

Prevalence of Phosphorus Containing Food Additives in Grocery Stores

Cathy Sullivan, MS RD, LD
Cleveland OH



Outline

- What are phosphorus containing food additives and how are they used?
- How do phosphorus containing food additives affect the accuracy of nutrient databases?
- Are phosphorus enhanced foods common and how much phosphorus do they add to foods?
- Why are these additives harmful for kidney disease patients?
- Is this a problem for the general population?

Common Phosphorus Additives

Dicalcium Phosphate

Hexametaphosphate

Monocalcium Phosphate

Phosphoric Acid

Pyrophosphate

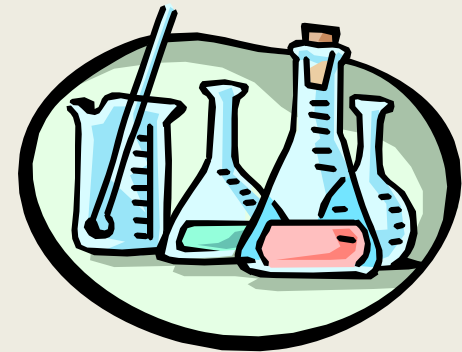
Sodium Acid Pyrophosphate

Sodium Aluminum Phosphate

Sodium Phosphate

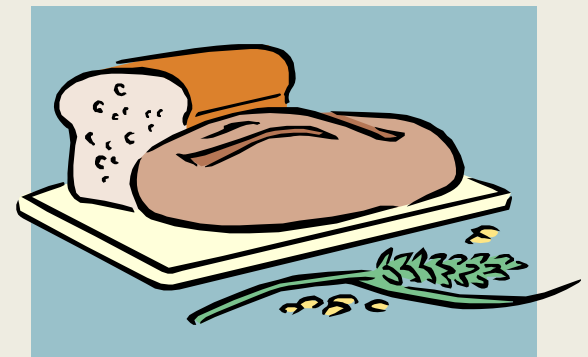
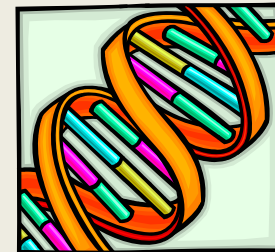
Sodium Tripolyphosphate

