

# Metabolic Rate, Body Mass Index and Calories

## Metabolic Rate

**B**asal metabolic rate, BMR, is the energy requirement to maintain life. It is measured at rest, but not asleep, in a thermo-neutral environment. BMR can also be estimated using the **Harris-Benedict Equation**, developed in 1919. The equation accounts for gender, age, height and weight. The equation appears to be reasonably accurate for people with normal body fat. However, it over-estimates the energy requirements for obese people - an important weakness in the equation.

1. Why would the equation below produce inflated metabolic rate values for clinically obese individuals?

### Calculating Theoretical Basal Metabolic Rate

This equation will give you BMR in kcal/day. (Remember 1 kcal = 1 Calorie)

**For men,  $BMR = 66.5 + (13.75 \times W) + (5.003 \times H) - (6.775 \times A)$**

**For women,  $BMR = 655.1 + (9.563 \times W) + (1.850 \times H) - (4.676 \times A)$**

W = weight in kilograms (1 kg = 2.2046 pounds) = # pounds/2.2046

H = height in centimeters (2.54 cm per inch) = # inches X 2.54

A = age in years

### Calculating Real World Metabolic Rate

The above calculation is based on a person lying awake in bed like someone in the hospital would be doing. Just showing up to class put you over that. So how do you take activity level into account? The chart and instructions on the next page shows you how to adjust your BMR to factor in what type of activity doing and how long you are doing it.

# Instructions

1. Complete the table on page 3 like this:
  - a. Think about your day yesterday. We will be calculating how many calories you actually used.
  - b. For each of the 24 hours in one of your "average" days, determine your **Energy Expenditure, EE** by reading the descriptions below. Then, multiply your hourly BMR (BMR divided by 24) times your energy expenditure.

For example, if your hourly BMR equals 85 calories, and your activity level during that hour was light (1.3), then simply multiply 85 times 1.3. Your hourly caloric expenditure equals 110.5 calories.

2. Do this for each hour of the day, add all of them together, and that is your daily caloric requirement (your actual metabolic rate).

<b>ENERGY EXPENDITURE GUIDE</b>	
<b>Multiply this number by hourly BMR</b>	<b>Activity Description</b>
<b>0.8</b>	Sleeping
<b>1.0</b>	Lying down totally relaxed but not sleeping - this is your "basal metabolic rate" (BMR)
<b>1.2</b>	<b>Very Light:</b> sitting, studying, talking, little walking.
<b>1.3</b>	<b>Light:</b> typing, lab/shop work, some walking.
<b>1.5</b>	<b>Moderate:</b> walking, jogging, yard work.
<b>1.8</b>	<b>Heavy:</b> heavy manual labor such as digging and construction.
<b>2.0</b>	<b>Exceptionally Heavy:</b> fitness-oriented cycling or similar vigorous activities, weight training, aerobic exercise.
<b>2.2</b>	<b>Sports:</b> vigorous sports competition such as football, basketball, tennis or other extended-play sports activities.
<b>2.3</b>	<b>All-Out Training:</b> extremely high intensity weight training with little rest between sets or exercises.
<b>2.5</b>	<b>Extended Maximum Effort:</b> extremely high intensity and high duration sports competition such as triathlon, cross country skiing or marathon.

# Real World Calorie Requirements

Name \_\_\_\_\_

Date \_\_\_\_\_

Calculations:

- Write the BMR you calculated using the formula on Page 1.

\_\_\_\_\_ Kcal / day.

- Calculate the number of calories that equates to per hour. (BMR / 24)

\_\_\_\_\_ Kcal / hr.

Hour	Activity	Kcal / hr	EE	Calories
12 – 1				
1 – 2				
2 – 3				
3 – 4				
4 – 5				
5 – 6				
6 – 7				
7 – 8				
8 – 9				
9 – 10				
10 – 11				
11 – 12				
12 – 1				
1 – 2				
2 – 3				
3 – 4				
4 – 5				
5 – 6				
6 – 7				
7 - 8				
8 – 9				
9 – 10				
10 - 11				
11 - 12				
				Total Calories -

**This is your Real World Calorie Requirement.  
Eat Up!**