

System Dynamics Simulation to Reduce the Number of Patients with Lifestyle-related Diseases and Medical Costs in Japan by Promoting Behavioral Change

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Abstract. Globally, many countries are about to become super-aging societies. This will likely be accompanied by a decrease in the ratio of working-age population and an increase in medical costs. In such societies, lifestyle-related diseases (LDs) account for a significant proportion of medical costs. LDs will gradually lead to disorders like hypertension, diabetes, and dyslipidemia, which may worsen and develop into more serious diseases. Therefore, it is important to promote behavioral change among the public to prevent the onset of LDs from the pre-disease stage. In this study, we developed a system dynamics model to simulate the number of patients with LDs and the medical costs, using statistical data in Japan as a case study. Utilizing two aging chains for each sex, which can describe the changes in the age-dependent structure of stocks, we represent populations of LD patients and non-LD patients by generation, and estimate changes in their population structure and associated medical costs by 2050. Compared with the current pace of change, by reducing the morbidity rate of LDs in each generation in line with their behavioral changes, we identify the effect of reducing the number of LD patients and medical costs. Furthermore, to effectively reduce these numbers, it is important to realize not just behavior change for a single generation but a series of behavior changes across generations. Thus, if statistical data are present, our model can predict the number of LD patients and medical costs for any country.

Keywords. System Dynamics, Lifestyle-related Diseases, Behavioral Change

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