

# Sodium, sugar, and fat content of complementary infant and toddler foods sold in the United States, 2015<sup>1–3</sup>

Joyce Maalouf,<sup>4,6</sup> Mary E Cogswell,<sup>4\*</sup> Marlana Bates,<sup>4</sup> Keming Yuan,<sup>4</sup> Kelley S Scanlon,<sup>5</sup> Pamela Pehrsson,<sup>7</sup> Janelle P Gunn,<sup>5</sup> and Robert K Merritt<sup>4</sup>

<sup>4</sup>Division for Heart Disease and Stroke Prevention and <sup>5</sup>Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, CDC, Atlanta, GA; <sup>6</sup>IHRC Inc., Atlanta, GA; and <sup>7</sup>USDA, Agricultural Research Service, Beltsville, MD

## ABSTRACT

**Background:** As part of a healthy diet, limiting intakes of excess sodium, added sugars, saturated fat, and *trans* fat has been recommended. The American Heart Association recommends that children aged <2 y should avoid added sugars.

**Objective:** We sought to determine commercial complementary infant-toddler food categories that were of potential concern because of the sodium, added sugar, saturated fat, or *trans* fat content.

**Design:** Nutrition label information (e.g., serving size, sodium, saturated fat, *trans* fat) for 1032 infant and toddler foods was collected from manufacturers' websites and stores from May to July 2015 for 24 brands, which accounted for >95% of infant-toddler food sales. The presence of added sugars was determined from the ingredient list. Reference amount customarily consumed (RACC) categories were used to group foods and standardize serving sizes. A high sodium content was evaluated on the basis of the Upper Intake Level for children aged 1–3 y and the number of potential servings per day ([i.e., 1500 mg/7 servings (>210 mg/RACC)], a sodium amount >200 mg/100 g, or a mean sodium density >1000 mg/1000 kcal.

**Results:** In 2015, most commercial infant-only vegetables, fruit, dinners, and cereals were low in sodium, contained no saturated fat, and did not contain added sugars. On average, toddler meals contained 2233 mg Na/1000 kcal, and 84% of the meals had >210 mg Na/RACC (170 g), whereas 69% of infant-toddler savory snacks had >200 mg Na/100 g. More than 70% of toddler meals, cereal bars and breakfast pastries, and infant-toddler grain- or dairy-based desserts contained ≥1 sources of added sugar. Approximately 70% of toddler meals contained saturated fat (mean: 1.9 g/RACC), and no commercial infant-toddler foods contained *trans* fats.

**Conclusion:** Most commercial toddler meals, cereal bars and breakfast pastries, and infant-toddler snacks and desserts have high sodium contents or contain added sugars, suggesting a need for continued public health efforts to support parents in choosing complementary foods for their infants and toddlers. *Am J Clin Nutr* 2017;105:1443–52.

**Keywords:** baby foods, fat, sodium, sugar, toddler

## INTRODUCTION

Key recommendations for a healthy diet include limiting intake of excess sodium, added sugars, and saturated and *trans* fats

(1–3). A National Heart Lung and Blood Institute Expert Panel concluded that there is “strong and consistent evidence that good nutrition beginning at birth has profound health benefits with the potential to decrease future risk of CVD (cardiovascular disease)” (4). Data suggest that 40% of mothers in 2005–2007 introduced complementary solid foods to their children before the age of 4 mo (5), and in 2009–2012, habitual diets of most US children aged 1–3 y exceeded upper intakes for sodium (1500 mg/d) and calories from added sugars and solid fats (e.g., saturated and *trans* fats) (6–8). As far back as the 1970s, the National Academy of Science recommended that the industry limit added salt and other sources of sodium (e.g., monosodium glutamate) in baby food (9). The American Heart Association (AHA)<sup>8</sup> recommends that children aged <2 y should avoid added sugars because these children have “minimal room for nutrient-free calories” (10). Although it has not been recommended to restrict total fat intake, the Institute of Medicine recommends consuming as little as possible “while consuming a nutritionally adequate diet” because saturated and *trans* fats can increase risk of cardiovascular diseases (3, 4). The saturated fat content is not currently required on food products that are meant for children aged <2 y (11), but the revised label requires the reporting of saturated fat with a tentative daily reference value <10 g for children aged 1–3 y (12). The avoidance of *trans* fats is recommended (1, 4), and partially hydrogenated oils, which are the major source of *trans* fats, are no longer generally recognized as safe (GRAS) for use in human food as determined by the Food and Drug Administration (FDA) in June 2015 (13). Information on the sodium, added sugar, saturated fat, and *trans* fat contents of complementary foods and beverages that are

<sup>1</sup> Supported by the CDC.

<sup>2</sup> The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the CDC.

<sup>3</sup> Supplemental Tables 1–4 and Supplemental Figure 1 are available from the “Online Supporting Material” link in the online posting of the article and from the same link in the online table of contents at <http://ajcn.nutrition.org>.

\*To whom correspondence should be addressed. E-mail: [mec0@cdc.gov](mailto:mec0@cdc.gov).

<sup>8</sup> Abbreviations used: AHA, American Heart Association; FDA, Food and Drug Administration; GRAS, generally recognized as safe; RACC, reference amount customarily consumed.

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labeled specifically for infants and toddlers can help parents and health professionals determine the place of these foods and beverages in a healthy diet.