Tricalcium Phosphate



Common Uses Of Food Additives

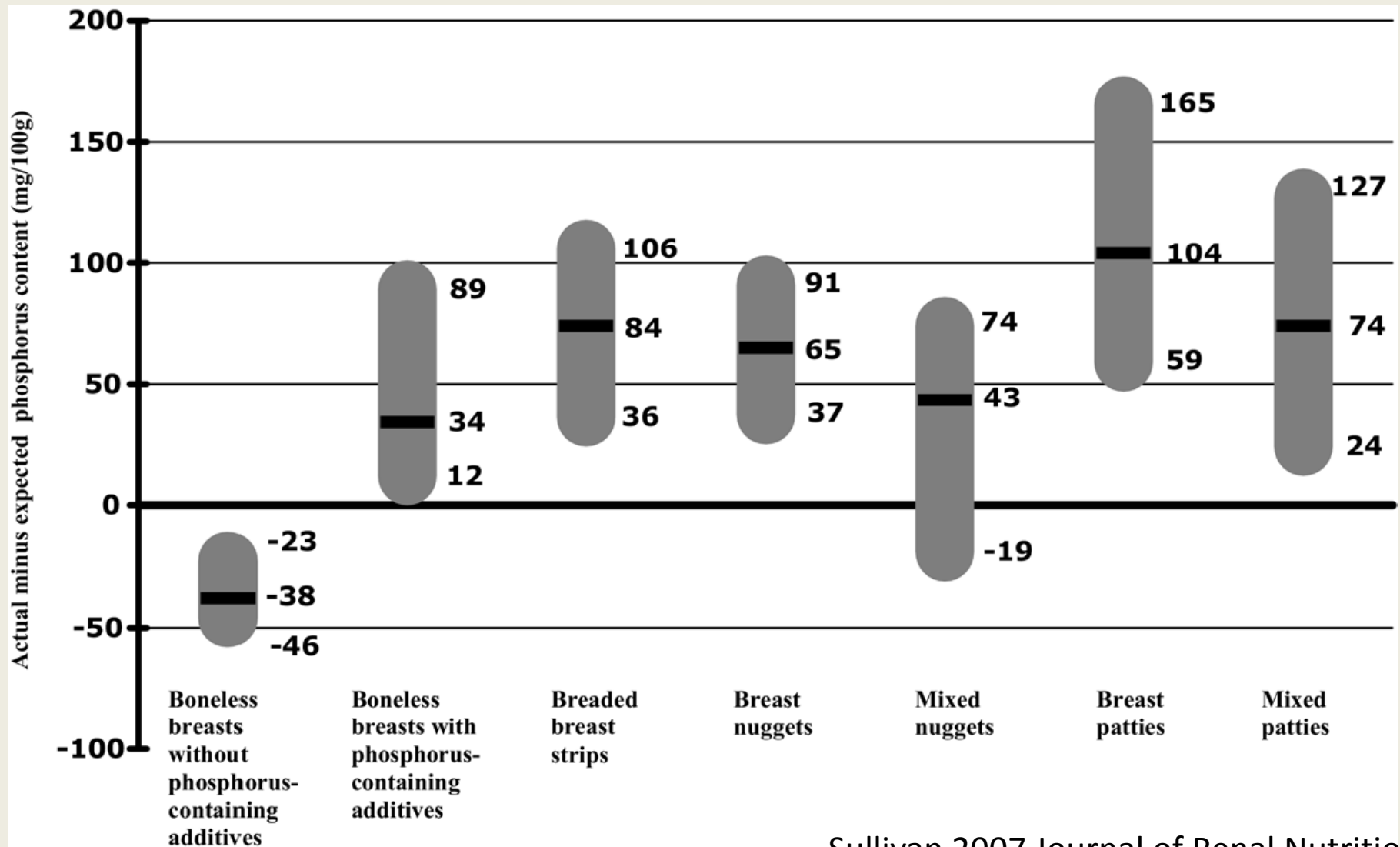
- Leavening
- Acid
- Suspension/dispersion agent
- Anti caking
- Decrease cooking time
- Emulsifier
- Stabilizer
- Moisture binding
- Improve texture
- Maintain color or firmness
- Flavor enhancer



Outline

- What are phosphorus containing food additives and how are they used?
- **How do phosphorus containing food additives affect the accuracy of nutrient databases?**
- Are phosphorus enhanced foods common and how much phosphorus do they add to foods?
- Why are these additives harmful for kidney disease patients?
- Is this a problem for the general population?

Actual minus USDA database phosphorus content of 38 chicken products



Actual and Expected Phosphorus Contents of a Variety of Chicken Products

Category	Product	Phosphorus containing additives*	Serving size (g)	Actual phosphorus (mg/100g)	Expected phosphorus (mg/100g)	Difference (mg/100g)
Boneless breast	Giant Eagle fresh chicken breast	None	112	205	228	-23
	Townsend quick frozen chicken breast	1	113	250	228	22
	Tyson quick frozen chicken breast	1	112	317	228	89
Breast patties	Tyson breast patties	1,3	73	185	126	59
	Banquet chicken breast patties	2,4,5	76	291	126	165

Outline

- What are phosphorus containing food additives and how are they used?
- How do phosphorus containing food additives affect the accuracy of nutrient databases?
- **Are phosphorus enhanced foods common and how much phosphorus do they add to foods?**
- Why are these additives harmful for kidney disease patients?
- Is this a problem for the general population?

