



# Dietary Intakes of Choline

What We Eat in America, NHANES 2007-2008

Food Surveys Research Group  
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## Highlights

- ▶ In 2007–2008, the estimated mean daily intake of the U.S. population for all individuals was 302 mg.
- ▶ Across age groups, males consumed significantly more choline than females with the exception of young children. Mean daily intake of choline for individuals 20 years of age and older was 396 mg for males and 260 mg for females.
- ▶ For those 0 – 5, 12 – 19 and 20 years of age and older, black males consumed significantly less choline than their white counterparts. Black males 0 – 5 and 12 – 19 years of age consumed significantly less than their Hispanic counterparts.
- ▶ Choline intake is positively correlated with caloric intake. Choline intakes expressed on a per 1,000 kcal basis were similar for most sex and age groups.
- ▶ Major contributors to choline in the diet include meat, poultry, and fish; grain-based mixed dishes; dairy; and eggs and egg dishes. Meat, poultry, and fish and mixed dishes that contain meat, poultry, or fish are the largest contributors at 30%.

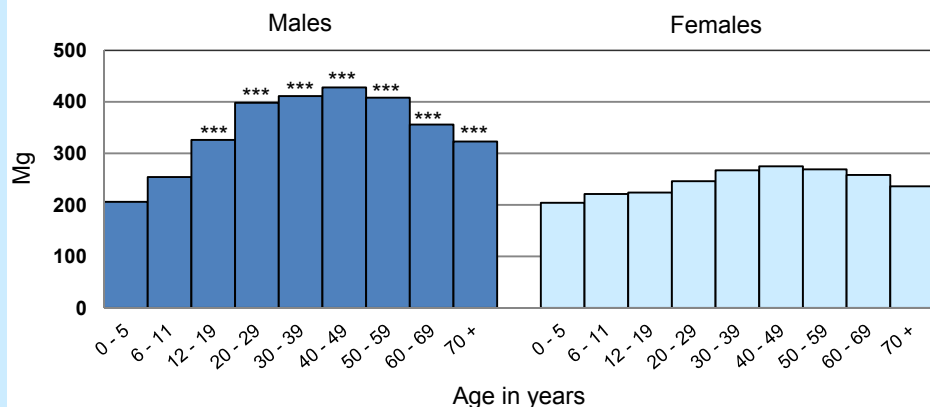
Choline is an essential nutrient important for normal function of all cells and for brain development and function (1, 2). Choline availability during pregnancy is important for optimal fetal development (3). In the past, little data were available on the choline content of foods from which dietary intake levels could be calculated. Beginning with the 2005–2006 What We Eat in America, NHANES, choline intakes were estimated.

Nationally representative data from What We Eat In America, NHANES 2007–2008 on dietary intakes from foods and beverages and food sources of choline are presented in this report. These estimates exclude choline intake from dietary supplements.

## How much choline are Americans consuming?

In 2007–2008, the estimated mean daily intake of choline from food for all individuals was 302 milligrams (mg) (data not shown). When comparing by age and gender, males consumed significantly more choline than females for all age groups with the exception of children (Figure 1). For individuals 20 years of age and older, estimated mean daily intake of choline was 396 mg for males and 260 mg for females (data not shown).

Figure 1. Mean daily choline intake by age and gender, 2007 - 2008



\*\*\*Intakes of males are significantly higher than those of females within age groups (p < 0.001).  
SOURCE: What We Eat in America, NHANES 2007-2008, Day 1 dietary intake data, all individuals, weighted.



