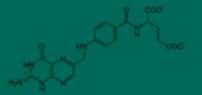


# Sources of Dietary Folate in US Women of Different Races: What is the Role of Fortified and Enriched Products?

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## Background

- Folate: water-soluble, B vitamin, naturally occurring in foods; folic acid: added to foods
- Recommendation, women of childbearing age: 400µg/day.
- 19 - 30% of neural tube defects (NTDs) prevented with folic acid<sup>1</sup>
- ~½ US pregnancies unplanned; many are unaware of NTD risks<sup>2</sup>
- Disparities in NTDs observed in subpopulations<sup>3</sup>
- In US, enriched grain products fortified with folic acid

## Objective

Examine disparities in total dietary folate intake from fortified, enriched, and intrinsic sources among US non-pregnant women 15-44 yr by race and Hispanic origin

## What's the difference?

- +** **Fortified** –voluntarily added vitamins and nutrients, not naturally present in the food
- ↻** **Enriched** –vitamins or nutrients added to them to meet standard of identity
- ✓** **Intrinsic** - occur naturally in a food

## Data

### National Health & Nutrition Examination Survey (NHANES) 2009-12

- Cross-sectional, nationally representative
- In person 24 hour recall

### ILSI North America Nutrient Database

- Nutrient intake by source for foods in NHANES 2009-12

## Analytic sample

- Non-pregnant women age 15-44 years, with valid dietary recall

## Analysis

- Mean dietary folate intake by source and race and Hispanic origin
  - Covariates: age, country of birth, income (poverty income ratio)
- Differences in means tested using Linear regression analyses
- Proportion of total folate by source
- Food group contribution to total folate
- SUDAAN 9.3, Day 1 dietary weights



**Table 1 – Mean (SE) folate (µg) intake by source, women 15-44 y, US, 2009-2012**

	n	Source of folate			
		Total Folate	Fortified	Enriched	Intrinsic
All	2916	488 (11.4)	104.2 (8.5)	195.4 (3.9)	188.2 (2.9)
Non-Hispanic white	1100	501 (17.5)	117.3 (13.6)	194.1 (5.0)	189.6 (4.4)
Non-Hispanic black	641	416 (11.6) <sup>1</sup>	62.7 (8.7) <sup>1</sup>	186.4 (7.5)	167.2 (5.0) <sup>1</sup>
Hispanic	810	492 (14.5) <sup>2</sup>	106.0 (12.5) <sup>2</sup>	199.6 (7.0)	186.9 (6.1) <sup>2</sup>

<sup>1</sup>Significant difference from non-Hispanic white, p<.05  
<sup>2</sup>Significant difference from non-Hispanic black, p<.05  
 SE: Standard error; Source: NHANES

**Table 2 – Adjusted<sup>1</sup> mean (SE) folate (µg) intake, women 15-44 y, US, 2009-2012**

	Total	Source of folate		
		Fortified	Enriched	Intrinsic
Non-Hispanic White	512.7 (27.0)	115.4 (21.1)	203.6 (8.0)	192.7 (7.0)
Non-Hispanic Black	434.7 (17.9) <sup>2</sup>	54.2 (14.9) <sup>2</sup>	198.2 (11.0)	182.3 (8.7)
Hispanic	509.0 (22.6) <sup>3</sup>	109.0(12.9) <sup>3</sup>	205.8 (11.8)	194.2 (9.8)

<sup>1</sup>Adjusted for age, country of birth and income  
<sup>2</sup>Significant difference from non-Hispanic white, p<.05  
<sup>3</sup>Significant difference from non-Hispanic black, p<.05  
 SE: Standard error; Source: NHANES

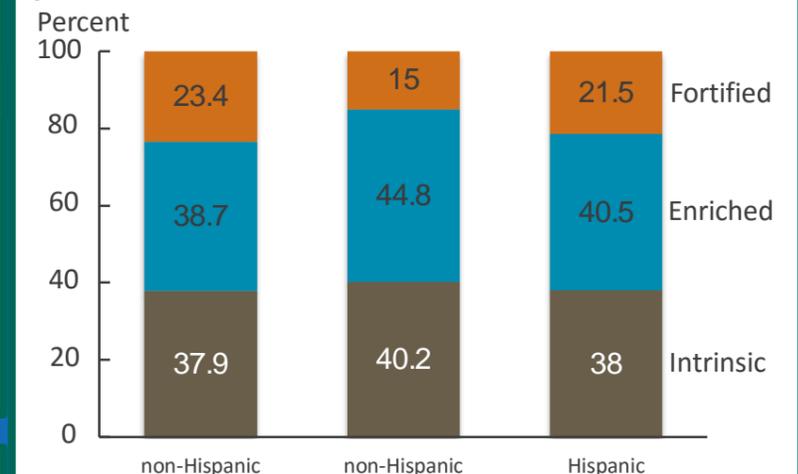
## Conclusions

- Mean intake of total folate and fortified folic acid were lower among non-Hispanic black women of childbearing age compared to non-Hispanic white and Hispanic women of childbearing age
- Patterns in the contribution of different food groups to total folate intake vary by race/Hispanic origin
- These data provide a baseline to compare intake post fortification of corn masa flour which occurred in April 2016

### References

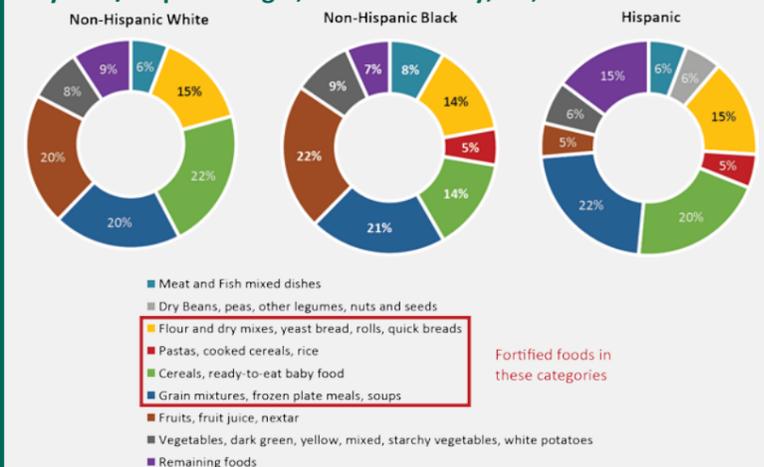
- Berry RJ et al. N Engl J Med 1999;341(20):1485–90
- Finer LB, Zolna MR. N Engl J Med [Internet] 2016;374(9):843–52.
- Canfield MA et al. Am J Public Health 2014;104(9):1999–2007.

**Figure 1 – Percent contribution of different sources to total folate, by race/Hispanic origin, US women 15-44 years, 2009-2012**



SOURCE: NHANES

**Figure 2 – Contribution of food groups<sup>1</sup> to total folate intake, by race/Hispanic origin, women 15-44 y, US, 2009-2012**



<sup>1</sup>For groups contributing >5%; defined based on USDA's Food Survey Research Group-defined food groups. Source: NHANES.

## Strengths

- Nationally representative
- New database allows for estimates on sources of total folate

## Limitations

- 24-hr recall does not capture usual intake and has known biases
- Totals do not include supplement intake

National Center for Health Statistics

Division of Health and Nutrition Examination Surveys

