Physical Activity Diary: School Day

Name: _____ Date: _____

Keep track of your physical activities for a 24-hour period during the school week. Within each one-hour time slot, list the activities you participated in and indicate the number of minutes you spent on each of type of activity (such as sleep, sitting activities, or high-level running activities).

Time	Activity	Time spent on activity (minutes)					
		Resting/ Sleeping	Very Light/ Sitting	Light/ Walking	Moderate/ Medium	Heavy/ Running	Total Minutes (must = 60)
5:00 a.m.							
6:00 a.m.							
7:00 a.m.							
8:00 a.m.							
9:00 a.m.							
10:00 a.m.							
11:00 a.m.							
Noon							
1:00 p.m.							
2:00 p.m.							
3:00 p.m.							
4:00 p.m.							
5:00 p.m.							
6:00 p.m.							
7:00 p.m.							
8:00 p.m.							
9:00 p.m.							
10:00 p.m.							
11:00 p.m.							
Midnight							
1:00 a.m.							
2:00 a.m.							
3:00 a.m.							
4:00 a.m.							
Total minutes							1,440

Physical Activity Diary: Weekend Day

Name: _____ Date: _____

Keep track of your physical activities for a 24-hour period during the school week. Within each one-hour time slot, list the activities you participated in and indicate the number of minutes you spent on each of type of activity (such as sleep, sitting activities, or high-level running activities).

Time	Activity	Time spent on activity (minutes)					
		Resting/ Sleeping	Very Light/ Sitting	Light/ Walking	Moderate/ Medium	Heavy/ Running	Total Minutes (must = 60)
5:00 a.m.							
6:00 a.m.							
7:00 a.m.							
8:00 a.m.							
9:00 a.m.							
10:00 a.m.							
11:00 a.m.							
Noon							
1:00 p.m.							
2:00 p.m.							
3:00 p.m.							
4:00 p.m.							
5:00 p.m.							
6:00 p.m.							
7:00 p.m.							
8:00 p.m.							
9:00 p.m.							
10:00 p.m.							
11:00 p.m.							
Midnight							
1:00 a.m.							
2:00 a.m.							
3:00 a.m.							
4:00 a.m.							
Total minutes							1,440

Some Typical Activities and Energy Expended, by Intensity Level

Intensity Level, Activity	Energy Expended* (calories/hour)
Resting/Sleeping	60
Sleeping	
Very Light (sitting activities)	85
Watching television	
Playing computer games	
Listening to music	
Sitting in class	
Talking	
Using the Internet	
Eating and bathing	
Light (low-level activities)	140
Doing household chores	
Walking	
Shopping	
Moderate (medium-level activities)	285
Mowing lawns	
Bicycling	
Dancing (practice)	
Playing tennis	
Heavy (high-level activities)	400
Swimming (practice)	
Playing basketball	
Participating in most athletic practices	

* Average values for middle-school–aged people. The values include calories expended for basal metabolic rate (BMR).

Sample Physical Activity Diary for a School Day

Name: [Student's Name] Date: [Date Completed]

Keep track of your physical activities for a 24-hour period during the school week. Within each one-hour time slot, list the activities you participated in and indicate the number of minutes you spent on each of type of activity (such as sleep, sitting activities, or high-level running activities).

Time	Activity	Time spent on activity (minutes)					
		Resting/ Sleeping	Very Light/ Sitting	Light/ Walking	Moderate/ Medium	Heavy/ Running	Total Minutes (must = 60)
5:00 a.m.	Sleep	60					60
6:00 a.m.	Sleep	60					60
7:00 a.m.	Eat, get dressed, walk to school, talk with friends		45	15			60
8:00 a.m.	English, walk to Social Studies		50	10			60
9:00 a.m.	Social Studies, walk to Math		40	20			60
10:00 a.m.	Math, walk to homeroom		50	10			60
11:00 a.m.	Homeroom, walk to lunch, Lunch		50	10			60
Noon	Eat, walk to Music, Music		50	10			60
1:00 p.m.	Music, walk to P.E., P.E. class		20	10	30		60
2:00 p.m.	P.E., walk to Science, Science		20	25	15		60
3:00 p.m.	Science, talk, basketball practice		30			30	60
4:00 p.m.	Basketball practice				20	40	60
5:00 p.m.	Walk home, chores, talk		15	45			60
6:00 p.m.	Eat, do dishes, talk		45	15			60
7:00 p.m.	Homework		60				60
8:00 p.m.	TV, phone		60				60
9:00 p.m.	TV, phone, go to bed	30	30				60
10:00 p.m.	Sleep	60					60
11:00 p.m.	Sleep	60					60
Midnight	Sleep	60					60
1:00 a.m.	Sleep	60					60
2:00 a.m.	Sleep	60					60
3:00 a.m.	Sleep	60					60
4:00 a.m.	Sleep	60					60
Total minutes		**570**	**565**	**170**	**65**	**70**	**1,440**

Total Calories Used Per Day at Various Intensity Levels

Name: _____ Date: _____

Review your school day and weekend day physical activities diaries. **Record the total minutes for each of the five intensity levels** in the tables below. Then, **divide the total minutes by 60** to calculate the number of hours of activity at each intensity level. Record your answer to the nearest 0.1 of an hour. **Multiply the hours of activity by the calories-per-hour factor** provided in the table to determine calories used. **Add the total calories used for each activity level** (bottom row) to estimate the total calories used for the day.

Calories Used on a School Day

Intensity Level	Resting (Sleeping)	Very Light (Sitting Activities)	Light (Walking Activities)	Moderate (Medium-Level Walking/ Running Activities)	Heavy (High-Level Running Activities)	Total calories
Minutes of Activity						
Minutes ÷ 60 = **Hours** of activity						
calories/hour*	**60**	**85**	**140**	**285**	**400**	
Hours × calories/hour = **calories used**						

Calories Used on a Weekend Day

Intensity Level	Resting (Sleeping)	Very Light (Sitting Activities)	Light (Walking Activities)	Moderate (Medium-Level Walking/ Running Activities)	Heavy (High-Level Running Activities)	Total calories
Minutes of Activity						
Minutes ÷ 60 = **Hours** of activity						
calories/hour*	**60**	**85**	**140**	**285**	**400**	
Hours × calories/hour = **calories used**						

* These energy value factors are age-adjusted, average values for middle school students that include the calories expended for BMR. They provide a rough estimate of energy expenditure for students your age.