Prevalence of Phosphate Additives in Top Selling Groceries

- Nielsen grocery sales data for NE Ohio
 - 52 weeks ending February 1, 2010
- Top 20 Total Departments by unit sales
- Deleted 5 categories
 - total fresh produce, milk, pet food, candy, paper products
- Reviewed 200 top selling food items/category
 - Eliminated store brands



15
departments
represent 45%
of total
grocery sales
in NE Ohio

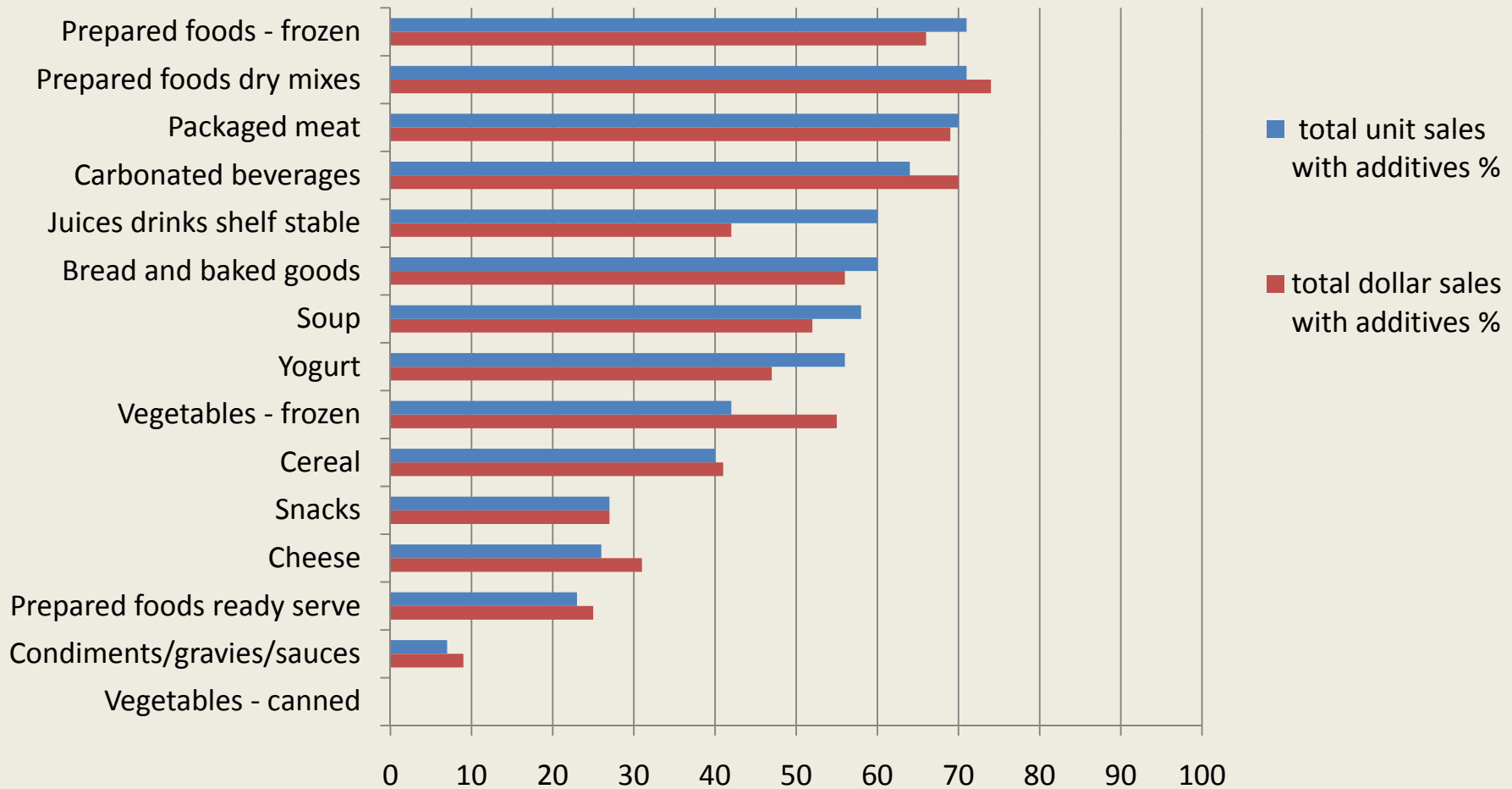
Department	Total Unit Sales (millions)
Carbonated beverages	61.4
Yogurt	51.6
Bread and baked goods	39.3
Snacks	34.1
Soup	31.4
Prepared foods - frozen	27.1
Juice drinks shelf stable	26.8
Packaged meat	26.5
Cereal	26.5
Condiments/gravies/sauces	26.3
Prepared foods – dry mixes	22.0
Vegetables – canned	21.7
Cheese	20.3
Vegetables – frozen	17.9
Prepared foods – ready serve	17.4
TOTAL	450.3

