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# Health, oral health and poverty

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**Editor's note:** The Council of Science Editors has organized among science journals throughout the world a global theme issue on poverty and human development. Participating journals are simultaneously publishing articles on this topic of worldwide concern to raise awareness, provoke interest and stimulate research. This is an international collaboration among journals from developed and developing countries—more than 230 in all. The Journal of the American Dental Association is pleased to be among them and presents an editorial and four cover stories on this topic of interest to practitioners in the United States and around the world.

“Poverty is the worst form of violence.”  
—Mahatma Gandhi

**P**overty has been defined in many ways. The World Bank measures global poverty by quantifying countries' purchasing powers according to purchasing power parities (PPPs), which take into account differences in the relative prices of goods and services and provide an overall measure of the real value of output produced by an economy. The World Bank generally uses the conversion of the international poverty line, which is equivalent to U.S. \$1 per day, into the national currency units of respective countries by using PPPs and determining the number of people who are below that threshold.<sup>1</sup>

There is, however, no single universal standard definition of poverty. Modern definitions of poverty have moved away from conceptions based on a lack of physical necessities toward a more social and relative understanding. According to the European Union:

Income poverty is only one part of the overall concept of poverty—or deprivation as it is also called. Poverty can be defined as a condition in which a person is deprived of the essentials for a minimum standard of well-being and life. Therefore, poverty does not only refer to material resources, such as money, food or housing, but also to

social resources, such as access to education and health-care or meaningful relations with other people.<sup>2</sup>

## MAGNITUDE AND PREVALENCE OF WORLD POVERTY



The World Health Organization (WHO) has placed foremost emphasis on the crisis of poverty: “More than one thousand million of the world's people have been excluded from the benefits of economic development and the advances in human health that have taken place during the 20th century.”<sup>3</sup> According to WHO, about 1.3 million people live in absolute poverty with an income of less than U.S. \$1 per day; to make matters worse, this level is rising. Moreover, people living in absolute poverty are five times more likely to die before reaching the age of 5 years and 2.5 times more likely to die between the ages of 15 and 59 years than are people in higher-income groups. Disease is both a cause and a consequence of poverty and can reduce house-

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hold saving, learning ability, productivity and quality of life—thus creating or perpetuating poverty. The poor, in turn, are more at risk of experiencing illness and disability. Improved health translates into greater, more equally distributed wealth and productivity.<sup>3</sup>

### THE ASSOCIATION BETWEEN HEALTH PROMOTION AND POVERTY REDUCTION

The 20th century's major milestone in efforts toward attaining "health for all" was the WHO's Declaration of Alma-Ata.<sup>4</sup> Written at the 1978 International Conference on Primary Health Care, this declaration clearly stated that "the existing gross inequality in the health status of the people particularly between developed and developing countries as well as within countries is politically, socially and economically unacceptable and is, therefore, of common concern to all countries."

Despite the acknowledged prevalence and magnitude of health inequities within and between countries, too little research has been conducted on the social determinants of ill health, and studies overwhelmingly have focused on biomedical research at the level of individuals. Factors such as socioeconomic class, race and sex are not commonly reflected in medical journals, which leads to biases in both the content and the process of research.<sup>5</sup>

The 10 statistical highlights in global public health that have been emphasized by the WHO include the following three poverty-related examples<sup>6</sup>:

- **Child nutrition:** In 2005, the global estimate of the prevalence of "wasting" (two standard deviations below the median weight-for-height measure) was 55 million children younger than 5 years. Of these, 29 million lived in south central Asia. An even more dismal pattern was found for "severe wasting" (three standard deviations below the median), with an estimated 19 million children affected. The prevalence of wasting and severe wasting appears to be increasing, and many of the affected children will die before reaching the age of 5 years.
- **Health expenditure:** In 2004, 90 percent of the world's health care resources was spent by 20 percent of the world's population. Africa and south-

east Asia (37 percent of the world's population) account for the largest burden of disease but spend only about 2 percent of global resources on health care.

- **Tobacco use and poverty:** By the year 2030, more than 80 percent of the 8.3 million deaths attributed to tobacco will occur in low-income countries. In the 2003-2004 period, daily smoking was more prevalent among the lowest-income households in developing economies. The difference in prevalence between the poor and the least poor was greatest among the southeast Asian countries, where average poverty was the highest.

