be found in chapter 1 (Bundy and others 2017).

## ORAL DISEASES AND CONDITIONS AFFECTING CHILDREN AND ADOLESCENTS

School-age children and adolescents are affected by a range of oral diseases and conditions. This chapter focuses on tooth decay (dental caries) as it is the most common disease with the highest global burden. It also includes oral injuries and trauma, as well as noma (a destructive

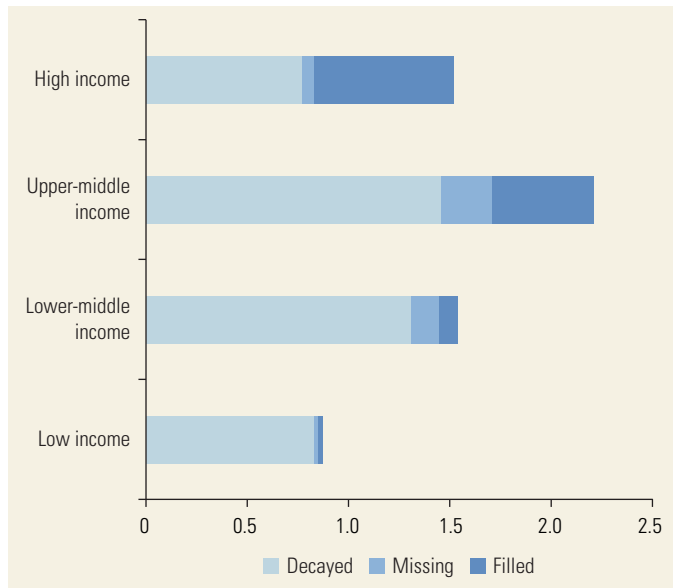
gangrene affecting orofacial soft and hard tissues with high mortality), as significant but neglected oral conditions. Other oral diseases, which are partly discussed in other volumes, include simple gingivitis and periodontitis, congenital malformations, fluorosis of teeth in areas of high fluoride concentrations in drinking water, oral mucosa lesions that are often symptoms of other systemic diseases, and simple malocclusions.

### Tooth Decay

Tooth decay affects about 3.1 billion people. The prevalence of tooth decay in permanent teeth ranked 1st and in deciduous teeth ranked 10th among 291 diseases analyzed in the Global Burden of Disease study (Marcenes and others 2013). The highest burden of tooth decay is in upper-middle-income countries, and the lowest is in low-income countries (LICs) (figure 16.1), although these averages mask large variations among countries within each income category. Between 40 percent and 90 percent of 12-year-old children in low- and middle-income countries (LMICs) suffer from tooth decay (FDI World Dental Federation 2015); tooth decay is also a problem in high-income countries (HICs). In the United States, tooth decay in children is four times more common than asthma (CDC 2004). Across all country income groups, the majority of decay remains untreated, ranging from 52 percent in HICs to almost 100 percent in LICs.

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**Figure 16.1** Average Number of Teeth Affected by Tooth Decay in 12-Year-Olds, by Country Income Group, Latest Data Available, 2000–14



Source: FDI World Dental Federation 2015.

Note: The data are based on the WHO Oral Health Country/Area Profile Project (<http://www.mah.se/capp/>), which is the only authoritative source of international data on tooth decay. The DMFT index is generally used to report tooth decay in epidemiological studies. The index records the number of decayed (D), missing (M), and filled (F) teeth (T). A DMFT score of 1.0 means that 1 of the 32 permanent teeth is decayed, missing, or filled.

Tooth decay can develop once the first teeth erupt. Toothache as the main symptom is highly prevalent among all age groups, ranging between 15 percent and 45 percent in different studies (Boeira and others 2012; Hayes and others 2013; Kassebaum and others 2015; Miotto, Barcellos, and Lopes 2013; Noro and others 2014). The decay process may progress to total tooth destruction and exposure of the pulp—causing severe pain, infection, and systemic reactions—which may be fatal as a result of septicemia (Kawashita, Kitamura, and Saito 2011).

Severe tooth decay may also affect child growth and nutrition, with significant impacts on psychosocial well-being, contributing to reduced quality of life and educational opportunities (Espinoza and others 2013; Leal and others 2012; Ramos-Jorge and others 2014; Sheiham 2006). Studies from LMICs such as Brazil, the Islamic Republic of Iran, the Philippines, South Africa, and Thailand, show that tooth decay negatively affects social interactions and the self-esteem of children and adolescents (Kakoei and others 2013; Miotto, Barcello, and Lopes 2013; Naidoo, Chikte, and Sheiham 2001). It is also among the most frequent reasons for school and work absenteeism (Department of Education 2008; Krisdapong and others 2013). An estimated 59 million

hours of school were lost because of oral health problems in 1989 in the United States, confirming such impacts in high-income settings (U.S. DHHS 2000).

