



Limitations of Food Composition Databases

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Revised Title

Considerations for Using Food Composition Databases



Outline

- Overview of databases and activities
- Data sources
- Data quality issues
- Food component variability
- Compiler decisions/issues
- Database needs
- Considerations for database use



Overview of Databases and Activities



- Many uses
 - Dietary evaluation/planning/counseling
 - Assess national food/food component adequacy
 - Guide nutrition policies
 - Food product development
- Always a work in progress (never complete)

US Databases and Activities

- USDA SR21
- USDA Special Interest Databases
- USDA FNDDS (software for assessment)
- NIH ODS Supplement Databases
- FDA Total Diet Study
- National Nutrient Databank Conference
- NNDC International Directory



International/European Databases/Activities



- INFOODS

publications, database directory

- International Food Data Conference

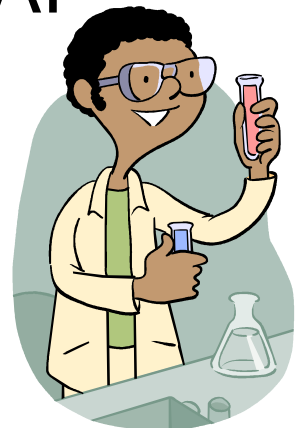
- Journal of Food Composition and Analysis

- European Food Information Resource Network (EuroFIR)



Sources of Food Composition Data

- Scientific literature, e.g., JFCA
- Contract lab analysis, e.g., NFNAP
- Food industry (labeling data)
- US/non-US databases
- Calculated from ingredients
- Estimated based on similar foods



Nutrition Facts	
Serving Size 1 Serving (127g)	
Servings Per Recipe 1	
Amount Per Serving	
Calories 60	Calories from Fat 20
% Daily Value*	
Total Fat 2g	3%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 470mg	20%
Total Carbohydrate 8g	3%
Dietary Fiber 2g	8%
Sugars 7g	
Protein 2g	
Vitamin A 15%	Vitamin C 4%
Calcium 2%	Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet.



Issues of Data Quality

- **Timeliness** (when collected and analyzed)
- **Representativeness** (sampling based on region, season, cultivar/breed, etc.)
- **Number of individual/composited samples**
- **Accuracy** (sample prep, analytical methods, use of reference stds, QC)
- **Data summation** (mean/median/mode; market share; ranges; outliers; SDs, SEs)