### ORAL DISEASE AND SYSTEMIC DISEASE

Oral diseases often are substantially associated with systemic morbidity, which unfortunately plagues the most vulnerable poorer population subgroups. Recent studies and reviews have shown a statistical association between periodontal disease and pre-eclampsia, pregnancy outcomes, cardiovascular disease, stroke, pulmonary disease and diabetes.<sup>7-10</sup> Concurrently, periodontal therapy has been shown to reduce the rate of preterm low birth weight among pregnant women.<sup>10,11</sup>

Malnutrition, specifically insufficient vitamin supply, has been shown to induce oral disease.<sup>12,13</sup> At the same time, dental disease has been implicated as contributing to malnutrition, which is particularly evident among lower social class communities and in developing countries.<sup>14,15</sup> The relationship between tooth decay, tooth loss and malnutrition is of great relevance, and great concern, among elderly people, owing to edentulism, and young children, owing to early childhood caries.<sup>15-17</sup>

Despite the fact that since the antibiotic era most oral diseases are not commonly life-threatening, reports of oral disease-related deaths should not be underestimated. Poor oral health has been documented as a risk factor for mortality and early death.<sup>18-20</sup> It is self-evident

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**ABBREVIATION KEY.** **DMFT:** Decayed, missing, filled teeth. **HDI:** Human Development Index. **PPPs:** Purchasing power parities. **WHO:** World Health Organization.

that prevention and treatment of most oral diseases are expensive and, therefore, often beyond the means of the poor, who thus are at a significantly higher risk of developing systemic diseases related to oral pathologies.

### ORAL HEALTH AND POVERTY

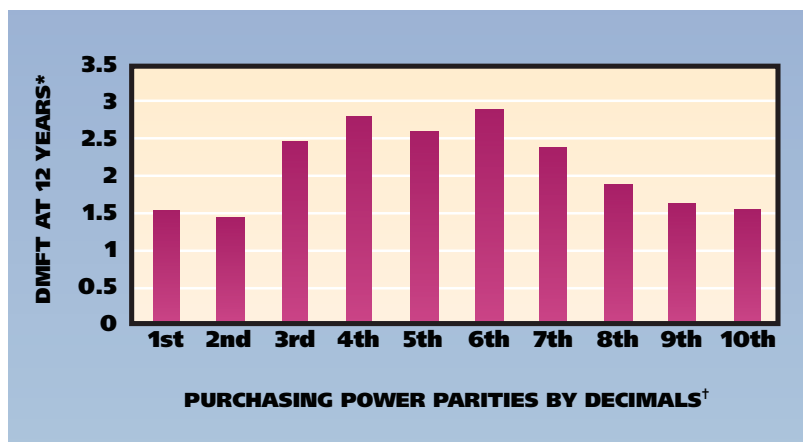
The WHO World Oral Health Report of 2003<sup>21</sup> underscored the fact that changing chronic disease patterns are closely related to socioenvironmental determinants and changing lifestyles (sugar-rich diet, tobacco use, alcohol use and so forth). Oral diseases are part and parcel of this common risk factor representation but, on the other hand, also are related to the protective capacities of exposure to fluoride and ample oral hygiene. The greatest burden of oral diseases is on disadvantaged countries and socially marginalized communities within countries.<sup>21</sup>

The landmark Oral Health in America report of the U.S. surgeon general, published in 2000, underscores the disparities in oral health according to income. The report draws attention to the fact that poor children have twice as much dental caries as their more affluent counterparts—and, moreover, that this disease is likely to be left untreated.<sup>22</sup>

In this article, we have limited our review to the effects of poverty on dental caries, periodontal disease, oral cancer and tooth loss. This in no degree indicates that poverty does not affect other oral diseases.

**Dental caries.** Dental caries is related strongly to lifestyle and self-controlled behavioral factors, including poor oral hygiene (for instance, inadequate use of fluoridated toothpaste), poor diet (specifically, frequent consumption of refined carbohydrates) and inappropriate feeding of infants. Other factors that increase caries risk are poverty, deprivation, number of years of education, dental insurance coverage and use of fissure sealants.<sup>23</sup>

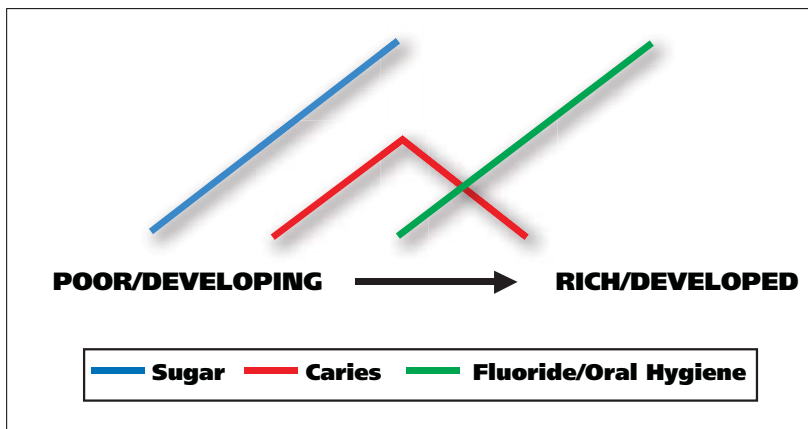
According to the WHO World Oral Health Report of 2003,<sup>21</sup> caries was most prevalent in several Asian and Latin American countries and appeared less severe in most African countries. The prevalence of caries was highest in the developed regions of the Americas and Europe and lowest in the developing regions of Africa and southeast Asia.