Growing evidence suggests that severe tooth decay and malnutrition are associated. Children with severe dental caries are at increased risk for undernutrition and failure to thrive because pain, chronic infection, and abscesses from decayed teeth impair their appetite, ability to chew, diet, and sleep (Sheiham 2006). Conversely, prevention and treatment can contribute to reduced malnutrition and undernutrition; underweight children with severe tooth decay show rapid weight gain once destroyed teeth are extracted (Benzian, Monse, and others 2011; Duijster and others 2013; Sheiham 2006).

The association between dental caries and obesity is more complex. Both diseases share common risk factors, such as overconsumption of sugar-laden foods and beverages. Studies confirm an association between obesity and caries for the permanent dentition, but the causal direction of the association requires more examination (Hayden and others 2013). Evolving evidence suggests that food-related preventive interventions addressing dental caries also provide benefits for reducing obesity and vice versa.

### Oral Injuries and Trauma

Oral injuries and trauma include fractures of facial bones, as well as fractures, dislocations, and loss of teeth. Orofacial injuries may be a result of traffic accidents, sport injuries, abuse, or violence. They account for 5 percent of injuries among all age groups, even though oral structures represent only 1 percent of body surface. Oral injuries are more frequent in the first 10 years of life, with more boys affected than girls. The likelihood of oral injuries decreases with age, but the incidence of trauma to the head and neck increases (Andersson 2013). Estimates indicate that 30 percent of children show signs of trauma to their deciduous teeth; 20 percent are affected by trauma to their permanent, mostly anterior, teeth. Oral injuries and trauma have significant physical, psychosocial, and economic impacts and are major public health problems. Dental treatment is necessary in about half of all trauma cases involving permanent teeth. The annual direct costs of dental trauma are between US\$3.6 million and US\$9.0 million in 2012 dollars per 1 million inhabitants per year (Borum and Andreasen 2001).

### Noma

Noma is a disease characterized by severe gangrenous destruction of soft and hard tissues of the mouth and face. It predominantly affects children under age six years

in Sub-Saharan Africa. Noma progresses rapidly from a small lesion to major destruction. The disease is rare but has significant impacts on the lives of those affected; mortality is between 70 percent and 90 percent. Survivors suffer lifelong impairments to speaking or eating because of significant tissue destruction. Victims and their families are often stigmatized, with increased risk of poverty for affected households (Marck 2013; Ogbureke and Ogbureke 2010).

Noma is most prevalent in Burkina Faso, Ethiopia, Mali, Niger, Nigeria, and Senegal; however, because of unreliable documentation, there are no accurate epidemiologic data. The etiology of noma is associated with malnutrition, insufficient access to improved sanitation, cohabitation with animals, and compromised immune systems. This confluence of etiologic factors can be disrupted; if diagnosed at early stages, simple and effective treatment, consisting of disinfection and hygiene measures combined with antibiotics, is possible. However, by the time patients receive care, noma is often in advanced stages. Surviving children usually require costly and complex surgery, which is either unavailable or unaffordable. Informing at-risk population groups, especially mothers, about simple oral and other hygiene improvements, balanced nutrition, and early detection of potential lesions can help prevent noma.

## RISK FACTORS, SOCIAL DETERMINANTS, INEQUALITIES, AND DISEASE TRENDS

The many factors that influence oral health include individual, environmental, family, community, and broader societal factors. For children and adolescents, high sugar intake and insufficient oral hygiene are the leading risk factors for poor oral health, while behavioral and environmental influences affect the likelihood of oral injuries and trauma.

The risk factors for oral diseases and major noncommunicable diseases (NCDs) overlap; these include, for example, unhealthy diet and the consumption of tobacco and alcohol. This overlap provides the basis for integrated prevention strategies through the common risk factor approach (Sheiham and Watt 2000), one of the cornerstones of oral health promotion.

