Examination of food industry progress in reducing the sodium content of packaged foods in Canada: 2010 to 2013

JoAnne Arcand, Katherine Jefferson, Alyssa Schermel, Ferdeela Shah, Susan Trang, Daniela Kutlesa, Wendy Lou, and Mary R. L’Abbe

Abstract: In 2010, as part of a national sodium reduction strategy, Canada published sodium reduction benchmark targets for packaged foods; however, no evaluation of this policy has occurred. The objective was to evaluate changes in the sodium content of packaged foods, identify categories reduced in sodium, and determine the proportion meeting Health Canada’s sodium reduction benchmarks. This was a cross-sectional analysis of Canadian packaged foods in 2010 and 2013 (n = 10 487 and n = 15 394, respectively). Sodium content was obtained from the Nutrition Facts table. Overall, 16.2% of food categories had significantly reduced sodium levels. The greatest shifts in the distribution of sodium within food categories occurred in imitation seafood (mean ± SD, mg/100 g: 602 ± 50 to 444 ± 81, 26.2%, p = 0.002), canned vegetables/legumes (269 ± 156 to 217 ± 180, 19.3%, p < 0.001), plain chips (462 ± 196 to 376 ± 198, 18.6% p = 0.004), hot cereals (453 ± 141 to 385 ± 155, 15.0%, p = 0.011), meat analogues (612 ± 226 to 524 ± 177, 14.4%, p = 0.003), canned condensed soup (291 ± 62 to 250 ± 57, 14.1%, p = 0.003), and sausages and wiener (912 ± 219 to 814 ± 195, 10.7%, p = 0.012). The proportion of foods meeting at least 1 of the 3 phases of the sodium reduction benchmark targets slightly increased (51.4% to 58.2%) and the proportion exceeding maximum benchmark levels decreased (25.2% to 20.8%). These data provide a critical evaluation of changes in sodium levels in the Canadian food supply. Although progress in reducing sodium in packaged foods is evident, the food industry needs to continue efforts in reducing the sodium in the foods they produce.

Key words: sodium, sodium reduction, food supply, food industry, diet, policy.

Résumé : En 2010, dans le cadre de la stratégie nationale de réduction de sodium, le Canada a publié des repères pour la réduction des teneurs en sodium dans les aliments transformés; toutefois, cette politique n’a pas fait l’objet d’une évaluation. Cette étude a pour objectif d’évaluer les modifications de la teneur en sodium dans les aliments transformés, d’identifier les catégories d’aliments concernés et de déterminer la proportion se conformant aux repères de réduction en sodium selon Santé Canada. L’étude consiste en une analyse transversale des aliments transformés au Canada en 2010 et en 2013 (n = 10 487 et n = 15 394, respectivement). Le contenu en sodium provient des tableaux de la valeur nutritive des produits. Globalement, 16.2 % des catégories d’aliments présentent des teneurs significativement réduites en sodium. Les plus grandes modifications de la répartition du sodium sont dans les similis-fruits de mer (moyenne ± écart-type, mg/100 g; 602 ± 50 à 444 ± 81, 26,2 %, p = 0,002), les condiments (1309 ± 790 à 1048 ± 620, 19,9 %, p = 0,005), les céréales pour petits déjeuners (375 ± 26 à 301 ± 242, 19,7 %, p = 0,001), les légumes/légumineuses en conserve (269 ± 156 à 217 ± 180, 19,3 %, p < 0,001), les croustillés ordinaires (462 ± 196 à 376 ± 198, 18,6 % p = 0,004), les céréales chaudes (453 ± 141 à 385 ± 155, 15,0 %, p = 0,011), les succédanés de viande (612 ± 226 à 524 ± 177, 14,4 %, p = 0,003), les soups condensées en conserve (291 ± 62 à 250 ± 57, 14,1 %, p = 0,003), les saucissons et les saucisses de Francfort (912 ± 219 à 814 ± 195, 10,7 %, p = 0,012). La proportion des aliments se conformant à au moins une des trois étapes de l’atteinte des teneurs repères réduites en sodium augmente légèrement (51,4 % à 58,2 %) et la proportion des aliments qui dépasse les teneurs maximales repères en sodium diminue (25,2 % à 20,8 %). Ces données constituent une évaluation critique des modifications des teneurs en sodium dans l’approvisionnement alimentaire au Canada. Même si la réduction de la teneur en sodium des aliments emballés fait des progrès évidents, l’industrie alimentaire doit continuer ses efforts pour la réduction de la teneur en sodium des aliments transformés. [Traduit par la Rédaction]