How Much Is One Serving?

Name: _____ Date: _____

	Column 1	Column 2	Column 3	Column 4	Column 5
Food	**Food label serving size**	**Amount in MY GROUP'S portion (what you measured)**	**Number of food label servings in our portion (divide column 2 by column 1)**	**Calories per food label serving**	**Calories in OUR portion (multiply column 3 and column 4)**
Dry cereal					
Juice					
Hamburger patty					
Cheddar cheese					
Milk					

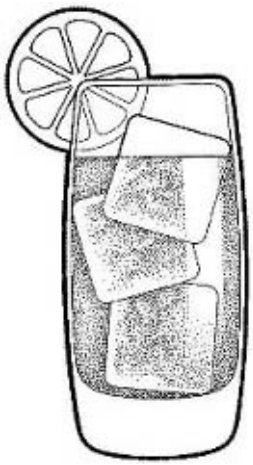
Serving Sizes for Various Beverages

Milk

Serving size = 1 cup (8 fluid oz.)

Calories per serving:

Nonfat	=	85 calories
1%	=	118 calories
2%	=	137 calories
Whole	=	156 calories



Fruit Juice

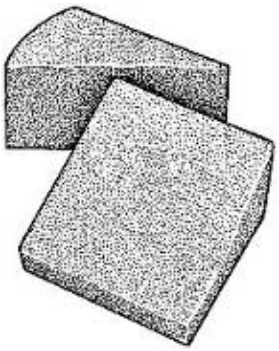
Serving size = 1 cup (8 fluid oz.)

Calories per serving:

Apple juice	=	116 calories
Grapefruit juice	=	93 calories
Orange juice	=	110 calories

Cheese and Hamburger Food Labels

Cheddar Cheese



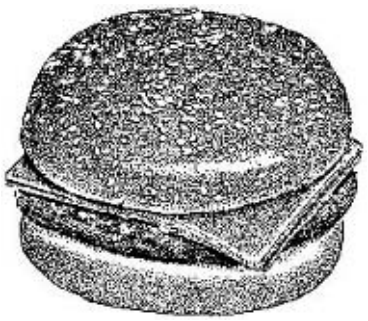
Extra Sharp Cheddar Cheese

Nutrition Facts
Serv. Size 1 oz (28g)
Servings varied
Calories 120
Fat Cal. 90
*Percent Daily Values (DV) are based on a 2,000 calorie diet.

Amount/serving	% DV*	Amount/serving	% DV*
Total Fat 10g	**15%**	**Total Carb.** 1g	**0%**
Sat. Fat 6g	**31%**	Fiber 0g	**0%**
Cholest. 40mg	**13%**	Sugars 0g	
Sodium 170mg	**7%**	**Protein** 7g	

Vitamin A 6% • Vitamin C 0% • Calcium 20% • Iron 0%

Hamburger—Just the Cooked Beef



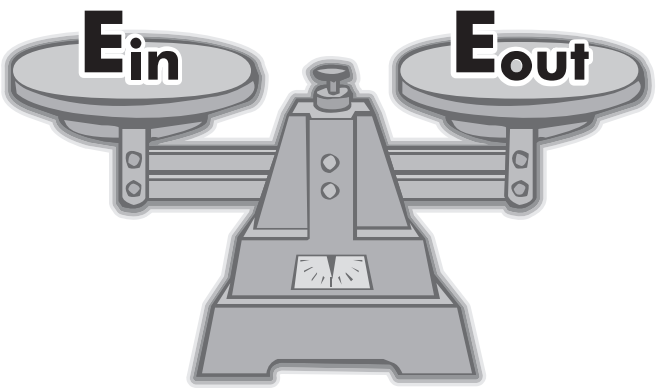
100% PURE
GROUND BEEF
85/15

Nutrition Facts
Serving Size 4 oz. (112 g)
Servings Per Container: Varied
Calories 240
Fat Cal. 150
*Percent Daily Values (DV) are based on a 2,000 calorie diet.

Amount Per Serving	% DV*	Amount Per Serving	% DV*
Total Fat 17g	**25%**	**Total Carb.** 0g	**0%**
Sat. Fat 7g	**33%**	Dietary Fiber 0g	**0%**
Cholest. 75mg	**25%**	Sugars 0g	
Sodium 55mg	**2%**	**Protein** 22g	

Vitamin A 0% • Vitamin C 0% • Calcium 0% • Iron 10%

The Energy Balance Equation



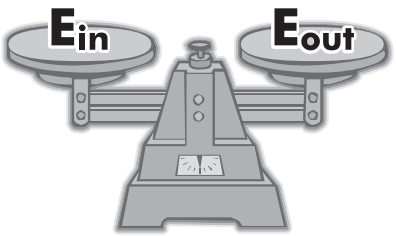
Energy Balance Equation: $E_{in} = E_{out}$

For adults, $E_{in} = E_{out}$ means there is no weight gain or weight loss.

For children, adolescents, and teenagers:

The Memo

ENERGY BALANCE CLINIC



MEMORANDUM

TO: Clinic Staff

FROM: Dr. Chu

SUBJECT: Help

Dear Clinic Staff,

I'm learning a lot at the Energy Balance Conference, where I presented our paper on "Energy Balance in Adolescents." It was a great success. In fact, a teacher in the audience asked me to talk to her middle school class tomorrow. What a great opportunity to discuss this important topic with those for whom it matters most!

Unfortunately, I have five patients scheduled for evaluation tomorrow. I need you to see them for me. You will find their files at the clinic office. The patients have completed food and activity diaries for a typical day. Please use your expertise to analyze their energy balance. If you have any questions, consult the *Energy Balance Reference Manual* in the library.

Thanks so much. You're great members of our team!

Sincerely,

Dr. Chu

P.S. By the way, you will have to present your analyses and recommendations to the clinic's review board. We need their approval before we meet again with the patients.

