

# Childhood overweight and obesity handbook

*A clinical application tool*

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# Epidemiology, classification and comorbidities of obesity

## Pediatric overweight/obesity statistics

- 14.9% of children are overweight in the U.S. (2011–2012)<sup>1</sup>
- 16.9% of children are obese in the U.S. (2011–2012)<sup>1</sup>
- 31.8% of children (1 in every 3) in the U.S. are overweight or obese
- About 50% of children who are obese (BMI  $\geq$  95<sup>th</sup> percentile) at age 6 years will become overweight/obese adults<sup>2</sup>

## Pediatric overweight/obesity definitions

BMI percentile	Classification
5th to 84th percentile	Healthy body mass index (BMI)
85th to 94th percentile	Overweight
95th to 99th percentile	Obese
>99th percentile	Morbidly obese

## Co-morbid health conditions associated with childhood obesity

- Blount's disease
- Cholelithiasis
- Constipation
- Gastroesophageal reflux disease
- High cholesterol and cardiovascular disease
- Hypertension
- Intertrigo
- Nephrolithiasis
- Nonalcoholic steatohepatitis (fatty liver)
- Obstructive sleep apnea
- Polycystic ovarian syndrome (females)
- Pseudotumor cerebri
- Psychological disorders (anxiety, depression, binge-eating disorder)
- Pubertal abnormalities (precocious in girls, delayed in boys, or premature adrenarche in either)
- Slipped capital femoral epiphysis
- Type 2 diabetes, impaired fasting glucose, or impaired glucose tolerance

### **Food and activity behaviors identified by the American Academy of Pediatrics (AAP) to be associated with obesity in children:**

- Skipping breakfast and eating a few, large meals later in the day
- High intake of sugar-sweetened beverages
- Frequently eating meals away from the home (fast-food, restaurant, take-out)

### **Food and activity behaviors identified by the AAP to be associated with a lower risk for obesity in children:**

- Having been breastfed for at least the first 6–12 months of life
- Eating smaller, more frequent meals throughout the day

# Indication for screening for comorbidities

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## Screening recommendations for overweight/obesity prevention and identification

The following should be calculated/plotted at every health care visit so that obesity-prevention interventions can be implemented when a child starts to cross BMI percentiles upward, even before they approach the 85th or the 95th percentile<sup>3</sup>

- Birth to 23 months: weight-for-age and weight-for-length using the World Health Organization (WHO) normative growth charts ([http://www.cdc.gov/growthcharts/who\\_charts.htm](http://www.cdc.gov/growthcharts/who_charts.htm))
- Children  $\geq$  2 years: BMI using the Centers for Disease Control (CDC) growth charts ([www.cdc.gov/growthcharts](http://www.cdc.gov/growthcharts))

### **Screening recommendations for laboratory screening of overweight/obese children: Fasting glucose, AST/ALT, and lipid panel<sup>4</sup>**

## Type 2 diabetes screening<sup>5</sup>

If BMI  $\geq$  85<sup>th</sup> percentile AND  $\geq$  2 risk factors:

- Family history of T2DM in first and second-degree relatives
- Of American Indian, African American, Hispanic, or Asian/South Pacific Islander descent
- Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, PCOS)

**Begin screening:** Age 10 years (or when puberty begins if earlier than age 10)

**Screening mechanism:** Fasting plasma glucose is preferred (lower cost and greater convenience)

**Frequency of screening:** Every 2 years if normal

## Cholesterol screening<sup>6</sup>

Based on AAP and National Heart, Lung, and Blood Institute (NHLBI) guidelines, routine cholesterol screening in children with NORMAL BMI should occur once at 9–11 years and, if normal, again at 17–21 years.<sup>6,7</sup>

### **Begin screening:**

- Age 2 years if BMI  $\geq$  95<sup>th</sup> percentile (screen anytime between ages 2 and 8 years if BMI becomes  $\geq$  95<sup>th</sup> percentile)
- Age 9–11 years (universal screening)
- Age 17–21 years (universal screening)

### **Screening mechanism:**

- If  $\leq$  8 years at time of screening, check fasting lipid panel\*
- At age 9–11 years, can check either:
  - (1) Non-fasting lipid panel and calculate non-HDL-C (Non-HDL-C = TC - HDL-C)\*\*  
If Non-HDL  $\geq$  145 mg/dL and/or HDL  $<$  40 mg/dL, then obtain a fasting lipid panel\*  
OR
  - (2) Obtain fasting lipid panel and if any of the levels are abnormal, then check a second fasting lipid panel 2 weeks to 3 months later and average them
- If child between 12–16 years and BMI  $\geq$  85<sup>th</sup> percentile, check fasting lipid panel\*
- If age 17–21 years, same screening options as 9–11 years above

\*Obtain two fasting lipid panels and average them (the second panel should be done 2 weeks to 3 months after the first)

\*\*Disregard LDL and TG measurements if using this method

## Nonalcoholic steatohepatitis screening<sup>8</sup>

**Begin screening:** Between ages 9 and 11 years

- BMI  $\geq$  95th percentile, or
- BMI  $\geq$  85th and  $<$ 95th percentile with additional risk factors (central adiposity, insulin resistance, pre-diabetes or diabetes, dyslipidemia, sleep apnea or family history of NAFLD/NASH).

**Screening mechanism:** ALT

\*Interpretation of results should be based upon sex-specific upper limits of normal in children (22 U/L for girls and 26 U/L for boys) and not individual laboratory upper limits of normal.

**Frequency of screening:** Every 2–3 years if normal initially and risk factors remain unchanged

# Determining daily caloric requirement

## Calorie needs

Estimated calorie needs per day by age, gender and physical activity level if a child needs to maintain his/her body weight (i.e. health weight/BMI) <sup>9</sup>

Age (years)	Boys			Girls		
	Sedentary	Moderately active	Active	Sedentary	Moderately active	Active
2	1,000	1,000	1,000	1,000	1,000	1,000
3	1,000	1,400	1,400	1,000	1,200	1,400
4	1,200	1,400	1,600	1,200	1,400	1,400
5	1,200	1,400	1,600	1,200	1,400	1,600
6	1,400	1,600	1,800	1,200	1,400	1,600
7	1,400	1,600	1,800	1,200	1,600	1,800
8	1,400	1,600	2,000	1,400	1,600	1,800
9	1,600	1,800	2,000	1,400	1,600	1,800
10	1,600	1,800	2,200	1,400	1,800	2,000
11	1,800	2,000	2,200	1,600	1,800	2,000
12	1,800	2,200	2,400	1,600	2,000	2,200
13	2,000	2,200	2,600	1,600	2,000	2,200
14	2,000	2,400	2,800	1,800	2,000	2,400
15	2,200	2,600	3,000	1,800	2,000	2,400
16	2,400	2,800	3,200	1,800	2,000	2,400
17	2,400	2,800	3,200	1,800	2,000	2,400

**Moderately active** means a lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles every day at a brisk pace (3–4 mph/15–20 minute mile), in addition to the activities of independent living.

