

Abstract

Cancer Risk Reduction by Dietary Guideline Adherence: A Prioritization Approach with a Web App [†]

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Abstract: Background and Objectives: Diet is an important modifiable cancer risk factor. Studies show that adherence to dietary guidelines reduces cancer risk and that adherence is affected by the complexity of dietary actions and the awareness of their effect. Intervention on complex nutrition issues requires clear nutrition messages to the public. To improve adherence for cancer prevention purposes, this research describes a method to provide tailored dietary recommendations by prioritizing dietary advice from the guideline, based on diet–disease relationships revealed by disease risk models. In addition, we developed the method as a risk calculator framework to provide the interoperability between risk models and guidelines. The framework is integrated into our cancer prevention app to facilitate risk communication and guideline adherence. Methods: We propose a simple and intuitive method to define and align cancer risk models and dietary guidelines using object-oriented programming paradigms, which can encapsulate the relationship between dietary advice, cancer risk, and lifestyle variables. The effect of each action can be simulated by applying modified dietary variables into the probability model to calculate an expected risk change. An interactive intervention is then designed to enhance understanding and promote the adoption of dietary actions. It consists of three steps: selecting dietary actions ranked by their preventive effect on cancer risk, modifying selected variables to desired values, and visualizing the simulated changes in cancer risk with dietary actions by humanoid pictogram. Results: We demonstrate the mapping of actions to the corresponding variables for a chosen cancer risk prediction model while ranking them according to their preventive effect. We further show that our method can easily be adapted to any dietary guideline. We implemented more than 10 cancer risk models covering common cancer types and integrated them into the system. Moreover, it is simple to add other cancer risk models to support the prevention of additional cancer types. As a key feature of a web-based application, the practical use of the method allows for the delivery of personalized action suggestions and notifications based on the user’s lifestyle factors. An usability testing was carried out between August and October 2023 with 9 participants using the guideline made by German Nutrition Society (DGE). The test proved the intervention’s effectiveness. Discussion: On the frontier of nutrition science and preventive medicine, our work is the first approach that combines risk models and dietary guidelines into a comprehensive digital health intervention system. It informs the user about the most impactful dietary behaviors, promotes adherence to dietary guidelines, and, accordingly, facilitates cancer risk reduction.

Keywords: dietary guideline; risk model; cancer; simulation; data integration; epidemiology; prevention; digital intervention



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