In 2012, US commercial infant-only foods were generally low-sodium foods (<140 mg/serving), and most of these foods did not contain added sugars (14). In contrast, toddler meals and savory snacks were sodium dense (>1000 mg/kcal), and 72% of toddler meals were high in sodium per serving (>210 mg) (14). In addition, the majority of toddler cereal bars and breakfast pastries, fruit, and infant-toddler snacks, infant mixed grains, desserts, and juices and drinks contained  $\geq 1$  source of added sugar (14). Since 2012, the nutrition content of US commercial infant and toddler foods was evaluated in 3 studies (15–17): None of the studies evaluated fat contents, and data were collected before mid-2015 (15–17). In addition, some manufacturers indicated that, since 2012, they have reduced the sodium and sugar contents of infant and toddler foods (18, 19) with the use of Codex standards for sodium-content limits (e.g., 200 mg Na/100 g) (19, 20). Studies have suggested that early dietary experiences can set later preferences for sweet and salty foods (21, 22).

The objective of this study was to determine commercial infant-toddler food categories that were of potential concern because of a high sodium, added sugar, saturated fat, or *trans* fat content. A secondary objective was to determine whether sodium and sugar contents changed since 2012.

## METHODS

### Data collection

With the use of similar methods that were used in the 2012 study (14), data were primarily collected from US manufacturers' websites; however, to identify major brands of infant and toddler foods, 9 retail and wholesale grocers and 2 drugstores were visited in metropolitan Atlanta, Georgia, and Seattle, Washington. Retail and wholesale grocers and drugstores were chosen on the basis of those that were listed in the top 20 food retailers and wholesalers in the United States and Canada in 2015 (23) and their availability in the United States and, specifically, in Atlanta, Georgia, and Seattle, Washington, where the researchers were located. The selected stores (retailers and wholesalers) represented 83% of the total annual sales volume in the top 20 food retailers and wholesalers in the United States (23). Sections and aisles that were labeled as containing baby or toddler foods were visited, and other aisles (e.g. dairy, freezer) in the stores were also checked. A total of 24 brands including 4 private-label or store brands were identified. These brands account for >95% of market share in infant and toddler foods sales (24). US manufacturers' websites were used to identify all of the infant-toddler food products that were available and to collect most of the nutrition and product information. For private-label and store-brand products ( $n = 90$ ) as well as some other products from major manufacturers for which nutrition information was not shown online ( $n = 13$ ), the identified grocers and retailers were revisited in Atlanta, Georgia, and Seattle, Washington, to collect nutrition information. As in the previous study (14), products that were targeted at infants and toddlers ( $\leq 36$  mo of age) were identified by the words baby, infant, toddler, and tots or by an age or stage within the range 0–36 mo. Products with the word “kid” or that were marketed or targeted at

children aged >36 mo were excluded. Infant formulas, fortified milk, and oral electrolytes were excluded because they are regulated separately by the FDA for labeling and nutrition contents (25).

Data collection took place between May and July 2015. Duplicates ( $n = 4$ ) and private-label products that were available online but not in stores were deleted ( $n = 10$ ), which resulted in a database of 1037 separate food products. As in the previous study (14), different brands of the same food type (e.g., carrot infant foods) were considered separate products, and nutritional information (e.g., total calories, sodium, total sugar, total fat, saturated fat, *trans* fat, and serving size) was entered in a database for each product from the Nutrition Facts label. The list of ingredients was also entered in the database along with the brand, product name, product description, and nutrient-content claims. Nutrition information came from manufacturers' websites ( $n = 934$  products), stores ( $n = 82$ ), or both ( $n = 21$ ). For quality-control purposes, a 5% sample of products with nutrition information from manufacturers' websites was selected ( $n = 48$ ) and checked in the stores. Thirty-eight products (80%) were identified in the stores, and the labels had identical package and nutrition information as that collected from the manufacturers' websites.

### Food categories

As in the previous study, food categories and standard serving sizes were based on the US FDA's reference amount customarily consumed (RACC) per eating occasion by age for infant and toddler foods, but for this study, new proposed RACCs were used (14, 26). New proposed RACCs are the same as those that were previously published except for the food-product categories of infant vegetables and infant fruit for which the RACC was changed from 60 to 110 g to correspond with the new proposed RACC in these categories (26) (**Table 1**). As in the previous study (14), food products were categorized according to the product name, main ingredients, age or stage, and serving sizes that are commonly used by the manufacturers (**Table 2**). Some food categories were modified on the basis of new products or food types that were identified in the marketplace (e.g., pureed fruit or fruit and vegetable mixtures for toddlers). Subcategories of vegetable-based infant foods were examined separately as follows: single vegetable, vegetable mixtures, and vegetables with legumes, grains, or rice. The term “infant foods” was used for products that were targeted at children aged 4–12 mo (stages 1–3), and the term “toddler foods” was used for products that were targeted at children aged 12–36 mo (stage 4). Five products that were categorized as sides were excluded from the analysis (e.g., toddler diced fruit or vegetables) because they did not have any corresponding assigned RACC. Therefore, the total number of food products included in the analysis was 1032 products.

