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Top sources of dietary sodium from birth to age 24 mo, United States, 2003–20101[2,3,4],5

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Abstract

Background—Sodium intake is high in US children. Data are limited on the dietary sources of sodium, especially from birth to age 24 mo.

Objective—We identified top sources of dietary sodium in US children from birth to age 24 mo.

Design—Data from the NHANES 2003–2010 were used to examine food sources of sodium (population proportions and mean intakes) in 778 participants aged 0–5.9 mo, 914 participants aged 6–11.9 mo, and 1219 participants aged 12–23.9 mo by sociodemographic characteristics.

Results—Overall, mean dietary sodium intake was low in 0–5.9-moold children, and the top contributors were formula (71.7%), human milk (22.9%), and commercial baby foods (2.2%). In infants aged 6–11.9 mo, the top 5 contributors were formula (26.7%), commercial baby foods (8.8%), soups (6.1%), pasta mixed dishes (4.0%), and human milk (3.9%). In children aged 12–23.9 mo, the top contributors were milk (12.2%), soups (5.4%), cheese (5.2%), pasta mixed dishes (5.1%), and frankfurters and sausages (4.6%). Despite significant variation in top food categories across racial/ethnic groups, commercial baby foods were a top food contributor in children aged 6–11.9 mo, and frankfurters and sausages were a top food contributor in children aged 12–23.9 mo. The top 5 food categories that contributed to sodium intake also differed by sex. Most of the sodium consumed (83–90%) came from store foods (e.g., from the supermarket). In children aged 12–23.9 mo, 9% of sodium consumed came from restaurant foods, and 4% of sodium came from childcare center foods.

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[4]Supplemental Tables 1–3 are available from the “Supplemental data” link in the online posting of the article and from the same link in the online table of contents at http://ajcn.nutrition.org.

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Conclusions—The vast majority of sodium consumed comes from foods other than infant formula or human milk after the age of 6 mo. Although the majority of sodium intake was from store foods, after age 12 mo, restaurant foods contribute significantly to intake. Reducing the sodium content in these settings would reduce sodium intake in the youngest consumers.

Keywords

children; infants; nutrition; sodium; birth; foods; toddler

INTRODUCTION

US children consume more sodium than recommended (1–3); 79% of preschoolers aged 1–3 y exceeded the tolerable upper intake (2, 3) of 1500 mg/d or the “amount of sodium that may place an individual at risk due to potential adverse health effects” (4). Sodium intake is related to high blood pressure, a major risk factor for heart disease and stroke, which are the leading causes of death in the United States (5, 6). Hypertension, although more common in adults, also occurs in children (7, 8). Results of meta-analyses of randomized controlled trials and studies in children suggested sodium intake is directly related to blood pressure (9–11). An average reduction of 42–54% of sodium intake in infants and children led to an average shift of −1.17 to −2.47 mm Hg in systolic blood pressure, respectively (9). High blood pressure in children can track into adulthood (12, 13). Because of the high dietary sodium intake of young children, identifying the top contributors could provide targets for changes in the marketplace and food environment and support the development of Dietary Guidelines for US infants and toddlers (14, 15). However, limited data exist particularly for infants and children from birth to age 24 mo, particularly in demographic subgroups.

The most recent data on dietary sources of sodium were provided by a study of a national sample of 3022 US infants and toddlers aged 4–24 mo collected in 2006 (16). Major sources of sodium were infant formula and breast milk for infants 4–5 mo of age and a variety of processed foods for infants 6–11 mo of age and toddlers 12–24 mo of age (16). Because of continual changes in the marketplace, sources of sodium intake may change over time. In addition, the study did not examine sources of sodium intake in non-Hispanic blacks, who, compared with non-Hispanic whites, are at higher risk of heart disease and stroke as adults and whose blood pressure may be more sensitive to sodium intake (4, 17). For infants and toddlers, exposure to excess sodium in foods may be particularly important because evidence suggested that a taste preference for salty foods is established after birth with the introduction of complementary foods (18, 19). After the initiation of complementary feeding, sodium intake can include sodium added as part of commercially prepared packaged and restaurant foods, naturally occurring sodium (e.g., in milk), or salt added at the table or in home cooking. The main objective of this study was to identify top dietary sources of sodium intake in US children from birth to 24 mo of age including food categories and places obtained (e.g., store and restaurant). A secondary objective was to examine differences in sodium intake and food sources by demographic characteristics such as age, sex, and race-ethnicity.

