

Cardiovascular Health Risk Behaviors Among Children and Adolescents

Concordance with Diet and Nutrition Guidelines

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HEALTH AND HUMAN SERVICES
National Institutes of Health

Evidence-based recommendations for diet and nutrition (Grade A/B)

- Primary beverage: fat-free unflavored milk
- Limit/avoid sugar sweetened beverages
- Total fat: 25-30% of daily kcal/EER
- Saturated fat: 8-10% of daily kcal/EER
- Cholesterol: < 300 mg/d

Evidence-based recommendations for diet and nutrition (Grade D)

- Avoid trans fats as much as possible
- Monounsaturated and polyunsaturated fat: up to 20% of daily kcal/EER

Supportive actions

- Teach portions based on EER for age/sex/age
- Encourage moderately increased energy intake during periods of rapid growth and/or regular moderate-to-vigorous physical activity
- Encourage dietary fiber from foods
- Limit naturally sweetened juice (no added sugar)
- Limit sodium intake
- Encourage healthy eating habits
- Support DASH-style eating plan

Estimated calorie needs per day

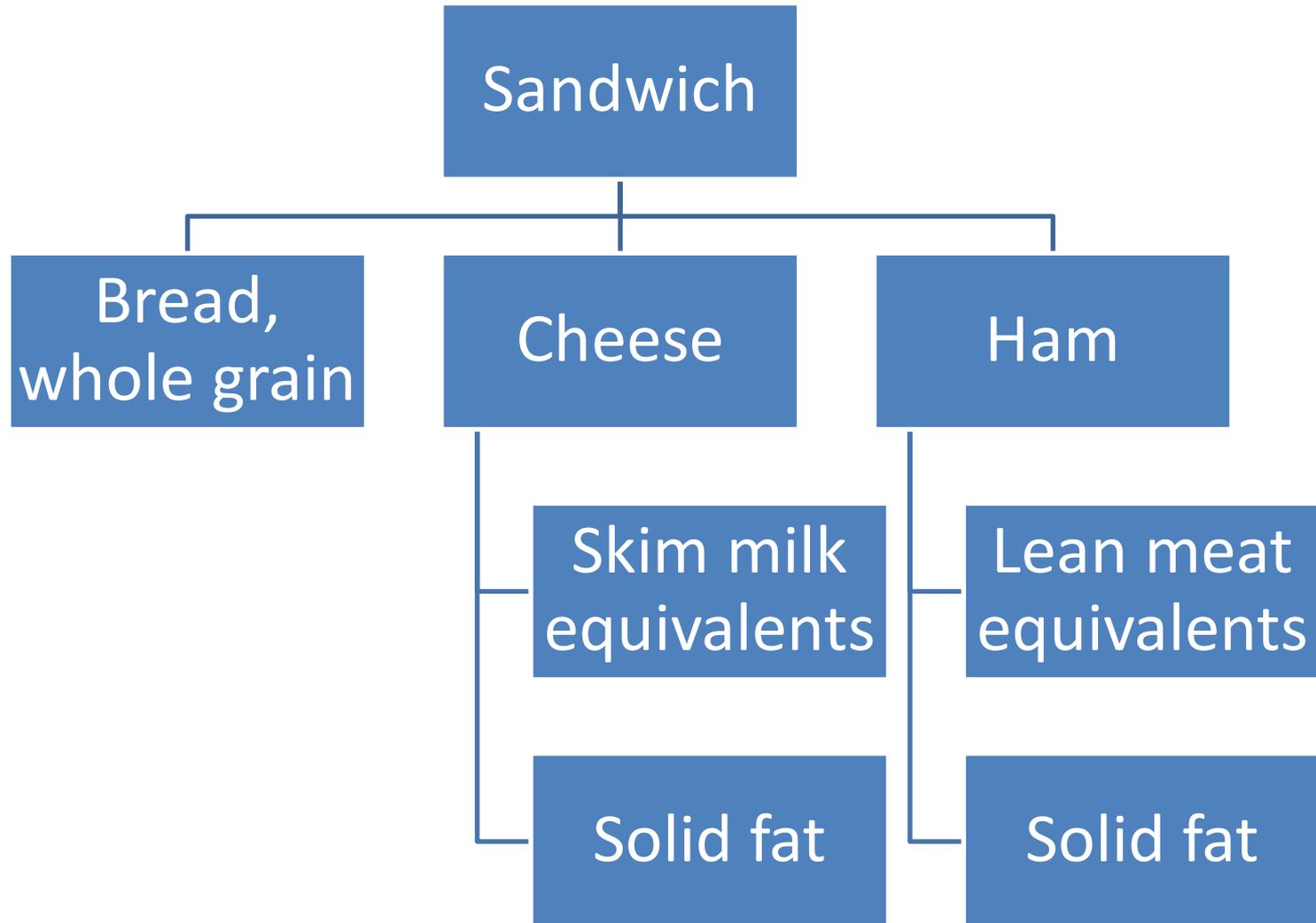
Gender	Age	Sedentary	Moderately Active	Active
Females/males	2-3	1,000-1,200	1,000-1,400	1,000-1,400
Females	4-8	1,200-1,400	1,400-1,600	1,400-1,800
	9-13	1,400-1,600	1,600-2,000	1,800-2,200
	14-18	1,800	2,000	2,400
Males	4-8	1,200-1,400	1,400-1,600	1,600-2,000
	9-13	1,600-2,000	1,800-2,200	2,000-2,600
	14-18	2,000-2,400	2,400-2,800	2,800-3,200

