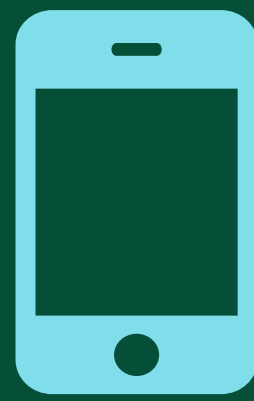


Influence of calcium, zinc, and iron intake on absorption of cadmium from diet

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Women with low zinc and iron intake may have increased absorption of cadmium from grains in diet.



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Methods

Data: Study of Environment, Lifestyle & Fibroids

- 1693 African-American women
- Ages 23-35 years
- Residing in Detroit, MI area
- No prior fibroid diagnosis
- Baseline data

Study population criteria (N=1087):

- Archived whole blood samples
- Cadmium measured in sample
- Never smoker
- Total energy intake 400-5000 kcal/day

Exposure: Dietary cadmium intake from food groups


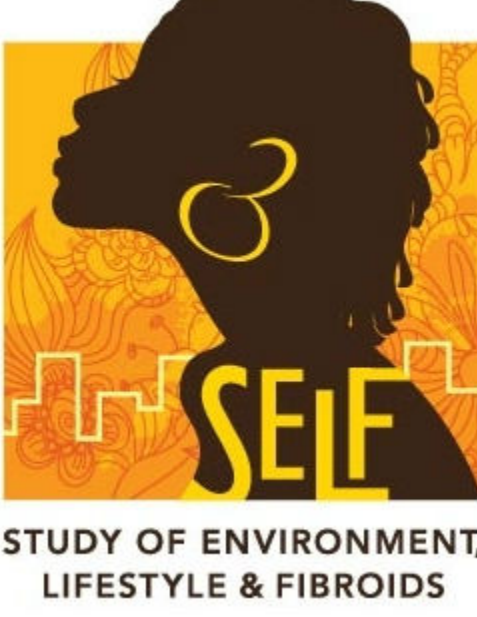
- Block 2005 Food Frequency Questionnaire
- U.S. FDA Total Diet Study

Outcome: Whole blood cadmium (µg/l)

- Inorganic and Radiation Analytical Toxicology Branch, CDC
- ICP-DRC-MS (LOD=0.10 µg/l)

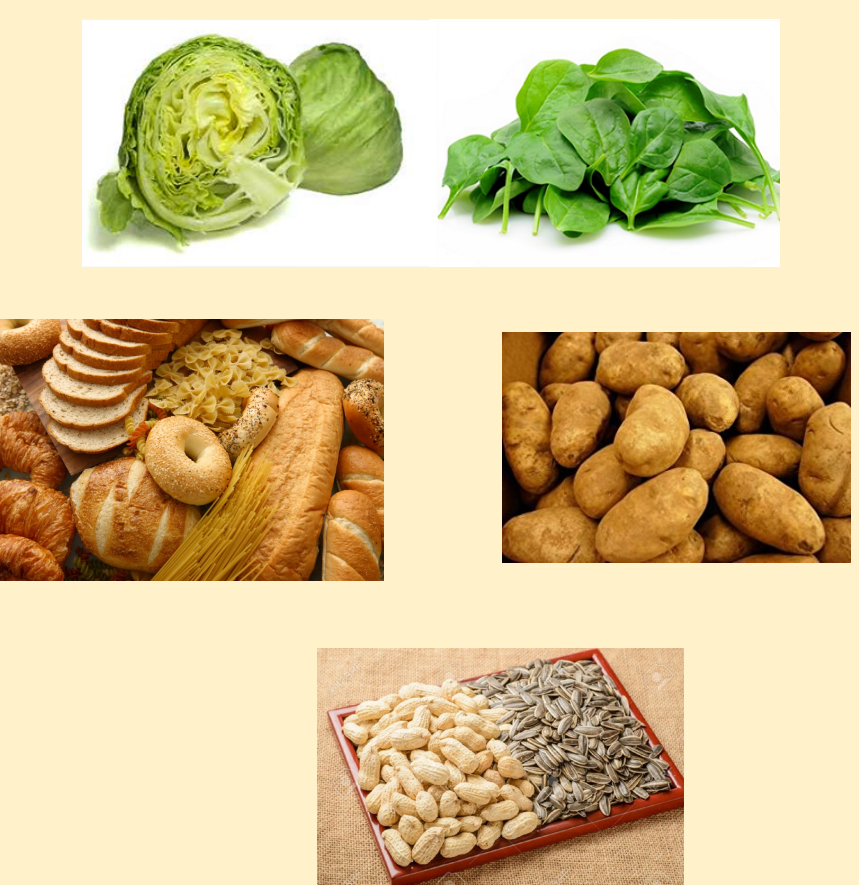
Effect modifier:

