

National Cancer Institute

Distributions of Usual Food Intake & Ratios of Usual Energy Intake

Dietary Guidelines Advisory Committee
January 29, 2009

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

National Cancer Institute

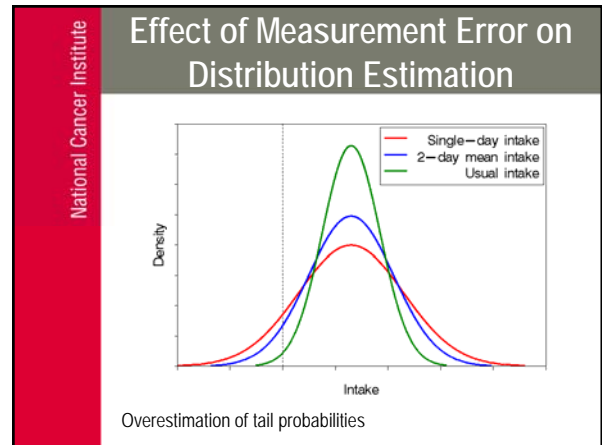
Usual Intake Assessment: Long Awaited Measure

- National dietary surveys have traditionally used 24-hour recalls.
- 24-hour recalls capture needed detail and provide cross-cultural equivalency.
- Individuals do not eat the same thing day-to-day, week-to-week, or season-to-season. Thus, if used as is, 24HRs provide only a "snapshot in time."

MyPyramid Recommendations

Daily Amount of Food From Each Group

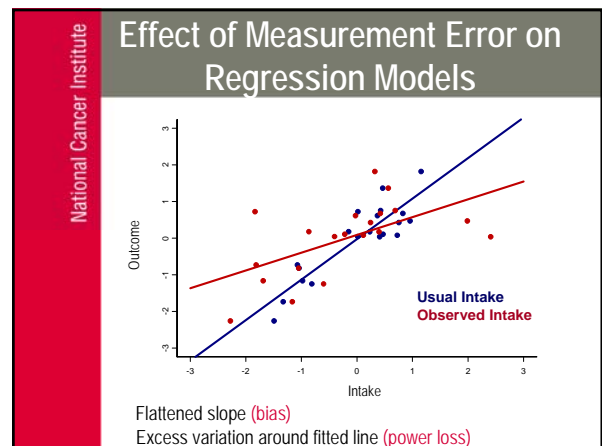
Calorie Level ¹	1000	1200	1400	1600	1800	2,000	2,200	2,400	2,600	2,800	3,000	3,200
Fruits ²	1 cup	1 cup	1.5 cups	1.5 cups	1.5 cups	2 cups	2 cups	2 cups	2 cups	2.5 cups	2.5 cups	2.5 cups
Vegetables ²	1 cup	1.5 cups	1.5 cups	2 cups	2.5 cups	2.5 cups	3 cups	3 cups	3.5 cups	3.5 cups	4 cups	4 cups
Grains ⁴	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	6 oz-eq	6 oz-eq	7 oz-eq	8 oz-eq	9 oz-eq	10 oz-eq	10 oz-eq	10 oz-eq
Meat and Beans ⁵	2 oz-eq	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	5.5 oz-eq	6 oz-eq	6.5 oz-eq	6.5 oz-eq	7 oz-eq	7 oz-eq	7 oz-eq
Milk ³	2 cups	2 cups	2 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups
Oils ⁷	3 tsp	4 tsp	4 tsp	5 tsp	5 tsp	6 tsp	6 tsp	7 tsp	8 tsp	8 tsp	10 tsp	11 tsp
Discretionary calorie allowance ⁸	165	171	171	132	195	267	290	362	410	426	512	648



National Cancer Institute

Usual Intake is Key

- Usual intake is the *long-run* average daily intake of a nutrient or food.
- Dietary recommendations are intended to be met over time.
- Diet-health hypotheses are based on dietary intakes over the long term.