Mots-clés : sodium, réduction du sodium, approvisionnement alimentaire, industrie alimentaire, régime alimentaire, politique.

Introduction

Population-wide dietary sodium reduction is a public health priority worldwide (Beaglehole et al. 2011), due to the adverse cardiovascular and cerebrovascular outcomes associated with excess sodium consumption (Aburto et al. 2013; Institute of Medicine 2013). To address the health and economic burden of excess sodium, the United Nations has set a target for countries to reduce dietary salt intake by 30% by 2025 (World Health Organization (WHO) 2012). The average daily sodium intake in Canada is 3400 mg/day, which is more than 2 times higher than the recommended Adequate Intake level of 1500 mg and well above the Tolerable Upper Level of 2300 mg (Garrigue 2007). Since most dietary sodium is...
derived from packaged and prepared foods, interventions to lower sodium in these foods is considered one of the most effective and equitable strategy to reduce sodium intakes (Fischer et al. 2009).

In 2010, a multi-stakeholder Sodium Working Group published Canada’s Sodium Reduction Strategy. The Strategy included recommendations directed at the food supply, education and awareness, and research initiatives. The interim goal was to reduce average sodium consumption to 2300 mg/day by 2016 in the majority of the Canadian population (Sodium Working Group 2010). There were 10 food supply recommendations, including Recommendation 1–1: “The Working Group recommends that Health Canada continue to work with the food industry to establish voluntary sodium reduction targets by food category”, to guide voluntary, incremental sodium reduction in packaged foods. Following a public consultation period, Health Canada published a set of benchmark targets to guide this process (Health Canada 2012).

Although the sodium reduction benchmark targets exist in Canada, the Sodium Working Group was disbanded prior to implementation of an evaluation framework, which was part of the Sodium Working Group’s Terms of Reference. Therefore, there is currently no federal or provincial sodium-monitoring program to track the food industry’s progress. Although sodium reduction efforts are occurring globally, most published studies report on changes in sodium in a few, pre-selected food categories (Dunford et al. 2011; Christoforou et al. 2013; Trevena et al. 2014) or selected foods (Jacobson et al. 2013). There are few comprehensive evaluations of changes to sodium levels across a broad range of food categories that contribute significant amounts of dietary sodium, and none in Canada. Such an analysis would give an indication of areas of success and challenge across a variety of sectors of the food supply. Therefore, the purpose of this study was to comprehensively assess changes in sodium levels in packaged foods sold in Canada from 2010 to 2013, particularly to determine changes in the distribution of sodium from 2010 to 2013 within foods categories, to assess the proportion of food categories that have had changes in sodium, and to examine food industry progress in meeting Health Canada’s sodium reduction benchmark targets.

Materials and methods

This analysis utilized 2 cross-sectional datasets that are part of the University of Toronto Food Label Information Program (FLIP) database (Schermel et al. 2013). The database contains the nutrition information on a national sample of packaged foods and beverages that was systematically collected from February 2010 to April 2011 (n = 10,487) and from May 2013 to September 2013 (n = 15,394). Data included national and private-label brand foods from the 4 largest Canadian grocery chains, accounting for approximately 75% of food retail sales (Mintel International 2013). Products with multiple package sizes were captured only once. Data entered into the database included the Nutrition Facts table information, company, brand, price, container size, date and location of collection, and nutrition marketing information. The Canadian Nutrient File was used to create recipes so that food products could be reported “as consumed”. Recipes were used so that like-products sold in different forms could be compared in an “as consumed” form in the same food category (i.e., so that baked cakes could be compared with dry mix cakes), which allows for accurate comparisons of sodium content when in a standardized format by food weight (mg sodium/100 g). Quality assurance procedures were implemented to ensure data quality and a protocol was developed to ensure consistency in classifications, weight conversions, and recipes between the 2010–2011 and 2013 data sets.