- Daily intake of calcium, zinc, and iron (mg/day)
 - Total intake from diet and supplements
- Used median to determine low/high intake



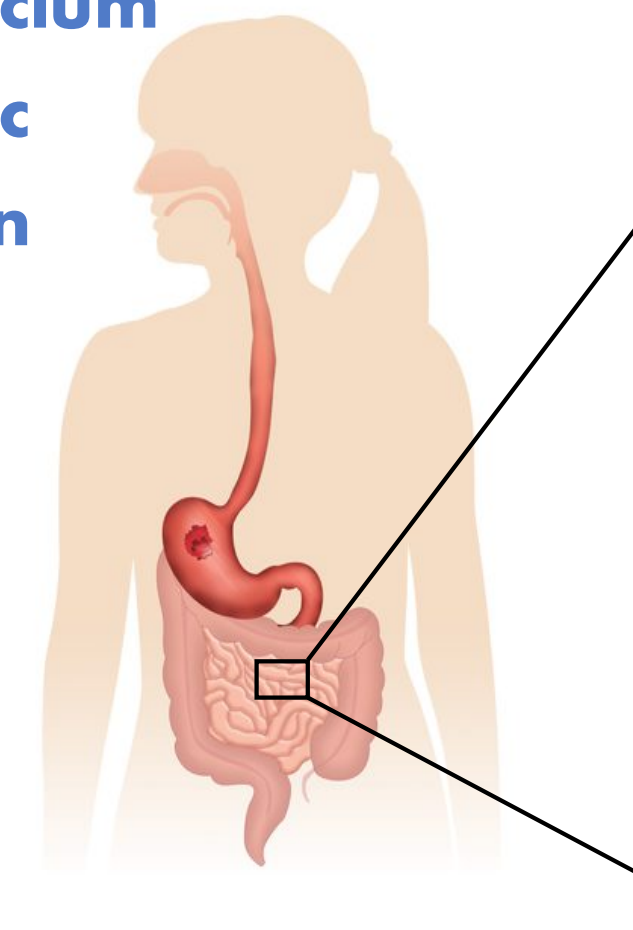
Conceptual Framework

Dietary cadmium intake

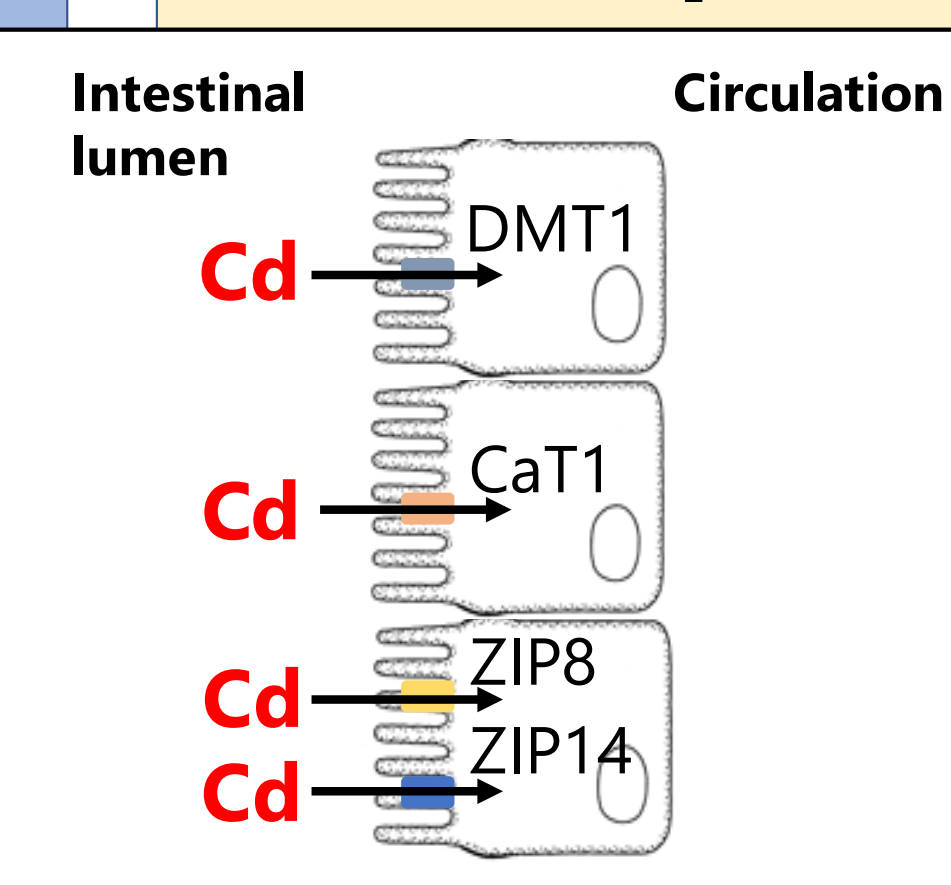


Nutrient status

Calcium
Zinc
Iron



Cadmium absorption



What is known:

- Major source of cadmium exposure is food
 - Cadmium concentration in foods not proportional to that absorbed
 - e.g., high concentration in leafy greens, but absorption may be lower
- Deficient intake of calcium, zinc, and iron leads to upregulation of gut metal ion transporters to increase absorption, also transport toxic metals

Hypothesis: Greater absorption of dietary cadmium from bioavailable sources, with low calcium, zinc, and iron intake

Results

Table: Percent difference (95% CI) in blood cadmium (µg/l) per median change in daily dietary cadmium intake from individual food groups, by calcium, zinc, and iron intake (N=1087).^{a,b}