### High Sugar Consumption

A diet characterized by frequent and high intake of sugary food or sugar-sweetened beverages (SSBs) increases the risk of developing tooth decay. Free sugars include all sugars added to foods and drinks by manufacturers, cooks, or consumers, as well as sugars

naturally present in honey, syrups, and fruit juices. High sugar consumption is often combined with an unhealthy diet characterized by, for example, low fruit and vegetable intake and overconsumption of foods with high fat and salt content (Alzahrani and others 2014); it is thus closely linked to the leading causes of major NCDs, such as diabetes and obesity. To reduce the likelihood of dental caries, obesity, and diabetes, the World Health Organization (WHO) Guideline on Sugars Intake (WHO 2015) recommends that less than 10 percent of the daily energy intake come from sugar. Further benefits may be achieved by reducing consumption to less than 5 percent (five teaspoons per day) of total daily energy intake (Moynihan and Kelly 2014).

### Alcohol and Tobacco Use

Children and adolescents are increasingly exposed to other risk factors that may lead to oral diseases later in life, particularly oral cancer. Tobacco use in all its forms is the main risk factor for oral cancer, and harmful alcohol consumption further amplifies the risk. Although exposure in HICs is decreasing as a result of effective regulations, the challenges in LMICs are increasing. The average age of smoking initiation has dropped from 15–17 years to 13–14 years; high rates of tobacco and alcohol use are increasingly common. Up to 20 percent of 15-year-olds in LMICs use tobacco, and more than 50 percent of 13-year-olds in the United States have tried alcohol. In the Philippines, 30 percent of those ages 11–16 years reported alcohol use in the past month. These habits may persist and deepen during adulthood (Ahlström and Österberg 2004; Bach 2015; Lillard and Christopoulou 2015; Peltzer and Pengpid 2015). Electronic nicotine delivery systems have grown in popularity. Although the evaluation of their health effects is still ongoing, indications of their harm include the induction of children and adolescents to smoking and nicotine addiction, with its negative impact on adolescent brain development.

### Changing Consumption Patterns

Moreover, global demographic changes, rapid urbanization, the economic transition from low-income status to lower-middle-income status, and migration streams within and between countries are influencing consumption patterns for many populations. In recent decades, the proportion of the population living in middle-income countries has grown from 26.7 percent in 1990 to 72 percent in 2012. During the same period, the proportion of people living in LICs decreased from 57.7 percent to 11.7 percent. Although these shifts have brought

major advances in general development (Jamison and others 2013), they have also modified population exposure to risk factors for diseases. In particular, these changes have increased the consumption of sugar, fat, and salt. Accordingly, the disease burden in LMICs has shifted from a focus on infectious diseases to a predominance of NCDs (Popkin, Adair, and Ng 2012).

Oral diseases are part of this global transition (figure 16.1), as exemplified by changes in disability-adjusted life years (DALYs<sup>1</sup>) caused by tooth decay in Sub-Saharan Africa. From 1990 to 2012, the global average increase in disease burden of dental caries, as measured in DALYs, was 34.5 percent; for most countries in this region, however, it was between 42 percent and 78 percent (Dye and others 2013; Kassebaum and others 2015).

## CHALLENGES TO EFFECTIVE ORAL HEALTH PROMOTION IN LMICs

Countries that have traditionally emphasized prevention and control of oral diseases, particularly in schools (such as Hong Kong SAR, China; Scandinavian countries; and Switzerland) have been able to achieve substantial improvements in oral health status with high rates of caries-free children. In LMICs, however, despite the growing oral disease burden, designing and implementing effective oral health promotion strategies has proved challenging for several reasons:

- Communicable diseases and diseases with high mortality receive priority over NCDs and oral diseases (Benzian, Hobdell, and others 2011; Piva and Dodd 2009).
- There is reluctance to view oral health in the context of systemic health care and to include it as part of comprehensive health care services and related infrastructure.
- Reliable information on the oral disease burden, which is often not integrated into national health surveillance, is lacking, resulting in the unavailability of up-to-date epidemiological data, even though standardized survey tools exist (FDI World Dental Federation 2015; Petersen and others 2005)
- Evidence-based and population-wide preventive strategies that take into account the broader determinants of health are absent (Watt 2007).
- Priority is given to curative clinical approaches, which are generally costly and associated with access barriers. Oral diseases are considered the fourth most expensive health condition and result in high out-of-pocket payments, particularly in LMICs (Kandelman and others 2012).

## PREVENTION AND HEALTH PROMOTION TO IMPROVE ORAL HEALTH

The development of effective prevention and oral health promotion strategies, in conjunction with pain relief and emergency services, may be the most realistic strategy for LMICs based on available resources and ethical considerations (Frencken, Holmgren, and van Palenstein Helderma 2002). This section discusses oral health promotion in school settings, including related supportive policies, as a cost-effective area for government and public health intervention.