### Nutrient assessment

Sodium, total sugar, and saturated fat and *trans* fat contents were evaluated according to the information that was collected from Nutrition Facts labels. The added sugar content is not currently required to be listed on the label, and thus, the ingredient list on the package was used to identify products with added sugars. Currently, no one standard criterion exists to assess the healthfulness of

**TABLE 1**Categorization of commercial infant and toddler food and drink products with associated serving sizes ( $n = 1032$ )<sup>1</sup>

Food-product category (examples)	RACC category <sup>2</sup>	<i>n</i>	RACC, <sup>3</sup> g	Serving size, <sup>4</sup> g
<b>Infant</b>				
Vegetables, stages 1–3 (single vegetables, e.g., pureed peas and pureed carrots)	Dinners, desserts, fruit, vegetables or soups, ready-to-serve, strained type	52	110	94
Dinners, soups, and vegetables, stages 2 and 3 (e.g., vegetables or vegetable, meat, pasta, or soup-based mixed dishes)	Dinners, desserts, fruit, vegetables or soups, ready-to-serve, junior type	189	110	113
Fruit, stages 1–3 (pureed single or mixed fruit)	Dinners, desserts, fruit, vegetables or soups, ready-to-serve, strained or junior type	256	110	113
Cereals, dry and instant (e.g., dry rice cereal)	Cereals, dry/instant	40	15	15
Mixed grains and fruit, ready-to-serve (e.g., oatmeal and fruit in a jar, ready-to-serve)	Cereals, prepared, ready-to-serve	78	110	113
<b>Toddler</b>				
Dinners or meals (vegetable, meat/poultry/fish, and pasta-, pizza- or soup-based mixed dishes)	Dinners, stews, or soups for toddlers, ready-to-serve	43	170	155
Cereal bars and breakfast pastries (e.g., cereal bars, cereal and fruit bars, and cakes or bread)	Other cereal and grain products, dry ready-to-eat	29	20	19
Fruit (e.g., pureed fruit mixtures or fruit and vegetable mixtures)	Fruits for toddlers, ready-to-serve	49	125	120
Dry fruit-based snacks (e.g., freeze-dried yogurt or fruit snacks and dehydrated fruit snacks)	Dinners, desserts, fruit, vegetables or soups, dry mix	55	15	7
<b>Infant or toddler</b>				
Savory snacks (e.g., crackers and savory rice cakes)	Dinners, desserts, fruit, vegetables or soups, dry mix	36	15	8
Dry grain-based desserts (e.g., cookies, sweet biscuits or graham crackers, and sweet rice cakes and puffs)	Other cereal and grain products, dry ready-to-eat (e.g., ready-to-eat cereals, cookies, teething biscuits, and toasts)	80	7	7
Dairy-based desserts (e.g., yogurt with or without fruit)	Dinners, desserts, fruit, vegetables or soups, ready-to-serve, junior type	100	110	113
Juices and drinks (e.g., single or mixed fruit juices and drinks)	Juices, all varieties	25	120	118

<sup>1</sup> *n* denotes the number of products with serving-size information. Stage 1 foods are finely pureed solid foods that are meant for infants aged 4–6 mo, stage 2 foods are strained junior foods that are meant for infants aged 7–8 mo, and stage 3 foods are partially strained foods with small, tender chunks that are meant for infants aged 9–12 mo. RACC, reference amount customarily consumed.

<sup>2</sup> RACC is a unit measure that was used to determine the amount of food that constituted a serving. Corresponding US Food and Drug Administration's food categories for infant and toddler foods were used to set the RACC to help determine serving sizes for Nutrition Facts labels.

<sup>3</sup> The new proposed values by the Food and Drug Administration were used to represent the amount of the specified food that was consumed, on average, per eating occasion. See reference 26.

<sup>4</sup> Median manufacturer serving size as listed on the Nutrition Facts label of the products in the specified food category.

sodium, sugar, and fat contents across all commercial infant-toddler foods. As in the previous analysis (14), to account for the variability in serving sizes across foods within each category, the amount of nutrient in the food was standardized according to the corresponding RACC for its category (Table 1). The nutrient amount (per 100 g food) also was assessed to account for the variability in RACCs between food categories. Additional criteria that were used to assess sodium, added sugar, saturated fat, and *trans* fat contents were as follows.

### Sodium

The sodium content of each food was determined in relation to the following 3 measures: 1) milligrams of sodium per standard serving (RACC); 2) sodium density in milligrams per 1000 kcal; and 3) the sodium amount in milligrams per 100 g. First, as in previous analyses (14, 27), products were defined as low sodium if they contained  $\leq 140$  mg/RACC and high sodium if they contained  $> 210$  mg/RACC. This approach has been described in more detail in previous articles (14, 27) and was determined on the basis of the Institute of Medicine's

Dietary Reference Intakes (Adequate Intake: 1000 mg; Tolerable Upper Intake Level: 1500 mg) for habitual daily sodium intake for children aged 1–3 y (12) and divided by 7 daily servings of applicable foods (grains, protein, and dairy food groups) on the basis of the USDA's MyPlate recommendations for children aged 2–3 y (28) and the FDA's labeling regulation for low sodium, which is  $\leq 140$  mg/serving (29). Second, the sodium density (milligrams of sodium per kilocalorie) has been proposed as a practical approach for identifying low-sodium-food choices (30). Sodium and energy intake are highly correlated and intake of foods that are more-sodium dense can result in excess intake (30). Consistent with this, the Codex Alimentarius international food-code standards state that cereal-based foods for children aged  $< 3$  y should not exceed 100 mg/100 kcal (or 1000 mg/1000 kcal) (31). Finally, the Codex standard states that canned baby foods for children aged  $< 3$  y should not exceed 200 mg/100 g and, thus, was also used to evaluate high sodium contents (20). Because the rationale for applying one measure over another is unclear, all 3 standards were applied in the current study.