METHODS

Study design and methods

We used data from the dietary component of the NHANES What We Eat in America (WWEIA).[6] NHANES is a large, nationally representative, cross-sectional survey of the US noninstitutionalized population. Data were collected by using a multistage, complex sampling design with oversampling of specific population subgroups and were publically released in 2-y cycles (20). For the purpose of this study, we combined 8 y of data from 4 cycles (2003–2004, 2005–2006, 2007–2008, and 2009–2010). Study protocols for NHANES were approved by the National Center for Health Statistics ethics review board. Signed informed consent was obtained from all participants or their proxies. For this study, 2911 NHANES participants aged from birth to 23.9 mo with data from the initial 24-h dietary recall were selected, including 778 infants aged 0–5.9 mo, 914 infants aged 6–11.9 mo, and 1219 toddlers aged 12–23.9 mo. Trained interviewers collected the 24-h dietary recall from the child's proxy by using the USDA's Automated Multi-Pass Method, which is a 5-step, fully computerized recall method with food models (21). The proxy was the person most familiar with the child's intake, which was usually the mother.

Sodium intake for the previous 24 h was estimated for each individual from the sum of sodium consumed from each food and beverage reported plus, as applicable, the sodium consumed from human milk. For infants and toddlers whose proxies reported they consumed human milk (n = 220) one or more times on the day of the dietary recall, breast milk was not quantified in the NHANES, and a fixed volume for breast milk was assigned in relation to infant age. Sodium intake from human milk was estimated by using an approach similar to that in a previous study (1) and described in detail elsewhere (2). We assigned a concentration of 177 mg Na/L human milk on the basis of the USDA National Nutrient Database for Standard Reference (SR) for mature human milk (22). Estimates excluded salt added at the table and were not adjusted related to the use of salt in home cooking. Each reported food was assigned to a food code in the USDA Food and Nutrient Database for Dietary Studies (FNDDS) that corresponded with each 2-y phase (23). Nutrient values for each FNDDS food code were based on the nutrient values in the SR (22). To identify the top 10 contributors to sodium intake, each of the ~7200 food codes in the FNDDS was assigned to one of 150 WWEIA Food Categories on the basis of the usage and nutrient content (24).

Age, sex, and race-ethnicity were based on questionnaire information reported by a proxy. In this study, results were only presented by race-ethnicity for non-Hispanic whites, non-Hispanic blacks, and Mexican Americans, but persons from other race-ethnicity groups were included in the overall analyses.

Statistics

Population proportions were calculated for each WWEIA Food Category by summing the amount of sodium consumed from foods within each category (e.g., cheese) for all persons within the age group and dividing that amount by the sum of sodium consumed from all

[6]Abbreviations used: FNDDS, Food and Nutrient Database for Dietary Studies; SR, USDA National Nutrient Database for Standard Reference; WWEIA, What We Eat in America.

foods for all persons within the age group. Food categories were ranked in descending order of the population proportion within each age group (25, 26). In addition, we determined mean population proportions of sodium consumed and the mean (±SE) sodium (mg), energy (kcal), and sodium density (mg/1000 kcal) by food source category and age group. The reporting of sodium density takes in consideration the energy adjustment because sodium and energy intake are highly correlated. Mean differences in population proportions by race/ethnic groups and sex were tested by using *t* tests. SAS-callable SUDAAN version 9.3 software (SAS Institute) and combined 8-y dietary day one-sample weights were used to take into account the complex sampling design. All tests were 2-sided, and $P < 0.05$ was considered statistically significant.

RESULTS

We performed a subanalysis by comparing the sources of sodium intake between 2003–2006 and 2007–2010. Except in infants 0–5.9 mo old, mean sodium and energy intakes and mean sodium density were not significantly different between 2003–2006 and 2007–2010 (Supplemental Tables 1–3). Some of the top contributors differed (e.g., macaroni and cheese in 6–11.9-mo-olds in 2003–2006; $P = 0.0012$), but population proportions of sodium consumed by top 10 food categories were not significantly different between 2003–2006 and 2007–2010 ($P = 0.06$–0.9) (Supplemental Tables 1–3). Therefore, to obtain a larger sample size for a stratified analysis by race-ethnicity (27), we combined 8 y of data from 4 cycles from 2003 to 2010, and we report these results throughout the article.