### Making Schools Healthy Places

Children and adolescents spend significant time in school, which is a key setting for promoting oral and general health. Net primary school enrollment rates worldwide for both genders have increased steadily for decades and averaged 89 percent in 2013 (UNESCO 2015). Reaching a majority of children through primary schools may be possible without requiring complex additional health structures. Oral health interventions can be used as entry points for wider integration with other health activities, including the potential to address broader determinants of health (Macnab and Kasangaki 2012). Building skills and providing services, together with improving the conditions of the school environment, have the potential to influence lifelong knowledge, attitudes, health status, and behaviors of children.<sup>2</sup>

Schools are also influential model institutions in their communities and may facilitate participatory approaches that involve parents and the wider community in health promotion. Creating health-promoting schools requires school-level commitment as well as policy guidance to encourage risk-reduction measures, such as banning smoking or foods with high sugar content on the premises (Bundy 2011), or providing clean and healthy environments that include sustained access to safe water, sanitation, and hygiene (Emory University Center for Global Safe Water and UNICEF 2013).

Research on the effects of oral health promotion in schools comes primarily from HICs, but evidence from LMICs is growing (Haleem and others 2016; Macnab 2015; Monse and others 2013; Petersen and others 2015). Several supportive policy frameworks exist to guide countries in developing school health strategies. The Focusing Resources on Effective School Health approach provides a conceptual framework and guides national policies; its principles also apply to oral health promotion in schools (World Education Forum 2000).

The WHO Health Promoting Schools framework includes technical guidance for oral health programs (Macnab 2015), although a recent Cochrane review revealed limited evidence for sustained impact and called for better implementation and research (Langford and others 2014). Building on both concepts, the Fit for School Action Framework provides practical implementation guidance and integrates daily, skills-based oral health activities with other school-based priority interventions (box 16.1) (Benzian and others 2012).

### Reducing Risk Exposure

**Reducing Sugar Consumption.** Public institutions, especially schools, should not only raise awareness of but also provide healthy food and beverage options. Some 370 million children worldwide receive school meals each day, providing opportunities to offer healthy choices low in free sugars, fat, and salt, thereby reducing the risk for tooth decay, obesity, and related chronic conditions (Vandevijvere and others 2015).

Canteens or vendors on or near school premises typically offer snacks and SSBs. Schools may consider limiting or prohibiting the sale of sugary foods and SSBs on school premises, along with providing healthy alternatives. Advertisements for and sponsorship of unhealthy foods and drinks may also be banned from schools (New Zealand Beverage Guidance Panel 2014; Patel and Hampton 2011; Wilder and others 2015).

On a policy level, the introduction of taxes on unhealthy products such as SSBs, regulations for transparent food labeling, and restrictions on marketing to children and adolescents may contribute to reducing risk exposure (Rayner, Scarborough, and Briggs 2015).

**Banning Tobacco and Alcohol Products.** A review of school-based tobacco prevention initiatives in 40 LMICs confirmed that only bans reduced smoking rates; educational interventions alone had no significant effect (Agaku and others 2015). Accordingly, an appropriate policy would be to ban the sale, marketing, and sponsorship of tobacco and alcohol products for children and adolescents in general and on school premises in particular (Saraf and others 2012).

**Improving Safety and Protection.** Although it is impossible to prevent all oral injuries and trauma, certain measures can make schools safer. For example, avoiding injury-prone installations, such as sharp edges or places for high climbing, can help prevent falls, oral injuries, and trauma (Glendor 2009). Wearing mouth protection can reduce the risk of trauma from contact sports, but it requires sufficient resources. Road safety on the way to school and enforced use of proper helmets

### Box 16.1

#### Integrated School Health: The Fit for School Programme

The Fit for School Programme is implemented by the Ministries of Education in Cambodia, Indonesia, the Lao People's Democratic Republic, and the Philippines, with support from Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. As the recipient of an award from the World Health Organization, the World Bank, and the United Nations Development Programme for innovation in global health, the model integrates an oral health intervention into a school health program addressing prevalent diseases in school-age children. Students brush their teeth with fluoride toothpaste as a daily group activity, combined with group handwashing with soap.

This approach helps familiarize children with healthy habits and reduces other hygiene-related diseases (Monse and Benzian 2011). Research in participating schools has shown that daily group toothbrushing with fluoride toothpaste has prevented 17.3 percent of new caries lesions (Monse and others 2013). However, results depend on implementation quality. Under controlled conditions, reviews show a preventive power of up to 25 percent for toothbrushing with fluoride toothpaste (Marinho and others 2009). The Fit for School Programme costs US\$0.60 per child per year in supplies and reduces absentee rates due to illness.