**TABLE 2**  
Sodium content of infant and toddler food and drink products according to 3 sodium measures by product category<sup>1</sup>

Food-product category	n	Per standard serving, mg/RACC <sup>2</sup>						Amount, mg/100 g		
		Mean (95% CI)	Median	≤140, n (%)	141–210, n (%)	>210, n (%)	Mean (95% CI)	>200, <sup>3</sup> n (%)	Density, <sup>4</sup> mg/1000 kcal	
										Mean (95% CI)
Sodium										
Infant										
Vegetables, stage 1–3	52	25 (17, 32)	12	52 (100)	0	0	23 (16, 29)	0	537 (367, 708)	
Dinners, soups, and vegetables, stages 2 and 3	189	32 (28, 37)	28	183 (97)	6 (3)	0	30 (26, 34)	0	482 (417, 547)	
Fruit, stages 1–3	256	7 (5, 8)	4	256 (100)	0	0	6 (5, 8)	0	102 (79, 125)	
Cereals, dry and instant	40	4 (1, 8)	0	40 (100)	0	0	29 (5, 53)	0	72 (12, 133)	
Mixed grains and fruit, ready-to-serve	78	10 (5, 16)	5	78 (100)	0	0	10 (4, 15)	0	110 (61, 160)	
Toddler										
Dinners or meals	43	297 (266, 327)	302	2 (5)	5 (12)	36 (84)	174 (157, 192)	2 (5)	2233 (1858, 2608)	
Cereal bars and breakfast pastries	29	38 (27, 50)	40	29 (100)	0	0	191 (134, 249)	13 (45)	625 (388, 862)	
Fruit (e.g., pureed fruit mixtures or fruit and vegetable mixtures)	49	11 (8, 13)	10	49 (100)	0	0	8 (6, 11)	0	142 (98, 185)	
Dry fruit-based snacks	55	17 (12, 21)	8	55 (100)	0	0	112 (82, 142)	20 (36)	276 (204, 348)	
Infant or toddler										
Savory snacks	36	67 (49, 85)	57	33 (92)	2 (6)	1 (3)	447 (325, 570)	25 (69)	997 (743, 1250)	
Dry grain-based desserts	80	9 (6, 11)	4	80 (100)	0	0	126 (91, 162)	22 (27)	312 (224, 399)	
Dairy-based desserts	100	32 (28, 37)	28	100 (100)	0	0	29 (25, 34)	0	330 (290, 370)	
Juices and drinks	25	11 (8, 14)	10	25 (100)	0	0	9 (7, 12)	0	201 (155, 248)	
Total	1032	31 (27, 35)	10	982 (95)	13 (1)	37 (4)	57 (50, 65)	82 (8)	380 (342, 417)	

<sup>1</sup> n denotes the number of products. Stage 1 foods are finely pureed solid foods that are meant for infants aged 4–6 mo, stage 2 foods are strained junior foods that are meant for infants aged 7–8 mo, and stage 3 foods are partially strained foods with small, tender chunks that are meant for infants aged 9–12 mo.

<sup>2</sup> RACC, reference amount customarily consumed. The amount per RACC was considered low if sodium was ≤140 mg and high if sodium was >210 mg.

<sup>3</sup> Codex international food standards that were formed by the WHO and Food and Agriculture Organization of the United Nations were used by the manufacturers for defining a high sodium content (>200 mg Na/100 g) (13, 14).

<sup>4</sup> All values are means (95% CIs).

### Added sugar

Foods that contained  $\geq 1$  source of added sugar in the ingredient list were identified by comparing the ingredient list for each food with a list of the added sugars from the *Dietary Guidelines for Americans 2015–2020* and USDA's MyPlate recommendations and from other studies (1, 14, 10, 12, 28). This list included sugar, sweetener, syrup, corn syrup, high-fructose corn syrup, honey, fructose, maltose, molasses, dextrose, glucose, lactose, sucrose, turbinado, trehalose, juice concentrate, and cane juice, syrup, or sugar. The placement of the added sugars in the ingredient list was identified (e.g., third ingredient). In the current study, the researchers also identified whether water was an ingredient and if the label indicated the product was reconstituted. When reconstituted to a single strength, fruit-juice concentrate can be considered not an added sugar (12). As an example, some manufacturers include, in the ingredient list, fruit juice concentrate in parentheses with water [e.g. (apple-juice concentrate, water)], meaning that the fruit juice was reconstituted to a single strength. If water was not added, the juice concentrate was used for flavor and was defined as an added sugar.

### Saturated and trans fats

Foods that contained saturated and *trans* fats were identified via the information on the Nutrition Facts label. Saturated fat is not required to be listed for products other than for infant formula that are "represented or purported to be specifically for infants and children <2 years" of age (11). Saturated fat and *trans* fat may be listed as zero if the food contains <0.5 g/serving (11). The saturated fat content is also not required to be listed on the Nutrition Facts label if the product contains <0.5 g total fat. Consistent with labeling rules of products that report the saturated fat content ( $\geq 0$  g), products that reported having >0.5 g saturated fat were counted as containing saturated fat (11).