Overall, mean sodium intakes were 191 and 518 mg/d in infants aged 0–5.9 and 6–11.9 mo, respectively, and 1709 mg/d in toddlers aged 12–23.9 mo (Table 1). The mean sodium density (mg/1000 kcal) was significantly different ($P < 0.0001$) in the 3 age groups (302 mg/1000 kcal in 0–5.9-mo-olds, 552 mg/1000 kcal in 6–11.9-mo-olds, and 1341 mg/1000 kcal in 12–23.9-mo-olds) (Table 1). The following 3 food categories contributed >95% of dietary sodium intake in infants aged 0–5.9 mo: formula (71.7%), human milk (22.9%), and commercial baby foods (2.2%) (Table 1). In infants aged 6–11.9 mo, the top contributors were formula (26.7%), commercial baby foods (8.8%), soups (6.1%), pasta mixed dishes (4.0%), and human milk (3.9%) (Table 1). In toddlers aged 12–23.9 mo, the top 5 contributors were milk (12.2%), soups (5.4%), cheese (5.2%), pasta mixed dishes (5.1%), and frankfurters and sausages (4.6%).

In infants aged 0–5.9 mo, the 3 leading contributors to sodium intake (human milk, formula, and commercial baby foods) were not different by racial/ethnic groups or sex (data not shown). In infants aged 6–11.9 mo, mean daily sodium and energy intakes and sodium density differed by race-ethnicity (Table 2). Mean daily sodium intake was significantly higher in non-Hispanic blacks (610 mg/d) than non-Hispanic whites (472 mg/d) ($P < 0.05$). Mean daily energy intake was significantly higher in non-Hispanic blacks (961 kcal/d) than non-Hispanic whites (844 kcal/d) and Mexican Americans (863 kcal/d) ($P < 0.05$) (Table 2). The mean sodium density was significantly lower in non-Hispanic whites (500 mg/1000 kcal) than non-Hispanic blacks (597 mg/1000 kcal) and Mexican Americans (627 mg/1000 kcal) ($P < 0.05$) (Table 2). In addition, the top contributing food categories and rankings varied by race-ethnicity (Table 2). For example, after infant formula, the top food

contributor to sodium intake for non-Hispanic white infants aged 6–11.9 mo was commercial baby food (10.9%). For non-Hispanic black and Mexican American infants of the same age group, the top food contributor to sodium intake was pasta mixed dishes (15.1%) and soups (15.2%), respectively (Table 2). Commercial baby foods were in the top 5 contributors to sodium intake in all 3 racial/ethnic groups aged 6–11.9 mo but contributed less to overall sodium intake in Mexican Americans (5.3%) than non-Hispanic whites (Table 2). Similarly, top contributors varied by raceial/ethnic group for toddlers aged 12–23.9 mo. After milk, the top food contributor to sodium intake was cheese (6.3%) for non-Hispanic white toddlers, pasta mixed dishes (8.0%) for non- Hispanic black toddlers, and soups (14.4%) for Mexican Americans (Table 3). Frankfurters and sausages were in the top 5 food categories that contributed to sodium intake in each of the 3 racial/ethnic groups examined (3.6–5.5%). Daily mean sodium intake and sodium density were significantly lower in Mexican Americans (1532 mg/d and 1261 mg/1000 kcal, respectively) than in non-Hispanic whites (1716 mg/d and 1351 mg/1000 kcal, respectively) and non-Hispanic blacks (1882 mg/d and 1375 mg/1000 kcal, respectively) ($P < 0.04$) (Table 3). Daily mean energy intake was significantly higher in non-Hispanic blacks (1356 kcal/d) than in non-Hispanic whites (1263 kcal/d) and Mexican Americans (1218 kcal/d) ($P < 0.05$) (Table 3).

The top 5 food categories that contributed to sodium intake also differed by sex. In 6–11.9-mo-olds, the common contributors were formula, commercial baby foods, and soups. Exceptions included frankfurters and sausages (5.2%) and pasta mixed dishes (5.1%) in boys (but not girls) and human milk (4.1%) and milk (3.9%) in girls (but not boys) (Table 4). As for toddlers 12–23.9 mo old, the main contributors were milk and cheese in both sexes. The different contributors were soups (6.2%), pasta mixed dishes (5.9%), and eggs and omelets (4.6%) in boys and frankfurters and sausages (5.4%), breads and rolls (4.9%), and macaroni and cheese (4.6%) in girls (Table 5). Daily mean sodium and energy intakes and sodium density did not differ by sex in either age group (Tables 4 and 5).