Assessment of sodium levels

The sodium content in foods was obtained from the Nutrition Facts table (mg/serving) and was converted to standardized units (mg/100 g). Health Canada’s document Guidance for the Food Industry on Reducing Sodium in Processed Foods guided the classification of foods into food group categories, major subcategories, and minor subcategories (Arcand et al. 2014c; Health Canada 2012). Health Canada did not develop sodium reduction benchmarks for foods without a high sodium content or that did not contribute significantly to Canadian sodium intakes (i.e., fruit juices, dried pasta or rice without sauces or seasonings) (Health Canada 2012); therefore, the current analysis excluded these foods.

Statistical analysis

Continuous variables were presented as mean and standard deviations. Percentiles were calculated for each food category and subcategory. Changes in the distribution of sodium between 2010 and 2013 were examined using the Kolmogorov–Smirnov test. To calculate the overall proportion of categories that had statistically significant changes in sodium, we counted major subcategories and minor subcategories, taking steps to ensure categories/foods were not double counted, i.e., all minor subcategories and major subcategories without minor subcategories were included (n = 105 categories overall). Categorical variables were presented as frequencies and percentages. Health Canada’s sodium reduction benchmarks include 2 interim benchmark target levels (phase 1 and 2), a 2016 goal level (phase 3), and a maximum level for each food category (Health Canada 2012). Standardized units (mg/100 g) were used to determine the proportion of products meeting the phased benchmarks and the maximum levels. All analyses were conducted using SAS version 9.4 (SAS Institute Inc., Cary, N.C., USA).

Results

Changes in the distribution of sodium between 2010 and 2013

The analysis overall included 16,105 packaged foods from 2010 (n = 6918) and 2013 (n = 9199) in 12 major food categories, which were further divided into major subcategories and minor subcategories for detailed analyses. On examination of the distribution of sodium levels between 2010 and 2013, 16.2% of food categories had statistically significant decreases in sodium, 1.9% had statistically significant increases in sodium, and 81.9% of food categories had no change in sodium (Supplementary Table S1). Statistically significant changes from 2010 to 2013 occurred in imitation and simulated seafood (mean ± SD, mg/100 g; 602 ± 50 to 444 ± 81; 26.2% reduction, p = 0.002), condiments (1309 ± 790 to 1048 ± 620; 19.9% reduction, p = 0.005), ready-to-eat breakfast cereals (375 ± 246 to 301 ± 242; 19.7% reduction, p = 0.001), canned vegetables and legumes (269 ± 156 to 217 ± 180; 19.3% reduction, p < 0.001), plain chips (462 ± 196 to 376 ± 198; 18.6% reduction, p = 0.004), instant hot cereals (453 ± 141 to 385 ± 155; 15.0% reduction, p = 0.011), meat analogues (612 ± 226 to 524 ± 177; 14.4% reduction, p = 0.003), canned condensed soup (291 ± 62 to 250 ± 57; 14.1% reduction, p = 0.003), sausages and wiener (912 ± 219 to 814 ± 195; 10.7% reduction, p = 0.012), granola and cereal bars (279 ± 108 to 254 ± 99; 9.0% reduction, p = 0.020), fresh and frozen meat and poultry (535 ± 228 to 496 ± 323; 7.3% reduction, p = 0.001), shelf-stable mixed dishes (330 ± 114 to 308 ± 111; 6.7% reduction, p = 0.002), packaged bread products (448 ± 125 to 418 ± 129; 6.6% reduction, p = 0.012) and pizza (529 ± 121 to 494 ± 118; 6.7% reduction, p = 0.018) (Table 1, Supplementary Table S1). Median sodium levels showed similar trends.