### Statistical analysis

For each food category, mean (95% CI) and median sodium contents (e.g., expressed as mg/RACC, mg/100 g, or mg/1000 kcal) and total sugar contents (expressed as mg/RACC and mg/100 g) were estimated as well as the proportions of products with 1) a low sodium content, 2) a high sodium content, 3)  $\geq 1$  source of added sugar, 4)  $\geq 0.5$  g saturated fat, and 5)  $\geq 0.5$  g *trans* fat. Food categories that were of potential concern because of a high sodium content were identified as those with a majority (>50%) of products with a high sodium content per standard serving or per 100 g or with a mean sodium density >1000 mg/1000 kcal. Food categories that were of potential concern because of added sugars were those in which >50% of products contained  $\geq 1$  source of added sugar. Food categories that were of potential concern for saturated fat were those in which >50% of food products contained  $\geq 0.5$  g saturated fat, whereas food categories that were of potential concern for *trans* fats were those in which any products contained  $\geq 0.5$  g *trans* fat.

Of products that containing saturated fat, the mean (95% CI) and median saturated fat contents per RACC and per 100 g were also estimated. In post hoc analyses, mean and median total fat contents (per labeled serving, per RACC, or per 100 g) were

estimated and stratified according to whether foods declared (reported) the saturated fat content on the Nutrition Facts label. *t* Tests were used to determine whether mean sodium contents differed. To test the difference in mean sodium and sugar contents of infant and toddler foods, a *t* test was used on the basis of the means  $\pm$  SEs for the current 2015 data and for the previously published 2012 data (14). Chi-square tests were used to determine the difference in the proportion of products with added sugars between 2012 and 2015. All statistical analyses were performed with the use of the statistical software packages PASW Statistics 23.0 for Windows (SPSS Inc.) and SAS version 9.4 (SAS Institute Inc.).

## RESULTS

### Sodium content

The mean sodium content of infant-only foods was generally low (Table 2). Almost all infant-only foods contained  $\leq 140$  mg/serving (RACC), no food contained >210 mg/serving or >200 mg/100 g (Table 2), and the mean sodium density was <1000 mg/1000 kcal for all infant-only food categories. Compared with foods that were meant only for infants, the sodium content in some food categories that were meant for toddlers (toddler or infant-toddler) was high. Only 2 of 43 toddler meals or dinners contained  $\leq 140$  mg Na/serving (RACC: 170 g); 84% of these meals or dinners had >210 mg Na/RACC, and the mean sodium density was 2233 mg/1000 kcal. In addition, 69% of infant-toddler savory snacks had >200 mg/100 g with a sodium density at 997 mg/1000 kcal (Table 2). In addition, although the majority of toddler or infant-toddler food categories were low in sodium per standard serving, >1 in 4 cereal bars and breakfast pastries, dry fruit-based snacks, and dry grain-based snacks had >200 mg Na/100 g.

### Added sugar

Most infant-only food products did not contain any added sugar. By category, the proportion of products with added sugars ranged from 2% of vegetables (1 of 52) (stages 1–3) to 44% of fruit (stages 1–3) (Table 3). In addition, in the infant-only food categories, the overall total sugar amount was generally low. The mean total sugar content per 100 g ranged from 4 mg [dinners, soups, vegetables (stages 2 and 3)] to 12 mg (cereals both dry and instant) (Table 3).

Compared with commercial foods that were meant only for infants, most of the foods in 5 of 8 categories that were meant for toddlers or infants and toddlers contained  $\geq 1$  source of added sugar (Table 3), including toddler meals (72%), cereal bars and breakfast pastries (97%), dry fruit-based snacks (73%), dry grain-based desserts (95%), and dairy-based desserts (71%). In addition, 37% of toddler fruit and 44% of savory snacks contained added sugars.

Of 440 total products (43% of 1032 products assessed) with a source of added sugar, fruit-juice concentrate was the most commonly used source, whereby 77% of the products with  $\geq 1$  source of added sugar included fruit-juice concentrate as an ingredient. Of 440 total products, sugar (31%), cane (12%), syrup (9%), and honey, malt, molasses, and dextrose (2–5% each) were also used as sources of added sugars. Added sugars

**TABLE 3**Total sugar content and presence of added sugars in infant and toddler food or drink products by product category<sup>1</sup>

Food- or drink-product category	<i>n</i>	Total sugar per standard serving, g/RACC <sup>2</sup>	Total sugar amount, g/100 g	≥1 source of added sugar, <sup>3</sup> <i>n</i> (%)
<b>Infant</b>				
Vegetables, stages 1–3	52	5 (5, 6) <sup>4</sup>	5 (4, 6)	1 (2)
Dinners, soups, and vegetables, stages 2 and 3	189	4 (4, 5)	4 (3, 4)	18 (9)
Fruit, stages 1–3	256	12 (12, 13)	11 (11, 12)	113 (44)
Cereals, dry and instant	40	2 (1, 2)	12 (8, 15)	5 (12)
Mixed grains and fruit, ready-to-serve	78	10 (9, 11)	9 (9, 10)	21 (27)
<b>Toddler</b>				
Dinners or meals	43	4 (3, 4)	2 (2, 3)	31 (72)
Cereal bars and breakfast pastries	29	5 (4, 6)	25 (21, 29)	28 (97)
Fruit (e.g., pureed fruit mixtures or fruit and vegetable mixtures)	49	14 (13, 15)	11 (10, 12)	18 (37)
Dry fruit-based snacks	56	9 (8, 9)	57 (53, 60)	40 (73)
<b>Infant or toddler</b>				
Savory snacks	36	1 (0, 2)	7 (3, 11)	16 (44)
Dry grain-based desserts	80	1 (1, 1)	12 (9, 15)	76 (95)
Dairy-based desserts	100	12 (12, 13)	11 (11, 12)	71 (71)
Juices and drinks	25	11 (9, 13)	9 (8, 11)	2 (8)
<b>Total</b>	<b>1032</b>	<b>8 (8, 8)</b>	<b>12 (11, 12)</b>	<b>440 (43)</b>