In US infants and toddlers, most of the sodium and calories consumed (71–86%) came from foods obtained from a store (e.g., supermarket or convenience store) (Table 6). In toddlers aged 12–23.9 mo, 9% of sodium consumed came from foods obtained at restaurants (6.0% from fast-food and pizza restaurants and 2.9% from restaurants with a waiter or waitress), and 3.7% came from childcare centers (Table 6). In 0–5.9-mo-old infants, breast milk was a major contributor to sodium intake (22.9%) in addition to community food programs (2.6%), others or do not know (2.3%), and someone else or a gift (0.9%) (Table 6). Across age groups, the mean sodium density (mg/1000 kcal) was greater for foods and beverages obtained from fast food or pizza or other restaurants than from retail purchases (Table 6).

DISCUSSION

This study identified the top contributors to sodium intake from birth to 24 mo of age in the United States with separate estimates in non-Hispanic blacks and Mexican Americans. Before 6 mo of age, almost all sodium was contributed by human milk and formula. After the age of 6 mo, we showed that the majority of sodium consumed came from complementary foods. Commercial baby foods were a top contributor to dietary sodium in infants. In toddlers, the vast majority of sodium intake came from sources other than fluid

milk, which was reflected by the significant increase in daily mean sodium intake across age groups. Average sodium intake increased almost 9-fold from children aged 0–5.9 mo to children aged 12–23.9 mo, whereas average energy intake increased 2-fold, which suggested that, as children age during the first 2 y, they consume considerably more sodium per calorie or sodium-rich foods. At age 12–23.9 mo, the average sodium intake exceeded the upper intake of 1500 mg (4), which suggested that the majority of toddlers consume toomuch sodium. Top sources of sodium intake varied by racial/ethnic group; soups contributed >10% of sodium intake in Mexican Americans from 6 to 24 mo of age. Compared with Mexican Americans, intakes of non-Hispanic white and black toddlers were significantly more sodium dense. Although, not significantly different from non-Hispanic whites, non-Hispanic black toddlers consumed the most sodium of the 3 ethnic groups examined. The majority of sodium (>80%) was in foods obtained at stores. At age 12–23.9 mo, food from restaurants and childcare centers also contributed to sodium intake. A reduction of sodium contents in these foods and settings would reduce sodium intakes in the youngest consumers (4). This reduction is important in the early establishment of salt preference that can affect intake and food choices in later life, which plays an important role in protecting against many chronic diseases (18, 19).

Our findings could not be directly compared with previous national (16, 28) and international studies (29–32) because of methodologic differences in data collection, food categories, racial/ethnic groups, age groupings, or country. But overall, previous reports were consistent with our findings that, on average, children consumed amounts of sodium higher than recommendations, and top sources were infant formula and milk in infant, and frequently consumed commercially prepared foods with moderate amounts of sodium like breads or chicken and less frequently consumed foods with higher amounts of sodium like cheese, processed meats, and mixed dishes in older infants and children (16, 28–32).

In our study, top contributors varied by race-ethnicity within age groups, but some foods were consistent top contributors across racial/ethnic groups such as commercial baby foods in infants aged 6–11.9 mo and frankfurters and sausages in children aged 12–23.9 mo. To our knowledge, there are no comparable data for sources of sodium intake by racial/ethnic groups. Data from the Feeding Infants and Toddlers Study focused on sources of sodium intake for infants and toddlers aged 4–24 mo but did not provide separate estimates for non-Hispanic blacks (16). Another Feeding Infants and Toddlers Study compared usual intakes of nutrients, meals, and snacks of Hispanic and non- Hispanic infants and toddlers but did not include data on sources of dietary sodium (33, 34). The difference in top sodium contributors and intake by race/ethnic groups in the current study suggested that, for sodium reduction to be effective, reductions need to occur across a wide variety of foods.

During the first 6 mo of life, breast milk, infant formula, and milk were the top sources of sodium intake. Infant formula is regulated by the Food and Drug Administration for labeling and nutrition contents (35). Sodium naturally occurs in milk. Milk provides a good source of protein, vitamins, and minerals, especially potassium. A recent analysis on US preschoolers aged from 7 mo to 5 y showed that most children, particularly non-Hispanic blacks, did not meet the adequate intake for potassium (2). This result is important because inadequate potassium intake coupled with high sodium intake can lead to hypertension in school-age

children (36). Higher potassium intake increases the urinary excretion of sodium chloride, which leads to decreased blood pressure (4).