Labels Reviewed

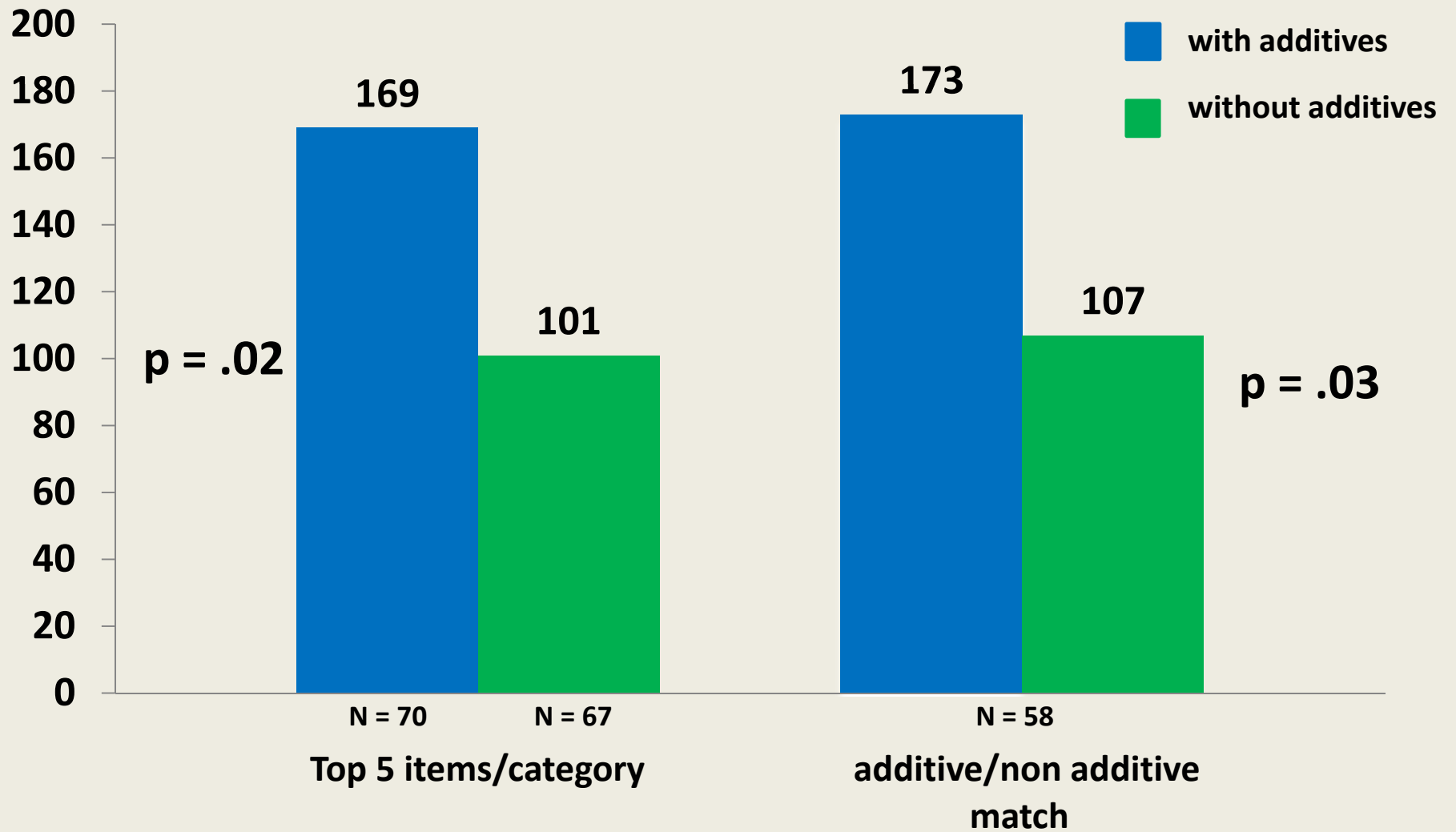
Department	# Items reviewed
Prepared foods – frozen	195
Prepared foods – dry mixes	171
Packaged meat	168
Bread and baked goods	145
Soup	172
Yogurt	164
Carbonated beverages	170
Vegetables – frozen	195
Juice drinks shelf stable	176
Cereal	167
Prepared foods – ready serve	165
Snacks	169
Cheese	116
Condiments/gravies/sauces	160
Vegetables – canned	122
TOTAL	2394

