Appl Physiol Nutr Metab. Author manuscript; available in PMC 2016 May 17.

Published in final edited form as:

Appl Physiol Nutr Metab. 2014 March ; 39(3): 413–414. doi:10.1139/apnm-2013-0322.

Developing a web-based dietary sodium screening tool for personalized assessment and feedback

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Abstract

Dietary sodium reduction is commonly used in the treatment of hypertension, heart and liver failure, and chronic kidney disease. Sodium reduction is also an important public health problem since most of the Canadian population consumes sodium in excess of their daily requirements. Lack of awareness about the amount of sodium consumed and the sources of sodium in diet is common, and undoubtedly a major contributor to excess sodium consumption. There are few known tools available to screen and provide personalized information about sodium in the diet. Therefore, we developed a web-based sodium intake screening tool called the Salt Calculator (www.projectbiglife.ca), which is publicly available for individuals to assess the amount and sources of sodium in their diet. The Calculator contains 23 questions focusing on restaurant foods, packaged foods, and added salt. Questions were developed using sodium consumption data from the Canadian Community Health Survey cycle 2.2 and up-to-date information on sodium levels in packaged and restaurant food databases from the University of Toronto. The Calculator translates existing knowledge about dietary sodium into a tool that can be accessed by the public as well as integrated into clinical practice to address the high levels of sodium presently in the Canadian diet.

Keywords

Sodium; diet; food intake; diet assessment; diet screening; questionnaire; food frequency questionnaire; electronic health tools

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Population-wide sodium reduction aims to reduce the health and economic burden of hypertension, stroke and cardiovascular disease attributable to excess sodium consumption (Bibbins-Domingo et al. 2010). Clinically, sodium reduction is used in the management of hypertension and other sodium-sensitive states like heart and liver failure and chronic kidney disease (Institute of Medicine 2005). Canadian children and adults consume an average 3400 mg of sodium per day, far exceeding the Adequate Intake level (AI, 1500 mg) and Tolerable Upper Intake level (UL, 2300 mg) (Garriget D 2007) with 77% of sodium coming from packaged and prepared foods (Mattes and Donnelly 1991). Although a large number of Canadians report taking action in limiting their sodium intake, most are unaware and have misconceptions about sodium in their diet (Arcand et al. 2013). In a recent survey, 89% of consumers felt that the Canadian population, in general, consumes too much sodium, but only 41% believed their personal consumption was too high (Decima Research 2009). Despite knowing that processed foods contribute the most to dietary sodium (Decima Research 2009), many also believe they consume low amounts of sodium because they do not add salt to their food at the table or during cooking (Arcand et al. 2013). This lack of self-awareness may impede personal motivation and/or effective implementation of strategies to lower dietary sodium.

There are few known practical, publicly available tools that provide a timely assessment of dietary sodium with feedback presented in a format suitable for the public, and none that can screen for hospital or clinic patients requiring dietary education interventions. Available methods to assess the amount and sources of dietary sodium are complex, requiring time consuming and burdensome techniques that are not easily applied (PAHO/WHO 2013). Furthermore, dietitian services are not always available in clinical settings and time constraints limit detailed assessments from other health professionals. Given these considerations, we developed a web-based, publicly accessible Salt Calculator (www.projectbiglife.ca) screening tool that is based on Canadian data and provides users with instant personalized information on the amount and sources of sodium in the diet.

Salt Calculator questions were developed considering the sources of sodium in the diet and the sodium content of foods. The sources of sodium for various age and sex groups were reviewed using the Canadian Community Health Survey cycle 2.2. (CCHS)(Fischer et al. 2009). Considered were both total food group contribution and the proportion of individuals who reported consuming a given food. The sodium content of Canadian foods was derived from the University of Toronto databases containing sodium and other nutrient information on 10,487 packaged and 9,201 restaurant foods (Schermel et al. 2013, Scourboutakos and L'Abbe 2013). Foods were classified into sodium-focused categories that included food group (e.g., bakery) and major (e.g., breads) and minor (e.g., pantry breads, bagels) subgroup categories (Health Canada 2012). Variation in sodium levels within major subcategories indicated a need to ask about exclusions in a given question. For example, "Don't count shredded cereals", was required since these have significantly less sodium compared to other breakfast cereals (Schermel et al. 2013). All questions were pilot tested among nutrition experts for context and face validity and the general public for usability and interface testing.

The Salt Calculator included 23 questions: three on restaurant foods, 19 on packaged foods and one on added salt. Background calculations were based on average portion sizes consumed by 13 age and sex groups, as reported in the CCHS: all 4–8 years, and males and females 9–13 years, 14–18 years, 19–30 years, 30–51 years, 51–70 years, and 71 years and older. Thus, data on a user's age and sex were captured prior to completion. Median sodium levels were derived from the databases described above (Schermel et al. 2013, Scourboutakos and L'Abbe 2013), and were weighted according to the number of products in the food subcategory relevant to the Calculator question. Food frequency responses included daily, weekly, monthly and never. Based on published data (Fischer et al. 2009), the questions accounted for 80.3% of the sources of dietary sodium and derived sodium estimates were calibrated to approximate habitual sodium consumption.

Both a brief and detailed report are generated for users based on responses. These reports communicate the estimated average amount of sodium consumed per day. This level is compared with the AI and UL for the user's age i.e., "174% more than the recommended level of 1500 mg for your age" (Institute of Medicine 2005). While AI and UL were established to reduce disease risk in the general population, they are also applicable to disease states where sodium reduction is warranted (Institute of Medicine 2005). Additional information in the detailed report includes the relative percent contribution of 7 distinct food groups to total sodium intake (e.g., bakery products, processed meats) and the contribution from eating out and using added salt.

The Salt Calculator was launched on March 8, 2013. Dissemination occurred through a nationally televised program on dietary sodium, communications surrounding World Sodium Awareness Week (March 11–17, 2013), and via social media and conference presentations. As of May 31, 2013, 39,598 calculations were performed by 31,315 unique users. Of the users, 5003 (16.0%) performed two or more calculations. The majority (60.3%) of the users were females and the mean (standard deviation) age was 47.3 ± 16.6 years.

By translating existing Canadian sodium consumption and food supply knowledge, the Salt Calculator allows individuals aged 4 years and older to rapidly identify the amount and sources of dietary sodium. The Calculator is publicly available for use by clinicians with their patients and by the public, providing an opportunity for screening and monitoring of longitudinal changes in sodium intake. Future applications of the Salt Calculator include integration into clinical practice tools, such as electronic medical records, and into diet and health education tools and websites accessible by patients and the public. Additionally, a longer web-based version of the Calculator, similar to a traditional food frequency questionnaire, is presently under development for users who wish for a more in-depth assessment of their sodium consumption.

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