DASH Eating Plan: Servings per day

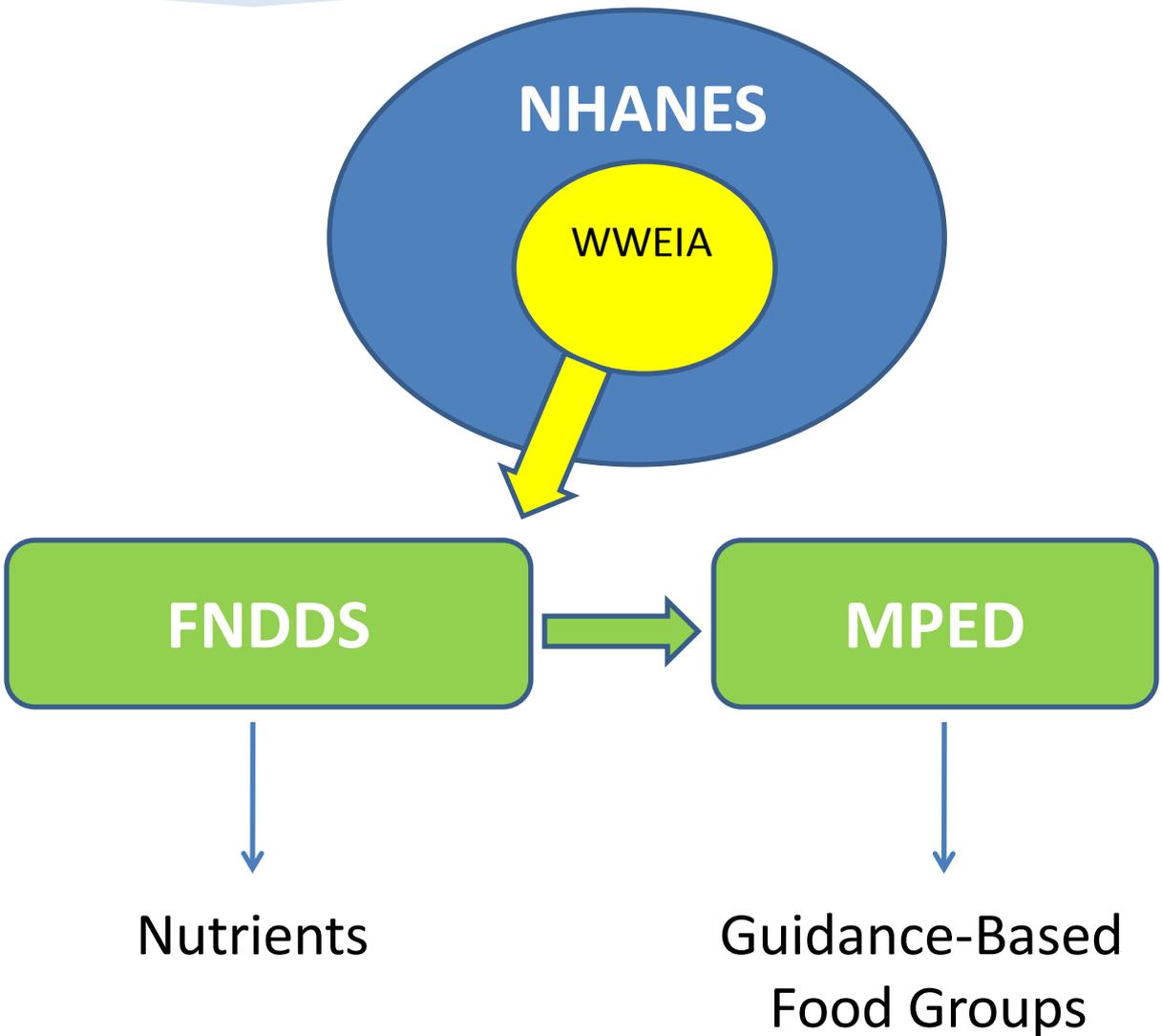
Food Group	1,200 Calories	1,400 Calories	1,600 Calories	1,800 Calories	2,000 Calories	2,600 Calories
Grains*	4-5	5-6	6	6	6-8	10-11
Vegetables	3-4	3-4	3-4	4-5	4-5	5-6
Fruits	3-4	4	4	4-5	4-5	5-6
Fat-free or low-fat milk/milk products	2-3	2-3	2-3	2-3	2-3	3
Lean meats/poultry/fish	3 or less	3-4 or less	3-4 or less	6 or less	6 or less	6 or less
Nuts, seeds and legumes	3/week	3/week	3-4/week	4/week	4-5/week	1
Fats & oils	1	1	2	2-3	2-3	3
Sweets & added sugars	≤3/week	≤3/week	≤3/week	≤3/week	≤3/week	≤2

*Whole grains are recommended for most grain servings

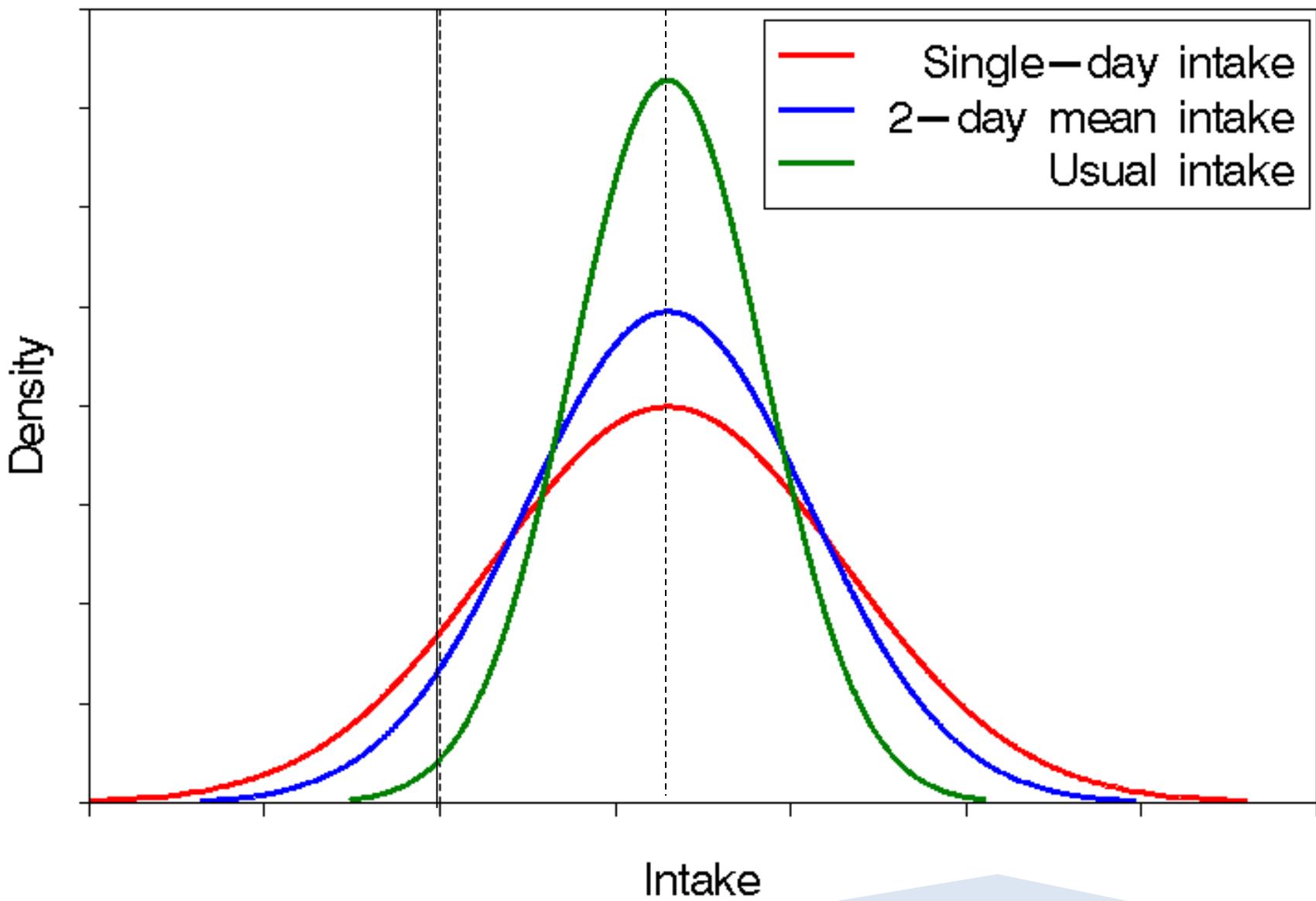
Disaggregation necessary to assess food group intake