Percent Grocery Department Sales Containing Phosphate Additives

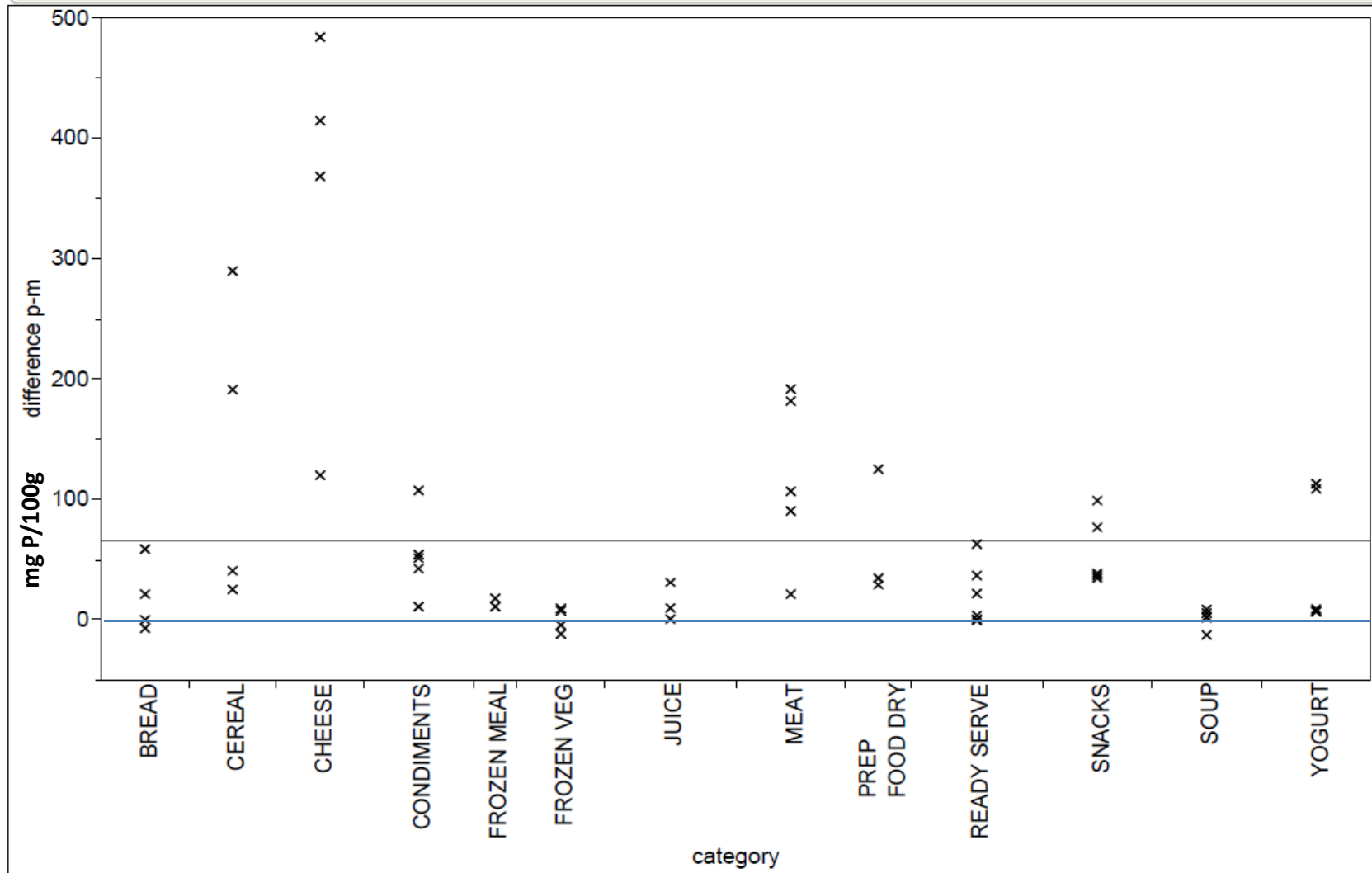
2394 food labels reviewed



Mean Phosphorus Content (mg/100g)