National Cancer Institute

<http://riskfactor.cancer.gov/diet/usualintakes/>

- Details of the NCI Method
- Food Intakes, US Population, 2001-04
- Intakes as Ratios of Energy Intake, US Population, 2001-04
- SAS Macros
- Documentation and References

National Cancer Institute

24-Hour Recall Data Can Be Used to Predict Usual Intake

Usual intakes of both foods and nutrients can be predicted...

- ... for the population
 - mean
 - percentiles
 - percentage above/below cut-off
- ... for an individual
 - to use in diet-health models

National Cancer Institute

<http://riskfactor.cancer.gov/diet/usualintakes/>

- Details of the NCI Method
- **Food Intakes, US Population, 2001-04**
- **Intakes as Ratios of Energy Intake, US Population, 2001-04**
- SAS Macros
- Documentation and References

National Cancer Institute

Team of Investigators

Dennis W. Buckman¹
 Raymond J. Carroll²
 Kevin W. Dodd³
 Laurence S. Freedman⁴
 Patricia M. Guenther⁵
 Victor Kipnis³
 Susan M. Krebs-Smith³
 Douglas Midthune³
 Amy F. Subar³
 Janet A. Tooze⁶

¹Information Management Services, Inc.
²Texas A&M University
³National Cancer Institute
⁴Gertner Institute for Epidemiology
⁵USDA Center for Nutrition Policy and Promotion
⁶Wake Forest University School of Medicine

National Cancer Institute

Distributions of Usual Intake: Methods

- NHANES, 2001-2004
- N=17,889 persons, ages 1 year and older
- Two 24-hour recalls
- MyPyramid Equivalents Database
- NCI method of estimating usual dietary intakes

National Cancer Institute

Tables of Food Intake, US Population, 2001-04

- Citrus, melon, berries
- Other fruit
- Total fruit
- Dark green vegetables
- Orange vegetables
- Legumes
- Potatoes
- Other starchy vegetables
- Tomatoes
- Other vegetables
- Total vegetables
- Whole grains
- Non-whole grains
- Total grains
- Oils
- Discretionary solid fat
- Added sugars
- Milk
- Yogurt
- Cheese
- Total milk, yogurt, cheese
- Meat
- Frankfurters, sausage, luncheon meats
- Poultry
- Fish high in omega-3 fatty acids
- Fish low in omega-3 fatty acids
- Eggs
- Soybean products
- Nuts and seeds
- Total meat and meat alternates
- Alcohol
- And more...

Tables available at: riskfactor.cancer.gov/diet/usualintakes/pop/

National Cancer Institute

Selected Tables of Intakes as Ratios of Energy Intake, US Population, 2001-04

- Ratio of energy from:
 - total fat to total energy
 - saturated fat to total energy

National Cancer Institute

Selected Tables of Food Intake, US Population, 2001-04

- Total fruit
- Dark green vegetables
- Orange vegetables
- Dried beans and peas
- Other vegetables
- Total vegetables
- Whole grains
- Total grains
- Total milk, yogurt, cheese
- Fish
- Total meat and meat alternates
- Oils
- Solid fat
- Added sugars
- Alcoholic beverages

National Cancer Institute

MyPyramid Recommendations Vary By Energy Level

Daily Amount of Food From Each Group												
Calorie Level ¹	1000	1200	1400	1600	1800	2,000	2,200	2,400	2,600	2,800	3,000	3,200
Fruits ²	1 cup	1 cup	1.5 cups	1.5 cups	1.5 cups	2 cups	2 cups	2 cups	2 cups	2.5 cups	2.5 cups	2.5 cups
Vegetables ³	1 cup	1.5 cups	1.5 cups	2 cups	2.5 cups	2.5 cups	3 cups	3 cups	3 cups	3.5 cups	3.5 cups	4 cups
Grains ⁴	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	6 oz-eq	6 oz-eq	7 oz-eq	8 oz-eq	9 oz-eq	10 oz-eq	10 oz-eq	10 oz-eq
Meat and Beans ⁵	2 oz-eq	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	5.5 oz-eq	6 oz-eq	6.5 oz-eq	6.5 oz-eq	7 oz-eq	7 oz-eq	7 oz-eq
Milk ⁶	2 cups	2 cups	2 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups
Oils ⁷	3 tsp	4 tsp	4 tsp	5 tsp	5 tsp	6 tsp	6 tsp	7 tsp	8 tsp	8 tsp	10 tsp	11 tsp
Discretionary calorie allowance ⁸	165	171	171	132	195	267	290	362	410	426	512	648