**Active** means a lifestyle that includes physical activity equivalent to walking >3 miles every day at a brisk pace (3–4 mph/15–20 minute mile), in addition to the activities of independent living.

**Sedentary** means a patient's lifestyle does not meet at least the moderately active specifications above.

## Mifflin-St. Jeor Equation for estimating calorie needs <sup>10</sup>

Calculate resting energy expenditure (REE)

$$\text{REE (men)} = 10 \times \text{wt(kg)} + 6.25 \times \text{ht(cm)} - 5 \times \text{age(years)} + 5$$

$$\text{REE (females)} = 10 \times \text{wt(kg)} + 6.25 \times \text{ht(cm)} - 5 \times \text{age(years)} - 161$$

To determine daily calorie needs for WEIGHT MAINTENANCE: REE x PAF

Physical Activity Factor (PAF)

- Sedentary: (PAF 1.2) – Typical activities of daily living (ADLs) such as gardening (no lifting), household tasks, light activity while sitting, loading/unloading car, mopping, mowing the lawn (power mower), etc. AND little to no other exercise
- Mild Activity: (PAF 1.375) – Typical ADLs AND 20 minutes of moderate physical activity 1–3 days per week (this may include bicycling, jogging, basketball, swimming, skating, etc.)
- Moderate Active: (PAF 1.55) – Typical activities of daily living AND 30–60 minutes of moderate physical activity 3–4 days per week
- Heavy Activity: (PAF 1.7) – Typical activities of daily living AND more than 60 minutes of moderate physical activity 5–7 days per week
- Extreme Activity: (PAF 1.9) – Exceedingly active and/or very demanding activities. Examples include: (1) athlete with an elite level, hardcore training schedule with multiple training sessions throughout the day; or (2) a very physically demanding job, such as shoveling coal or working long hours on an assembly line. Generally, this level of activity is very difficult to achieve.

To determine daily calorie needs for WEIGHT LOSS = Daily calorie needs for weight maintenance reduced by 10–20%

\*\*To lose 1 pound of fat, a deficit of 3,500 calories must be created over time

# Portion sizes

## Portion size versus serving size

- **Serving size** on a Nutrition Facts Label is a specific measured amount based on a 2,000 calorie diet.
- **Portion size** is the amount of food served to a person/child at a meal or snack. The portion size of food that a child needs varies depending on their age, activity level and calorie needs.

## Macronutrient Information

There are three classes of macronutrients:


- Carbohydrates (4 kcals per gram)
- Protein (4 kcals per gram)
- Fat (9 kcals per gram)

## Recommended portion sizes of food at a meal/snack for various age groups<sup>11</sup>

Food groups	Servings per day	Recommended portion size		
		Ages 1–3 years	Ages 4–6 years	Ages 7–18 years
Fruits	2–3 servings	1/4 cup cooked, frozen or canned 1/2 piece fresh	1/4 cup cooked, frozen or canned 1/2 piece fresh	1/3 cup cooked, frozen or canned 1 piece fresh
Vegetables	2–3 servings	1/4 cup cooked	1/4 cup cooked 1/2 cup salad	1/2 cup cooked 1 cup salad
Grains	6–11 servings	1/2 slice bread 1/4 cup cooked cereal, rice or pasta 1/3 cup dry cereal 2-3 crackers	1/2 slice bread 1/3 cup cooked cereal, rice or pasta 1/2 cup dry cereal 3–4 crackers	1 slice bread 1/2 cup cooked cereal, rice or pasta 3/4 to 1 cup dry cereal 4–5 crackers
Meats and other proteins	2–3 servings	1 ounce meat, fish, chicken, or tofu 1/4 cup cooked beans 1/2 egg	1 ounce meat, fish, chicken, or tofu 1/3 cup cooked beans 1 egg	2–3 ounces meat, fish, chicken, or tofu 1/2 cup cooked beans 1–2 eggs
Dairy	2–3 servings	1/2 cup milk 1/2 ounce cheese 1/3 cup yogurt	1/2 cup milk 1 ounce cheese 1/2 cup yogurt	1 cup milk 1 ounce cheese 3/4–1 cup yogurt



## Helpful portion size estimates

1 cup  One fist  One baseball

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3 oz. of meat  Palm of hand  Deck of cards

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$\frac{3}{4}$  cup  One tennis ball


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1.5 oz. of cheese  3 dice

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$\frac{1}{2}$  cup  Half of a fist  Half of a baseball

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2 Tbsp.  One golf ball (Helpful for 1 serving peanut butter and salad dressing.)

# Nutritional facts

## Reading a nutrition label

<b>Nutrition Facts</b>		
Serving Size 1 cup (228g) Servings Per Container 2		1 Start here
<b>Amount Per Serving</b>		2 Check calories
<b>Calories</b> 250	Calories from Fat 110	
<b>% Daily Value*</b>		3 Quick guide to % DV
<b>Total Fat</b> 12g	18%	5% or less is low 20% or more is high
Saturated Fat 3g	15%	
Trans Fat 3g		
<b>Cholesterol</b> 30mg	10%	
<b>Sodium</b> 470mg	20%	4 Limit these
<b>Potassium</b> 700mg	20%	
<b>Total Carbohydrate</b> 31g	10%	5 Get enough of these
Dietary Fiber 0g	0%	
Sugars 5g		
<b>Protein</b> 5g		
Vitamin A	4%	
Vitamin C	2%	
Calcium	20%	
Iron	4%	6 Footnote
* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.		
	Calories:	2,000    2,500
Total Fat	Less than	65g    80g
Sat Fat	Less than	20g    25g
Cholesterol	Less than	300mg    300mg
Sodium	Less than	2,400mg    2,400mg
Total Carbohydrate		300g    375g
Dietary Fiber		25g    30g

### 1. Serving size

- Look for both serving size (amount for one serving) and number of servings in the package.
- Remember to check your serving size to the portion size on the label.