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<td>Vegetable juice and cocktail</td>
<td>2010</td>
<td>371</td>
<td>217±180</td>
<td>0</td>
<td>8</td>
<td>128</td>
<td>211</td>
<td>293</td>
<td>2143</td>
<td></td>
</tr>
<tr>
<td>Pickled vegetables</td>
<td>2010</td>
<td>112</td>
<td>820±423</td>
<td>188</td>
<td>383</td>
<td>533</td>
<td>767</td>
<td>974</td>
<td>2467</td>
<td>6.0</td>
</tr>
<tr>
<td>Olives</td>
<td>2010</td>
<td>153</td>
<td>869±499</td>
<td>17</td>
<td>357</td>
<td>567</td>
<td>800</td>
<td>1069</td>
<td>3500</td>
<td>16.2%</td>
</tr>
</tbody>
</table>

Note: Data are presented as means ± standard deviation. A complete, detailed analysis of all subcategories is provided in Supplementary Table S1. This table presents a summary of data. For data on all major categories, major subcategories, and minor subcategories, please see the online supplementary material.

Statistically significant changes in the distribution of sodium were determined by the Kolmogorov–Smirnov test. A value <0.05 was considered statistically significant.

For the above-mentioned categories, the statistically significant changes in the distribution of sodium for major subcategories were often driven by certain minor food categories. For example, English muffins (462 ± 190 to 299 ± 77; 35.3% reduction, p = 0.008) and pantry rolls and buns (488 ± 88 to 444 ± 78; 9.0% reduction, p = 0.009) influenced the significant reduction in sodium in packaged breads from 2010 to 2013, whereas the other 9 minor packaged bread categories, which included pancake breads, had no significant change (Supplementary Table S1). Likewise, changes to the shelf-stable mixed dishes major subcategory was influenced by pasta noodles with sauce (324 ± 76 to 291 ± 78; 10.2% reduction, p < 0.001), with no significant change in the 5 other minor categories. Breaded meat and poultry (605 ± 157 to 523 ± 198; 13.6% reduction, p = 0.001) and chicken wings (779 ± 244 to 705 ± 266; 9.5% reduction, p = 0.012) were the minor categories responsible for the sodium reduction observed in the fresh and frozen meat and poultry major subcategory.

In contrast, 3 categories showed a statistically significant increase in mean sodium levels from 2010 to 2013. These included the sauces, dips, gravies, and condiments major subcategory (986 ± 806 to 1046 ± 1243; 6.1% increase, p = 0.002), which was influenced by the minor category soya and other oriental sauces (1355 ± 1345 to 3783 ± 2443; 179.2% increase, p < 0.001) (Table 1, Supplementary Table S2). Sodium levels were also higher in oriental noodles in 2013 compared with 2010 (222 ± 110 to 258 ± 79; 16.2% increase, p = 0.025). Several other categories had nutritionally relevant but not statistically significant increases in sodium, such as uncooked moisture enhanced meat, seasoned and stuffed fish and seafood, and sweet oriental sauces. However, these changes in the distribution of sodium likely resulted from large outliers or by sampling variation between 2010 and 2013.

Changes in the proportion of products meeting Health Canada’s sodium benchmarks

Overall, there was a slight increase in the proportion of foods that met at least one of the benchmark targets, from 51.4% of products in 2010 to 58.2% in 2013 (Fig. 1, Supplementary Table S2). This pattern was evident in most major food categories with the greatest...
est improvements from 2010 to 2013 observed among canned vegetables and legumes (33.5% to 46.1%), meat and meat substitutes (49.6% to 61.0%), and ready-to-eat breakfast cereals (64.1% to 74.2%). In contrast, nut butters had a lower proportion of products that met any benchmark in 2013 (83.3% to 71.4%) (Fig. 1b).