National Cancer Institute

Tables of Intakes as Ratios of Energy Intake, US Population, 2001-04

- Ratio of energy from:
 - protein to total energy
 - carbohydrate to total energy
 - total fat to total energy
 - saturated fat to total energy
 - polyunsaturated fat to total energy
 - monounsaturated fat to total energy
 - solid fats, alcoholic beverages, and added sugars to total energy

Tables available soon at: riskfactor.cancer.gov/diet/usualintakes/

National Cancer Institute

MyPyramid Calorie Ranges Vary By Age/Sex Group

	Calorie Range	
	Sedentary	Active
Children		
2-3 years	1,000	1,400
Females		
4-8 years	1,200	1,800
9-13	1,600	2,200
14-18	1,800	2,400
19-30	2,000	2,400
31-50	1,800	2,200
51+	1,600	2,200
Males		
4-8 years	1,400	2,000
9-13	1,800	2,600
14-18	2,200	3,200
19-30	2,400	3,000
31-50	2,200	3,000
51+	2,000	2,800

Table 3. Total fruit: Mean (standard error) and percentiles¹ of usual intake, 2001-2004

Age (years)	N ¹	Mean (SE) ²	Cup Equivalents ³							
			5%	10%	25%	50%	75%	90%	95%	
Children	1-3	1515	1.5 (0.05)	0.38	0.55	0.90	1.40	2.02	2.71	3.18
	4-8	1701	1.1 (0.05)	0.18	0.30	0.58	0.99	1.53	2.12	2.53
Males	9-13	1061	1.0 (0.06)	0.08	0.16	0.38	0.79	1.39	2.12	2.64
	14-18	1424	1.0 (0.07)	0.06	0.12	0.33	0.78	1.45	2.25	2.82
	19-30	1100	0.9 (0.08)	0.04	0.09	0.27	0.67	1.31	2.09	2.67
	31-50	1466	1.1 (0.07)	0.06	0.13	0.35	0.81	1.49	2.30	2.90
	51-70	1252	1.2 (0.05)	0.10	0.19	0.45	0.95	1.65	2.48	3.08
	71+	832	1.4 (0.05)	0.20	0.34	0.67	1.22	1.96	2.83	3.45
	19+	4650	1.1 (0.05)	0.07	0.14	0.38	0.85	1.54	2.36	2.95
Females	9-13	1112	1.0 (0.05)	0.09	0.17	0.38	0.77	1.32	1.99	2.45
	14-18	1362	0.8 (0.06)	0.05	0.10	0.28	0.63	1.17	1.82	2.28
	19-30	1325	0.8 (0.05)	0.05	0.10	0.27	0.62	1.15	1.81	2.27
	31-50	1995	0.9 (0.06)	0.06	0.13	0.33	0.72	1.30	1.98	2.46
	51-70	1284	1.1 (0.04)	0.11	0.20	0.47	0.93	1.59	2.34	2.86
	71+	860	1.3 (0.06)	0.19	0.32	0.64	1.16	1.84	2.63	3.18
	19+	5064	1.0 (0.04)	0.07	0.14	0.37	0.80	1.41	2.13	2.65
All Persons	1+	17889	1.1 (0.03)	0.08	0.15	0.39	0.84	1.49	2.24	2.77

1: Number of persons in sample.
2: Standard error of the mean (SE-30).
3: Standard errors of the percentiles are presented in Appendix Table A3.
4: 1 cup equivalent = 1 cup cut-up raw or cooked fruit; 1/2 cup dried fruit; or 1 cup juice.