### 2. Total calories

- Find out how many total calories are in a single serving.
- Find out how many calories in a single serving are from fat.

### 3. Daily values (DV)

- Daily values are average levels of nutrients for a person eating 2,000 calories per day.
- You may need more or less than 2000 calories per day depending on your age and activity level.
- You may also need more or less than 100% DV for a particular nutrient each day.
- 5% or less is low. Aim for low in total fat, saturated fat, transfat, cholesterol and sodium.
- 20% or more is high. Aim for high in vitamins, minerals and fiber.

### 4. Total fat, cholesterol and sodium

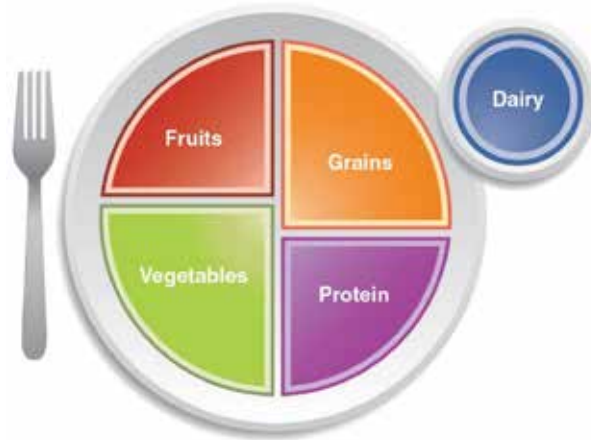
- Eating less of these nutrients may help reduce your risk for heart disease, high blood pressure and cancer.
- Total fat should be limited to 100% DV or less daily.
- Saturated and transfat are linked to increased risk of heart disease.

### 5. Vitamins, minerals and fiber

- Eat more fiber, vitamins A and C, calcium and iron to maintain good health.
- Choose more fruits, vegetables and whole grains to get more of these nutrients.

### 6. Guidelines for 2,000 and 2,500 calorie diets

# MyPlate® guidelines



## Daily recommendations (by age) for each food group

Daily fruit recommendations		
Children	2–3 years old	1 cup
	4–8 years old	1-1.5 cups
Girls	9–13 years old	1.5 cups
	14–18 years old	1.5 cups
Boys	9–13 years old	1.5 cups
	14–18 years old	cups

In general, 1 cup of fresh fruit or 1/2 cup of dried fruit is equivalent to a 1 cup serving.

Daily vegetable recommendations		
Children	2–3 years old	1 cup
	4–8 years old	1.5 cups
Girls	9–13 years old	2 cups
	14–18 years old	2.5 cups
Boys	9–13 years old	2.5 cups
	14–18 years old	3 cups

In general, 1 cup of raw or cooked vegetables or vegetable juice or 2 cups of raw leafy greens can be considered as 1 cup from the vegetable group.

## Daily recommendations (by age) for each food group (continued)

Daily dairy recommendations		
Children	2–3 years old	2 cups
	4–8 years old	2.5 cups
Girls	9–13 years old	3 cups
	14–18 years old	3 cups
Boys	9–13 years old	3 cups
	14–18 years old	3 cups

In general, 1 cup of milk, yogurt or soymilk (soy beverage), 1 1/2 ounces of natural cheese or 2 ounces of processed cheese can be considered as 1 cup from the dairy group.

Daily protein recommendations		
Children	2–3 years old	2 ounce equivalents
	4–8 years old	4 ounce equivalents
Girls	9–13 years old	5 ounce equivalents
	14–18 years old	5 ounce equivalents
Boys	9–13 years old	5 ounce equivalents
	14–18 years old	6.5 ounce equivalents

Daily grain recommendations			
		Daily recommendation	Daily min. amount of whole grains
Children	2–3 years old	3 ounce equivalents	1.5 ounce equivalents
	4–8 years old	5 ounce equivalents	2.5 ounce equivalents
Girls	9–13 years old	5 ounce equivalents	3 ounce equivalents
	14–18 years old	6 ounce equivalents	3 ounce equivalents
Boys	9–13 years old	6 ounce equivalents	3 ounce equivalents
	14–18 years old	8 ounce equivalents	4 ounce equivalents

In general, one slice of bread, 1 cup of ready-to-eat cereal, or 1/2 cup of cooked rice, cooked pasta, or cooked cereal can be considered as 1 ounce-equivalent from the grains group.

## Fiber recommendations in children<sup>12</sup>

General rule for children ages 2–20 years old: child's age (in years) + 5–10 grams.

## Juice recommendations in children<sup>13</sup>

Age	Juice intake recommendations
12 months or younger	No juice
13 months–3 years old	No more than 4 ounces (1/2 cup) daily
4–6 years old	No more than 4–6 ounces (1/2 to 3/4 cup) daily
7–18 years old	No more than 8 ounces (1 cup) daily

Fruit juice should be 100% juice (fresh or reconstituted)

## Milk recommendations in children

Milk type	Grams of fat in 8 ounces (1 cup)
Whole milk	8
2% reduced fat milk	5
1% low fat milk	2–2.5
Skim milk	0

### The AAP recommends<sup>14</sup>

- Changing to reduced fat milk (2% milk) between 12 months of age and 2 years old if obesity is a concern or if there is a family history of obesity, dyslipidemia or cardiovascular disease
- Changing to a low fat milk (1% or skim) at age  $\geq$  2 years old
- Milk consumption recommendations by age:
  - Age 1–2 years old: 16–24 ounces (2–3 cups) of milk daily
  - Age  $>$  2–3 years old: 16 ounces (2 cups) of milk daily

## Infant formula consumption guidelines<sup>14</sup>

2.5 ounces of formula per 1 pound of body weight per day to max of about 32 ounces per day

## Micronutrient information

### Vitamin D recommendations<sup>15</sup>

- Birth to 3 years old: 400 IU per day\*
- 4 to 18 years old: 600 IU per day\*\*

\*Term infant formula contains 60 IU of vitamin D per 5 ounces

\*\*Whole, 2%, 1% and skim cow's milk contains 100 IU of vitamin D per 8 ounces

### Fluoride recommendations<sup>16</sup>

- Fluoridated toothpaste is recommended for all children starting at tooth eruption, regardless of caries risk.
- A smear (the size of a grain of rice) of toothpaste should be used up to age 3. After the third birthday, a pea-sized amount may be used.
- Fluoride varnish is recommended in the primary care setting every 3–6 months starting at tooth emergence.
- Over-the-counter fluoride rinse is not recommended for children younger than 6 years old due to risk of swallowing higher-than-recommended levels of fluoride.