Calculating $Energy_{in}$ and $Energy_{out}$

Name: _____ Date: _____

Place the appropriate numbers in the calculator boxes and then calculate your patient's total $Energy_{in}$ and total $Energy_{out}$.

Daily Energy Intake Calculator

	Grams		calories/gram		Total
Total Carbohydrates		x		=	
Total Fat		x		=	
Total Protein		x		=	

Calculate Total calories _____ **$Energy_{in}$**

Daily Activity Calculator

	Hours		calories/hour		Total
Resting		x		=	
Very Light		x		=	
Light		x		=	
Moderate		x		=	
Heavy		x		=	

Calculate Total calories _____ **$Energy_{out}$**

Master 3.2

Patient Notes

Team: _____ Date: _____

ENERGY BALANCE CLINIC

PATIENT NOTES

Patient's name _____

Patient's question _____

Summary of Analysis

Total calories consumed (E_{in}):

Total calories used (E_{out}):

Explanation

How would you answer the patient's question? Explain.

What is the appropriate energy balance for the patient? Should the patient be gaining weight, losing weight, or maintaining the same weight? Explain.

Recommendations

What recommendations do you have for the patient about his/her food consumption and physical activities?

Why would following the above recommendations lead to the appropriate energy balance for the patient?

Evaluating Energy Balance Review Board Presentations

Criterion	Score		
	2	1	0
Explanation	The patient's question was answered clearly and completely, using appropriate visual aids.	The patient's question was not answered clearly *or* was partially answered *or* was inappropriate *or* no visual aids were used.	The patient's question was not answered and was inappropriate *or* no visual aids were used.
Recommendations	Appropriate recommendations were offered to help the patient attain a healthy energy balance.	Recommendations were offered to help the patient attain a healthy energy balance, but not all were appropriate.	No recommendations were offered to help the patient attain a healthy energy balance.
Team effort	All team members participated in developing the presentation.	Most team members participated in developing the presentation.	One or two team members did most of the work in developing the presentation.
Participation as board member	One or more team members asked appropriate questions about two or more of the other presentations.	One or more team members asked appropriate questions about one of the other presentations.	No team members asked questions about any of the other presentations *or* only inappropriate questions were asked about other presentations.

Ashley's Patient File

Am I going to get fat?

I always ate as much as I wanted and never worried about my weight. I love my summer job giving tours at the art museum, and I keep busy doing other things I like—drawing, dancing, just being with my friends. But now all my friends are worried about getting fat, and they told me that one of these days I'll understand why they're concerned. Sure enough, I've gained 3 pounds this summer! Am I going to get fat?

Official Patient Record — Confidential

Patient name Ashley V.

Age 13 **(years)** 1 **(month)** **Sex** X **female** _____ **male**

Height 61 **(in.)** **Weight** 103 **(lbs.)** 5 **(oz.)**

Referring physician Dr. Keller

Referral information:

Ashley was referred to the clinic by her family doctor, Dr. Keller. He noted that Ashley weighed 100 pounds at the end of the school year. He told Ashley and her parents that her weight and summer weight gain were acceptable for a female of her age and height. He felt that an analysis of her energy balance state at the clinic might provide reassurance to Ashley and her parents that her weight gain is normal.

Initial clinic visit:

Dr. Chu met with Ashley and her father on August 10. He asked Ashley to keep track of her food consumption and physical activities and record a typical day on our Food and Physical Activities forms. He requested that Ashley return the forms to clinic staff for evaluation before her next appointment.

Ashley's Patient File

Patient Name Ashley V.

Food Diary

Meal and Food	Carbohydrates (g)	Fat (g)	Protein (g)
Breakfast			
Light cream cheese (2 tbsp.)	1.8	4.7	2.9
Plain bagel, toasted	30.5	0.9	6.0
Orange juice (8 fluid oz.)	25.5	0.1	1.6
Breakfast total	**57.8**	**5.7**	**10.5**
Lunch			
1% milk (8 fluid oz.)	11.3	2.5	7.7
American cheese (1 oz.)	0.5	8.9	6.3
Ham (1 oz.)	0.0	2.6	6.4
Wheat bread (2 slices)	23.6	2.0	4.6
Peanut butter ($1\frac{1}{2}$ tbsp.)	3.8	12.4	6.9
Celery (3 sticks)	0.7	0.0	0.1
Lunch total	**39.9**	**28.4**	**32.0**
Dinner			
Sirloin steak (5 oz.)	0.0	9.6	43.0
Tossed green salad (2 cups)	3.1	0.3	1.5
Blue cheese dressing (2 tbsp.)	1.7	11.6	1.9
Baked potato, with skin	50.9	0.2	4.4
Light sour cream (2 tbsp.)	1.3	3.6	0.9
Strawberries (1/2 cup)	5.3	0.3	0.5
Pound cake (1 piece)	33.7	17.5	3.6
Light whipped cream (1/2 cup)	1.8	18.4	1.3
Dinner total	**97.8**	**61.5**	**57.1**
Snacks			
Popcorn, with oil and salt (4 cups)	25.2	12.4	4.0
Butter (1 tsp.)	0.0	3.8	0.0
Snack total	**25.2**	**16.2**	**4.0**

Physical Activity Diary

Intensity Level and Activity	Hours	Intensity Level and Activity	Hours
Resting		**Light**	
sleeping	9.0	doing household chores	1.0
Very light		**conducting** tours	2.0
eating and bathing	4.0	**Moderate**	
watching television	2.0	dancing (practice)	1.0
attending art class	3.0	**Heavy**	
talking on the telephone	1.0	(none)	0.0
reading	1.0		

Emily's Patient File

Am I gaining too much weight?

My doctor thinks I've gained too much weight this summer. I *have* gained weight, but I don't think it's that big a deal. My family just has big people—it's in our genes. My mom said she weighed more than I do at my age, so I think I'm fine. It's natural for me to be gaining weight now.

Official Patient Record — Confidential

Patient name Emily G.

