



# Evaluating children's growth and weight

For each of the 4 examples below, choose the appropriate chart to record and evaluate the child's growth and weight.

Is the child in the normal range, likely to be too thin or likely to be too heavy?  
Do any of them have serious growth problems?

1. **Sam** is 4 years old. He weighs 22 kg and is 115 cm tall. Determine Sam's growth status by finding his percentile on the chart and evaluate whether or not he is in the normal range.
2. **Sara** is 2 years old. She weighs 11 kg and is 90 cm tall. Determine Sara's growth status by finding her percentile on the chart and evaluate whether or not she is in the normal range.
3. **Charity** is 3 years old and weighs 19 kg and is 102 cm tall. Determine Charity's growth status by finding her percentile on the chart and evaluate whether or not she is in the normal range.
4. **Paul** is 5 years old. He weighs 12 kg and 100 cm tall. Determine Paul's growth status by finding his percentile on the chart and evaluate whether or not he is in the normal range.

Answer key: 1 Sam is at the 80th percentile for his weight for his height, therefore he falls within normal range. This means that he is likely to be at a normal weight for his height.

2 Sara is at the 4th percentile, therefore she falls below normal range. This means that she is likely to be underweight for her height.

3 Charity is at the 95th percentile, therefore she is at the top of the overweight range. This means that she is likely to be borderline obese.

4 Paul is below the 3th percentile, therefore he is below the normal range. This means that he is likely to have serious growth problems.





# Fill in the gaps

Check your understanding of energy balance by choosing the correct word from the box to complete each sentence. Use each word once.

- a. obesity    b. gain    c. maintain    d. reducing    e. activities  
 f. loss    g. metabolize    h. age    i. out    j. increasing    k. in

- We need energy for our heart to beat, our lungs to breathe, our brain to think, our stomachs to digest and our cells to ..... food.
- We also need energy for all our daily ..... and physical movements.
- Our energy needs depend on our ..... sex, physiological condition and activity level.
- Taking in just the right amount of energy needed for body functions and daily activities helps us ..... healthy body weight.
- Taking in less energy than we need over time can lead to weight .....
- Taking in more energy than we need over time can lead to weight .....
- The ability of the body to store fat can protect us in times of hunger but can also put us at risk of .....
- Overweight and obesity can be prevented and treated by ..... calories consumed and ..... physical activity.
- Energy ..... *minus* Energy ..... *equals* Weight Gain or Weight Loss.



Answer key: 1: g; 2: e; 3: c; 4: d; 5: f; 6: i; 7: h; 8: a; 9: k



# Calculating energy balance

## Are these people in energy balance?

For each example, calculate the person's energy expenditure by adding calories burned through BMR and daily activities. Compare this number to the amount of calories consumed (food energy intake).

Determine whether these people are likely to lose weight, gain weight or remain at a constant weight if they continue this lifestyle. Make recommendations for improving each situation.

**Henry** is 28 and works as a builder on a construction site. He weighs 89 kg and is 190 cm tall. Can you calculate his BMI?

Henry awakes at 5.30 every morning, gets ready for work and has a large breakfast. This usually takes 30 minutes, burning 70 calories. He then rides his bike to work for one hour, burning 300 calories. He works an 8-hour shift, burning 200 calories per hour and takes a short break mid-morning for a snack and something to drink. At work, he has one hour to rest and have a cooked lunch he brings from home; this burns 50 calories.

After work, he rides his bike home again for one hour, burning 300 calories. At home, he has a snack and spends an hour playing with his children, burning 150 calories and then helps them with their homework for an hour, burning 70 calories. The rest of the evening he relaxes with his family, reads the newspaper and has dinner; this burns 70 calories per hour. At 10.00 pm he goes to bed. He burns 53 calories per hour until he wakes up again.

We know that Henry:

- has a BMR of 2 045 calories per day
- burns at least 3 000 calories in daily activity
- consumes an average of 5 000 calories a day

1. What is Henry's overall energy balance? (BMR + calories burned from daily activity compared with calorie intake (food and beverages consumed))
2. Is he likely to gain weight, lose weight or maintain the same body weight if his food intake (calories) and activity level remain the same?
3. What advice would you give to Henry, taking into consideration his BMI and current energy balance status?