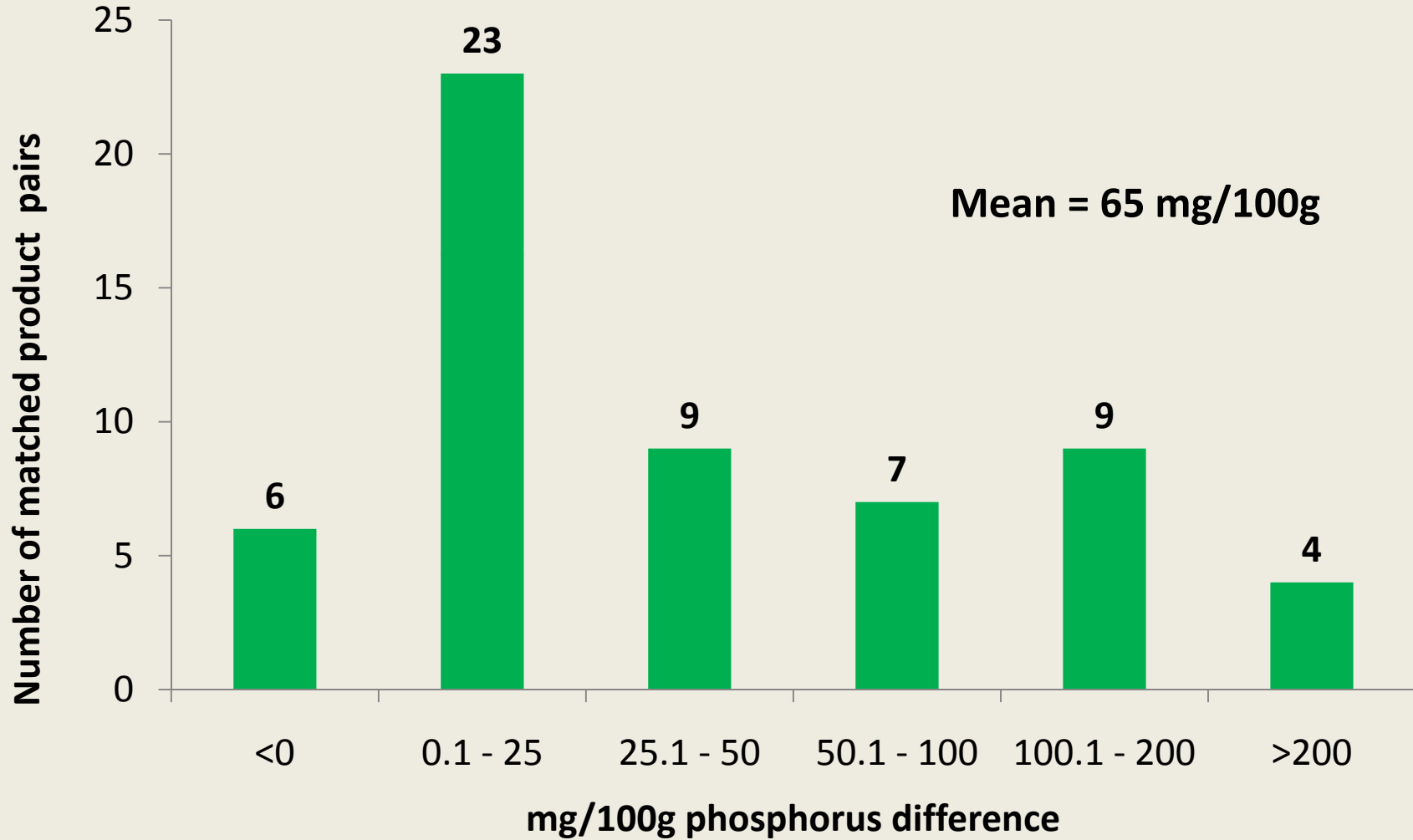


Difference in Phosphorus Content Additive and Non-additive by Category



Mean = 65

Difference in Phosphorus Content Between Matched Items



Comparison Examples

- Velveeta shells and cheese = 456 mg
- Kraft mac and cheese = 280 mg
- Kraft mac and cheese organic = 200 mg

- Kraft singles deluxe American = 148 mg
- Horizon organic American = 79 mg

- Yoplait strawberry (regular) = 311 mg
- Yoplait light strawberry = 137 mg
- Breyer strawberry (regular) = 119 mg



Comparison Examples

- Spaghettios with meatballs = 194 mg
- Chef Boyardee shells & meatballs = 101 mg
- Cheerios = 132 mg
- Nature's Path organic whole o's = 55 mg
- Sugardale bacon = 445 mg/100g
- Hormel black label bacon = 263 mg/100g
- Ragu roasted garlic parmesan = 67 mg
- Classico roasted garlic alfredo = 37 mg



Outline

- What are phosphorus containing food additives and how are they used?
- How do phosphorus containing food additives affect the accuracy of nutrient databases?
- Are phosphorus enhanced foods common and how much phosphorus do they add to foods?
- **Why are these additives harmful for kidney disease patients?**
- Is this a problem for the general population?

Why is this important in CKD?



- Significant cause of CVD morbidity/ mortality
 - 45% of HD patients have persistently high Phosphorus
 - Exceeds limits of medication
- Difficult for patients and clinicians to determine which foods are high in phosphorus
 - Increased reliance on convenience foods
 - Many people are not learning cooking skills
- Additives are almost entirely absorbed, natural only ~60%