Table 3. Total fruit: Mean (standard error) and percentiles¹ of usual intake, 2001-2004

Age (years)	N ¹	Mean (SE) ²	Cup Equivalents ³							
			5%	10%	25%	50%	75%	90%	95%	
Children	1-3	1515	1.5 (0.05)	0.38	0.55	0.90	1.40	2.02	2.71	3.18
	4-8	1701	1.1 (0.05)	0.18	0.30	0.58	0.99	1.53	2.12	2.53
Males	9-13	1061	1.0 (0.06)	0.08	0.16	0.38	0.79	1.39	2.12	2.64
	14-18	1424	1.0 (0.07)	0.06	0.12	0.33	0.78	1.45	2.25	2.82
	19-30	1100	0.9 (0.08)	0.04	0.09	0.27	0.67	1.31	2.09	2.67
	31-50	1466	1.1 (0.07)	0.06	0.13	0.35	0.81	1.49	2.30	2.90
	51-70	1252	1.2 (0.05)	0.10	0.19	0.45	0.95	1.65	2.48	3.08
	71+	832	1.4 (0.05)	0.20	0.34	0.67	1.22	1.96	2.83	3.45
	19+	4650	1.1 (0.05)	0.07	0.14	0.38	0.85	1.54	2.36	2.95
Females	9-13	1112	1.0 (0.05)	0.09	0.17	0.38	0.77	1.32	1.99	2.45
	14-18	1362	0.8 (0.06)	0.05	0.10	0.28	0.63	1.17	1.82	2.28
	19-30	1325	0.8 (0.05)	0.05	0.10	0.27	0.62	1.15	1.81	2.27
	31-50	1995	0.9 (0.06)	0.06	0.13	0.33	0.72	1.30	1.98	2.46
	51-70	1284	1.1 (0.04)	0.11	0.20	0.47	0.93	1.59	2.34	2.86
	71+	860	1.3 (0.06)	0.19	0.32	0.64	1.16	1.84	2.63	3.18
	19+	5064	1.0 (0.04)	0.07	0.14	0.37	0.80	1.41	2.13	2.65
All Persons	1+	17889	1.1 (0.03)	0.08	0.15	0.39	0.84	1.49	2.24	2.77

1: Number of persons in sample.
2: Standard error of the mean (SE-30).
3: Standard errors of the percentiles are presented in Appendix Table A3.
4: 1 cup equivalent = 1 cup cut-up raw or cooked fruit; 1/2 cup dried fruit; or 1 cup juice.

Table 3. Total fruit: Mean (standard error) and percentiles¹ of usual intake, 2001-2004

Age (years)	N ¹	Mean (SE) ²	Cup Equivalents ³							
			5%	10%	25%	50%	75%	90%	95%	
Children	1-3	1515	1.5 (0.05)	0.38	0.55	0.90	1.40	2.02	2.71	3.18
	4-8	1701	1.1 (0.05)	0.18	0.30	0.58	0.99	1.53	2.12	2.53
Males	9-13	1061	1.0 (0.06)	0.08	0.16	0.38	0.79	1.39	2.12	2.64
	14-18	1424	1.0 (0.07)	0.06	0.12	0.33	0.78	1.45	2.25	2.82
	19-30	1100	0.9 (0.08)	0.04	0.09	0.27	0.67	1.31	2.09	2.67
	31-50	1466	1.1 (0.07)	0.06	0.13	0.35	0.81	1.49	2.30	2.90
	51-70	1252	1.2 (0.05)	0.10	0.19	0.45	0.95	1.65	2.48	3.08
	71+	832	1.4 (0.05)	0.20	0.34	0.67	1.22	1.96	2.83	3.45
	19+	4650	1.1 (0.05)	0.07	0.14	0.38	0.85	1.54	2.36	2.95
Females	9-13	1112	1.0 (0.05)	0.09	0.17	0.38	0.77	1.32	1.99	2.45
	14-18	1362	0.8 (0.06)	0.05	0.10	0.28	0.63	1.17	1.82	2.28
	19-30	1325	0.8 (0.05)	0.05	0.10	0.27	0.62	1.15	1.81	2.27
	31-50	1995	0.9 (0.06)	0.06	0.13	0.33	0.72	1.30	1.98	2.46
	51-70	1284	1.1 (0.04)	0.11	0.20	0.47	0.93	1.59	2.34	2.86
	71+	860	1.3 (0.06)	0.19	0.32	0.64	1.16	1.84	2.63	3.18
	19+	5064	1.0 (0.04)	0.07	0.14	0.37	0.80	1.41	2.13	2.65
All Persons	1+	17889	1.1 (0.03)	0.08	0.15	0.39	0.84	1.49	2.24	2.77