### Fluoride supplementation schedule for children

Age	Fluoride ion level in drinking water*		
	<0.3 ppm	0.3–0.6 ppm	>0.6 ppm
Birth–6 months	None	None	None
6 months–three years old	0.25 mg/d**	None	None
3–6 years old	0.50 mg/d	0.25 mg/d	None
6–16 years old	1.0 mg/d	0.50 mg/d	None

\*1.0 ppm = 1 mg/L.

\*\*2.2 mg of sodium fluoride contains 1 mg of fluoride ion.

# Parental role

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## Parent and caregiver responsibilities for their child's nutrition<sup>17</sup>

### **Choose breastfeeding for first nutrition; try to maintain for 12 months**

- Control when food is available and when it can be eaten (nutrient quality, portion size, snacking, regular meals)
- Provide social context for eating behavior (family meals, role of food in social intercourse)
- Teach about food and nutrition at the grocery store and/or when cooking meals
- Counteract inaccurate information from the media and other influences
- Teach other care providers (e.g. daycare, babysitters) about what you want your children to eat
- Serve as role models and lead by example; "do as I do" rather than "do as I say"
- Promote and participate in regular daily physical activity

## Overview of AAP treatment recommendations

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### Contingency/rewards for meeting goals

The AAP recommends against using food or financial incentives as a reward for a child's good behavior or attaining of goals. Recommended rewards include:

- Verbal praise from a caregiver
- Token economies with non-financial rewards (e.g. choosing the movie on movie night, extra outside playtime, quality time with caregiver or friend, etc.)

### AAP screen time recommendations<sup>18,19</sup>

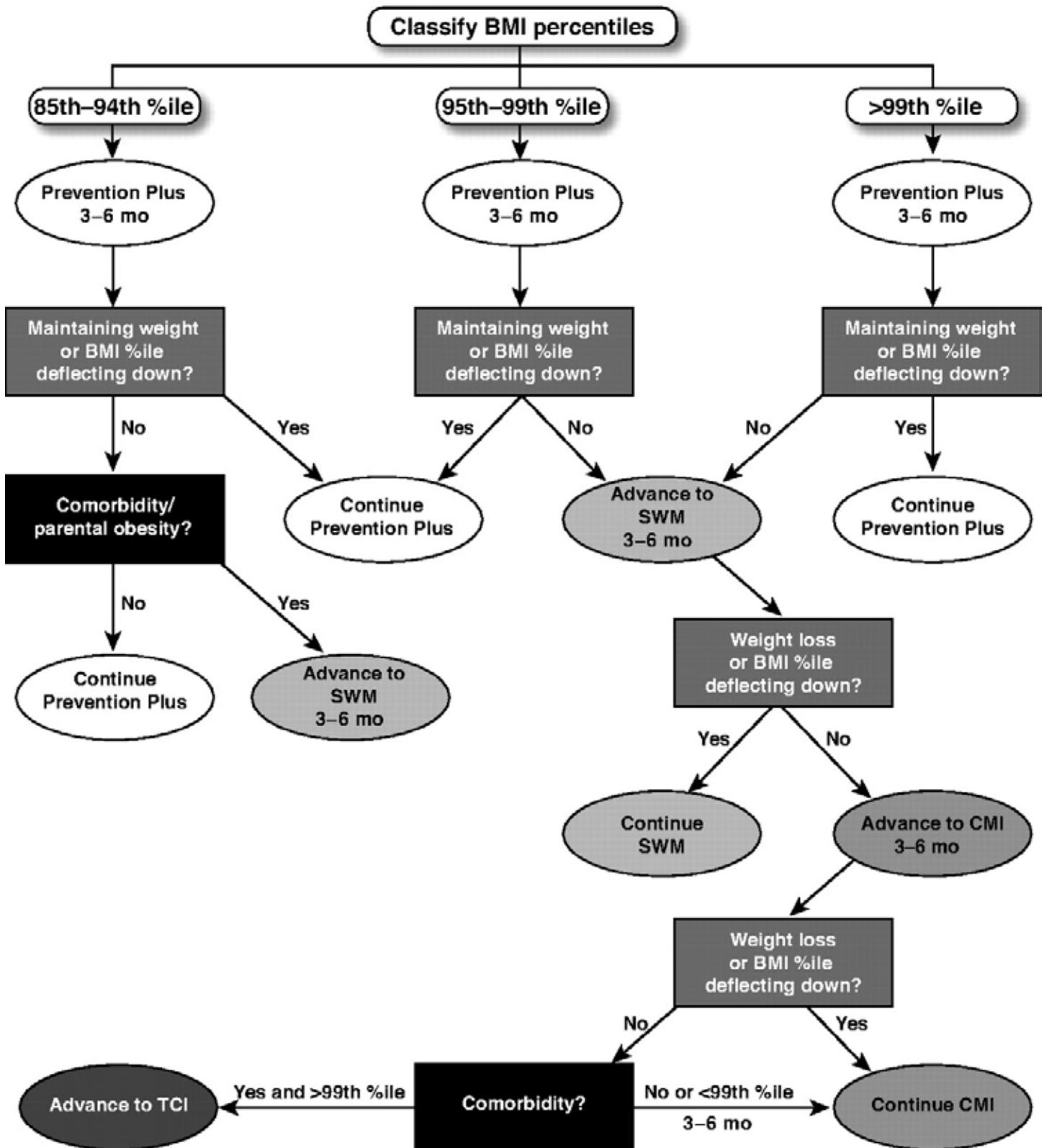
- **Age < 18 months:** Avoid use of screen media other than video-chatting
- **Ages 18 to 24 months:** If parents want to introduce digital media, they should choose high-quality programming, and watch it with their children to help them understand what they're seeing
- **Ages 2 to 5 years old:** Limit screen use to 1 hour per day of high-quality programs. Parents should co-view media with children to help them understand what they are seeing and apply it to the world around them
- **Age ≥ 6 years old:** Place consistent limits on the time spent using media, and the types of media, and make sure media does not take the place of adequate sleep, physical activity and other behaviors essential to health (ideal is ≤ 2 hours per day)

### US DHHS physical activity recommendations (endorsed by the AAP)<sup>20</sup>

- At least 60 minutes of moderate to intense physical activity every day.