Taste preferences are established during the first 2 y of life (18). Studies suggested the influential role of early dietary experiences in shaping salty taste responses of infants and young children (18, 19). Some studies suggested that the ability to detect and respond to salty tastes develops after birth at around 2–6 mo of age (18). A longitudinal study showed that infants who were exposed to foods high in sodium (e.g., processed grain products) at 6 mo of age were more likely to develop a liking for salt at 36–48 mo of age than were infants exposed to lower sodium diets (37). Therefore, early intervention may be important in shaping eating habits and salt preference in children. This intervention lays the foundation for future healthy dietary patterns and food choices, which play an important role in health later in life (18, 19).

To our knowledge, our study included the most-recent available data on a nationally representative sample of US infants and children and is the first research to provide data on the sources of sodium intake from birth to 24 mo of age and by raceethnicity. Results from our study provided additional data needed on this age group to support the inclusion of Dietary Guidelines for US infants and toddlers from birth to 24 mo of age in 2020 (the B-24 Project) (14, 15). However, the study had several limitations. The ranking of food categories by the contribution to sodium consumption depended on methods used for the categorization of specific foods and portion sizes and frequency of their consumption (26). Total sodium intake may have been underestimated because of the self-report and exclusion of salt added at the table [<0.5% of sodium intake in children aged 1–3 y (38)] and from supplements and medicines (<1% of total consumption) (39). In addition, foods and beverages were reported by a proxy, and foods consumed at childcare centers or from other sources might have been underestimated or overestimated. The concentration of sodium in breast milk used in our study was an older value from the SR (1976), but studies through which it will be updated are under way. Finally, commercial baby foods were a major contributor to sodium intake in infants. However, we acknowledge the changing marketplace for baby and toddler foods, and although we captured the type of food correctly (as reported by the proxy), we were, at times, unable to distinguish between toddler or junior foods.

In conclusion, the results of our study help to identify the sources of sodium intake from birth to 24 mo of age. The identification of these foods is important for strategies to reduce sodium intake in this population. The Institute of Medicine recommends reducing added sodium in commercial and restaurant foods as a strategy for the prevention of high blood pressure (38). In our study, contributors to sodium intake varied by age group and between racial/ethnic groups. Foods from restaurants were important sources of sodium intake, and foods from childcare centers also contributed to dietary sodium intake in the 12–23.9-mo age group. These settings are an important place to ensure that children have access to healthy foods that are low in sodium. Because of the early establishment of taste preference for salty foods, it is important to set the stage for healthy eating habits as early as possible in childhood. Parents, caregivers, and childcare providers can be advised to promote breastfeeding exclusively for 6 mo and continued breastfeeding for 12 mo with the introduction of complementary foods or for as long as both the mother and baby desire as

recommended by the American Academy of Pediatrics (40); feed children fruit and vegetables, lean sources of proteins, and grains without added salt and sugars when possible (41); read food labels and compare the sodium content in various products and choose the options with the lowest amounts; and ask the grocer to stock food products that are lower in sodium.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE 1

Population proportions of sodium consumed by selected food categories and age groups in US infants and toddlers aged 0–23.9 mo: WWEIA, NHANES, United States, 2003–2010[1]

	Age, mo					
	0–5.9		6–11.9		12–23.9	
	Food category[2]	Values[3]	Food category[2]	Values[3]	Food category[2]	Values[3]
Rank						
1	Formula	71.7 ± 2.3	Formula	26.7 ± 1.8	Milk	12.2 ± 0.4
2	Human milk	22.9 ± 2.1	Commercial baby foods	8.8 ± 0.8	Soups	5.4 ± 0.9
3	Commercial baby foods	2.2 ± 0.3	Soups	6.1 ± 0.9	Cheese	5.2 ± 0.5
4	Fluid replacement, electrolytes	1.2 ± 0.6[4]	Pasta mixed dishes	4.0 ± 0.9	Pasta mixed dishes	5.1 ± 0.4
5	—	—	Human milk	3.9 ± 0.4	Frankfurters and sausages	4.6 ± 0.6
6	—	—	Milk	3.5 ± 0.5	Breads and rolls	4.5 ± 0.3
7	—	—	Frankfurters and sausages	3.3 ± 1.8[4]	Eggs and omelets	4.0 ± 0.4
8	—	—	Macaroni and cheese	3.0 ± 0.6	Macaroni and cheese	3.6 ± 0.5
9	—	—	Breads and rolls	2.7 ± 0.4	Chicken patties, nuggets, tenders	3.4 ± 0.5
10	—	—	Crackers	2.4 ± 0.3	Crackers	3.1 ± 0.2
Sodium,[5] mg/d	—	191 ± 3	—	518 ± 28	—	1709 ± 37
Energy,[5] kcal/d	—	634 ± 7	—	861 ± 13	—	1268 ± 22
Sodium density,[5] mg/1000 kcal	—	302 ± 5	—	5526 18	—	13416 21
Unweighted sample size, *n*	—	778	—	914	—	1219