'BMR' is the amount of energy required for basic body functions.

The calculations used here are:

**Men:**  $(13.7 \times \text{wt in kg}) + (5 \times \text{ht in cm}) - (6.8 \times \text{age in years}) + 66$

**Women:**  $(9.6 \times \text{wt in kg}) + (1.8 \times \text{ht in cm}) - (4.7 \times \text{age in years}) + 655$

**BMI Formula:**  $\text{weight (kg)} / [\text{height (m)}]^2$

**Irene** is 19 and works as a radio DJ. She weighs 71 kg and is 161 cm tall.  
Can you calculate her BMI?

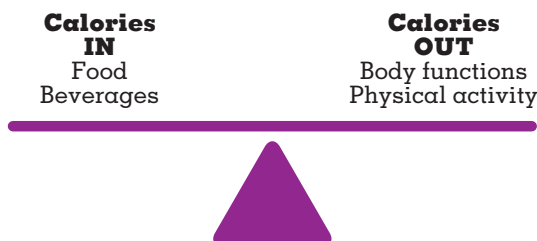
She gets up every morning at 6 am, eats breakfast and rushes out of her house so she can be on time for her morning radio programme which starts at 7 am. Her colleague who lives next door, gives her a lift to work every day; sitting in the car for 30 minutes burns about 30 calories. Irene’s radio programme lasts 4 hours starting at 7 am and finishing at 11 am, burning 70 calories per hour. She snacks and drinks various beverages throughout her programme. When her programme is finished, she works for two hours on her computer, updating the radio’s website and replying to emails. This burns 80 calories per hour. She takes a one-hour break to eat a big lunch, relaxing and talking with her colleagues; this burns 70 calories. After lunch she spends another 2 hours in the office, preparing her next programme, listening to music and looking for interesting stories about the latest music stars. This burns 80 calories per hour.

After work, Irene usually meets some friends for 2–3 hours to get something to eat for dinner; sometimes they go to a local pub or the cinema, burning 70 calories an hour. She goes to bed at around 11 o’clock. She burns 50 calories an hour until she wakes up again.

We know that Irene:

- has a B.M.R. of 1 537 calories per day
- burns at least 1 260 calories in daily activity
- consumes an average of 3 200 calories a day

1. What is Irene’s overall energy balance? (BMR + calories burned from daily activity compared with calorie intake (food and beverages consumed))
2. Is she likely to gain weight, lose weight or maintain the same body weight if her food intake (calories) and activity level remain the same?
3. What advice would you give Irene, taking into consideration her BMI and current energy balance status?



**Marie** is 35 and she is a farmer. She weighs 50 kg and is 168 cm tall.  
Can you calculate her BMI?

In the morning she awakes at 6 am, takes one hour to prepare breakfast for her family, do a few household chores and eats her own breakfast; this burns 120 calories. She then walks to her fields for half an hour, burning 130 calories. She ploughs, plants, weeds and digs for 6 hours each day. This burns 200 calories per hour. At noon she has a 2-hour break to have a little food and rest; this burns 70 calories per hour. When she has finished her work for the day, she walks home again (130 calories).

At home, she spends one and a half hours taking care of her chickens and preparing the evening meal for her family, burning 110 calories an hour. After dinner she spends some time with her husband and children, finishes her household chores (burning 120 calories) and goes to bed around 10.30 pm. She burns 50 calories an hour while she is sleeping.

We know that Marie:

- has a B.M.R. of 1 273 calories per day
- burns at least 2 380 calories in daily activity
- consumes an average of 1 800 calories a day

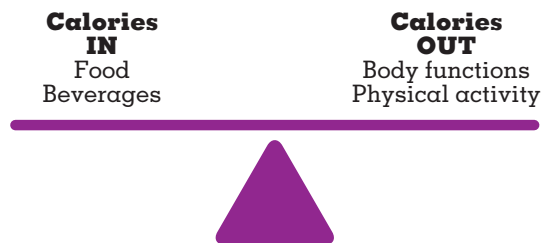
1. What is Marie's overall energy balance? (BMR + calories burned from daily activity compared with calorie intake (food and beverages consumed))
2. Is she likely to gain weight, lose weight or maintain the same body weight if her food intake (calories) and activity level remain the same?
3. What advice would you give Marie, taking into consideration her BMI and current energy balance status?