# Recommendations for appropriate weight loss

AAP obesity treatment guidelines<sup>21</sup>





## Prevention plus

**Where implemented:** Primary care office

**Implemented by whom and skills needed:** PCP or trained professional staff member (e.g., RN)

**Frequency of visits/duration before moving to next stage:** Visit frequency should be based on accepted readiness to change/behavioral counseling techniques and tailored to patient and family. Provider should encourage more-frequent visits when obesity is more severe.

**Components:** Recommend the following:

- $\geq 5$  servings of fruits and vegetables per day.
- $\leq 2$  hours of screen time per day, no TV in room where child sleeps, and no TV if  $<2$  years of age.
- Minimize or eliminate sugar-sweetened beverages.
- Address eating behaviors (e.g., eating away from home, daily breakfast, family dinners and skipping meals).
- Recommend  $\geq 1$  hour of physical activity per day. Amount of physical activity may need to be graded for children who are sedentary; they may not achieve 1 hour per day, initially. Involve the whole family in lifestyle changes.

## Structured weight management (SWM)

**Where implemented:** Referral to dietitian; primary care office

**Implemented by whom and skills needed:** RD or MD/NP with expertise in MI/behavioral counseling, food planning (including energy density and macronutrient knowledge), physical activity counseling, and resources/referrals.

**Frequency of visits/duration before moving to next stage:** Monthly visits should be tailored to patient and family.

**Components:**

- Develop balanced dietary plan with family (structured meals and snacks; because diet provides less calories, ensure enough protein to prevent loss of muscle mass).
- Reduce screen time to  $\leq 1$  hour per day.
- Increase time spent in physical activity ( $\geq 60$  min of supervised active play per day).
- Instruct patient and/or parent in monitoring (e.g., screen time, physical activity, dietary intake and restaurant logs) to improve adherence.
- Perform medical screening for comorbid health conditions.

## Comprehensive multidisciplinary intervention (CMI)

**Where implemented:**

- Primary care office can coordinate multidisciplinary care
- Weight management program (community)
- Pediatric weight management center
- Commercial programs with the following components:
  - Age-appropriate and culturally appropriate treatments
  - Nutrition, exercise and behavioral counseling provided by trained professionals
  - Weight loss goals of  $\leq 2$  pounds per week

**Implemented by whom and skills needed:** Multidisciplinary team with expertise in childhood obesity, including:

- Behavioral counselor (e.g., social worker, psychologist, trained NP or other mental health specialist)
- RD
- Exercise specialist
- Alternative could be dietitian and behavioral counselor based in PCP office, along with outside, structured, physical activity program (e.g., team sports, YMCA or Boys and Girls Club program)

**Frequency of visits/duration before moving to next stage:**

- Ideal is weekly for a minimum of 8–12 weeks and then once monthly
- If not feasible, then telephone or other modalities could be used, with weight checks no less than once per month in local MD office

**Components:**

- More-frequent patient/provider contact (multidisciplinary is key)
- Moderate/strong parental involvement for children <12 years; parental involvement should decrease gradually as adolescents increase in age
- Assessment of diet, physical activity and weight (body fat) before treatment and at specified intervals thereafter to evaluate progress
- Structured behavioral program that includes at least food monitoring, short-term diet and activity goal setting, and contingency management
- Parent/caregiver education to improve home food and activity environments
- Structured dietary and physical activity interventions that improve dietary quality and result in negative energy balance

## Tertiary care intervention (TCI)

**Where implemented:**

- Pediatric weight management center operating under established protocols (e.g., clinical or research) to assess and to monitor risks and outcomes
- Residential settings (camps or boarding facilities with appropriate medical supervision)

**Implemented by whom and skills needed:** Same as CMI

**Frequency of visits/duration:** According to protocol

**Components:** Continued diet and activity counseling plus consideration of meal replacement, very-low-energy diet, medication and surgery

## Goals for BMI reduction/weight loss by age group<sup>21</sup>

Age	BMI	Target
2–5 years old	85th to 94th percentile	Weight maintenance until BMI of <85th percentile or slowing of weight gain, as indicated by downward deflection in BMI curve.
	≥95th percentile	Weight maintenance until BMI of <85th percentile; however, if weight loss occurs with healthy, adequate-energy diet, then it should not exceed 1 pound per month. If greater loss is noted, then the patient should be monitored for causes of excessive weight loss.
	>21 kg/m <sup>2</sup> (rare)	Gradual weight loss, not to exceed 1 pound per month. If greater loss occurs, then the patient should be monitored for causes of excessive weight loss.
6–11 years old	85th to 94th percentile	Weight maintenance until BMI of <85th percentile or slowing of weight gain, as indicated by downward deflection in BMI curve.
	95th to 98th percentile	Weight maintenance until BMI of <85th percentile or gradual weight loss of ~1 pound per month. If greater loss is noted, then the patient should be monitored for causes of excessive weight loss.
	≥99th percentile	Weight loss not to exceed average of 2 pounds per week. If greater loss is noted, then the patient should be monitored for causes of excessive weight loss.
12–18 years old	85th to 94th percentile	Weight maintenance until BMI of <85th percentile or slowing of weight gain, as indicated by downward deflection in BMI curve.
	95th to 98th percentile	Weight loss until BMI of <85th percentile, no more than average of 2 pounds per week. If greater loss is noted, then the patient should be monitored for causes of excessive weight loss.
	≥99th percentile	Weight loss not to exceed average of 2 pounds per week. If greater loss is noted, then the patient should be monitored for causes of excessive weight loss.