[1] Population proportion (%) of sodium consumed was defined as the sum of the amount of sodium consumed from each specific food category for all participants in the age group divided by the sum of sodium consumed from all food categories for all participants in the age group multiplied by 100.

[2] Formula includes formula prepared from concentrate, prepared from powder, and ready to eat. Milk includes unflavored low-fat, nonfat, reduced fat, and whole milk. Commercial baby foods include cereal, fruit and vegetables, meat and dinners, snacks and desserts, yogurt, and juice. Cheese includes natural and processed cheese. The pasta mixed dishes category does not include macaroni and cheese, which are a separate category. Breads and rolls include yeast breads, rolls, and buns. Crackers include saltines. For mean daily sodium (mg), energy (kcal), and sodium density (mg/1000 kcal) between 0–5.9 and 6–11.9 of age, between 0–5.9 and 12–23.9 mo of age, and between 6–11.9 and 12–23. 9 mo of age, $P < 0.0001$ (*t* test).

WWEIA, What We Eat in America.

[3] All values are percentages ± SEs.

[4] Data are statistically unreliable; relative SE ≥40%.

[5] All values are means ± SEs.

TABLE 2

Population proportions of sodium consumed by selected food categories by selected race-ethnicity in US infants aged 6–11.9 mo: WWEIA, NHANES, United States, 2003–2010[1]

	Non-Hispanic white		Non-Hispanic black		Mexican American	
	Food category[2]	**Values[3]**	**Food category[2]**	**Values[3]**	**Food category[2]**	**Values[3]**
Rank						
1	Formula	28.0 ± 3.0	Formula	27.4 ± 3.2	Formula	24.7 ± 1.4
2	Commercial baby food	10.9 ± 1.3	Pasta mixed dishes	15.1 ± 4.6	Soups	15.2 ± 2.2
3	Frankfurters and sausages	5.1 ± 3.1[4]	Commercial baby food	8.3 ± 1.8	Commercial baby food	5.3 ± 0.7
4	Human milk	5.0 ± 0.8	White potato mixtures	4.0 ± 1.1	Eggs and omelets	4.6 ± 0.9
5	Milk	4.0 ± 0.8	Cooked cereals	3.0 ± 1.1[4]	Milk	3.8 ± 1.3[4]
Sodium,[5] mg/d	—	472 ± 40[a]	—	610 ± 58[a]	—	570 ± 27
Energy,[5] kcal/d	—	844 ± 19[a]	—	961 ± 37[c]	—	863 ± 25[c]
Sodium density,[5] mg/1000 kcal	—	500 ± 25[a,b]	—	597 ± 45[a]	—	627 ± 28[b]
Unweighted sample size, *n*	—	307	—	144	—	336

[1] Population proportion (%) of sodium consumed was defined as the sum of the amount of sodium consumed from each specific food category for all participants in the age group divided by the sum of sodium consumed from all food categories for all participants in the age group multiplied by 100.

[2] Formula includes formula prepared from concentrate, prepared from powder, and ready to eat. Commercial baby foods include cereal, fruit and vegetables, meat and dinners, snacks and desserts, yogurt, and juice. The pasta mixed dishes category does not include macaroni and cheese, which are a separate category. White potato mixtures include baked or boiled white potatoes, mashed potatoes, and white potato mixed dishes. Milk includes unflavored low-fat, nonfat, reduced fat, and whole milk. Cooked cereals include oatmeal, grits, and other cooked cereals.

[a,b,c] $P < 0.05$ (*t* test): [a]between non-Hispanic white and non-Hispanic black; [b]between non-Hispanic white and Mexican American; [c]between non-Hispanic black and Mexican American.

WWEIA, What We Eat in America.

[3] All values are percentages ± SEs.

[4] Data are statistically unreliable; relative SE ≥30%.

[5] All values are means ± SEs.