In 2013, the greatest proportion of products meeting the phase 3 goal benchmark targets were among breakfast cereals (51.3%), dairy products (48.5%), soups (44.4%), and meat and meat substitutes (39.8%) (Fig. 1b, Supplementary Table S2). From 2010 to 2013, most categories made a positive change towards meeting the phase 3 benchmark targets, increasing from 28.6% to 33.6%, over-
all. The greatest positive changes were seen in soups (28.4% to 44.4%), meat and meat substitutes (30.8% to 39.8%), snack foods (21.6% to 30.4%), and ready-to-eat breakfast cereals (42.7% to 51.3%). In contrast, nut butters and dairy products had a decrease in the proportion of products meeting the phase 3 goal benchmark level, 43.3% to 28.6% and 50.6% to 48.5%, respectively.

The proportion of foods that exceeded Health Canada’s maximum benchmark level reduced from 25.2% in 2010 to 20.8% in 2013 (Fig. 1a, Supplementary Table S2). The greatest reductions were observed among meat and meat substitutes (60.9% to 46.2%), canned vegetables and legumes (28.7% to 21.5%), breakfast cereals (14.6% to 9.0%), and bakery products (24.3% to 19.6%). These data are supported by the findings of a shift in the distribution of sodium from 2010 to 2013, whereby many categories had reduced sodium levels at the maximum end of the range, such as packaged bread products (range: 11–976 to 0–782 mg/100 g) and canned condensed soup (range: 128–477 to 128–399 mg/100 g). Additionally, a slight reduction in sodium content was also observed at the 75th percentile for many of these categories. These data point to efforts that are being made to improve the products with the highest levels of sodium.

**Discussion**

This data provides a detailed first evaluation of the effects of Canada’s voluntary approach to sodium reduction in foods that contribute the most sodium to the Canadian diet, work that is crucial in the absence of any federal or provincial sodium-monitoring program. Globally, this study is one of the largest known comprehensive assessments of changes to sodium levels in the food supply, and offers insight into food categories that are rapidly improving. In this study, only 16% of categories showed a statistically significant reduction in sodium from 2010 to 2013. Thus, despite some foods that had modest changes, the majority of food categories achieved no significant change (i.e., did not attain statistical significance). There was an overall increase in the proportion of foods meeting one of Health Canada’s sodium benchmark targets, from 51.4% in 2010 to 58.2% in 2013, and a reduction in the proportion of foods exceeding Health Canada’s maximum benchmark level (25.2% to 20.8%). This data has identified areas for action for the government and the food industry as other sodium reduction initiatives are implemented in an effort to meet the sodium intake goals set for 2016.

The 2010 “baseline” data on sodium levels in packaged foods represented the food supply at the release of Canada’s Sodium Reduction Strategy in 2010, with comparable data 2 years into implementation of that Strategy. The benchmark targets were set to achieve a 25%-30% overall sodium reduction by 2016, with interim targets developed to encourage incremental reductions of approximately one-third (8%-10% reduction) for phase 1, and one-third (16%-20% reduction) for phase 2. Examining the data in this manner allows for the observation of gradual incremental reductions that are occurring in the food supply, given that this is a mid-term analysis. Indeed, our data show that some manufacturers have opted to make dramatic reformulations in a short period of time. For example, ready-to-eat breakfast cereals, instant hot cereals, canned vegetables and legumes, plain chips, condiments, and imitation and simulated seafood each achieved a reduction in sodium of almost 15% or more. More modest, yet significant reductions in sodium of 7% to 14% occurred in packaged bread products, canned condensed soup, sausages and wiener, granola and cereal bars, fresh and frozen meat and poultry, shelf-stable mixed dishes, pasta, and meat analogues. These early, progressive changes may reflect the nature of sodium reduction in these types of foods, i.e., they may be more easily reformulated considering product quality and food safety or reformulated products may be well-accepted by consumers. In categories that did not achieve statistical significance, there was evidence of product reformulations occurring at the higher range of sodium, as demonstrated by lower sodium levels at the 75th percentile, lower maximum values, and reductions in the proportion of foods exceeding Health Canada’s maximum benchmark level. Despite these successes, statistically significant reductions in sodium were only observed in a small number of food categories. Since variations in food intake patterns vary across population subgroups, sodium reduction will eventually need to occur across all sectors of the foods supply to ensure equitable benefits for all Canadians.