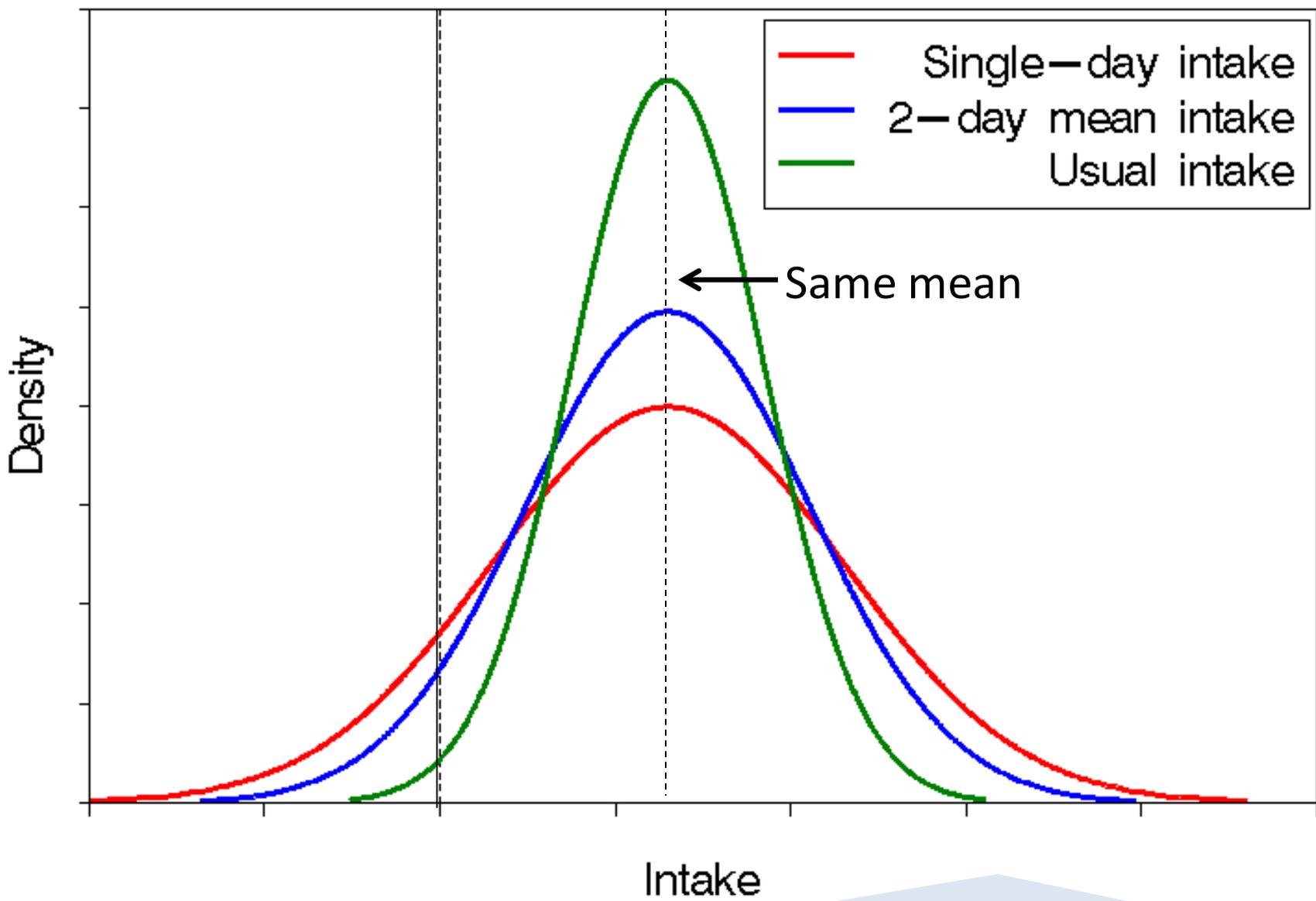
Two key databases



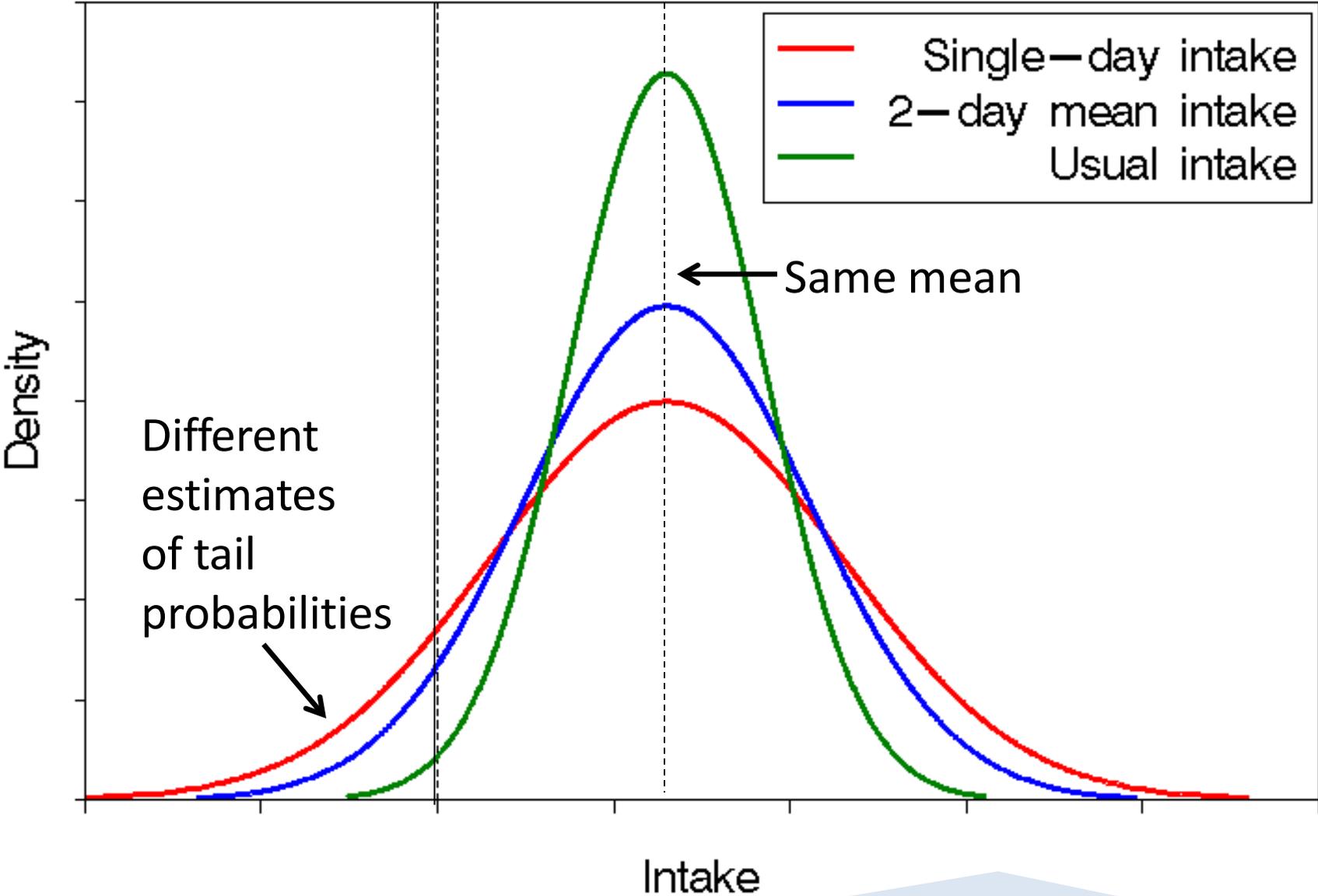
Single day, 2-day, or usual intake



Single day, 2-day, or usual intake

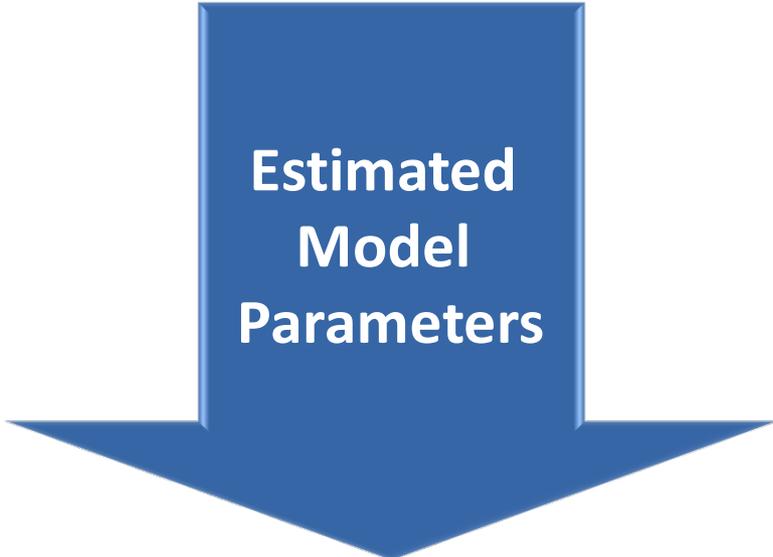


Single day, 2-day, or usual intake



Usual intake estimation

Step 1: Fit a two-part statistical model with correlated person-specific effects



**Estimated
Model
Parameters**

Step 2: Estimate final products depending on application of interest

Usual intake of sodium (mg) from food, 2001-02 NHANES

	Age (years)	←-----mg-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	2140	1144	1318	1648	2071	2554	3049	3379
	4-8	2831	1844	2025	2352	2761	3233	3727	4059
Males	9-13	3549	2485	2692	3055	3495	3982	4474	4798
	14-18	4086	2682	2947	3424	4009	4664	5322	5752
Females	9-13	2806	2009	2159	2426	2757	3135	3520	3770
	14-18	4799	1740	1934	2284	2727	3238	3758	4098

Target: < 2,300 mg/day

Usual intake of sodium (mg) from food, 2001-02 NHANES

	Age (years)	←-----mg-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	2140	1144	1318	1648	2071	2554	3049	3379
	4-8	2831	1844	2025	2352	2761	3233	3727	4059
Males	9-13	3549	2485	2692	3055	3495	3982	4474	4798
	14-18	4086	2682	2947	3424	4009	4664	5322	5752
Females	9-13	2806	2009	2159	2426	2757	3135	3520	3770
	14-18	4799	1740	1934	2284	2727	3238	3758	4098

Target: < 2,300 mg/day

Usual intake of fiber (gm) from food, 2001-02 NHANES

	Age (years)	←-----gm-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	9.5	4.8	5.5	7.1	9.1	11.5	14.0	15.7
	4-8	11.6	7.4	8.1	9.6	11.3	13.4	15.5	16.9
Males	9-13	14.2	10.0	10.8	12.2	14.0	15.9	17.8	19.0
	14-18	15.3	8.1	9.3	11.6	14.6	18.3	22.2	24.9
Females	9-13	12.3	7.2	8.0	9.6	11.8	14.6	17.4	19.1
	14-18	11.7	5.9	6.9	8.8	11.2	14.0	17.0	19.0

Target: Age + 5 gm/day or 14 g/1,000 kcal, depending on age

Usual intake of total grains (oz equivalents), 2001-04 NHANES

	Age (years)	←-----oz equivalents-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	4.3	2.43	2.77	3.40	4.20	5.11	6.00	6.58
	4-8	6.7	4.16	4.63	5.49	6.53	7.70	8.82	9.57
Males	9-13	8.4	4.77	5.42	6.66	8.19	9.92	11.59	12.66
	14-18	9.0	5.18	5.91	7.19	8.78	10.55	12.25	13.34
Females	9-13	6.9	3.76	4.34	5.40	6.71	8.16	9.57	10.44
	14-18	6.6	3.53	4.10	5.12	6.39	7.81	9.21	10.11