**Figure 1.** Decayed, missing, filled teeth (DMFT) levels among children aged 12 years in 158 countries, in descending order of economic strength. \* Source: World Health Organization.<sup>24</sup> † Source: The World Bank.<sup>1</sup>

The World Bank assesses PPPs of all participant countries.<sup>1</sup> Figure 1 illustrates the PPP levels of countries according to ranking by decimals. For each decimal, we have calculated ecologically (by groups of countries) the average number of decayed, missing, filled teeth (DMFT) for 12-year-olds according to available data for 158 countries from the WHO Oral Health Country/Area Profile Program of 2006.<sup>24</sup> We should note that caries profiles by country are influenced by variances in methodologies and age groups examined. Nevertheless, a general trend is clear. Caries levels are lowest at the first and second (richest) and ninth and 10th (poorest) decimals, and the DMFT score is approximately 1.5 at age 12 years. From the third decimal on, there is an apparent increase, which climaxes at the sixth decimal, and caries levels decrease thereafter.

Figure 2 presents an attempt to explain this trend. Dental caries is associated with destructive factors (specifically, sugar-rich diet and poor oral hygiene) and protective factors (specifically, fluoride use and good oral hygiene), the balance between which determines the presence or absence of disease. As societies and countries develop and adopt an urbanized, industrialized and Westernized culture, sugar consumption increases and, concurrently, caries prevalence increases from an initial low level. At a certain point of development, affluent societies, with a priori higher caries levels, adopt the caries-protective measures of fluoride use, improved oral hygiene and healthier diets. We should note that this picture is complex owing to the fact that sugar is relatively cheap, whereas at-home fluo-



**Figure 2.** The trends of sugar consumption, fluoride use, oral hygiene maintenance and caries prevalence, according to country's state of development. Sources: The World Bank<sup>1</sup> and World Health Organization.<sup>24</sup>

ride supplements and other preventive dental measures often are relatively more expensive.

The trend of caries, as associated with poverty and economic development, therefore is different in comparison with other, previously described chronic diseases. Because of changing lifestyles and an emerging adoption of the Westernized globalization effect, one can estimate that caries will increase in regions such as Africa, owing to consumption of a diet higher in sugar and inadequate exposure to fluoride and other protective measures. The WHO has demonstrated that caries has declined in many developed countries from a high DMFT level, at age 12 years, of about 4.5 in 1980 to about 2.5 in 1998.<sup>21</sup> Across the same period, caries levels for developing countries always were lower, but they have been increasing constantly, at the same age, from about 1.5 to 2.5.<sup>21</sup> This increase is particularly alarming owing to the fact that the developing countries represent most of our world.

**Periodontal disease.** Researchers who conducted an ecological study of 44 countries used the Human Development Index (HDI), obtained from the United Nations Development Program, as a socioeconomic indicator.<sup>25</sup> The HDI measures the average achievements in a country, including a long and healthy life, knowledge and a decent standard of living. In another study, by Hobdell and colleagues,<sup>26</sup> the median number of sextants with periodontitis (Community Periodontal Index scores of 3 or 4) among 35- to 44-year-olds in 44 countries decreased significantly, from 2.05 to 1.6 and 1.1, according to low, medium and high HDI levels, respectively.

Periodontal disease is related strongly with

smoking and decreases alongside a reduction in smoking.<sup>21</sup> As previously noted, smoking is heaviest among lowest-income households in developing economies.<sup>24</sup>

**Oral cancer.** The prevalence of oral cancer is particularly high among men and is the eighth most common cancer globally. In southeast Asia, oral cancer ranks as one of the three most prevalent types of cancer.<sup>21</sup> Oral cancer incidence levels among men range from one to 10 cases per 100,000 and generally are twice as high in developing countries as they are in developed countries.<sup>21</sup>

Hobdell and colleagues<sup>26</sup> compared median age-standardized oral cancer mortality and incidence rates for males and females for 172 countries according to the HDI. They found a significant association with poverty, according to decreases for mortality rates from 3.2 to 1.5 and 1.1 and for incidence rates from 5.4 to 3.1 and 3.4 in countries with low, medium and high HDI scores, respectively.