Age 13 **(years)** 6 **(months)** **Sex** X **female** _____ **male**

Height 62 **(in.)** **Weight** 125 **(lbs.)** 2 **(oz.)**

Referring physician Dr. Russo

Referral information:

Emily was referred to the clinic by the family's doctor, Dr. Russo. Dr. Russo noted that Emily has gained 11 pounds over the summer. She recommends an energy balance evaluation for Emily. If necessary, perhaps the clinic staff can explain to Emily the health risks of being overweight, and give her advice about making changes in her diet and exercise so that she can avoid becoming overweight.

Initial clinic visit:

Dr. Chu met with Emily and her mother on August 3. He noted that both Emily and her mother commented that the visit was unnecessary because Emily "is perfectly healthy." He asked Emily to keep track of her food consumption and physical activities and record a typical day on our Food and Physical Activity forms. He asked that Emily return the forms to clinic staff for evaluation before her next appointment. Emily reluctantly agreed.

Emily's Patient File

Patient Name Emily G.

Food Diary

Meal and Food	Carbohydrates (g)	Fat (g)	Protein (g)
Breakfast			
Refried beans (1/2 cup)	24.2	9.0	8.1
Shredded cheddar cheese (1 oz.)	0.4	9.4	7.1
Flour tortilla (1)	27.2	3.5	4.3
Soda, cola (12 fluid oz.)	36.9	0.0	0.0
Breakfast total	**88.7**	**21.9**	**19.5**
Lunch			
Spaghetti ($1\frac{1}{2}$ cups)	59.5	1.4	10.0
Meatless spaghetti sauce (3/4 cup)	13.8	3.9	2.8
Ground beef (2 oz.)	0.0	10.4	13.6
Tossed green salad (2 cups)	3.1	0.3	1.5
Thousand Island dressing (4 tbsp.)	9.8	20.3	0.8
Soda, cola (12 fluid oz.)	36.9	0.0	0.0
Lunch total	**123.1**	**36.3**	**28.7**
Snacks			
Chocolate chip cookies (4)	24.7	11.7	2.2
Soda, cola (12 fluid oz.)	36.9	0.0	0.0
Snack total	**61.6**	**11.7**	**2.2**
Dinner			
Beef, bean, and cheese burrito (2 burritos)	39.7	13.3	14.6
Chopped tomatoes (1/8 cup)	0.8	0.1	0.2
Spanish rice (1/2 cup)	21.3	0.1	2.8
Soda, cola (12 fluid oz.)	36.9	0.0	0.0
Dinner total	**98.7**	**13.5**	**17.6**

Physical Activity Diary

Intensity Level and Activity	Hours	Intensity Level and Activity	Hours
Resting		**Light**	
sleeping	7.0	doing household chores	1.0
Very light		shopping	2.0
watching television	4.0	**Moderate**	
cooking	1.0	(none)	1.0
visiting friends	2.0	**Heavy**	
reading	1.0	(none)	0.0
browsing the Internet	2.0		
eating and bathing	4.0		

Enrique's Patient File

Why am I losing weight?

I've been working out all summer. I need to build up my muscles for swimming and basketball. I eat well and I exercise, so I should be building muscle, right? But I've *lost* more than 5 pounds this summer! And on top of that, I'm tired all the time, so now I don't feel like I can work out any more. What's wrong with me? Am I sick or something?

Official Patient Record — Confidential

Patient name Enrique S.

Age 13 **(years)** 4 **(months)** **Sex** _____ **female** X **male**

Height 62 **(in.)** **Weight** 92 **(lbs.)** 3 **(oz.)**

Referring physician Dr. Phillips

Referral information:

Enrique was referred to the Clinic by his primary care physician, Dr. Phillips. Dr. Phillips noted that Enrique weighed 100 pounds at the end of the school year. He is concerned about Enrique's weight loss, but the tests he ran did not indicate any infections or other diseases. He would like the Clinic to evaluate Enrique's energy balance to see if that can explain his weight loss and fatigue.

Initial clinic visit:

Dr. Chu met with Enrique and his father on August 9. He asked Enrique to keep track of his food consumption and physical activities for the next week and record a typical day on our Food and Physical Activity forms. He asked Enrique to return the forms to clinic staff for evaluation before his next appointment.

Enrique's Patient File

Patient Name Enrique S.

Food Diary

Meal and Food	Carbohydrates (g)	Fat (g)	Protein (g)
Breakfast			
2% milk (8 fluid oz.)	11.4	4.5	7.9
Apple-cinnamon Pop Tart	37.5	5.3	2.3
Breakfast total	**48.9**	**9.8**	**10.2**
Lunch			
2% milk (16 fluid oz.)	22.7	9.0	15.7
Peanut butter (2 tbsp.)	5.1	16.5	9.2
Jelly (1 tbsp.)	13.2	0.0	0.0
White bread (2 slices)	24.8	1.8	4.1
Pear	25.1	0.7	0.6
Chocolate cookies (3)	28.2	10.2	3.0
Lunch total	**119.1**	**38.2**	**32.6**
Dinner			
2% milk (12 fluid oz.)	17.0	6.8	17.0
Lasagna (6 oz.)	30.2	13.6	26.3
Garlic bread (2 slices)	29.5	8.7	5.0
Green beans (1 cup)	6.1	0.1	1.5
Dinner total	**82.8**	**29.2**	**49.8**
Snacks			
Banana	27.6	0.6	1.2
Sports drink (32 fluid oz.)	56.0	0.0	0.0
Fruit rolls (2)	47.8	1.7	0.6
Fruit punch (12 fluid oz.)	41.6	0.0	0.0
2% milk (8 fluid oz.)	11.4	4.5	7.9
Snack total	**184.4**	**6.8**	**9.7**

Physical Activity Diary

Intensity Level and Activity	Hours
Resting	
sleeping	10.0
Very light	
watching television	2.0
playing computer games	1.0
browsing Internet	1.0
listening to music	1.0
eating and bathing	3.0
Light	
doing household chores	0.5
Moderate	
mowing lawn	1.0
bicycling	1.5
Heavy	
swimming (practice)	2.0
playing basketball	1.0

Jerome's Patient File

Why am I gaining weight?

I've gained more than 20 pounds this summer! I can't figure out why. I don't eat that much. Lots of my friends eat five or six different things at one meal, but I only have one or two foods. I keep busy with my computer hobbies and visiting my friends. And I usually walk to my friends' homes. What's going on? I must have a gland problem.

