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Limitations of food composition databases and nutrition surveys for evaluating food fortification in the United States and Canada

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Abstract

Background: As the availability of fortified foods expands, it is increasingly important to monitor risk of excessive nutrient intake. However, neither Canadian nor US nutrient composition databases systematically differentiate between naturally occurring nutrients and those added to foods at manufacturers' discretion, and the consumption of fortified foods is not comprehensively assessed during dietary data collection. **Objective**: To describe limitations in the estimation of nutrient intakes from voluntarily fortified foods from the Canadian Community Health Survey (CCHS 2004) and National Health and Nutrition Examination Survey (NHANES 2007-08) for the purposes of evaluating fortification policies and practices. **Description:** Working with the US Food and Nutrient Database for Dietary Studies, we identified voluntarily fortified foods by food code descriptions containing certain key words and the presence of nutrients for which additions were tracked in the database. This strategy is likely to have resulted in an underestimation of voluntarily fortified food consumption and thus an underestimation of the probability of excessive intakes in the US population. Our efforts to model proposed policy changes to food fortification in Canada were similarly limited by our inability to differentiate added sources of niacin and retinol in the CCHS. This thwarted assessment of risks associated with fortification because the Tolerable Upper Intake Levels only apply to retinol and added niacin. **Conclusion**: It is important that food composition databases and 24hr dietary recall collection methods evolve to facilitate monitoring and evaluating health benefits and risks associated with growing voluntary food fortification practices.

Keywords: Food fortification, dietary assessment, database limitations

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1. Introduction

1.1. Food fortification practices in Canada and the United States

In both Canada and the United States, mandatory food fortification has long been employed as a tool to address public health need [1-5]. For example, although regulatory frameworks differ, in both Canada and the United States white flour is enriched with niacin, thiamine, riboflavin and iron to replace losses during processing [6,7], and enriched cereal grains are fortified with folic acid to reduce the risk of neural tube defects [8-11]. The two countries differ markedly, however, in their policies and practices with respect to voluntary fortification.

In the United States, fortification of any non-standardized food with a vitamin or mineral is permitted at the discretion of the manufacturer [12]. Although the Food and Drug Administration has issued a policy statement outlining conditions under which the voluntary addition of vitamins and minerals to foods is appropriate (e.g. to correct a nutrient insufficiency in the population), this statement is policy, not regulation [12]. In Canada, voluntary food fortification has historically been tightly regulated [13]. Very few foods have been permitted to be voluntarily fortified, with restrictions on the types and amounts of added nutrients permitted. Breakfast cereals are one example of a food category in which voluntary fortification has been permitted in Canada [14, 15]. However, in 2005, Health Canada proposed a discretionary food fortification policy, which would have allowed for much broader voluntary food fortification practices in Canada, permitting manufacturers to add nutrients to foods at their discretion [16]. Part of the rationale for this policy was to facilitate harmonization with the United States. The proposed policy defined a list of foods that were previously excluded from fortification, and the types and levels of nutrients to be permitted. Although the proposed policy was not formally implemented in Canada, alternative regulatory amendments have increased opportunities for voluntary vitamin and mineral fortification of food , with products approved on a case-by-case basis [17].

Despite different regulatory environments, voluntary food fortification practices appear to be expanding in both the United States and Canada. This is evident through the recent introductions of entirely new categories of fortified foods, such as energy drinks and vitamin waters, and through the continued expansion of fortification in products such as breakfast cereals and beverages [18].

1.2. Contribution of voluntary food fortification to nutrient intakes

Historically, interest in the effects of food fortification has centered on risk of nutrient inadequacy in the population, a direction consistent with the intent of the Food and Drug Administration's policy guidance in the United States [12]. An examination of data from the 1989-91 CSFII [19], for example, revealed that voluntary fortification contributed substantially to total nutrient intakes in the United States, possibly lessening the prevalence of nutrient inadequacies. More recently, Fulgoni et al. [20] used data from NHANES 2003-06 to compare distributions of usual nutrient intake in the US population with and without considering nutrients provided through fortification (mandatory and voluntary combined). Their findings suggest that these practices have a marked effect on reducing the prevalence of inadequate vitamin A, folate, and thiamine in the population.

It is generally accepted by the scientific community that it is possible to consume too much of a given nutrient, and this is associated with risks of adverse effects. This formed the basis for the creation of the Tolerable Upper Intake Levels (ULs) for several nutrients beginning in the late-1990s [21]. ULs are the highest intake level known to be safe; toxicity of intakes above this level is unknown. ULs have not been established for all nutrients. However, this does not mean that risk of excessive intake of these nutrients does not exist, but rather that the available evidence did not support creation of an UL for that nutrient. For some nutrients, the UL only applies to one form of the nutrient, or only applies when the nutrient is consumed through food fortification or as a dietary supplement [21].