1: Number of persons in sample.
2: Standard error of the mean (SE-30).
3: Standard errors of the percentiles are presented in Appendix Table A3.
4: 1 cup equivalent = 1 cup cut-up raw or cooked fruit; 1/2 cup dried fruit; or 1 cup juice.

National Cancer Institute

Total Fruit

- Measured in terms of cup equivalents per day
- Recommendations range from 1-2.5 cups
- Among all sex-age groups, intakes up through 25th percentile are below the minimum recommendation
- For most sex-age groups, intakes up through the 75th percentile are below the minimum recommendation

Table 3. Total fruit: Mean (standard error) and percentiles¹ of usual intake, 2001-2004

Age (years)	N ¹	Mean (SE) ²	Cup Equivalents ³							
			5%	10%	25%	50%	75%	90%	95%	
Children	1-3	1515	1.5 (0.05)	0.38	0.55	0.90	1.40	2.02	2.71	3.18
	4-8	1701	1.1 (0.05)	0.18	0.30	0.58	0.99	1.53	2.12	2.53
Males	9-13	1061	1.0 (0.06)	0.08	0.16	0.38	0.79	1.39	2.12	2.64
	14-18	1424	1.0 (0.07)	0.06	0.12	0.33	0.78	1.45	2.25	2.82
	19-30	1100	0.9 (0.08)	0.04	0.09	0.27	0.67	1.31	2.09	2.67
	31-50	1466	1.1 (0.07)	0.06	0.13	0.35	0.81	1.49	2.30	2.90
	51-70	1252	1.2 (0.05)	0.10	0.19	0.45	0.95	1.65	2.48	3.08
	71+	832	1.4 (0.05)	0.20	0.34	0.67	1.22	1.96	2.83	3.45
	19+	4650	1.1 (0.05)	0.07	0.14	0.38	0.85	1.54	2.36	2.95
Females	9-13	1112	1.0 (0.05)	0.09	0.17	0.38	0.77	1.32	1.99	2.45
	14-18	1362	0.8 (0.06)	0.05	0.10	0.28	0.63	1.17	1.82	2.28
	19-30	1325	0.8 (0.05)	0.05	0.10	0.27	0.62	1.15	1.81	2.27
	31-50	1995	0.9 (0.06)	0.06	0.13	0.33	0.72	1.30	1.98	2.46
	51-70	1284	1.1 (0.04)	0.11	0.20	0.47	0.93	1.59	2.34	2.86
	71+	860	1.3 (0.06)	0.19	0.32	0.64	1.16	1.84	2.63	3.18
	19+	5064	1.0 (0.04)	0.07	0.14	0.37	0.80	1.41	2.13	2.65
All Persons	1+	17889	1.1 (0.03)	0.08	0.15	0.39	0.84	1.49	2.24	2.77

1: Number of persons in sample.
2: Standard error of the mean (SE-30).
3: Standard errors of the percentiles are presented in Appendix Table A3.
4: 1 cup equivalent = 1 cup cut-up raw or cooked fruit; 1/2 cup dried fruit; or 1 cup juice.