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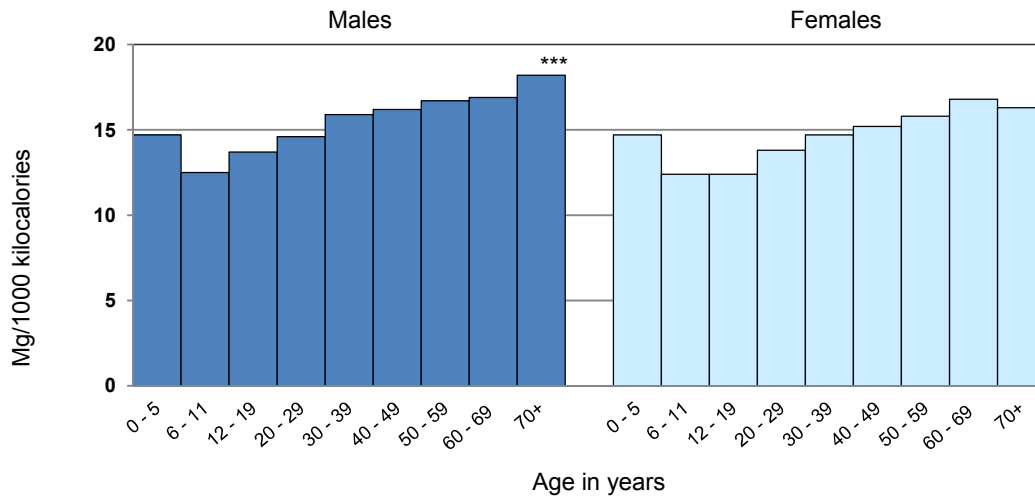
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**Is choline intake related to calorie intake?**

Yes. The differences in choline intake across age and gender groups are related to intake in calories. With the exception of males 70 years of age and older, there are no gender and age differences in choline intakes expressed per 1,000 kilocalories (kcal). Thus, choline intake is positively correlated with caloric intake.

**Figure 2. Mean daily choline intake per 1000 kilocalories by age and gender, 2007 - 2008**

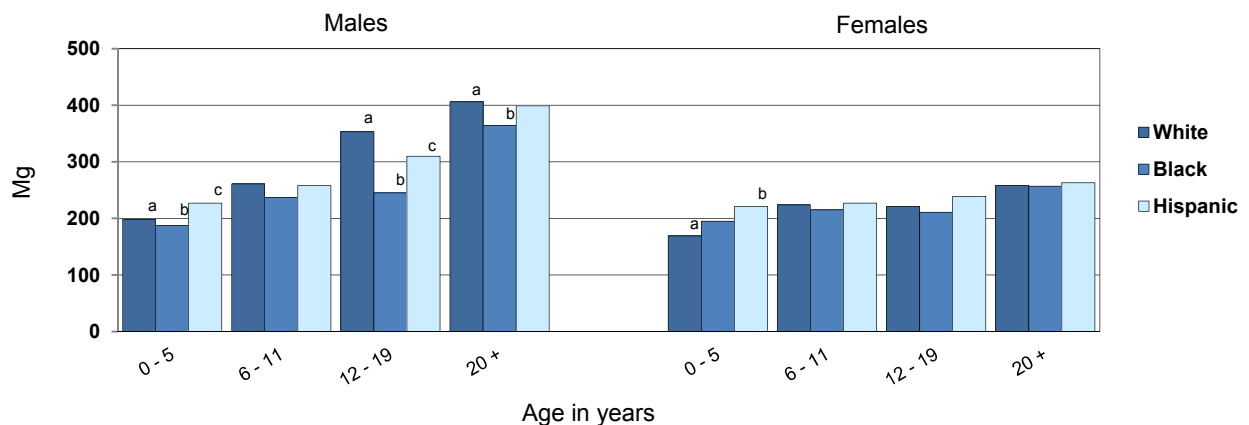


\*\*\*Intakes of males are significantly higher than those of females within age groups (p<0.001)  
 SOURCE: What We Eat in America, NHANES 2007-2008, Day 1 dietary intake data, all individuals, weighted.

**Does choline intake differ by race and ethnicity?**

Yes. White children 0 – 5 years of age had lower mean choline intakes than their Hispanic counterparts. Black males with the exception of those 6 – 11 years of age had lower mean intakes than their white counterparts. Black males 0 – 5 and those 12 – 19 years of age consumed less choline than their Hispanic counterparts. Also, within age groups, black males had the lowest mean choline intakes. Few race and ethnicity differences were observed in the mean choline intakes of females.

**Figure 3. Comparison of mean daily choline intake by age and race and ethnicity, 2007 - 2008**



\*\*Statistically significant difference between race/ethnic groups p<0.01). Differences between groups noted using a, b, and c.  
 SOURCE: What We Eat in America, NHANES 2007-2008, Day 1 dietary intake data, all individuals, weighted.