Target: 4-11/day, depending on calorie level

Usual intake of whole grains (oz equivalents), 2001-04 NHANES

	Age (years)	←-----oz equivalents-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	0.5	0.07	0.11	0.20	0.37	0.61	0.91	1.13
	4-8	0.5	0.07	0.11	0.22	0.41	0.68	1.02	1.25
Males	9-13	0.7	0.03	0.06	0.18	0.48	0.97	1.61	2.08
	14-18	0.5	0.01	0.02	0.08	0.26	0.64	1.18	1.60
Females	9-13	0.5	0.03	0.06	0.14	0.34	0.66	1.07	1.37
	14-18	0.5	0.03	0.05	0.13	0.33	0.69	1.16	1.52

Target: most grain servings should be whole grain

Usual intake of total fruit (cup equivalents), 2001-04 NHANES

	Age (years)	←-----cup equivalents-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	1.5	0.38	0.55	0.90	1.40	2.02	2.71	3.18
	4-8	1.1	0.18	0.30	0.58	0.99	1.53	2.12	2.53
Males	9-13	1.0	0.08	0.16	0.38	0.79	1.39	2.12	2.64
	14-18	1.0	0.06	0.12	0.33	0.78	1.45	2.25	2.82
Females	9-13	1.0	0.09	0.17	0.38	0.77	1.32	1.99	2.45
	14-18	0.8	0.05	0.10	0.28	0.63	1.17	1.82	2.28

Target: 3-6 servings (1.5-3.0 cups)/day, depending on calorie level

Usual intake of total vegetables (cup equivalents), 2001-04 NHANES

	Age (years)	←-----cup equivalents-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	0.7	0.28	0.35	0.48	0.66	0.88	1.12	1.29
	4-8	0.9	0.39	0.47	0.64	0.86	1.12	1.40	1.59
Males	9-13	1.2	0.42	0.53	0.76	1.10	1.53	1.99	2.31
	14-18	1.4	0.52	0.66	0.93	1.31	1.79	2.29	2.63
Females	9-13	1.1	0.44	0.54	0.74	1.02	1.36	1.73	1.96
	14-18	1.1	0.45	0.55	0.76	1.04	1.39	1.76	2.01

Target: 3-6 servings (1.5-3.0 cups)/day, depending on calorie level

Usual intake of milk* (cup equivalents), 2001-04 NHANES

	Age (years)	←-----cup equivalents-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	2.0	0.48	0.70	1.16	1.80	2.58	3.39	3.94
	4-8	1.7	0.37	0.55	0.95	1.54	2.25	3.01	3.53
Males	9-13	1.8	0.24	0.39	0.77	1.45	2.45	3.73	4.68
	14-18	1.5	0.16	0.27	0.58	1.17	2.07	3.21	4.07
Females	9-13	1.4	0.24	0.37	0.68	1.20	1.92	2.79	3.43
	14-18	0.9	0.08	0.15	0.34	0.72	1.28	1.99	2.52

* Skim milk equivalents, from all milk products
Target: 2-3 cups/day, depending on calorie level

Usual intake of lean meats, poultry, fish* (oz equivalents), 2001-04 NHANES

	Age (years)	←-----oz equivalents-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	2.0	0.75	0.99	1.40	1.90	2.48	3.10	3.52
	4-8	2.9	1.31	1.63	2.16	2.81	3.54	4.30	4.79
Males	9-13	4.0	1.83	2.22	2.94	3.85	4.88	5.98	6.70
	14-18	5.2	2.55	3.08	3.97	5.08	6.35	7.62	8.48
Females	9-13	3.1	1.55	1.86	2.38	3.02	3.74	4.47	4.97
	14-18	3.3	1.53	1.93	2.53	3.25	4.04	4.84	5.37

* Lean meat equivalents from all sources, does not include weight of intrinsic fat
 Target: ≥ 3 to ≤ 6 ounces/day, depending on calorie level

Usual intake of nuts and seeds (oz equivalents), 2001-04 NHANES

	Age (years)	←-----oz equivalents-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	0.2	0.01	0.02	0.04	0.11	0.25	0.44	0.60
	4-8	0.3	0.02	0.03	0.07	0.17	0.37	0.62	0.82
Males	9-13	0.5	0.02	0.04	0.11	0.28	0.64	1.27	1.83
	14-18	0.3	0.01	0.02	0.06	0.15	0.38	0.79	1.19
Females	9-13	0.3	0.00	0.01	0.04	0.13	0.38	0.88	1.36
	14-18	0.3	0.00	0.01	0.03	0.11	0.36	0.86	1.38

* Note: recommendation is for nuts, seeds and legumes

Target: with legumes, 3 servings/week to 1/day, depending on calorie level

Usual intake of legumes (cup equivalents), 2001-04 NHANES

	Age (years)	←-----cup equivalents-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	0.0	0.00	0.01	0.01	0.02	0.05	0.11	0.16
	4-8	0.0	0.00	0.01	0.01	0.03	0.06	0.11	0.17
Males	9-13	0.1	0.00	0.01	0.02	0.04	0.11	0.23	0.33
	14-18	0.1	0.00	0.01	0.01	0.04	0.10	0.21	0.32
Females	9-13	0.1	0.00	0.01	0.02	0.04	0.09	0.18	0.26
	14-18	0.1	0.00	0.01	0.01	0.03	0.07	0.15	0.22

* Note: recommendation is for nuts, seeds and legumes

Target: with nuts and seeds, 3 servings/week to 1/day, depending on calorie level

Usual intake of oils (gm), 2001-04 NHANES

	Age (years)	←-----gm-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	8.6	3.43	4.20	5.76	7.96	10.75	13.80	15.84
	4-8	14.2	6.51	7.73	10.15	13.43	17.48	21.71	24.70
Males	9-13	19.2	6.69	8.41	12.18	17.54	24.52	32.16	37.61
	14-18	22.4	8.10	10.23	14.54	20.64	28.46	36.72	42.56
Females	9-13	16.4	5.80	7.28	10.46	15.04	20.89	27.34	31.77
	14-18	18.0	6.50	8.13	11.56	16.43	22.72	29.71	34.59

Target: with solid fats, 1 serving (~4 gm) to 3 servings/day, depending on calorie level