TABLE 3

Population proportions of sodium consumed by selected food categories by selected race-ethnicity in US toddlers aged 12–23.9 mo: WWEIA, NHANES, United States, 2003–2010[1]

	Non-Hispanic white		Non-Hispanic black		Mexican American	
	Food category[2]	**Values[3]**	**Food category[2]**	**Values[3]**	**Food category[2]**	**Values[3]**
Rank						
1	Milk	12.3 ± 0.7	Milk	9.7 ± 0.8	Milk	14.76 0.7
2	Cheese	6.3 ± 0.6	Pasta mixed dishes	8.0 ± 1.0	Soups	14.46 1.3
3	Pasta mixed dishes	5.56 0.8	Frankfurters and sausages	5.5 ± 0.8	Eggs and omelets	7.76 0.9
4	Breads and rolls	5.2 ± 0.5	Breads and rolls	4.5 ± 0.5	Frankfurters and sausages	3.6 ± 0.8
5	Frankfurters and sausages	4.4 ± 0.7	Eggs and omelets	3.86 0.6	Ready-to-eat cereals	3.4 ± 0.3
Sodium,[4] mg/d	—	1716 ± 61[b]	—	1882 ± 76[c]	—	1532 ± 45[b,c]
Energy,[4] kcal/d	—	1263 ± 37[a]	—	1356 ± 31[a,c]	—	1218 ± 24[c]
Sodium density,[4] mg/1000 kcal	—	1351 ± 33[b]	—	1375 ± 40[c]	—	1261 ± 28[b,c]
Unweighted sample size, *n*	—	385	—	275	—	393

[1] The population proportion (%) of sodium consumed was defined as the sum of the amount of sodium consumed from each specific food category for all participants in the age and race/ethnic group divided by the sum of sodium consumed from all food categories for all participants in the age and race/ethnic group multiplied by 100.

[2] Milk includes unflavored low-fat, nonfat, reduced fat, and whole milk. Cheese includes natural and processed cheese. The pasta mixed dishes category does not include macaroni and cheese, which are a separate category. Breads and rolls include yeast breads, rolls, and buns,

[a,b,c] $P < 0.05$ (*t* test): [a]between Non-Hispanic white and non-Hispanic black; [b]between non-Hispanic white and Mexican American; [c]between non-Hispanic black and Mexican American.

WWEIA, What We Eat in America.

[3] All values are percentages ± SEs.

[4] All values are means ± SEs.

TABLE 4

Population proportions of sodium consumed by selected food categories by sex in US infants aged 6–11.9 mo: WWEIA, NHANES, United States, 2003–2010[1]

	Boys		Girls	
	Food category[2]	**Values[3]**	**Food category[2]**	**Values[3]**
Rank				
1	Formula	24.3 ± 2.3	Formula	29.1 ± 1.9
2	Commercial baby food	8.56 1.0	Commercial baby food	9.0 ± 0.9
3	Frankfurters and sausages	5.2 ± 3.1[4]	Soups	7.2 ± 1.2
4	Pasta mixed dishes	5.1 ± 1.7	Human milk	4.1 ± 0.6
5	Soups	5.0 ± 1.1	Milk	3.9 ± 0.8
Sodium,[5] mg/d	—	566 ± 47	—	477 ± 24
Energy,[5] kcal/d	—	895 ± 21	—	832 ± 15
Sodium density,[5] mg/1000 kcal	—	572 ± 25	—	534 ± 21
Unweighted sample size, *n*	—	455	—	459

[1] The population proportion (%) of sodium consumed was defined as the sum of the amount of sodium consumed from each specific food category for all participants in the age group divided by the sum of sodium consumed from all food categories for all participants in the age group multiplied by 100.

[2] Formula includes formula prepared from concentrate, prepared from powder, and ready to eat. Commercial baby foods include cereal, fruit and vegetables, meat and dinners, snacks and desserts, yogurt, and juice. The pasta mixed dishes category does not include macaroni and cheese, which are a separate category. Milk includes unflavored low-fat, nonfat, reduced fat, and whole milk.

WWEIA, What We Eat in America.

[3] All values are percentages ± SEs.

[4] Data are statistically unreliable; relative SE ≥30%.

[5] All values are means ± SEs.