<sup>1</sup>Total sugar content included monosaccharides and disaccharides as shown in the sugar line of the Nutrition Facts panel. *n* denotes the number of products. Stage 1 foods are finely pureed solid foods that are meant for infants aged 4–6 mo, stage 2 foods are strained junior foods that are meant for infants aged 7–8 mo, and stage 3 foods are partially strained foods with small, tender chunks that are meant for infants aged 9–12 mo.

<sup>2</sup>RACC, reference amount customarily consumed. The RACC is a unit measure that was used to determine the amount of food that constituted a serving.

<sup>3</sup>Contained ≥1 of the following ingredients: sugar, sweetener, syrup, corn syrup, high-fructose corn syrup, honey, fructose, malt, maltose, molasses, dextrose, glucose, lactose, sucrose, turbinado, trehalose, fruit-juice concentrate, and cane juice.

<sup>4</sup>Mean; 95% CI in parentheses (all such values).

were listed in the first 5 ingredients on the labels of 95% of products that contained added sugars (data not shown). In the remaining products with no added sugars (*n* = 592), water was used as an ingredient along with the fruit-juice concentrate in 46 products (not shown). In 10 of these 46 products, according to the package information, the fruit-juice concentrate was diluted to 100% juice.

### Saturated fat and trans fat

As expected, the saturated fat content was not consistently reported especially in infant-only food categories (Table 4). In products that reported the saturated fat content, most of them contained 0 to <0.5 g saturated fat per reported label serving with 1 exception. Approximately 70% of toddler meals contained saturated fat, and of these products, the mean saturated fat content was 1.9 g/RACC (170 g). In contrast, of products that did not report the saturated fat content (*n* = 278), the total fat content ranged from 0.5 to 10 g per label serving, and the mean total fat per RACC was 1.8 g (95% CI: 1.6, 1.9 g) compared with 0.5 g (95% CI: 0.4, 0.6 g) in products that reported the saturated fat content (Supplemental Table 1). According to the labels, none of the infant or toddler food products contained trans fat.

### Comparison of 2012 and 2015 data

Overall, the number of infant-toddler dinners or meals and juices and drinks that we assessed had declined between 2012 and 2015, whereas the number of dairy-based desserts and fruit that we assessed had increased (Supplemental Tables 2 and 3).

Between 2012 and 2015, the mean sodium density and amount did not significantly decline for most categories of infant-toddler foods with some exceptions. The mean sodium amount (milligrams per 100 g) of toddler dinners or meals was 18% lower than in 2012 (*P* = 0.02) (Supplemental Table 2) with the distribution shifted so that most products had just <200 mg/100 g (Supplemental Figure 1). No significant decline occurred in the mean sodium density of toddler meals, and as noted previously, the majority of toddler meals were high in sodium per standard serving (>210 mg/170 g) (84% compared with 72% in 2012). The mean sodium amount and density significantly declined in dairy-based desserts, but the overall magnitude of the decline was small (Supplemental Table 2). Between 2012 and 2015, the mean sodium density for savory snacks declined ~385 mg/1000 kcal, but the mean sodium amount did not significantly decline.

Similar to the sodium content, the mean total sugar amount and proportion of products with added sugars did not significantly decline for most food categories (Supplemental Table 3). A significant decline in the mean total sugar amount occurred in dry grain-based desserts (–5.9 g total sugar/100 g), whereas a significant increase occurred in infant cereals (4.2 g total sugar/100 g) (Supplemental Table 3). The proportion of products with ≥1 source of added sugars decreased in 4 food categories and increased in 3 food categories; however, the mean total sugar amount did not change in these categories (Supplemental Table 3).

### DISCUSSION

To our knowledge, this study provides the most-current summary and comprehensive data on the sodium, sugar, and fat contents of commercial infant and toddler food products that are