★ You can check your answers on  
Answer work sheet **Calculating energy balance**

# Calculating energy balance

Even though we do not have complete information on the total food intake, total daily expenditure (daily activities) or health status of Henry, Irene and Marie, we have enough information to make an approximate assessment of their **energy balance** and make **some reasonable observations and recommendations for each of them.**



## BMI Weight Status Categories

BMI	Weight status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and Above	Obese

**Henry** has a BMI of 24.6, which puts him in the normal weight range. He is also in energy balance, because the calories he takes in are equal to the calories he uses for his normal body processes (BMR) and for daily movement and activities. If he continues his current pattern of eating and activity, he is likely to maintain his healthy body weight and BMI. However, Henry may need to be careful, because he is at the top of the normal weight range for his height and it will not take much for him to slip into the overweight category. If he eats only a little bit more each day or moves a little bit less, over time his weight and BMI will increase.



★ Use this Answer Work sheet to check your answers on the Ask yourself work sheet **Calculating Energy Balance**

**Irene** has a BMI of 27.4, which means that she is overweight. She is also in positive energy balance, because she is consuming more calories than she burns for her body processes (BMR) and for daily movement and activity. If she continues her current eating pattern and lack of physical activity, she will continue to gain weight. Irene has a job that requires many hours of sitting and she does not seem to be very physically active outside of work. To lose weight, Irene will need to reduce the amount of calories she consumes and find ways to increase her physical activity, such as walking part way or all the way to and from work, taking a short walk during her lunch break and doing some more vigorous activities after work or on the weekends. Being more physically active will also have many other health benefits for Irene.

**Marie** has a BMI of 17.7, which means that she is underweight. She is also in negative energy balance, because she is consuming fewer calories than she needs to cover her body processes (BMR) and her daily movement and activity. If she continues her current pattern of undereating and heavy physical labour and activity, she will continue to lose weight. Marie's health is at risk; as she continues to lose weight, she will become more underweight, she will be less able to fight infections and will become ill more easily and more seriously. She needs to immediately increase her food consumption. It would be good for her to see a health care professional and try to reduce her physical work load, if possible.

★ You can read more about the importance of physical activity for good health in Lesson 10 *Keeping fit and active*

★ You can read more about the health problems related to underweight and undernutrition in Lesson 3 *Understanding problems of poor nutrition*

★ You can read more about the health problems related to overweight and obesity in Lesson 3 *Understanding problems of poor nutrition*



# Energy balance equation

$$\begin{array}{rcl} \text{Energy intake} & - & \text{Energy needs} & = & \text{Weight gain} \\ \text{(Food)} & & \text{(BMR and activity)} & & \text{or} \\ & & & & \text{Weight Loss} \end{array}$$

*or more simply:*

$$\begin{array}{rcl} \text{Energy IN} & - & \text{Energy OUT} & = & \text{Weight gain} \\ \text{(Food)} & & \text{(BMR and activity)} & & \text{or} \\ & & & & \text{Weight Loss} \end{array}$$

**Calories IN**  
Food  
Beverages

**Calories OUT**  
Body functions  
Physical activity



**If you are...**

**Your energy status is...**

...maintaining your weight

...in balance.

You are eating about the same number of calories that your body is using. If you continue to stay in balance, your weight will remain the same.

...gaining weight

...in calorie excess.

You are eating more calories than your body is using. Your body is storing these extra calories as fat, so you are gaining weight.

...losing weight

...in calorie deficit.

You are eating fewer calories than you are using. Your body is using its fat stores for the energy it needs, so you are losing weight.

*Adapted from the CDC "Healthy Weight"*





