**Short Communication**

# How real world data is reshaping dental public health: from evidence to action

**Kanimozhi Kulasekaran[1]\***

[1]Dept. of Epidemiology, Private Practitioner, India

**Abstract**

Epidemiological data serves as a cornerstone in shaping effective preventive strategies in dentistry. This short communication explores the vital role of population-based oral health data in the design, implementation, and evaluation of evidence-driven interventions. It discusses how trends in disease distribution, identification of risk factors, and surveillance mechanisms influence both public health priorities and clinical decision-making. Despite available preventive tools, conditions such as dental caries, periodontal disease, and oral cancers remain highly prevalent, especially in underserved region, largely due to the inadequate translation of data into actionable policies. This paper underscores the need for robust, context-sensitive epidemiological evidence to support equitable and sustainable dental public health responses, particularly in low-resource settings.

**Keywords:** Preventive dentistry, Oral epidemiology, Dental public health, Caries surveillance, Periodontal disease, oral cancer, Data-driven strategies, Health equity.

## 1. Introduction

Oral diseases are among the most widespread non-communicable conditions globally, affecting individuals of all age groups and socioeconomic strata. The Global Burden of Disease Study (GBD 2019) reports that untreated dental caries in permanent teeth is the most common health condition, impacting over 2.5 billion people worldwide.[1] Periodontal diseases and oral cancers also significantly contribute to the global disease burden. Although preventive measures are available, the persistent high prevalence of these diseases points to systemic gaps in translating epidemiological evidence into effective practice.

Epidemiology, which examines the distribution and determinants of health conditions in populations, is fundamental to evidence-based policy-making and program planning in oral health. It enables authorities to monitor disease trends, identify at-risk populations, and allocate resources appropriately.

This short communication highlights the essential role of epidemiological data in developing preventive dental strategies. It emphasizes the integration of surveillance, risk assessment, and modelling techniques to inform both community-level initiatives and individualized interventions, ultimately improving health outcomes.

## 2. Epidemiological Foundations in Dentistry

Epidemiology provides the quantitative basis for preventive dentistry. Measures such as incidence, prevalence, relative risk, and attributable risk help stakeholders assess the scale and impact of oral diseases. Descriptive studies map disease patterns, while analytical approaches reveals causal relationships.

Standard indices like the DMFT (Decayed, Missing, and Filled Teeth), Community Periodontal Index (CPI), and Oral Hygiene Index-Simplified (OHI-S) allow for benchmarking across populations and over time.[2] These tools support the evaluation of intervention effectiveness and the identification of emerging health needs.

*Corresponding author: Kanimozhi Kulasekaran
Email: drkani.epidemiologist@gmail.com

Furthermore, epidemiological studies reveal the influence of social determinants, such as education, income, and access to care, on oral health outcomes. For instance, children from lower socioeconomic backgrounds are consistently found to have higher rates of dental caries,[3] underlining the importance of equity-focused preventive efforts.

## 3. Global Oral Disease Burden: Data-Driven Insights

The burden of oral diseases varies widely by region, shaped by lifestyle, environmental, and healthcare factors. According to the World Health Organization, 60–90% of school children and nearly 100% of adults worldwide are affected by dental caries.[4] Severe periodontitis impacts around 10–15% of the global adult population and ranks among the top ten most prevalent diseases.[5]

Longitudinal data have identified key risk factors including excessive sugar consumption, tobacco and alcohol use, poor oral hygiene, and inadequate access to care. For example, early childhood caries has been strongly linked to bottle feeding and sugary diets in low-income households.[6] Additionally, the International Agency for Research on Cancer (IARC) recognizes tobacco and areca nut use as major contributors to oral cancer in South and Southeast Asia.[7]

These findings not only illustrate disease burden but also inform behavioral, legislative, and systemic interventions for oral disease prevention.

## 4. Epidemiology-Driven Preventive Strategies

Epidemiological data underpins the design and targeting of both population-level and clinical preventive interventions:

1. Water fluoridation: Countries such as the United States and Australia have adopted community water fluoridation based on decades of evidence linking it to a significant reduction in dental caries.[8]
2. School-based programs: Prevalence studies in children have led to initiatives involving fluoride varnishes, sealants, and oral health education in school settings.
3. Tobacco control policies: Data linking tobacco use to oral cancer and periodontal disease have driven public policies such as taxation, advertising bans, and pictorial health warnings.

### 4.1. Case example – India

The National Oral Health Program (NOHP) in India was launched in the year 2014-15, as a result of the findings from the 2002–2003 National Oral Health Survey. This programme implemented school screenings, mobile dental units, and community awareness campaigns to address rural-urban disparities in access to care.

### 4.2. Case example – Mexico

In Mexico, national health survey data supported the introduction of a sugar tax in 2014. This intervention led to a reduction in sugary beverage consumption and has been associated with improvements in oral and metabolic health outcomes.

At the clinical level, risk-based care models, guided by epidemiological evidence, allow dentists to tailor recall intervals, preventive procedures, and dietary advice based on individual risk profiles.

## 5. The Role of Surveillance and Data Systems

Robust surveillance is central to evidence-informed oral health policy. Key data systems include:

1. WHO's Oral Health Country/Area Profile Programme (CAPP)
2. National Oral Health Survey of India
3. Behavioral Risk Factor Surveillance System (BRFSS, USA)

These platforms collect comprehensive data on oral disease prevalence, behavioral risk factors, healthcare utilization, and social determinants of health.[9]

Efforts are also underway to integrate oral health surveillance with broader non-communicable disease (NCD) monitoring platforms, promoting holistic population health approaches.

However, many low- and middle-income countries still face challenges such as outdated datasets, lack of digital infrastructure, and insufficient workforce capacity in epidemiology.

## 6. Challenges in Data Application

Despite its importance, several obstacles limit the full utilization of epidemiological data in dental public health:

1. Data Gaps – Many regions, particularly rural and underserved communities, lack current and representative data.
2. Standardization Issues – Differences in diagnostic criteria and data collection tools hinder meaningful cross-country comparisons.
3. Weak Policy Translation – Even when data is available, it is not always effectively incorporated into strategic planning or legislation.
4. Resource Constraints – Budgetary and logistical limitations restrict the implementation of surveillance and evidence-based interventions.

Overcoming these barriers requires strategic investments in data infrastructure, workforce training, and multisectoral collaboration.

## 7. Conclusion and Recommendations

Epidemiological data is a vital pillar of effective and equitable preventive dentistry. As global health priorities increasingly recognize oral health as integral to overall well-being, data-driven strategies must take center stage in policy and practice.

*Key recommendations*

1. Strengthen national and regional surveillance systems for real-time monitoring.
2. Integrate oral health modules into general health surveys and NCD programs.
3. Provide foundational epidemiology training for dental professionals.
4. Encourage collaboration among health ministries, academic institutions, and community organizations.

By embedding robust, context-specific epidemiological data into every level of oral health planning, we can advance toward a future where prevention, rather than treatment, defines dental public health—especially for vulnerable and underserved populations.

## 8. Conflict of Interest

None.

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