**TABLE 4**  
Saturated fat content of infant and toddler food and drink products by product category<sup>1</sup>

Food-product category	n	Saturated fat reported, <sup>2</sup> n	Total foods, n (%)	Foods containing $\geq 0.5$ g saturated fat/serving			
				Saturated fat per standard serving, g/RACC <sup>3</sup>		Saturated fat amount, g/100 g	
				Mean	Median (range)	Mean	Median (range)
<b>Infant</b>							
Vegetables, stages 1–3	52	50	0	0	0	0	0
Dinners, soups, and vegetables, stages 2 and 3	189	70	0	0	0	0	0
Fruit, stages 1–3	256	243	0	0	0	0	0
Cereals, dry and instant	40	9	0	0	0	0	0
Mixed grains and fruit, ready-to-serve	78	40	2 (5.0)	0.4	0.4 (0.4–0.4)	0.4	0.4 (0.4–0.4)
<b>Toddler</b>							
Dinners or meals	43	43	30 (69.8)	1.9	1.7 (0.5–5.9)	1.1	1.0 (0.3–3.4)
Cereal bars and breakfast pastries	29	23	2 (8.7)	0.2	0.2 (0.2–0.3)	1.2	1.2 (1.1–1.3)
Fruit (e.g., pureed fruit mixtures or fruit and vegetable mixtures)	49	47	2 (4.3)	0.8	0.8 (0.5–1.1)	0.7	0.7 (0.4–0.9)
Dry fruit-based snacks	55	50	1 (2.0)	0.6	0.6	4.2	4.2
<b>Infant or toddler</b>							
Savory snacks	36	27	6 (22.2)	0.8	0.5 (0.5–2.1)	5.5	3.6 (3.3–14.3)
Dry grain-based desserts	80	72	8 (11.1)	0.6	0.4 (0.3–1.0)	7.9	5.0 (4.4–14.3)
Dairy-based desserts	100	55	24 (43.6)	1.4	1.1 (0.5–2.3)	1.2	1.0 (0.4–2.1)
Juices and drinks	25	25	0	0	0	0	0
<b>Total<sup>4</sup></b>	<b>1032</b>	<b>754</b>	<b>75</b>	<b>1.4</b>	<b>1.1 (0.2–5.9)</b>	<b>2.2</b>	<b>1.2 (0.3–14.3)</b>

<sup>1</sup> Stage 1 foods are finely pureed solid foods that are meant for infants aged 4–6 mo, stage 2 foods are strained junior foods that are meant for infants aged 7–8 mo, and stage 3 foods are partially strained foods with small, tender chunks that are meant for infants aged 9–12 mo.

<sup>2</sup> There were 278 of 1032 total products that did not report the saturated fat content on the food label, and thus, they were excluded from this analysis.

<sup>3</sup> RACC, reference amount customarily consumed. RACC is a unit measure that was used to determine the amount of food that constituted a serving.

<sup>4</sup> None of the products contained industrially produced *trans* fat.

sold in the United States. In 2015, commercial foods that were meant only for infants were generally low in sodium and most of them did not contain added sugars, and foods that were meant for infants and toddlers were generally low in saturated and *trans* fat contents although a substantial proportion of products did not report the saturated fat content. In contrast, commercial toddler meals and infant-toddler snacks and desserts may be of potential concern because of the high sodium or added-sugar content. Since 2012, reductions in sodium and sugar contents were inconsistent across commercial infant-toddler food categories. The results from this study suggest that there is a need for continued public health efforts to support parents in choosing foods for their infants and toddlers.

The changes in sodium and sugar contents between 2012 and 2015 may reflect differences in the types and numbers of foods that were assessed in each category as well as any changes, or lack thereof, in the reformulation of foods. Although it appears that manufacturers reduced the mean sodium amount of toddler meals  $\sim 20\%$ , the reductions appeared aimed at reducing the sodium amount to just  $< 200$  mg/100 g. This is an issue because the amount of sodium per standard serving and sodium density remained high. Savory snacks significantly declined in sodium density to just  $< 1000$  mg/1000 kcal, but the sodium amount did not decrease, thereby suggesting an increase in calories rather than a decrease in sodium.

For added sugar, the food category with the largest decline was juices and drinks; however, at least part of this decline was explained by how added sugar was defined. In 2015, juice concentrate was not counted as an added sugar if it was reconstituted to

100% juice on the basis of further information on the package. In contrast, in 2012, juice concentrate was counted as an added sugar regardless of the reconstitution. If the 2012 method of counting was used in 2015, 12 of 25 juices and drinks (48%) in 2015 would be counted as having a source of added sugars, which would still be a significant decrease from 88% in 2012. Toddler meals had the largest increase in the proportion of products with added sugars. Although sugar might have been added to foods in which the sodium content was lowered, the mean total sugar amount of toddler meals and juices and drinks did not significantly change. The lack of a significant change in the total mean sugar amount could be explained by the addition of only minimal amounts of sugar or by the exchange of types of sugars (added or inherent) while maintaining the same mean sugar amount.

The food categories that were identified as being of potential concern because of a high sodium or sugar content were similar to those identified in 2012 except for juices and drinks. According to the AHA, it is unclear whether the sugar in 100% juice has similar health effects to those from added sugars (5); however, the National Heart, Lung, and Blood Institute expert panel, the AHA, and the AAP recommend limiting juice to 4 ounces/d for young children because the juice may replace other more-nutrient-dense foods or add unnecessary calories (2, 10, 32).

The categories that were identified as having high sodium contents (i.e., toddler meals and savory snacks) were generally similar to the food categories that were identified in 2016 by the FDA as having “potential for meaningful sodium reduction” on the basis of their consumption and the amount of added, rather than inherent, sodium (**Supplemental Table 4**) (33). The additional

category that was identified by the FDA (i.e., “baby/toddler snacks: cookies/biscuits”) could have encompassed toddler cereal bars and breakfast pastries and infant-toddler dry grain-based desserts in this study. These categories were the basis for a draft of voluntary sodium-reduction goals (33). Although differences in analyses and food categorizations limit comparisons, it appears that mean sodium amounts in 2015 of the products that were assessed in this study were less than the 10-y draft goals for toddler meals and cookies and biscuits but not of seasoned puffs (Table 2, Supplemental Table 4) with the sodium amounts of only a few toddler meals being above upper bounds (Supplemental Table 4, Supplemental Figure 1). The goals are not final, and comments are being reviewed.