*Source: Marinho and others 2003.*

for cycling and use of motorbikes or similar vehicles are measures to reduce the frequency and severity of dental and craniofacial trauma.

### Strategies to Promote Oral Health

**Skills-Based Oral Health Promotion.** Oral health promotion in schools has traditionally focused on educational approaches that transfer knowledge about disease or healthy behavior. However, evidence suggests that these approaches alone have limited long-term effects. Instead, a focus on activities that develop children's skills, hygiene practices, and habits is more successful in improving individual oral health behaviors (Cooper and others 2013; Hopkins and others 2007; Kay and Locker 1998; Peters and others 2009).

Skills-based oral health education includes daily group toothbrushing with fluoride toothpaste at school. Group activities are fun for children and enforce healthy social norms, which are effective drivers of oral hygiene behavior

(Claessen and others 2008). Toothbrushing in a group while using appropriate washing facilities is a practical way to facilitate implementation with little extra workload for supervising teachers. Because these activities do not require the involvement of health professionals, they can be readily integrated into the daily school schedule.

#### **Promoting Access and Use of Appropriate Fluorides.**

Ample evidence demonstrates that use of fluorides is the most effective method for preventing dental caries in populations. The WHO, the FDI World Dental Federation, and the International Association for Dental Research, and the Chinese Stomatological Association (2007) strongly recommend twice-daily toothbrushing with fluoride toothpaste (box 16.2) for the following reasons:

- Prevention of tooth decay by using fluoride is the most realistic way to reduce the burden of tooth decay in populations.
- Fluoride toothpaste remains the most widespread, significant, and rigorously evaluated form of fluoride used globally.
- Fluoride toothpaste is generally safe to use.

The most efficient and effective way to improve use of fluoride in schools is integrating toothbrushing with fluoride toothpaste as a routine activity into the daily school schedule (Petersen and others 2015). Other sources of

fluoride may include brushing with high-fluoride-containing gel once a week or application of fluoride varnish by trained health workers in schools. In HICs, the application of fissure sealants may be considered. These procedures require adequate infrastructure, staff, and resources, which are beyond the means of most LMICs. Moreover, as with many health interventions, robust cost-effectiveness data from large-scale implementation are lacking (Isman 2010; Marinho and others 2013).

The institutionalization of such activities requires supportive structures on several levels (Benzian and others 2012). On a policy level, improving access to and use of appropriate fluorides requires reducing taxation of fluoride toothpaste, increasing taxation of toothpaste without fluoride to discourage its use, and strengthening national regulations for the quality and labeling of fluoride toothpaste.

**Oral Health Care Services.** Generally, provision of health services at schools is costly and challenging to sustain. Referral systems are often deficient, even in HICs (Pine 2007); primary oral health care in LMICs is generally challenged by low numbers of oral health professionals, lack of infrastructure and supplies, or high access barriers posed by costs and transportation (Petersen 2014).

Depending on available resources, schools may offer oral health care services in the form of an attached dental clinic or regular visits of oral health professionals or trained community health workers. Basic treatment, such as pain relief and emergency care, may be provided on site or through referral to nearby health facilities. Teachers may preselect children with dental problems. Screening without provision of basic care to children in need is considered unethical.

A study using data from 1999 estimated that, for 1 billion children in LMICs (ages 6–18 years), restorative oral care would cost more than US\$860 billion (Yee and Sheiham 2002), an amount exceeding the capacities of any health care system. The direct treatment costs of oral disease in 2010 (all age groups and countries combined) were estimated to be US\$300 billion, with HICs spending US\$244 billion and the United States and Canada alone spending US\$120 billion (Listl and others 2015). These findings highlight dramatic inequalities in oral health care expenditure, reflecting low service availability in LMICs. They also show that a focus on costly clinical oral health care is not a realistic option in these settings. Delivery of dental procedures is discussed in chapter 1 of volume 1 in this series (Mock and others 2015).