Usual intake of solid fats (gm), 2001-04 NHANES

	Age (years)	←-----gm-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	37.9	20.34	23.34	29.27	36.75	45.23	53.70	59.10
	4-8	44.5	24.99	28.54	35.13	43.37	52.71	61.90	68.01
Males	9-13	53.9	27.34	31.89	40.71	52.01	65.05	78.10	86.65
	14-18	60.4	31.67	36.92	46.43	58.57	72.51	86.08	95.03
Females	9-13	45.2	22.58	26.42	33.95	43.68	54.80	65.94	73.10
	14-18	42.4	20.53	24.33	31.54	40.71	51.47	62.46	69.73

Target: with oils , 1 serving (~4 gm) to 3 servings/day, depending on calorie level

Usual intake of added sugars* (teaspoons), 2001-04 NHANES

	Age (years)	←-----teaspoons-----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	12.2	4.31	5.48	7.88	11.30	15.57	20.13	23.19
	4-8	21.0	9.21	11.17	14.89	19.89	25.96	32.23	36.39
Males	9-13	29.2	9.75	12.58	18.46	26.82	37.41	48.80	56.60
	14-18	34.3	12.35	15.76	22.53	31.94	43.67	55.91	64.20
Females	9-13	23.2	7.50	9.68	14.42	21.24	29.80	39.10	45.38
	14-18	25.2	8.42	10.89	16.02	23.17	32.24	42.20	49.08

* Includes all sugar, syrup, honey, and molasses eaten separately or as ingredient in other food

Target: ≤ 3 servings (9 tsps)/week to ≤ 2 servings (6 tsps)/day, depending on calorie level

Usual energy intake from total fat (%), 2001-04 NHANES

	Age (years)	←----- % -----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	32.57	25.49	26.94	29.44	32.38	35.50	38.42	40.24
	4-8	32.30	25.68	27.03	29.37	32.13	35.06	37.80	39.54
Males	9-13	33.37	24.41	26.26	29.40	33.03	36.91	40.57	42.91
	14-18	32.98	24.74	26.46	29.37	32.76	36.36	39.76	41.84
Females	9-13	33.38	24.94	26.69	29.68	33.19	36.84	40.34	42.54
	14-18	33.44	25.01	26.74	29.72	33.23	36.93	40.44	42.62

