Objective

Supporting management decision-making processes is extremely important in many areas. Health protection is undoubtedly one of them. Within this research project, we will look into ways of supporting decision-making processes for dental caries prevention services. **The aim of the project is to develop a methodology for building a hybrid model combining computer simulation and Markov chain in the area of dental caries prevention management. Simulation experiments will be carried out to support decision making in planning size and structure of specialist dental care dedicated to chosen primary schools, so that preventive care can be provided to pupils.**

Research description

Our research will focus in particular on presenting capabilities of selected quantitative methods used to support human resources management in the prevention of tooth decay. It is planned to imitate the actual fragment of the health care system concerning the prevention of tooth decay, using a computer model. Discreet event simulation is a method that allows observing dynamic and stochastic changes over time. Markov chain, on the other hand, will make it possible to present a sequence of possible events such as preventive actions, that depends on the state reached in the previous event. The combination of these two methods will be used to construct a hybrid model. In addition, the assumptions concerning interactions between pupils and medical and other professionals will be verified due to the constructed prototype of agent based simulation model as part of the proposed hybrid approach. It is considered that the strength of the relationship between factors such as the demographic structure of the population and the demand for given prophylactic services may have a significant impact on the development of supply. The most important research tasks include obtaining demographic data (from the Central Statistical Office) and empirical data (from dentists), then conducting statistical analyses and building analytical, simulation and hybrid models, validation and verification and carrying out experiments.

Description of the reasons for undertaking the research topic

Dental caries is a disease that affects more than half of the world's population and can cause many complications. However, properly conducted prevention is in preventing the disease. In order to access prophylaxis services, it is crucial to plan human resources who will provide them. It should also be point out that doctors individually have no reason to carry out prophylaxis on their own. Preventive activities should be inspired, organized and financed by the state, which has facilities to do it. Investment in the prevention of tooth decay can save a lot of money, because it is much cheaper than treatment. Therefore, making management decisions in this area requires a multidimensional approach because of the different aspects to be taken into account. These include, among others, dependence of personnel resources on demographic changes. What is needed here are tools that can be used to support decisions that will take this multidimensionality into account.

Main expected results

The conducted research and the obtained conclusions will constitute a value from the point of view of the discipline of management and quality sciences. The decision-making area will be enriched by research instrumentation allow to verify human resources needed to provide caries prevention services at a certain level. Additionally, research will be able to provide a theoretical basis for activities aimed at increasing knowledge and awareness of pupils and parents. The most important expected effects are: to determine how many medical personnel are required to meet the prophylactic needs for dental caries for pupils, with the current scope of responsibilities and activities performed by doctors and the division between different groups of specialists. The groups of specialists include dentists, dental hygienists and other persons who have a significant influence on conducting caries prophylaxis for pupils (e.g. tutor, parents, legal guardians). Also the impact of new medical technologies, morbidity trends and the demographic factor on the shape of future human resources necessary for the prevention of caries in children in primary schools will be determined. Moreover the possibility of agent based simulation in expanding the range of conditions taken into account in planning the amount of resources necessary for caries prophylaxis will be indicated.

The knowledge of caries disease, which has been studied so far, has led to the conclusion that it is a disease that is very easy to prevent, but still affects more than half of the world's population. This is a clear signal for the author that prevention and the provision of appropriate services require very precise and well thought-out planning, and thus require methodologically advanced tools, which certainly include hybrid system modelling.