#### **Strengthening Surveillance and Research**

Oral disease surveillance in LMICs should be strengthened and integrated with national surveillance systems to improve epidemiological information on the disease

#### **Box 16.2**

#### **Principles of Toothbrushing with Fluoride Toothpaste**

- Brush teeth at least twice a day for two minutes with fluoridated toothpaste (1,200–1,500 parts per million fluoride concentration). Children up to age six years should use only a pea-sized amount of toothpaste.
- Brush preferably after meals, especially breakfast, and before going to bed.
- Do not swallow toothpaste; spit out the slurry after brushing, without rinsing with water.
- Parents and teachers should supervise toothbrushing so that children do not swallow toothpaste.
- Rinse toothbrush after use, store it in an upright position, allow it to air dry, and ensure that it does not touch other toothbrushes or surfaces to avoid cross-contamination.
- Visit a dental or health professional for routine check-ups and in cases of discomfort, pain, or discoloration of the teeth.

burden for better advocacy and effective action (Varenne 2015). A number of opportunities exist for integrating oral health data into ongoing international collaborative surveys such as the Global School-Based Student Health Survey, the Global Youth Tobacco Survey, and the WHO STEPs surveys for NCDs. Oral health-specific modules exist for each of these surveys, but they are not regularly applied or reported.

More evidence is also needed to better understand what interventions are effective and under what conditions. Applied research and rigorous evaluation of approaches, projects, and programs may help identify effective and appropriate strategies. Furthermore, research results need to be accessible and presented in a format that can inform policy decisions, particularly for effective school health interventions (Benzian and others 2012).

### Supportive Policies for Oral Health

Advocacy at the global and national levels to highlight the burden and consequences of oral diseases among children and adolescents may help prioritize interventions for prevention and control. Approaches with good evidence and cost-effectiveness, as well as skills-based oral health education, may strengthen healthy lifelong behaviors. Strategies addressing the social determinants and common risk factors of oral diseases require policies promoting oral health as part of the general health sector, as well as other sectors such as education, agriculture, transportation, commerce and trade, housing, and water and sanitation, to establish health-conducive environments and healthy nutrition. The emerging regional and national action plans addressing NCDs may provide opportunities for integration of simple, sustainable, and scalable oral health interventions.

### Strengthening Intersectoral Collaboration

School-based health promotion is an intersectoral challenge, with stakeholders mainly from the education; health; and water, sanitation, and hygiene sectors; but also from other sectors that jointly address key determinants of health. Task-sharing and leveraging the existing workforce may reduce costs and facilitate implementation. Defining clear roles and responsibilities for all involved stakeholders, including parents and the community, is crucial to ensuring successful and sustainable implementation.

## CONCLUSIONS

Worldwide, children and adolescents suffer from a significant and largely preventable burden of oral diseases, particularly dental caries. The consequences affect

well-being and quality of life, general health, school performance, and social interactions. Preventing oral diseases with simple and cost-effective population-wide interventions is possible, even in resource-constrained LMICs (Geneau and others 2010), and schools are ideal platforms for reaching children. Recommended approaches require action at the school, community, and policy levels, and include the following:

- Prioritization of schools as health-promoting settings where skills-based and high-impact interventions, such as daily toothbrushing with fluoride toothpaste, can be implemented as part of integrated school health
- Increased advocacy to emphasize the burden and consequences of oral diseases to prioritize interventions for prevention and control in LMICs
- Development of concepts, practical implementation models, evaluation tools, and related national capacity for cost-effective best-buy interventions to address caries and other priority oral diseases in LMICs.

The disease and risk factor trends indicate that inaction is likely to increase the challenges. Although most evidence is from HICs, further research may strengthen the links between concept, policy, and action. Such an agenda needs consensus from stakeholders and organizations active in the prevention and control of oral diseases to better prioritize oral diseases in LMICs. Only then can advocacy, science, strengthening of capacities, and technical assistance go hand in hand to have a significant effect on the global burden of oral diseases (Benzian, Hobdell, and others 2011).

## DISCLAIMER

Renu Garg and Benoit Varenne are staff members of the World Health Organization (WHO), and Bella Monse is a staff member of the Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The authors alone are responsible for the views expressed in this publication, since they do not necessarily represent the decisions, policies, or views of the WHO or of GIZ.

## NOTES

World Bank Income Classifications as of July 2014 are as follows, based on estimates of gross national income (GNI) per capita for 2013:

- Low-income countries (LICs) = US\$1,045 or less

- Middle-income countries (MICs) are subdivided:
    - a) lower-middle-income = US\$1,046 to US\$4,125
    - b) upper-middle-income (UMICs) = US\$4,126 to US\$12,745
  - High-income countries (HICs) = US\$12,746 or more.
1. The DALY is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability, or early death.
  2. The measures described for the school context are equally relevant for the kindergarten and preschool contexts, even if these settings are not explicitly mentioned.

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