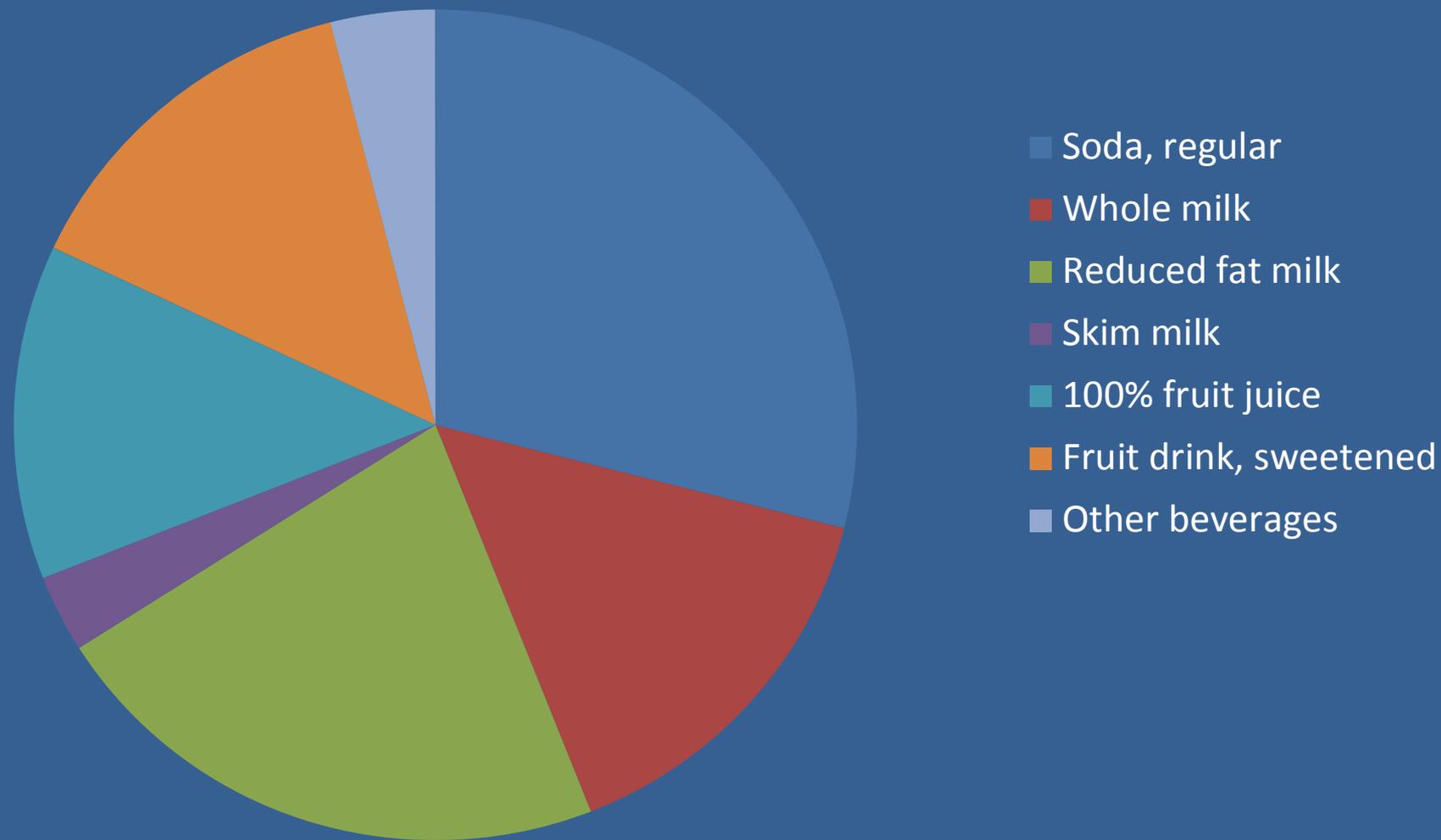
Target: 25-30% of total energy

Usual energy intake from saturated fat (%), 2001-04 NHANES

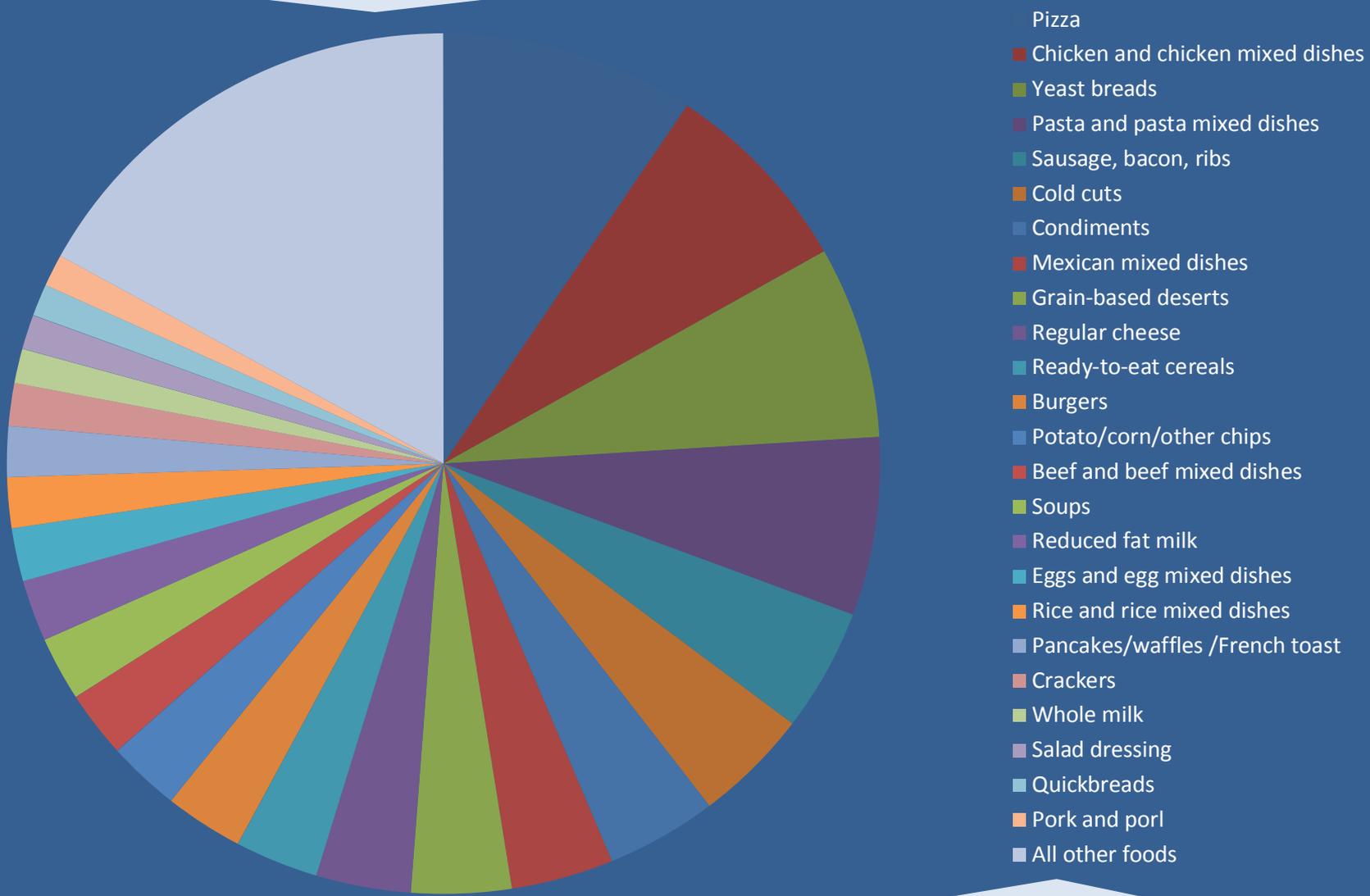
	Age (years)	←----- % -----→							
		Mean	5%	10%	25%	50%	75%	90%	95%
Children	1-3	12.71	9.05	9.78	11.04	12.57	14.23	15.82	16.85
	4-8	11.55	8.37	8.99	10.10	11.43	12.88	14.26	15.14