Overall, the majority of categories (84%) had no significant change in sodium content between 2010 and 2013. Additionally, some of the foods that contribute the most significant amounts of dietary sodium remained relatively unchanged. For example, changes to the sodium content of packaged bread products were driven by reductions in English muffins and rolls and buns. Whereas, pantry breads, a widely consumed food, had only a 6.7% reduction in sodium with no significant change in the distribution of sodium from 2010 to 2013, a less than the expected rate of reduction. Other countries have made far greater gains in the reformulation of breads. Over a similar time period, sodium in breads have been reduced by 18% in Argentina and Spain (Ballesteros 2014; NCD Health Promotion and Control Department 2014), 12% in France (De L’Agence Nationale de Sécurité Sanitaire de L’alimentation de L’environnement et du Travail 2012), and 9% in Australia (Dunford et al. 2011). After breads, processed meats are the second greatest contributor to the sodium intakes of Canadians. Only sausages and wiener and fresh and frozen meat and poultry products had significantly lower levels of sodium in 2013. Importantly, the widely consumed package deli meat category had an insignificant 0.9% reduction in mean sodium levels, with no differences from 2010 to 2013 in the sodium content of either fully cooked or dry cured meats (data not presented). While some movement has been made on the proportion of deli meats that exceed Health Canada’s maximum benchmark level, as a whole, sodium levels have not changed enough to shift the distribution of the sodium content of foods in this category. On examination of all of the packaged foods included in this analysis, 41.8% of foods still do not meet any benchmark target and 20.8% still exceed Health Canada’s maximum benchmark level; therefore, there is still much progress to be made.

This data are a snapshot of the food industry’s progress 2 years into Health Canada’s sodium reduction target date of 2016; however, it raises the question of the effectiveness and sustainability of a voluntary approach to reducing sodium levels in packaged foods in the absence of other complementary policies or programs. In comparison, the success of voluntary trans fat reduction in the Canadian food supply is largely attributable to Health Canada’s Trans Fat Monitoring Program, which conducted periodic analysis and public reporting of the trans fat content in foods (Ratnayake et al. 2009a, 2009b; Krenosky et al. 2012). A recent assessment found that 97% of Canadian packaged and restaurant foods fall within the recommended trans fat limits (Arcand et al. 2014b). In the current Canadian political climate, however, it is unlikely that more assertive steps to sodium reduction will occur in Canada. Therefore, responsibility for the food industry to honor their commitments, on the government and other third parties to monitor food industry progress, and on consumers to choose lower sodium foods. Although Canadian consumers report a preference for lower sodium foods (Wong et al. 2013), some of the top-reported barriers to reducing sodium intake are the limited variety of lower sodium packaged foods and restaurant foods (Arcand et al. 2013). Therefore, industry must continue their efforts to meet the needs of engaged consumers. Reducing sodium across the food supply will also improve the health of Canadians who do not actively seek lower sodium foods.

While this study offers a comprehensive look at nutritional changes in the packaged food supply, there are limitations. There
Conflict of interest statement
The authors have no conflicts of interest to disclose.

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In summary, this study is the first comprehensive examination of early successes and shortcomings of the efforts made by the food industry in a voluntary program of reducing the sodium content of Canadian packaged foods. Though some progress has been made in various sectors, this data supports the need for continued efforts by the food industry in lowering the sodium content of packaged food items and for continued monitoring of this progress as foods are reformulated to meet the 2016 benchmark targets.

References


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