Cadmium intake	Overall	Calcium intake		Zinc intake		Iron intake	
		<Median	≥Median	<Median	≥Median	<Median	≥Median
Leafy vegetables	1% (-1, 4)	-2% (-7, 4)	1% (-1, 4)	-2% (-6, 2)	3% (0, 6)	-2% (-7, 3)	2% (-1, 5)
Grains	10% (2, 19)	10% (-4, 25)	9% (-1, 20)	15% (2, 30)	7% (-3, 17)	16% (3, 31)	7% (-2, 18)

^aAnalyses adjusted for age at baseline, BMI, height, education and cadmium intake from eggs, grains (cooked cereals, cold breakfast cereals, pasta, bread, crackers, sweets containing flour), rice, corn, dairy, fruit (fresh, canned, juice), leafy vegetables, other vegetables, potatoes, meat (red, processed, organ, poultry), seafood (fish, shellfish), nuts, beverages (alcoholic, non-alcoholic), and other food (legumes, soy-based, mixed foods, chocolate, non-flour sweets, sauces/dressing, oil/fat). Calcium, zinc, iron, and cadmium intake from foods were energy-adjusted using the residual method.

^bEnergy-adjusted median intake of calcium, zinc, and iron were 754 mg/d, 10.4 mg/d, and 14.02 mg/d, respectively.