

# Dental health



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## Application of Geographic Information System in Dental Public Health/Oral Health Care

Health is one of the most important factors which indicate general welfare and quality-of-life of people. Many factors which cause diseases differ in distribution and concentration due to the locations. Historically, the systems of public health information have collected data on causes of injuries and death, disabilities, factors of environmental and behavioral risk, and a lot of other issues related to health (5). With the flow of time the spatial analysis tools have been improved and the information has become of higher quality and more accessible. It has led to the increasing use of Geographic Information System taking into account associations between the causative influences of geographic context and outcomes of public health (6).

Geographic Information System (GIS) is considered to be an effective tool which is more and more often used in public health globally. It is possible to use GIS technology to give the description of health care information and to change the spatial organization of health care (7). GIS has been applied in epidemiology, public health, and many other areas of public health. GIS helps in detecting, giving an overview of health problems, mapping the spread of disease, identifying risk population, and determining prevalence areas. GIS technology may also be used while examining the relationship of health outcomes and access, setting priorities which target area interventions which are most in need, and exploring the improvement of the delivery system of health care. GIS applications provide information concerning the placement of water pumps in the areas most infected by Guinea Worm (3), identification of distribution points of health promotion

material for diabetes literature which is culturally appropriate, enhancement of child welfare services which are community-based (13). GIS technologies have also been widely used to predict injuries of child pedestrians, monitor vector-borne diseases, and analyze policy and planning of various diseases.

Planning of public health service is “ the process of formulating population based projects, programs, or strategies which aim to reduce morbidity and mortality and to improve health” (13). The focus is put onto the strategy implementations. It has become evident that GIS technology does not deliver health outcomes which are better, but it helps improve the service delivered efficacy or reduce service delivery costs (8). Planners use GIS to place public health and clinical services, to identify neighborhoods with health outcomes which are strongly influenced by such socio-economic and demographic determinants as highly rural communities, disadvantaged communities, cultural and linguistic diversity concentrations, and others.

Providers of health care seek to minimize the geographic and social inequity in health. Boulous studied the The National Health Service (NHS) dentists distribution per 1000 population in England and Wales (1). The study illustrates the NHS dental work force shortage using the ‘ traffic light’ mapping techniques in the mentioned regions. GIS has been also used to locate dental trauma in some areas in Brazil. Geographical databases of streets and GIS are used to analyze dental trauma. It has been found that areas which are at risk of dental traumas are those, which have a low socio-economic status and had substandard conditions of living. One of the most useful aspects of GIS in the sphere of public health is mapping population at risk. Different mapping techniques help display and investigate disease

distributions. Looking at the location geography where the disease seems to thrive is considered to be a good way of studying the spread of disease (14). GIS technologies make it possible to visualize the spread of disease in certain areas and analyze this tendency.

The past 10 years presented a variety of research which has been undertaken to provide the link between oral health and diabetes. Periodontal disease is considered to be the sixth major complication of diabetes. People diagnosed with diabetes, are 3 or 4 times more likely to have periodontal disease (4). Diabetes can affect people's eyes, kidneys, heart, nerves, mouth, and other important systems in the body. The link between problems with oral health and diabetes is due to high blood sugar. In case of poor control of blood sugar, it is a higher possibility of the development of oral health problems. This happens because white blood cells are weakened by uncontrolled diabetes, and they are the body's main defense against mouth infections (9).

In spite of the fact that GIS is not frequently used in public health, and quite rarely used in dental health studies, the method has gained popularity among professionals in the area as it offers the innovative information taking into account monitoring, planning, understanding, and allocation of health resources (10). Nowadays, GIS has been more and more often used as an analytical tool in health (11).

Thus, Geographic Information System is an innovative decision- support tool with a huge potential which may be used in planning, evaluating, and monitoring of public health care services including dental care. Mapping

diseases gives the opportunity to detect spatial patterns and disparities, to help in public health policy and health care planning, to contribute to identifying high risk areas, and to generate hypotheses for research (15). Unfortunately, people from rural and remote areas have no opportunity to access private services of oral health. The use of GIS mapping helps plan health care services in the solution of the issue. As oral health is and diabetes is closely related, it obvious that GIS is used as a tool to prevent and treat both of them.