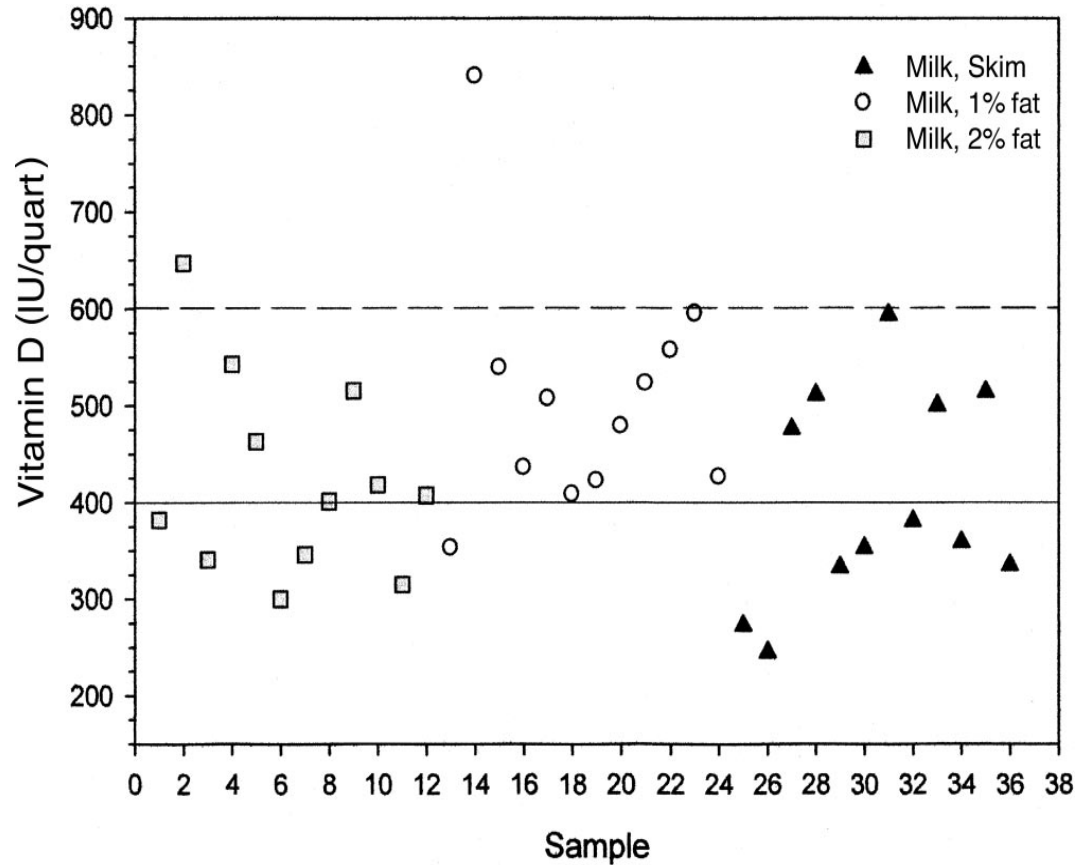
Food Component Variability

- Inherent (cultivar/breed, maturity/age, color)
- Environmental (soil, water, weather, sunlight, feed)
- Processing/preparation
 - Transport and storage (time and temp)
 - Exposure to heat, light, air
 - Removal/addition of components, e.g., fat removal; nutrient fortification
 - Use of various recipes (if >1 ingredient)



Vitamin D Variability

(Holden et al, Am J Clin Nutr 87:1092S-6S, 2008)



Vitamin D in Milk (IU/quart)

(Holden et al. Am J Clin Nutr 87:1092S-6S, 2008)

- Nonfat milk – 423 ± 103 (24% CV)
- 1% fat milk – 507 ± 126 (25% CV)
- 2% fat milk – 406 ± 109 (27% CV)

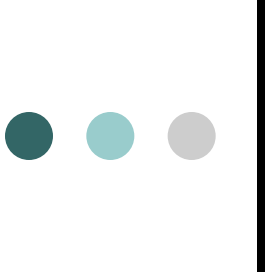


Calcium in Milk (FDA TDS)

(mg/8 fl oz; n=51)

Type	mean/med \pm SD (range)
Whole	246/256 \pm 39 (63-283)
2% fat	266/271 \pm 34 (90-315)
Nonfat	278/281 \pm 44 (117-427)
Chocolate	264/256 \pm 49 (112-407)





Iron in FDA TDS Foods (mg/100 g; n=51)

○ Food	mean \pm SD	(range)
○ Beef loin, ckd	2.6 \pm 0.4	(1.8-3.5)
○ Farina, ckd	4.9 \pm 2.0	(1.6-10.5)
○ Raisin bran	25.1 \pm 12.0	(10.9-56.0)
○ Spinach, ckd	2.5 \pm 2.4	(0.8-16.6)
○ Meatloaf, ckd	2.4 \pm 0.4	(1.3-3.4)
○ Chicken pot pie	1.2 \pm 0.6	(0.6-3.8)

Fat: Time of Day



- Significant circadian variation in fat content of preterm breast milk; higher fat content in the evening ($7.9 \pm 2.9\%$) than morning ($6.6 \pm 2.8\%$)



Lubetzky et al., 2006. J Am Col Nutr 25, 151-154

Vit C - Height of Plant



- Vitamin C decreased while carotenoids, chlorophylls, and polyphenols increase with height in dill plants:

plant ht (cm)	vit C (mg/100g) in leaves
20	138 \pm 5
40	122 \pm 4
60	119 \pm 5

Lisiewska et al., 2006. J Food Comp Anal 19, 134-140

Antioxidant Capacity - Season

- Cherry tomatoes of same cultivar, conditions, & location showed marked differences in antioxidant capacity based on harvest time:

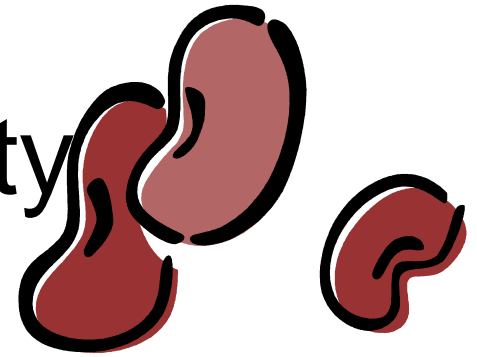


Apr	.191	mm Trolox eq/100 g
Jun	.263	
Jan	.170	
Mar	.420	

Raffo et al. 2006. J Food Comp Anal 19, 11-19



Phenolic Acid - Variety



- Total phenolic acid of 15 varieties of dry beans:

cranberry beans	19.1 mg/100 g
kidney beans, dark	20.9
pink beans	34.4
navy beans	48.3

Luthria and Pastor-Corrales. 2006. J Food Comp Anal 19, 205-211

Database Compiler Decisions



- Foods/food components
- Merging data from various sources
- Documentation of data
- Food component names/units
- Food groups/subgroups
- Food descriptors (Languag, INFOODS)
- Food names (examples of issues)



Languag Food Description Factors (retrieval system)

- Product type
- Food source
- Part of plant/animal
- Physical state
- Heat treatment
- Cooking method
- Treatments applied
- Preservation
- Packing medium
- Container/wrapping
- Food contact surface
- Consumer group/dietary use
- Geographic place/region
- Cuisine



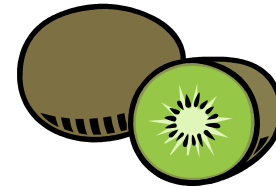
INFOODS Food Descriptors

- Scientific name
- Variety/breed/strain
- Part of plant/animal
- Area of origin
- Manufacturer
- Ingredients
- Processing/prep
- Preservation
- Cooking method
- Agricultural issues
- Maturity/ripeness
- Storage conditions
- Grade
- Container
- Physical state
- Color