Official Patient Record — Confidential

Patient name Jerome J.

Age 13 **(years)** 8 **(months)** **Sex** _____ **female** X **male**

Height 62 **(in.)** **Weight** 134 **(lbs.)** 2 **(oz.)**

Referring physician Dr. Washington

Referral information:

Jerome was referred to the clinic by the family physician, Dr. Washington. Dr. Washington noted that Jerome weighed 110 pounds at the end of the school year. She is quite concerned about Jerome's weight gain and requested that the clinic staff evaluate Jerome's energy balance.

Initial clinic visit:

Dr. Chu met with Jerome and his mother on August 11. He asked Jerome to keep track of his food consumption and physical activities for the next week and record a typical day on our Food and Physical Activity forms. He asked Jerome to return the forms to clinic staff for evaluation before his next appointment.

Jerome's Patient File

Patient Name Jerome J.

Food Diary

Meal and Food	Carbohydrates (g)	Fat (g)	Protein (g)
Breakfast			
2% milk (8 fluid oz.)	11.4	4.5	7.9
Sugar Smacks cereal	63.1	1.4	4.7
Breakfast total	**74.5**	**5.9**	**12.6**
Lunch			
Meat and cheese pizza (4 slices)	79.5	27.8	40.5
Lunch total	**79.5**	**27.8**	**40.5**
Dinner			
Fast food double hamburger	42.9	27.9	29.9
Super-size French fries	77.0	29.0	9.0
Cola drink (12 fluid oz.)	36.9	0.0	0.0
Dinner total	**156.8**	**56.9**	**38.9**
Snacks			
Cola drink (12 fluid oz.)	36.9	0.0	0.0
Popcorn, with oil & salt (5 cups)	31.5	15.5	4.9
Butter (1 tsp.)	0.0	3.8	0.0
Snack total	**68.4**	**19.3**	**4.9**

Physical Activity Diary

Intensity Level and Activity	Hours	Intensity Level and Activity	Hours
Resting		**Light**	
sleeping	10.0	doing household chores	0.5
Very light		walking the dog	1.0
watching television	4.0	walking to friends' homes	0.5
playing computer games	3.0	**Moderate**	
browsing Internet	2.0	(none)	0.0
eating and bathing	3.0	**Heavy**	
		(none)	0.0

Kim's Patient File

Why can't I lose weight?

I'm going to be a cheerleader next year, and you know what those cheerleading outfits are like. Mine is already a little tight, so I need to lose weight. I've been careful all summer not to overeat. I hardly ever have dessert and I only snack on carrots and reduced-calorie treats. But I haven't lost a *single* pound! It doesn't help that my mom keeps trying to fatten me up. She wants me to *gain* weight. Can you believe it?!

Official Patient Record — Confidential

Patient name Kim R.

Age 12 **(years)** 3 **(months)** **Sex** X **female** _____ **male**

Height 58 **(in.)** **Weight** 99 **(lbs.)** 12 **(oz.)**

Referring physician Dr. Abrams

Referral information:

Kim was referred to the clinic by her pediatrician, Dr. Abrams. Dr. Abrams noted that Kim began and ended the summer at the same weight, 100 pounds. She expressed concern about Kim's aversion to food and also noted a growing conflict between Kim and her mother regarding food issues.

Initial clinic visit:

Dr. Chu met with Kim and her mother on August 12. He asked Kim to keep track of her food consumption and physical activities and record a typical day on our Food and Physical Activity forms. He asked Kim to return them to clinic staff for evaluation before her next appointment.

Kim's Patient File

Patient Name Kim R.

Food Diary

Meal and Food	Carbohydrates (g)	Fat (g)	Protein (g)
Breakfast			
Orange juice (8 fluid oz.)	25.5	0.1	1.6
Breakfast total	**25.5**	**0.1**	**1.6**
Lunch			
Creamy Italian dressing (4 tbsp.)	4.9	21.1	0.2
Shredded cheddar cheese (2 oz.)	0.7	18.8	14.1
Hard-cooked egg (1)	0.6	5.3	6.3
Tossed green salad (2 cups)	3.1	0.3	1.5
Seasoned croutons (1 oz.)	18.0	5.2	3.1
Lemonade (12 fluid oz.)	39.0	0.0	0.4
Lunch total	**66.3**	**50.7**	**25.6**
Snack			
Raw baby carrots (12)	9.8	0.6	1.0
Diet cola (20 fluid oz.)	0.6	0.0	0.6
Snack total	**10.4**	**0.6**	**1.6**
Dinner			
Chicken breast (8 oz.)	0.0	8.1	70.4
Green peas (1 cup)	21.4	0.6	7.5
Raw tomato (1/2)	2.9	0.2	0.5
Corn on the cob (1 ear)	19.3	1.0	2.6
White rice (1 cup)	44.5	0.4	4.3
Lemonade (16 fluid oz.)	52.1	0.0	0.5
Dinner total	**140.2**	**10.3**	**85.8**
Snacks			
Sherbet (1 cup)	45.0	3.0	1.6
Frozen yogurt ($1\frac{1}{2}$ cups)	53.8	13.0	8.6
Snack total	**98.8**	**16.0**	**10.2**

Physical Activity Diary

Intensity Level and Activity	Hours	Intensity Level and Activity	Hours
Resting		**Light**	
sleeping	8.0	doing household chores	0.5
Very light		**Moderate**	
watching television	2.0	playing tennis	1.0
talking on the telephone	2.0	cheerleading (practice)	2.5
doing e-mail	1.0	**Heavy**	
reading	1.0	(none)	0.0
listening to music	2.0		
eating and bathing	4.0		

Energy Balance Reference Manual

Energy Balance Reference Manual
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Section 2: Uses of Energy

Basal metabolic rate
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Growth and stored energy

Section 3: Energy Balance

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Adults
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Weight gain in adolescents

Section 1: Sources of Energy (Food)

The human body uses food as a source of energy and for raw materials to maintain the body and produce new body tissues. The major nutrients in food are carbohydrates, fats, and proteins. The energy from these nutrients is represented as E_{in}.