*trans* Fats were not a concern in infant-toddler foods as might have been expected on the basis of revoking the GRAS status of partially hydrogenated oils in all foods in June 2015 (13). The lack of the saturated fat content on the label does not necessarily translate to a low content of saturated fat because foods that do not have the saturated fat content listed on the label, on average, had a higher total fat content (Supplemental Table 1). The saturated fat content was declared on all of the toddler meals that were assessed, and although the majority of the meals contained saturated fat, on average, the amount was low at <1.3 g, which is the mean amount in 2% cow milk (34). However, the amount per serving could have been as high as 5.9 g, which is greater than one-half the tentative daily reference value of <10 g for children aged 1–3 y (12). Of the infant-toddler snacks (dry fruit-based or savory) and grain-based desserts for which the saturated fat content was declared, the majority of foods contained no (<0.5 g/serving) saturated fat, but of those foods with the saturated fat content declared, the mean amounts (3.6–5.0 g Na/100 g) were >50% higher than those in whole milk (1.9 g Na/100 g) (34) with some food products having sodium amounts as high as 14.3 g/100 g. However, when examined per standard serving size, the mean saturated fat content of these infant-toddler snacks ( $n = 7$ ) and grain-based desserts ( $n = 8$ ) was <1.0 g. Selecting foods with lower saturated fat per serving as well as limiting the consumption to the standard serving size or less could help meet the tentative daily reference value of <10 g for children aged 1–3 y (12).

A potential limitation of this study is that the foods of concern were selected because of potential high sodium contents differed depending on which measure was used. Each measure has its strengths and challenges; the use of the amount of sodium per serving is helpful for counseling parents to choose foods that are low in sodium because this method is how the sodium content is declared on the label. Also, the sodium per standard serving accounts for the number of servings (snacks and meals) per day. The use of the standard serving helps to identify foods that may be moderate in sodium but are typically consumed in larger servings, thereby contributing more to sodium intake than foods do that typically are consumed in smaller servings but with higher sodium amounts. The sodium amount in a food is an indicator of its salty taste, and as indicated earlier, research has suggested that intake of salty foods should be limited at an early age, which may help to determine later taste preferences (21, 22). Finally, because calories and sodium are highly correlated, the consumption of foods that are less sodium dense can reduce overall sodium intake (30). However, some foods, such as savory snacks, are high in both sodium and calories per gram, which is why the amount is relatively low compared with that of other foods such as toddler meals. The use of all 3 standards can potentially better identify food categories that

are high in sodium. A potential revision to the guidance on the labeling of foods as healthy is under consideration (35), and if standards become available for infant-toddler foods, they could be applied in future analyses.

There are other potential limitations to this study. First, nutrient values that were declared on the label could have varied from the actual values by  $\pm 20\%$  (11). Second, this evaluation was limited to the nutrient contents of commercial infant and toddler foods and did not include information on the consumption or contribution to total dietary intake, which might have identified different or additional categories. Although a previous study in 2003–2010 suggested that complementary infant foods are one of the top contributors to US sodium intake in children aged 6–12 mo, data on other nutrients or the contributions of commercial toddler foods to dietary intake are unknown (36). Third, the database in this study did not include Universal Product Codes, sales data, or market shares of the food products and might not have included all of the infant and toddler food products that were available on the market at the time (e.g., private-label brands in regions other than those surveyed). Fourth, the 2015 database manufacturers were identified by visiting top food retailer and wholesalers, whereas a commercial nutrition database was used in 2012 (14). Although there were some differences in brands that were identified because of the regional variability and discontinuation of some smaller brands, the majority of identified brands did not differ. Because the market is constantly changing, the 2015 database contained slightly different numbers of products and potentially different or new products, which might have accounted for some of the changes that were observed since 2012 and may not have reflected all of the products that are available in 2017 or those that are currently in the USDA’s Branded Food Products Database (34).

The current study suggests that excess sodium or added sugars may be a concern in most of the foods that are manufactured for toddlers and commercial infant-toddler snacks or desserts. The absence of *trans* fat was positive and expected because the data collection occurred after *trans* fats were no longer GRAS. After a limit of 0.25% was set for the addition of salt to baby foods in 1970, the amount of sodium declined and has remained low in infant-only foods (9, 14, 37).

In conclusion, new FDA voluntary sodium-reduction goals for the industry could support increased access to and greater availability of lower-sodium foods across the US food supply including commercial infant-toddler foods (33). Added sugar and saturated fat information on the revised Nutrition Facts label may make it easier for parents to choose healthier foods for their children (12). These and other actions can support the efforts of parents and caregivers to offer their children fruit and vegetables without added salt, solid fats, and sugars; to limit the consumption of salty snacks, sweet desserts, and sugar-sweetened beverages; and to check labels and choose products that are lower in excess sodium, added sugar, and saturated fat. Feeding infants and toddlers foods that are low in excess sodium, added sugar, and saturated fat can lead to a preference for these foods and improve the health of children as they grow.

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statistical analyses and revised the manuscript for its final content; PP: revised the manuscript for its final content; and all authors: read and approved the final manuscript. None of the authors reported a conflict of interest related to the study.

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