National Cancer Institute

Vegetable Subgroups

- Dark green, orange, legumes, starchy, and other vegetables
- Measured in terms of cup equivalents per day
- Recommendations are in terms of cups/week
- Except for starchy vegetables, most persons in all sex/age groups eat less than recommended amounts of these subgroups

Total Vegetables

- Measured in terms of cup equivalents per day
- Recommendations range from 1-4 cups per day
- Among nearly all sex-age groups, intakes up through 75th percentile are below recommendations

Fish Guidelines

- The consumption of two servings (~ 8 oz) per week of fish high in EPA and DHA is associated with reduced risk of both sudden death and CHD death in adults. (2005 Dietary Guidelines Advisory Committee)
- Women and young children should include fish in their diets and can safely consume up to 12 ounces per week of cooked fish. (FDA/EPA Advisory)

Whole Grains

- Measured in terms of ounce equivalents per day
- Recommendations range from 1.5-5 ounces
- Among all sex-age groups, intakes up through 95th percentile are below the recommendations.

Total Fish & Other Seafood

- Measured in terms of ounce equivalents per day
- 8 ounces per week = 1.41 ounces/day
- 12 ounces per week = 1.71 ounces/day
- Up through the 75th percentile, adult intakes are below 8 ounces per week
- None of the women or young children showed intakes greater than 12 ounces per week, at the 95th percentile.

Total Grains

- Measured in terms of ounce equivalents per day
- Recommendations range from 3-10 ounces
- Most of this intake is *non-whole grain*
- Among most sex-age groups, intakes are sufficient for most of the population
- For some groups, intakes are above recommendations

Total Meat & Meat Alternates

- Measured in terms of *lean* ounce equivalents per day
- Recommendations range from 2-7 ounces
- Among all sex-age groups, intakes up through 25th percentile are below recommendations; this is also the case for many groups, up through 50th and for adolescent girls up through the 75th
- At tails of distribution, adult men and women have intakes in excess of recommendations

Total Milk, Yogurt & Cheese

- Measured in terms of cup equivalents per day
- Recommendations range from 2-3 cups
- Intakes are below recommendations at
 - 25th percentile for children
 - 50th percentile for adolescent males
 - 75th percentile and above for adult males
 - 90th percentile for females in most age categories

Added Sugars

- Measured in terms of teaspoons per day
- Examples range from 3-24 teaspoons per day
- For nearly all sex-age groups, values at 50th percentile and beyond are above the amount corresponding to “active” energy level. For some groups intakes beyond the 25th percentile were above this standard.

Oils

- Measured in terms of teaspoons per day
- Recommendations range from 3-11 tsp/day
- Among most sex-age groups, intakes up through 75th percentile are below recommendations

Alcoholic Beverages

- Measured in terms of drinks per day
- Recommendations are up to one drink per day for women and two drinks per day for men
- Usual intake vs. acute exposure
- Intakes exceeding the recommendations at the tails of the distributions for adults.

Solid Fats

- Measured in terms of grams per day
- Examples range from 11-34 grams per day
- Among all sex-age groups, intakes at the 10th percentile and beyond are above the amount corresponding to “active” energy level

Energy from Solid Fats, Alcohol, and Added Sugars (SoFAAS)

- Measured in terms of calories
- Represent large portion of discretionary calories
- Recommendations for discretionary calories range from 171-512 calories per day
- Among all sex-age groups, 75% or more of the population had intakes of SoFAAS which exceeded the maximum recommendation for discretionary calories

Total Fat

- Measured in terms of % of calories
- Recommendation is between 20-35% of calories
- At 5th percentile, none of the sex-age groups had intakes below 20% of calories from total fat
- At 75th percentile, all sex-age groups had intakes above 35% of calories from total fat

Saturated Fatty Acids

- Measured in terms of % of calories
- Recommendation is less than 10 % of calories
- Among all sex-age groups, intakes at the 50th percentile and beyond were above the recommendation; for some groups, values at 25th percentile were also above

Summary

Most Americans have:

- Low intakes of
 - Fruit
 - Vegetables, especially non-starchy
 - Whole grains
 - Milk, yogurt, cheese
 - Oils
- Modest intakes of
 - Fish
- Sufficient, and in some cases excessive, intakes of
 - Total grains
 - Meat/meat alternates
- Excessive intakes of
 - Calories from SoFAAS
 - Saturated fat