E_{in} = energy from food consumed

Carbohydrates are the major source of energy for the body.

1 g carbohydrate = 4 calories

Fats are important for energy storage.

1 g fat = 9 calories

Proteins are used to build new body tissues, but they also can be energy sources.

1 g protein = 4 calories

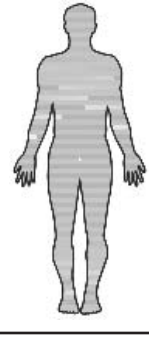
Section 2: Uses of Energy

Basal Metabolic Rate

Basal metabolic rate, or BMR, represents the energy used to carry out necessary body activities such as breathing, regulating body temperature, and maintaining a heart beat. The majority of daily energy output, 60 to 70 percent, is used for these activities.

BMR varies among individuals:

- Age: younger people have higher BMR
- Growth: children and pregnant women have higher BMR
- Height: tall, thin people have higher BMR
- Body composition: people with more lean tissue have higher BMR



BMR varies across time for an individual:

- Fever: fever increases BMR
- Stress: phyical stress increases BMR
- Temperature: hot and cold weather raises BMR
- Fasting: drastic dieting lowers BMR

Physical Activities

For most people, physical activities account for about 20 to 30 percent of the body's total energy output. The number of calories used for an activity varies with a person's age, weight, and gender. The total number of calories used for an activity depends on the intensity level and duration of the activity.

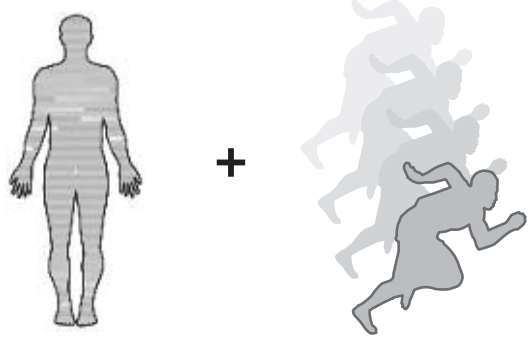
Activity Level	Calories/Hour
Resting sleeping, lying quietly	60
Very Light watching television, eating	85
Light walking, doing household chores	140
Moderate bicycling, dancing (practice)	285
Heavy swimming (practice), playing basketball, walking fast (5 mph)	400

Energy Balance Reference Manual

Energy Output

The energy used for basal metabolic rate and physical activities is represented by E_{out}.

E_{out} = energy used for BMR + energy used for activities



Growth and Stored Energy

In addition to BMR and physical activities, the bodies of growing children, adolescents, and teenagers use energy to produce new body tissues such as bone, muscle, and blood. This energy is represented by E_{growth}.

E_{growth} = energy used to produce new body tissues

Young people's bodies also store energy in the form of fat as a normal part of development. This stored energy, represented by E_{stored}, may be used later for growth. It takes 3,500 calories to make 1 pound of stored fat.

E_{stored} = energy stored as fat

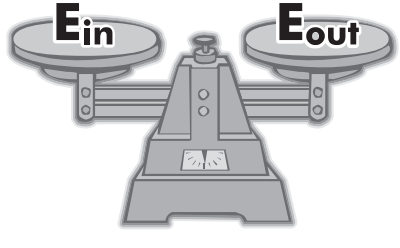
Section 3: Energy Balance

The Energy Balance Equation

$E_{in} = E_{out}$

The energy balance equation shows the relationship between energy input (E_{in}) and energy output (E_{out}). Energy balance is determined over long periods of time (months or years), not over short periods of time (days).

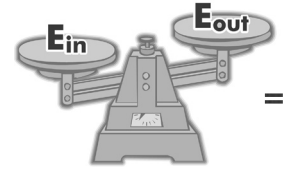
Energy input and output are expressed in calories.



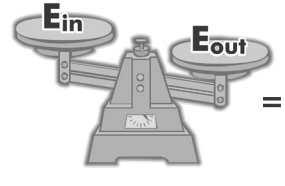
Adults

Adults who, over time, consume the same number of calories in food that they expend in BMR and physical activities are in energy balance: $E_{in} = E_{out}$. They maintain a constant body weight.

Adults who consistently consume more calories than they expend are in positive energy balance: $E_{in} > E_{out}$. They gain weight.



= **excess energy stored as fat**



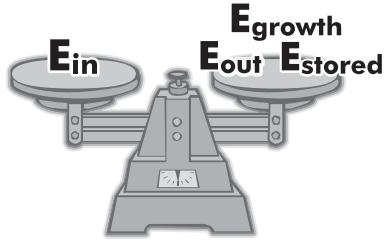
= **weight loss**

Adults who consistently expend more calories than they consume are in negative energy balance: $E_{in} < E_{out}$. They lose weight.

Energy Balance Reference Manual

Children and Adolescents

To grow properly and maintain a healthy state, children, adolescents, and teenagers must be in positive energy balance: $E_{in} > E_{out}$. They need to consume more calories than needed for BMR and physical activities (E_{out}). The extra calories they consume are used for increasing the amount of important body tissues such as bone, muscle, and blood (E_{growth}). Extra calories may also be stored as fat (E_{stored}).



For healthy children and adolescents, the energy balance equation is $E_{in} = E_{out} + E_{growth} + E_{stored}$.

Weight Gain in Adolescents

Adolescence is a time of rapid growth and development. Extra energy is required and weight is gained. Normal weight gain varies with age, gender, weight, and height.

A 12-year-old girl is expected to gain 8 to 13 pounds over the next year. Normal average weight gain is 10 pounds.

A 12-year-old boy is expected to gain 8 to 15 pounds over the next year. Normal average weight gain is 11 pounds.

A 13-year-old girl is expected to gain 7 to 11 pounds over the next year. Normal average weight gain is 7 pounds.