# Medical and surgical treatment for obesity

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## Medications APPROVED for use in pediatric obesity

Orlistat (Xenical®, Alli®) – approved for over-the-counter use by FDA in 2006

- Reversible lipase inhibitor-binds lipase in the lumen of the stomach and intestine, making it unavailable to hydrolyze dietary triglycerides. The intact triglycerides and cholesterol cannot be absorbed and are excreted in the feces.
- Reduces fatty acid absorption by ~30%.
- Side effects: abdominal cramping, flatus, oily bowel movements, flatus with discharge, and oily spotting on underwear caused by unabsorbed fat in the feces.
- Impair absorption of fat-soluble vitamins.
- Mild decrease in BMI (0.5–2 kg/m<sup>2</sup>).<sup>22,23</sup>
- Dose: age 12 years and older – 120 mg TID with meals.

*\*\*Note: Most weight loss occurs in the first 6 months of use, and rebound weight gain is common after medication discontinuation.*

## Medications NOT APPROVED for use in pediatric obesity

Sibutramine (Meridia®)

- SSRI
- Withdrawn from the US market in Oct. 2010, because of an increased risk of MI and stroke

Metformin (Glucophage®, Glucophage XR®, Fortamet®, Glumetza®, Riomet®)

- FDA-approved for management of Type 2 diabetes in children
  - Metformin – approved in ages 10 years and older
  - Extended release metformin – approved in ages 17 and older
- Modest reduction in BMI (-0.86 kg/m<sup>2</sup>) when used in the treatment of pediatric obesity (over 6–12 months) <sup>24</sup>, but no long-term data available

## Criteria for considering an adolescent for bariatric surgery<sup>25</sup>

Meet one of the following BMI criteria

- BMI ≥ 40 kg/m<sup>2</sup>
- BMI between 35–39.9 kg/m<sup>2</sup> in the presence of severe co-morbidities
  - Type 2 diabetes
  - Life-threatening cardiopulmonary problems
    - Severe sleep apnea
    - Pickwickian syndrome
    - Obesity-related cardiomyopathy
  - Obesity-induced physical problems interfering with a normal lifestyle
    - Joint disease treatable but for the obesity
  - Body size problems precluding or severely interfering with
    - Employment
    - Family function
    - Ambulation
- Puberty complete and attained 95% or more of adult stature
- Need to understand that:
  - Long-term efficacy and potential adverse consequences related to decreased absorption of nutrients is unknown
  - Degree of recidivism remains unknown

# Commercial weight loss programs and diets

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## Primary care physicians' primer for assessing commercial weight loss programs<sup>21</sup>

- Do you have a program for adolescents? The program should have options specific for children and adolescents or should be targeted specifically for the child's age group.
- What type of counseling/behavior modification models do you follow? The program should provide behavior modification that (a) emphasizes positive efforts and rewards success, (b) is sensitive to child/adolescent body image issues, (c) is culturally appropriate, (d) incorporates family members both to change the environment and to reinforce progress, (e) incorporates all three elements of weight loss/management (behavior, eating and activity), and (f) meets frequently enough to support the child's efforts and to monitor progress toward established goals.
- Do you offer nutrition and exercise counseling/education? Programs should provide nutrition and exercise counseling/education tailored to the needs of the adolescent or child. Programs should have trained professionals conducting the sessions.
- Must participants purchase proprietary meals? What are the initial and long-term costs? Initial fees, proprietary meals and recurring costs, and how they will affect the patient's participation, should be factored into the costs of the program. Proprietary meals can be costly, and no studies have examined their effect for children or adolescents.
- Do you offer culturally appropriate services? The program should offer culturally appropriate services.
- What are your immediate and long-term weight loss results? Immediate weight loss should not be more than 2 pounds per week. The percentage of clients who are able to maintain adequate weight loss should be determined.
- What is your attrition rate? The likelihood of patient success in program can be gauged by inquiring about the program's attrition rate.
- Do you advocate complementary/alternative weight loss methods? Programs that advocate complementary/alternative weight loss methods should use researched or reasonably approved methods, without the use of over-the-counter medications or products.

## Protein-sparing modified fast (PSMF) diet<sup>21</sup>

- Examples: Atkins diet, Paleo diet, etc.
- High protein, low carbohydrate diet
- Not a diet to be used for long-term treatment (>1 year) because long-term treatment effectiveness is not known
- Purpose is to bring about rapid weight loss during the initial phase of obesity treatment while minimizing the negative effects of a very-low-calorie diet

## Glycemic index (GI)<sup>21</sup>

- Defined as the area under the glucose dose-response curve after consumption of 50 grams of available carbohydrate from a test food, divided by the area under the curve after consumption of 50 grams of available carbohydrate from a control food (either white bread or glucose)
  - Basically measures how a carbohydrate-containing food raises blood glucose (BG) levels
  - Foods with a high GI, raise BG levels more than foods with a low GI
- Short-term feeding studies indicated that hunger and cumulative food intake were greater 3 to 5 hours after a high-GI versus low-GI meal
- Examples of high GI foods:
  - White grains (breads, pasta, potatoes, rice)
  - High sugar fruits (melon, pineapple)
- Examples of low GI foods:
  - Dried beans and legumes
  - Non-starchy vegetables
  - Lower sugar fruits (eg. berries)
  - Some starchy vegetables (e.g., sweet potatoes)

# Appendix

## Understanding health phrases

	Phrase	What it means
Salt	Sodium free or salt free	Less than 5 milligrams (mg) per serving
	Very low sodium	35mg or less of sodium per serving
	Low sodium	140mg or less of sodium per serving
	Low sodium meal	140mg or less of sodium per 3 1/2 ounce (100g)
	Reduced or less sodium	At least 25% less sodium than the regular version
	Light in sodium	50% less sodium than the regular version
	Unsalted or no salt added	No salt added to the product during processing
Fat and cholesterol	Fat free	Less than 0.5g per serving
	Low saturated fat	1 gram (g) or less (saturated fat) per serving
	Low fat	3g or less (total fat) per serving
	Reduced fat	At least 25% less fat than the regular version
	Light in fat	Half the fat than the regular version
	Transfat free	0.5g or less (transfat) per serving
	Low cholesterol	20mg or less of cholesterol per serving and 2g or less of saturated fat per serving
Calorie	Calorie free	Less than 5 calories per serving
	Reduced calorie	At least 25% fewer calories per serving than regular version
	Low calorie	40 calories or less per serving
	Light	Product has 1/2 fat or 1/3 fewer calories than original
Meat	Lean	Less than 10g fat, 4.5g or less of saturated fat, and less than 95mg cholesterol per serving
	Extra lean	Less than 5g fat, less than 2g saturated fat, and less than 95mg cholesterol per serving