**Tooth loss.** U.S. data for 1999 through 2004, from the Third National Health and Nutrition Examination Survey, clearly showed that people with incomes equal to or above twice the poverty guideline, at ages 20 through 64 years, had an average of 2.96 missing teeth owing to caries, as compared with 4.15 missing teeth among those with incomes below the poverty guideline.<sup>27</sup> For the same age group, those with incomes equal to or above twice the poverty guideline had an average complete tooth loss of 4.41 percent, as compared with 9.28 percent among those with incomes below the poverty guideline.<sup>27</sup> At ages 65 years and older, those with incomes equal to or above twice the poverty guideline had an average complete tooth loss of 26.9 percent, as compared with an average complete tooth loss of 44.19 percent among people with incomes below this level.<sup>27</sup>

**THE COST OF ORAL HEALTH CARE DELIVERY**

The WHO Declaration of Alma-Ata emphatically stated that health is “a fundamental human right and that attainment of the highest possible level of health is a most important worldwide social goal” and went on to say, “Governments have a responsibility for the health of their people which can be fulfilled only by adequate health and social measures.”<sup>24</sup>

Public health and dental public health professionals unanimously agree that oral health is an integral component of general health.<sup>22</sup> Nevertheless, despite this inescapable consensus, even among countries with a national health insurance scheme, oral health care remains curiously and frustratingly excluded. Some explain this exclusion by the fact that oral disease (at least caries and periodontal disease) is not life-threatening, and others by the high cost of treatment. Conventional dental treatment often is expensive in industrialized countries and therefore not potentially feasible in low-income developing regions.<sup>21</sup> None of these excuses is acceptable rationally.

In the absence of universal national oral health care coverage, many countries supply a plethora of dental treatment delivery systems, including partial, voluntary and statutory insurance. According to the U.S. surgeon general's report,<sup>22</sup> uninsured U.S. children are three times more likely to have dental disease and 2.5 times less likely to receive dental care than are their more fortunate insured peers. There are 2.6 times more U.S. children without dental insurance than without medical insurance coverage. For every adult without medical insurance, there are three without dental insurance. One-half of the U.S. adults at or below the poverty line are likely to report having had annual dental visits. In general, only two-thirds of adults report having visited a dentist during the past year. According to the U.S. National Center for Health Statistics,<sup>27</sup> 23.9 percent of older adults (65 years or older) are edentulous, which represents an improvement over the last 20 years; however, these levels are higher (46 percent) among those at or below the poverty line. Many older U.S. citizens lose their dental insurance benefits once they retire, and this loss is a specific source of concern.<sup>22</sup>

The economic basis of disparities in access to dental care has been reiterated in U.S. research.<sup>1,27,28</sup> Similar socioeconomic disparities in oral health and oral health care have been demonstrated clearly in Australia,<sup>29</sup> Brazil,<sup>30</sup> Scotland,<sup>31</sup> New Zealand<sup>32</sup> and other countries around the world.

### THE NEED FOR MORE RESEARCH

Research can and should play a stronger role in addressing issues concerning oral health and poverty. The following are among the issues that should be addressed in future investigations:

- Are there specific and effective interventions that could mitigate some of the dental health and dental health care disparities?
- Are simple and affordable clinical procedures—such as atraumatic restorative treatment—optimally effective, appropriate and potentially accessible for poorer communities?
- Which preventive modalities are most effective for poorer communities (sealants, fluoridated dentifrice, fluoridated water)?
- What are the significant cultural, political, economic, environmental, social and behavioral variables related to oral health status among the poor?
- Can preventive dentistry be effective in narrowing oral health disparities according to socioeconomic status?
- What is the motivation of poorer communities, as far as oral health promotion and self-care are concerned?
- What is the amplitude of oral health effect on quality of life among the poor?
- What are the economic, political and professional obstacles that potentially hinder closing the oral health social gap?
- Why are governments (by and large) less involved in promoting oral than general health?
- How might oral health advocates promote the need for more oral health care legislation for all, or at least poorer, communities?

### CONCLUSIONS

Access to dental care has been widely studied and generally found to be closely related to socioeconomic disparities.<sup>33,34</sup> The goal of oral “health for all” is still far in the distance, almost 30 years after the Alma-Ata declaration.<sup>4</sup> This global state of affairs is unacceptable, especially among developed countries, where the reasons or excuses are difficult to fathom. Dental public health personnel need to recruit political public opinion to initiate the required policy changes and improvements. Most oral diseases threaten if not life, then quality of life. We need to impress upon the public the growing amount of evidence that indicates a significant association between oral and systemic health.

Notwithstanding the important health/oral health/poverty associations, dentists should neither ignore nor forget the scourge of poverty per se. The dentist is an inseparable and integral component of the health care team, all of whose members have the common mission of promoting

## health and well-being. Dentists should recognize this social responsibility and commit their utmost efforts toward the eradication of poverty. ■

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