TABLE 5

Population proportions of sodium consumed by selected food categories by sex in US infants aged 12–23.9 mo: WWEIA, NHANES, United States, 2003–2010[1]

	Boys		Girls	
	Food category[2]	**Values[3]**	**Food category[2]**	**Values[3]**
Rank				
1	Milk	12.1 ± 0.6	Milk	12.4 ± 0.5
2	Soups	6.2 ± 1.7	Cheese	5.4 ± 0.6
3	Pasta mixed dishes	5.9 ± 0.7	Frankfurters and sausages	5.4 ± 1.0
4	Cheese	5.0 ± 0.7	Breads and rolls	4.9 ± 0.6
5	Eggs and omelets	4.6 ± 0.6	Macaroni and cheese	4.6 ± 0.8
Sodium,[4] mg/d	—	1723 ± 55	—	1693 ± 43
Energy,[4] kcal/d	—	1286 ± 29	—	1249 ± 25
Sodium density,[4] mg/1000 kcal	—	1336 ± 35	—	1346 ± 23
Unweighted sample size, *n*	—	628	—	591

[1] The population proportion (%) of sodium consumed is defined as the sum of the amount of sodium consumed from each specific food category for all participants in the age group divided by the sum of sodium consumed from all food categories for all participants in the age group multiplied by 100.

[2] Milk includes unflavored low-fat, nonfat, reduced fat, and whole milk. Cheese includes natural and processed cheese. The pasta mixed dishes category does not include macaroni and cheese, which are a separate category. Breads and rolls include yeast breads, rolls, and buns.

WWEIA, What We Eat in America.

[3] All values are percentages ± SEs.

[4] All values are means ± SEs.

TABLE 6

Population proportions of sodium consumed and mean sodium, calories, and sodium density in US infants and toddlers aged 0–23.9 mo by place obtained and age group: WWEIA, NHANES, United States, 2003–2010[1]

	Place obtained				
Age group	**Store**	**Restaurant with fast food/pizza**	**Restaurant with waiter/waitress**	**Childcare center**	**Others**
0–5.9 mo					
Population proportion[3]	71.2 ± 2.5	0 ± 0	0 ± 0	0 ± 0	28.7 ± 2.5[2]
Sodium,[4] mg	136 ± 6	0.1 ± 0.04	0 ± 0.03	0 ± 0.04	55 ± 4
Calories,[4] kcal	412 ± 17	0 ± 0.02	0 ± 0.02	0.1 ± 0.1	222 ± 17
Sodium density,[4] mg/1000 kcal	330 ± 6	1735 ± 166	1390 ± 825	376 ± 0	248 ± 2
6–11.9 mo					
Population proportion[3]	86.4 ± 1.3	2.2 ± 0.6	1.8 ± 0.5	1.8 ± 0.9	7.8 ± 0.7
Sodium,[4] mg	448 ± 26	11 ± 3	9 ± 3	9 ± 5	40 ± 4
Calories,[4] kcal	720 ± 17	7 ± 2	4 ± 1	9 ± 4	120 ± 11
Sodium density,[4] mg/1000 kcal	621 ± 30	1574 ± 146	2406 ± 196	1008 ± 108	335 ± 22
12–23.9 mo					
Population proportion[3]	82.4 ± 0.8	6.0 ± 0.5	2.9 ± 0.4	3.7 ± 0.5	5.1 ± 0.5
Sodium,[4] mg	1408 ± 33	102 ± 9	49 ± 7	636 8	87 ± 9
Calories,[4] kcal	1075 ± 20	596 5	23 ± 3	42 ± 6	69 ± 5
Sodium density,[4] mg/1000 kcal	1309 ± 22	1734 ± 42	2131 ± 134	1487 ± 114	1271 ± 83

[1] The population proportion (%) of sodium consumed was defined as the sum of the amount of sodium consumed from each specific food source category for all participants in the age group divided by the sum of sodium consumed from all food source categories for all participants in the age group multiplied by 100. Sodium density is a measure that accounted for differences in the amount of calories consumed from foods obtained from each source defined as milligrams of sodium per 1000 kcal. Food-source categories were analyzed from responses to the question "Where did you get this (most of the ingredients for this) [food name]?" Sources other than those shown were combined under the Others category and included mainly for the overall age group (birth to 23.9 mo), from someone else or as a gift (2.7%), and breast milk (1.6%).

WWEIA, What We Eat in America.

[2] Sources included mainly breast milk (22.9%), community food program (2.6%), others or do not know (2.3%), and from someone else or as a gift (0.9%).

[3] All values are percentages ± SEs.

[4] All values are means ± SEs.