## Healthy breakfast cereals

Cereal brands	Serving size	Fiber (g)	Sugar (g)
Cheerios (Regular)	1 cup	3	1
Honey-Nut Cheerios	3/4 cup	2	9
Multigrain Cheerios	1 cup	3	6
Kix	1 1/4 cup	3	3
Honey Kix	1 1/4 cup	6	3
Wheat Chex	3/4 cup	6	5
Life (Original)	3/4 cup	2	6
Frosted Mini Wheats	21 biscuits	6	11
Wheaties	3/4 cup	3	4
Fiber One Honey Clusters	1 cup	10	9
Quaker Oatmeal Squares (Cinnamon)	1 cup	5	9
Kashi Autumn Wheat	32 biscuits	7	7
Raisin Bran	1 cup	7	18
Special K with Red Berries	1 cup	3	9
Special K Honey Oat	2/3 cup	3	8
Instant Whole Grain Cream of Wheat	1 Packet	5	1
Quaker Quick Oats (Plain)	1/2 cup dry	4	1

## Specific serving sizes for fruits

<b>Fruit</b>	<b>Amount that counts as 1 cup</b>	<b>Amount that counts as 1/2 cup (unless otherwise noted)</b>
Apple	1/2 large (3 1/4 inches diameter) 1 small (2 1/4 inches diameter) 1 cup, sliced or chopped, raw or cooked	1/2 cup, sliced or chopped, raw or cooked
Applesauce	1 cup	1 snack container (4 ounces)
Banana	1 cup, sliced 1 large (8 to 9 inches long)	1 small (less than 6 inches long)
Cantaloupe	1 cup, diced or melon balls	1 medium wedge (1/8 of a medium melon)
Grapes	1 cup, whole or cut-up 32 seedless grapes	16 seedless grapes
Grapefruit	1 medium (4 inches diameter) 1 cup, sections	1/2 medium (4 inches diameter)
Mixed fruit (fruit cocktail)	1 cup, diced or sliced, raw or canned, drained	1 snack container (4 ounces) drained = 3/8 cup
Orange	1 large (3 1/16 inches diameter) 1 cup, sections	1 small (2 3/8 inches diameter)
Orange, mandarin	1 cup, canned, drained	
Peach	1 large (2 3/4 inches diameter) 1 cup, sliced or diced, raw, cooked, or canned, drained 2 halves, canned	1 small (2 inches diameter) 1 snack container (4 ounces) drained = 3/8 cup
Pear	1 medium pear (2 1/2 per lb) 1 cup, sliced or diced, raw cooked, or canned, drained	1 snack container (4 ounces) drained = 3/8 cup
Pineapple	1 cup, chunks, sliced or crushed, raw, cooked or canned, drained	1 snack container (4 ounces) drained = 3/8 cup
Plum	1 cup, sliced raw or cooked 3 medium or 2 large plums	1 large plum
Strawberries	About 8 large berries 1 cup, whole, halved, or sliced, fresh or frozen	1/2 cup whole, halved, or sliced
Watermelon	1 small (1 inch thick) 1 cup, diced or balls	6 melon balls
Dried fruit (raisins, prunes, apricots, etc.)	1/2 cup dried fruit	1/4 cup dried fruit or 1 small box raisins (1 1/2 ounce)



## Specific serving sizes for vegetables

Vegetable		Amount that counts as 1 cup	Amount that counts as 1/2 cup
Dark green vegetables	Broccoli	1 cup, chopped or florets 3 spears, 5 inches long raw or cooked	
	Greens (collards, mustard greens, turnip greens, kale)	1 cup, cooked	
	Spinach	1 cup, cooked 2 cups, raw	1 cup, raw
	Raw leafy greens: spinach, romaine, watercress, dark green leafy lettuce, endive, escarole	2 cups, raw	1 cup, raw
Red and orange vegetables	Carrots	1 cup, strips, slices, or chopped, raw or cooked 2 medium 1 cup baby carrots (about 12)	1 medium carrot About 6 baby carrots
	Pumpkin	1 cup, mashed, cooked	
	Red peppers	1 cup, chopped, raw, or cooked 1 large pepper (3 inches diameter, 3 3/4 inches long)	1 small pepper
	Tomatoes	1 large raw whole (3 inches diameter) 1 cup, chopped or sliced, raw, canned or cooked	1 small raw whole (2 1/4 inches diameter) 1 medium canned
	Tomato juice	1 cup	1/2 cup
	Sweet potato	1 large baked (2 1/4 inches or more diameter) 1 cup, sliced or mashed, cooked	
	Winter squash (acorn, butternut, hubbard)	1 cup, cubed, cooked	1/2 acorn squash, baked = 3/4 cup
Beans and peas	Dry beans and peas (such as black, garbanzo, kidney, pinto, or soy beans, or black-eyed peas or split peas)	1 cup, whole or mashed, cooked	

## Specific serving sizes for vegetables (continued)

Vegetable		Amount that counts as 1 cup	Amount that counts as 1/2 cup
Starchy vegetables	Corn, yellow or white	1 cup 1 large ear (8 to 9 inches long)	1 small ear (about 6 inches long)
	Green peas	1 cup	
	White potatoes	1 cup, diced, mashed 1 medium boiled or baked potato (2 1/2 to 3 inches diameter)	
Other vegetables	Bean sprouts	1 cup, cooked	
	Cabbage, green	1 cup, chopped or shredded raw or cooked	
	Cauliflower	1 cup, pieces or florets raw or cooked	
	Celery	1 cup, diced or sliced, raw or cooked 2 large stalks (11 to 12 inches long)	1 large stalk (11 to 12 inches long)
	Cucumbers	1 cup, raw, sliced or chopped	
	Green or wax beans	1 cup, cooked	
	Green peppers	1 cup, chopped, raw or cooked 1 large pepper (3 inches diameter, 3 3/4 inches long)	1 small pepper
	Lettuce, iceberg or head	2 cups, raw, shredded or chopped	1 cup, raw, shredded or chopped
	Mushrooms	1 cup, raw or cooked	
	Onions	1 cup, chopped, raw or cooked	
	Summer squash or zucchini	1 cup, cooked, sliced or diced	