 - Most restaurants use enhanced meats
- Depending on food choices, additives add as much as 1000 mg/day of phosphorus to diet. (Calvo MS, 1996)
 - Based on intake data from 1989-90

Outline

- What are phosphorus containing food additives and how are they used?
- How do phosphorus containing food additives affect the accuracy of nutrient databases?
- Are phosphorus enhanced foods common and how much phosphorus do they add to foods?
- Why are these additives harmful for kidney disease patients?
- **Is this a problem for the general population?**

General Population Concerns

- Numerous studies in the non CKD population have found associations with serum phosphorus and:
 - Vascular Calcification and stiffness
 - Cardiovascular Events
 - All cause mortality
 - Bone metabolism



Public health approach: Is it relevant to enough people?

- **400,000 dialysis patients in the US**
- **10 million Americans with moderate kidney disease**

prevalence (age ≥ 20 years), percent

CKD all stages	16.8
Stage 3	5.4
Stage 4/5	0.4

Conclusions

- Phosphorus additives are commonly used in the most frequently purchased grocery items
- Phosphorus additives contribute a significant amount of phosphorus to grocery items
- Large variation in content in like foods found on analysis
- Patients and clinicians unable to determine quantity of phosphorus in foods

Thoughts

- Epidemiological and clinical trials require accurate databases
- Manufacturers must analyze products for phosphorus content to populate databases
- Current databases are unable to show the wide variability in products due to additive phosphorus