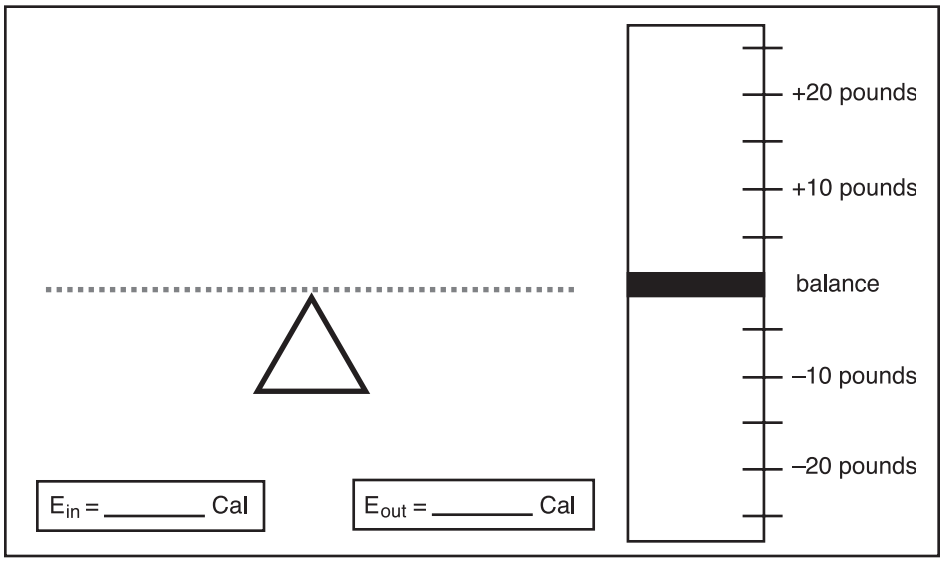
A 13-year-old boy is expected to gain 9 to 14 pounds over the next year. Normal average weight gain is 12 pounds.

Growth occurs in spurts. Young teens and pre-teens may gain several pounds in one month and none at all the next month. This is normal. Nutritionists consider weight gain over longer periods of time to evaluate whether the amount of weight gain is too little or too much.

Energy Balance Diagram

Team: _____ Date: _____

_____ 's Energy Balance
(patient's name)



Directions:

1. Write in the number of calories consumed in food (E_{in}) and the number of calories expended in BMR and physical activities (E_{out}) on the appropriate blanks in the diagram.

2. Calculate the expected pounds gained or lost during the summer using the formula below.*

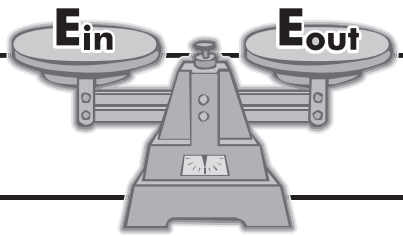
$$\frac{(E_{in} - E_{out}) \times 84}{3{,}500}$$

3. Draw in the balance so that it tilts upward or downward toward the appropriate number of pounds on the scale, as you determined from the calculation in Step 2.

4. Draw a box on the left side of the balance that represents the total number of calories consumed in food. Draw a box on the right side of the balance that represents the total number of calories used in BMR and physical activities. (If the same number of calories was consumed and used, the boxes should be the same size; if more calories were consumed than used, the box on the left side should be larger; and if more calories were used than consumed, the box on the right side should be larger.)

* This formula is based on 84 days in the summer and 3,500 calories per pound of stored fat tissue. A negative number indicates the number of pounds lost, and a positive number indicates the number of pounds gained.

Award to Study Factors Affecting Energy Balance



Energy Balance Institute

Memorandum

FOR IMMEDIATE RELEASE

TO: Research Scientists
FROM: Director of Research
RE: Research Award

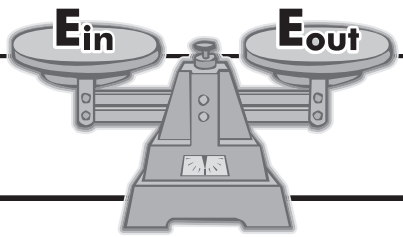
Congratulations everyone! We recently received an award from the National Calorie Council to investigate important questions about factors that affect energy balance. We will use mice as our experimental model and measure weight change as an indication of energy balance in the mice. Our three research questions are

1. Does genetics have an effect on weight gain in healthy infant mice?
2. Does the amount of food available affect weight gain in juvenile mice?
3. Does exercise in adult mice affect weight gain or loss?

Our institute received this award because of our earlier studies of energy balance in adolescents. The results of those studies give us something to build on as we explore this new area.

This research is very important to our understanding of basic relationships that may affect an individual's energy balance. Your hard work is greatly appreciated. I look forward to hearing about your results.

Memo to the Director on Research Question 1



Energy Balance Institute

Memorandum

TO: Director of Research
FROM: Research Team # _____
RE: Analysis of Results from Experiment 1

Below, we describe the experiment to answer Research Question 1, our analysis of the results, and our conclusions.

Research question — Does genetics have an effect on weight gain in healthy infant mice?

Our hypothesis — Genetics does not affect weight gain in healthy infant mice.

Experiment — Our laboratory technician selected 10 newborn mice from Strain A and 10 newborn mice from Strain B. He weighed the mice weekly for eight weeks.

Note: We directed the lab technician to use 10 mice from each strain because _____

_____

Results and data analysis — See attached graph.

Conclusions — Our hypothesis was SUPPORTED or NOT SUPPORTED (circle one).

Ways that weight gain in the two strains of mice were similar: _____

_____

Ways that weight gain in the two strains of mice were different: _____

_____

Our conclusion about energy balance from this experiment is that _____

_____

Reference Manual for Scientific Research

Animal Models

Experiments that involve laboratory animal models are very important for increasing our understanding of conditions that affect humans. Animals that have been used as models systems include mice, rats, chickens, and goats. Animals are good models for humans because there are no basic differences between their physiology and human physiology: they all control their internal functions in about the same way and respond similarly to infections and injuries.

Using animal models for research is usually less expensive and less time-consuming than using humans. Researchers can also control experimental conditions (such as the amount of food or exercise) more easily for animals than for humans. There are fewer ethical concerns when using animals for research studies; however, researchers must follow strict guidelines for ethical treatment of animals.

Mouse Life Spans

Infants
Mice are considered infants from birth to 21 days of age. At that age, they are weaned (prevented from nursing)—their mothers are removed from the cages.