## Specific serving sizes for dairy

Dairy	Amount that counts as 1 cup	Common portions and cup equivalents
Milk	1 cup regular milk 1 half-pint container fat-free or low-fat milk 1/2 cup evaporated milk	
Yogurt	1 regular container 8 fluid ounces fat-free or low-fat yogurt 1 cup yogurt	1 small container (6 ounces) = 3/4 cup 1 snack size container (4 ounces) = 1/2 cup
Cheese	1 1/2 ounces hard cheese (cheddar, mozzarella, Swiss, Parmesan) 1/3 cup shredded reduced-fat or low-fat cheese 2 ounces processed cheese (American) 1/2 cup ricotta cheese 2 cups cottage cheese	1 slice of hard cheese is equivalent to 1/2 cup milk 1 slice of processed cheese is equivalent to 1/3 cup milk 1/2 cup cottage cheese is equivalent to 1/4 cup milk
Milk-based desserts	1 cup pudding made with milk 1 cup frozen fat-free or low-fat yogurt 1 1/2 cups ice cream	1 scoop ice cream is equivalent to 1/3 cup milk
Soy milk	1 cup calcium-fortified soymilk 1 half-pint container calcium-fortified soymilk beverage	

## Specific serving sizes for protein

<b>Protein</b>	<b>Amount that counts as 1 ounce</b>	<b>Common portions and ounce equivalents</b>
Meat	1 ounce cooked lean beef 1 ounce cooked lean pork or ham	1 small steak (eye of round, filet) = 3 1/2 to 4 ounce-equivalents 1 small lean hamburger = 2 to 3 ounce-equivalents
Poultry	1 ounce cooked chicken or turkey, without skin 1 sandwich slice of turkey (4 1/2 inch x 2 1/2 inch x 1/8 inch)	1 small chicken breast half = 3 ounce-equivalents 1/2 Cornish game hen = 4 ounce-equivalents
Seafood	1 ounce cooked fish or shell fish	1 can of tuna, drained = 3 to 4 ounce-equivalents 1 salmon steak = 4 to 6 ounce-equivalents 1 small trout = 3 ounce-equivalents
Eggs	1 egg	3 egg whites = 2 ounce-equivalents 3 egg yolks = 1 ounce-equivalent
Nuts and seeds	1/2 ounce of nuts (12 almonds, 24 pistachios, 7 walnut halves) 1/2 ounce of seeds (pumpkin, sunflower, or squash seeds, hulled, roasted) 1 tablespoon of peanut butter or almond butter	1 ounce of nuts or seeds = 2 ounce-equivalents
Beans and peas	1/4 cup of cooked beans (such as black, kidney, pinto, or white beans) 1/4 cup of cooked peas (such as chickpeas, cowpeas, lentils, or split peas) 1/4 cup of baked beans, refried beans 1/4 cup (about 2 ounces) of tofu 1 ounce. tempeh, cooked 1/4 cup roasted soybeans, 1 falafel patty (2 1/4, 4 ounces) 2 tablespoons of hummus	1 cup split pea soup = 2 ounce-equivalents 1 cup lentil soup = 2 ounce-equivalents 1 cup bean soup = 2 ounce-equivalents 1 soy or bean burger patty = 2 ounce-equivalents

## Specific serving sizes for grains

Grain whole grain vs. refined grain	Amount that counts as 1 ounce	Common portions and ounce equivalents
Bagels Whole wheat Plain, egg	1 inch mini bagel	1 large bagel = 4 ounce-equivalents
Biscuits Baking powder/buttermilk	1 small (2 inches diameter)	1 large (3 inches diameter) = 2 ounce-equivalents
Breads 100% whole wheat White, white wheat, French, sourdough	1 regular slice, 1 small slice (French), 4 snack-sizes (rye bread)	2 regular slices = 2 ounce-equivalents
Bulgur Cracked wheat	1/2 cup, cooked	
Cornbread	1 small piece (2 1/2 inches x 1 1/4 inches x 1 1/4 inches)	1 medium piece (2 1/2 inches x 2 1/2 inches x 1 1/4 inches) = 2 ounce-equivalents
Crackers 100% whole wheat, rye Saltines, snack crackers	5 whole wheat crackers, 2 rye crisp breads 7 square or round crackers	
English muffins Whole wheat Plain, raisin	1/2 muffin	1 muffin = 2 ounce-equivalents
Muffins Whole wheat Bran, corn, plain	1 small (2 1/2 inch diameter)	1 large (3 1/2 inch diameter) = 3 ounce-equivalents
Oatmeal	1/2 cup, cooked, 1 packet instant, 1 ounce (1/3 cup), dry (regular or quick)	
Pancakes Whole wheat, buckwheat Buttermilk, plain	1 pancake (4 1/2 inches diameter), 2 small pancakes (3 inches diameter)	3 pancakes (4 1/2 inches diameter) = 3 ounce-equivalents
Popcorn	3 cups, popped	1 mini microwave bag or 100-calorie bag, popped = 2 ounce-equivalents
Ready-to-eat-breakfast cereal Toasted oat, whole wheat flakes Corn flakes, puffed rice	1 cup, flakes or rounds; 1 1/4 cup, puffed	
Rice Brown, wild Enriched, white, polished	1/2 cup cooked 1 ounce, dry	1 cup, cooked = 2 ounce-equivalents

## Specific serving sizes for grains (continued)

<b>Grain</b> <b>whole grain vs. refined grain</b>	<b>Amount that counts as 1 ounce</b>	<b>Common portions and ounce equivalents</b>
Pasta: spaghetti, macaroni, noodles Whole wheat Enriched, durum	1/2 cup, cooked 1 ounce, dry	1 cup, cooked = 2 ounce-equivalents
Tortillas Whole wheat, whole grain corn Flour, corn	1 small flour tortilla (6 inches diameter) 1 corn tortilla (6 inches diameter)	1 large tortilla (12 inches diameter) = 4 ounce-equivalents

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