Males	9-13	11.78	8.31	9.01	10.23	11.67	13.23	14.68	15.62
	14-18	11.36	8.16	8.82	9.94	11.26	12.67	14.03	14.88
Females	9-13	11.76	8.22	8.93	10.16	11.64	13.21	14.75	15.74
	14-18	11.26	7.81	8.50	9.70	11.13	12.69	14.19	15.12

Target: 8-10% of total energy

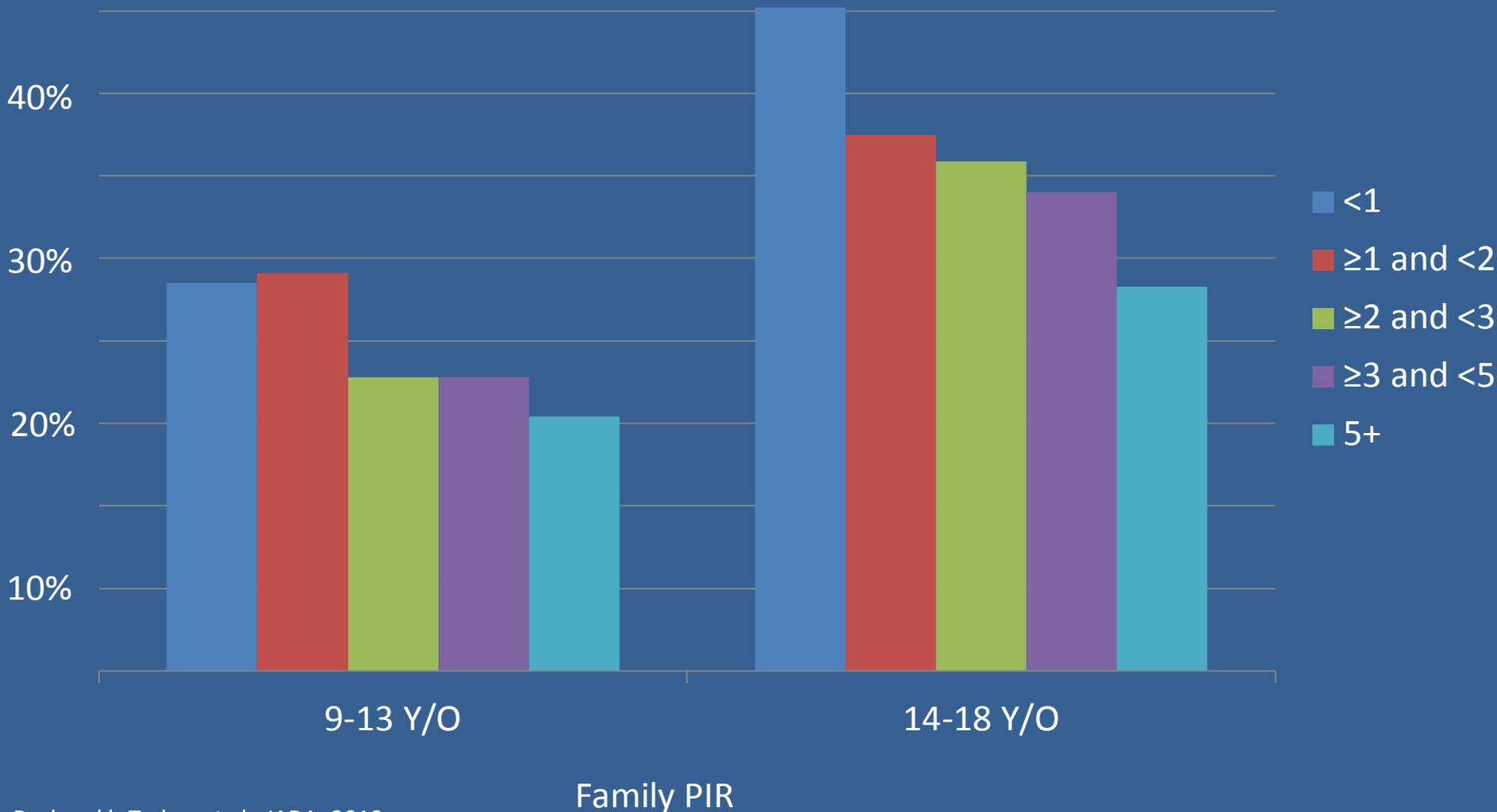
Percentage of beverage intake (calories) by type, 2-18 years old, 2005-06 NHANES