Food Name Synonyms

- Balsam pear (bitter melon, bitter gourd)

- Celeriac (celery root)



- Jerusalem artichoke (sunchoke)

- Kiwi fruit (Chinese gooseberry)

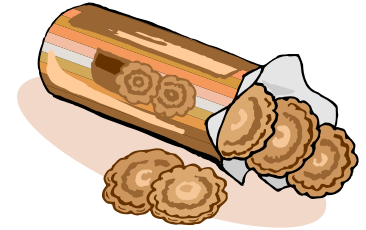
- Ocean perch (redfish)

- Rutabaga (Swede)



- Sub (grinder, hero, hoagie, torpedo)

Same Name – Different Foods




- Biscuit: dinner roll vs. British cookie
- Half & half: milk & cream vs. porter & ale
- Lady finger: sponge cake vs. okra
- Marrow: bone tissue vs. summer squash
- Snowball: shaved ice vs. snack cake
- Sweetbread: calf/lamb pancreas vs. pastry
- Truffle: fungus vs. chocolate cream
- Tuna: fish vs. prickly pear (cactus fruit)
- Twister: Tropicana drink vs. KFC entree

Foods with Geographic Names (not known in named country)

- Brussels sprouts
- Canadian bacon
- Danish/Danish pastry
- French fries
- German chocolate cake
- Scotch broth
- Swede
- Swiss steak





Food names that may not be useful outside the US

- Baby Ruth/Twizzler
- Buffalo wings
- Chicken fried steak
- Chicken/hen of the woods; cloudear
- Dirty rice
- Hush puppy; cornpone
- Pebbles/Froot Loops
- Pig-in-a-blanket
- Old fashioned; rusty nail; screwdriver
- Succotash
- Whopper



Complexity of Beef Cuts in SR21

- Bottom sirloin, tri-tip (11)
- Brisket (27)
- Chuck (69)
- Composite cuts (14)
- Flank (13)
- Ground (31)
- Loin (3)
- Plate (4)
- Rib (64)
- Round (119)
- Short loin (44)
- Tenderloin (24)
- Top sirloin (19)





69 Beef Chuck Cuts in SR21

- arm pot roast (16 listings)
- blade roast (17 listings)
- clod steak (6 listings)
- mock tender steak (6 listings)
- shoulder clod (18 listings)
- top blade (6 listings)

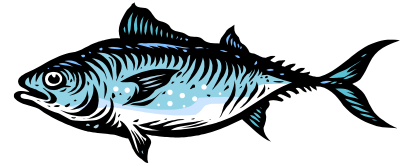
31 Ground Beef Listings in SR21

- 70, 75, 80, 85, 90, 95% lean
- Crumbles, loaf, patty
- Pan-browned, baked, broiled, frozen, raw



16 Tuna Listings in SR21

- Fresh, raw (3): blue/yellowfin, skipjack
- Fresh, ckd (3): blue/yellowfin, skipjack
- Light, canned in oil (2)
- Light, canned in water (2)
- White, canned in oil (2)
- White, canned water (2)
- Tuna salad (1)
- Fast food sub with tuna salad (1)



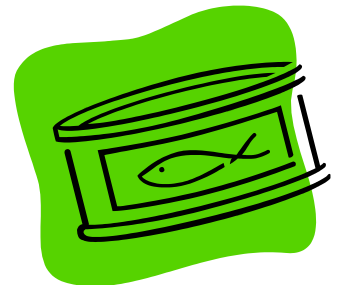
StarKist (22 products)



- Flavor Fresh Pouch (albacore white/chunk light)
- StarKist Creations in pouches (5 flavors)
- StarKist Tuna Fillets (3 types)
- Lunch-To-Go (2 flavors snack packs)
- Gourmet Choice (low-sodium chunk light/albacore)

Bumble Bee (19 products)

- Easy Peel Boxes (spicy Thai chili; lemon & cracked pepper, sundried tomato & basil)
- Prime fillet solid white in vegetable broth
- Prime fillet albacore in pouches
- Solid white albacore in oil/water
- Premium albacore in pouch





Database Areas in Need of Improvement

- Documentation of sources
- Information on variability & # of samples
- Common and consistent terminology for food names/descriptors
- Data for cultural/ethnic foods
- Data for fast foods/restaurant foods
- Keep up with the food industry
- Data for bioactive components



Considerations for Using Databases

- They require continuous/considerable upkeep to reflect food supply
- Data are uneven in quality, reliability, representativeness, accuracy
- Usually means without clear indications of variability
- No way to control for variability

Considerations for Using Databases (contd.)

- Nationally-representative data may not be useful for individuals
- Often don't have the exact food needed, i.e., must pick closest match
- Not reliable enough for clinical/individual studies where intakes are compared with biological measures