**What foods contribute to choline intake in the diets of Americans?**

Foods that are rich in choline include milk, liver, eggs, and peanuts (1). Table 1 shows the contribution of food categories to choline intake for all individuals. Major contributors to choline in the diet include meat, poultry, and fish; grain-based mixed dishes; dairy; and eggs and egg dishes. About a third of the choline comes from the meat, poultry, and fish and mixed dishes that contain meat, poultry, or fish. Close to one-quarter comes from grain-based products. Eggs and egg dishes and dairy each contribute slightly more than 10%.

**Table 1. Percent contribution of food categories to choline intake, 2007-2008**

<b>FOOD CATEGORIES<sup>†</sup></b>	<b>Individuals Reporting<sup>‡</sup></b> (%)	<b>Contribution to Choline</b> (%)
<b>Meat, Poultry, and Fish</b>		<b>24</b>
Meats: beef, pork, lamb, game	24	9
Deli and Cured Meats: ham, luncheon meats, frankfurters, bacon, sausage	35	6
Poultry: fried and baked chicken, patties, nuggets, turkey, duck	28	6
Fish and Seafood: finfish and shellfish, cakes, salads	11	3
<b>Grain-based Mixed Dishes</b>		<b>13</b>
Pasta and Macaroni Dishes: spaghetti, ravioli, macaroni, lasagna, salads	17	3
Fast Food Sandwiches: sandwiches purchased from fast food outlets	12	3
Pizza: pizza, calzones, pizza rolls	12	2
Mexican and Latin-type Items: burritos, tacos, tamales, nachos, other mixed dishes	8	2
Indian and Asian-type Items: curries, egg rolls, fried rice, stir-fries, sushi	7	2
Rice and Rice Dishes: plain rice, rice dishes w/sauces, meat, beans, and/or vegetables	14	1
<b>Dairy</b>		<b>13</b>
Fluid Milk: flavored and unflavored milks	52	10
Ice Cream and Dairy Items: frozen dairy items, yogurt, shakes, smoothies	36	2
Cheese: all cheese and cheese items	39	1
<b>Eggs and Egg Dishes: scrambled and fried, omelets, quiches, soufflés</b>	<b>19</b>	<b>12</b>
<b>Bread and Grain Products</b>		<b>9</b>
Breads and Rolls: yeast breads and rolls, tortillas, bagels, English muffins	65	3
Dessert-type Items: cookies, cakes, pies, bars, pudding, gelatins	46	3
Breakfast Bakery Items and Quick Breads: biscuits, combread, muffins, pancakes, waffles, French toast, doughnuts, pastries	16	2
Cereals and Grains: RTE cereals, grits, oatmeal	32	1
<b>Vegetables</b>		<b>7</b>
Vegetables: salads, canned, fresh, frozen, except white potatoes	54	4
White Potatoes: baked, boiled, mashed, fried, salads, except potato chips	31	2
Beans and Legumes: dried and canned, bean dishes	10	1
<b>Beverages</b>		<b>7</b>
Beer: light and regular	10	4
Coffee: all coffee based drinks	39	2
Other beverages: All beverages excluding milk, fruit and vegetable juices, beer and coffee	97	1
<b>Meat, Poultry, and Fish-based Mixed Dishes: meat, poultry, fish w/sauces, gravies, bread, and/or vegetables</b>	<b>19</b>	<b>6</b>

<sup>†</sup>Food categories not listed including fruits, soups, savory snacks, nuts and seeds, candies, condiments, sauces and pickled vegetables, salad dressings, spreads, and dips, baby foods, sugar and substitutes, other miscellaneous foods each contribute ≤3% of choline.

<sup>‡</sup>Percentage of individuals reporting the foods in the category at least once on the day.

Source: What We Eat in America, NHANES 2007-2008, Day 1 dietary intake data, all individuals, weighted.

### Data Source

Estimates in this report are based on one day of dietary intake data collected in What We Eat in America (WWEIA), the dietary intake interview component of the National Health and Nutrition Examination Survey (NHANES), in 2007-2008. Data on choline consumption and contribution of food categories to total choline intake of the population are based on Day 1 dietary intake data of all individuals excluding breast fed children (N=9,118). Sample weights were applied in all analyses to produce nationally representative estimates.

### References

1. Institute of Medicine, Food and Nutrition Board. Dietary Reference Intakes for Thiamine, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline, National Academy Press, Washington, DC 1997; 390-422.
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### Suggested citation

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