Percentage of sodium intake by type of food, 2-18 year olds, 2005–06 NHANES

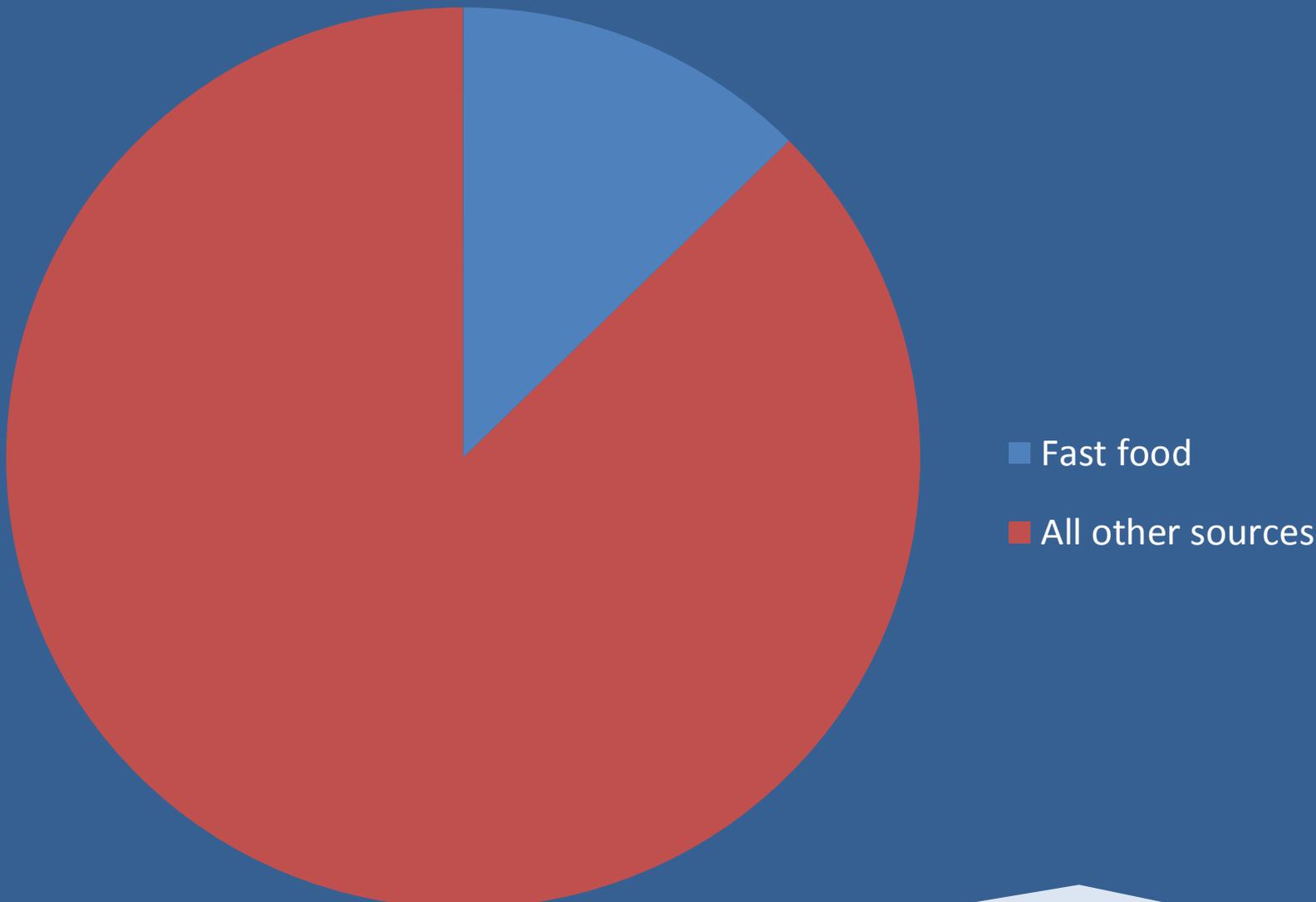


Percentage of breakfast skippers, 1999-2006 NHANES



Deshmukh-Taskar et al. JADA, 2010

Percentage of energy acquired from fast food restaurants, 2-18 year olds, 2007-08 NHANES



Summary

- Lagging database releases and complex statistical methods have resulted in less-than-current data
- Children's and adolescents' diets are especially low in whole grains, fruits, vegetables and lowfat milk, ...
- sufficient in grains and meat, poultry, fish, ...
- and high in fats and oils (including saturated fatty acids) and added sugars.

For more information

- NHANES dietary web tutorial:
<http://www.cdc.gov/nchs/tutorials/Dietary/index.htm>
- Data presented here (and more!):
riskfactor.cancer.gov
- Measurement Error Webinar Series:
riskfactor.cancer.gov/measurementerror