Juveniles
Mice are considered juvenile (young) from 3 weeks to 8 weeks of age.

Adults
After 2 months, mice are considered adults. Laboratory mice live about $1^1/_2$ years.

Mouse Strains

Many different strains of mice are used in laboratory experiments. Each strain is composed of mice that are genetically identical. Researchers select the strain of mouse that is most appropriate for their work. This allows them to control the effect of genes on the results of their experiments.

The Animal Laboratory at the Energy Balance Institute has two strains of mice.

Strain A mice are brown.

Strain B mice are white.

Raising Mice

Cages
Mice are social animals that prefer to be housed together. At the Energy Balance Institute, the number of mice per cage is determined by the size of the mice and the size of the cage.

Food and water
Mouse cages are checked daily. Water is provided in unlimited amounts. Food dishes are kept filled, unless experiment design calls for limiting the amount of food available.

Exercise
Exercise wheels are not placed in mouse cages unless required by experiment design. When present, mice are allowed to use the wheels according to the experiment design.

Reference Manual for Scientific Research

Hypotheses

A hypothesis is a statement that predicts a result. For example:

Mice that have different genes will gain different amounts of weight in the first eight weeks following birth.

Researchers may be able to make the hypothesis more specific. For example, if they know that gene *X* affects weight gain in mice, they might write the following hypothesis:

Mice that have gene X will gain more weight in the first eight weeks following birth than mice that do not have this gene.

Experimental Design

Experimental groups, control groups, and growth groups
Researchers identify experimental and control groups of animals based on their hypothesis.

For example, suppose the hypothesis is, Rats that exercise daily will gain less weight than rats that do not exercise.

The **experimental group** would be rats that use an exercise wheel daily. The **control group** would be rats that do not use an exercise wheel, because exercise wheels are not provided for rats under standard laboratory conditions.

All other **growth conditions** should be the same for the two groups. They should receive the same amount of food and water, and they should be kept in cages of the same size with the same number of rats per cage.

Experimental Design (continued)

Selecting the number of mice
Because the amount of weight gain or loss varies from individual, all experiments conducted at the Energy Balance Institute use experimental and control groups with more than one mouse in each group.

However, raising mice and conducting experiments with them is expensive, so we do not use very large numbers of mice for every experiment.

Researchers at the Energy Balance Institute have decided that using 10 mice per condition is acceptable for our experiments.

Average and Range

Average
Calculate the average by adding all the measured values in a data set and dividing by the number of measures. For example, consider the following data:

Day of the Week	Calories Consumed Per Day
Sunday	3,200
Monday	2,200
Tuesday	2,500
Wednesday	2,400
Thursday	2,700
Friday	2,800
Saturday	3,000
Total	18,800
Average (Total ÷ 7)	**2,686**

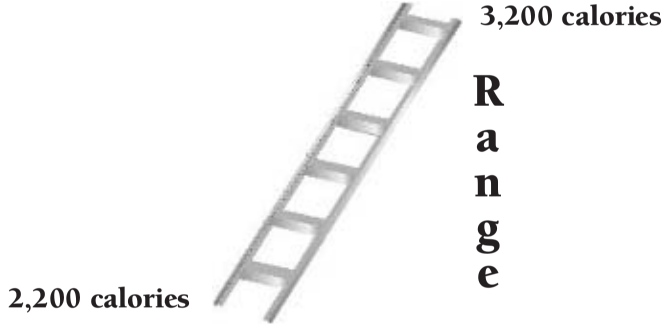
The average number of daily calories consumed by this individual is 18,800 ÷ 7 days, or 2,686 calories per day.

The average of a set of measures evens out natural fluctuations, or variations, that often occur when measures are made across time or across individuals. The average provides researchers with an approximation of a "true" value for the measure.

Reference Manual for Scientific Research

Average and Range (continued)

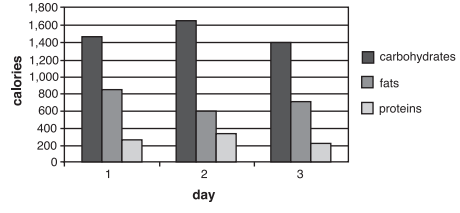
Range
The range for a data set gives the lowest and the highest value. For the individual in the previous example, calories per day ranged from 2,200 calories to 3,200 calories.



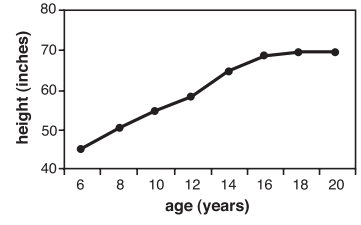
Reporting the range is useful to researchers because it indicates how much variation was observed in the measures.

Graphing Choices

Bar graphs
Bar graphs are used for data that can be sorted into categories. For example, nutrients fall into three categories: carbohydrates, fats, and proteins. A bar graph would compare the number of calories of each nutrient consumed on different days:

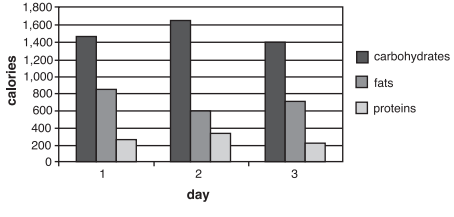


Line graphs
Line graphs are used for data that increase or decrease continuously. For example, an individual's height increases continuously across the first 12 to 20 years of life:

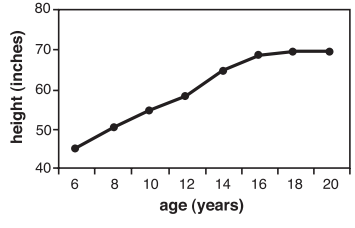


Interpreting Graphs

Graphs provide a picture of the data. Once the researchers have prepared a graph, they can identify trends or patterns in the results of their experiments.



This bar graph shows that the calories from carbohydrates, fats, and proteins vary from day to day for this individual. It also shows that regardless of the day, the majority of the calories come from carbohydrates.



This line graph shows that human height increases throughout childhood and adolescence, and then levels off and remains constant in the adult years.

Drawing Conclusions

Because the hypothesis and experiment are based on the research question, this question must be considered in drawing conclusions. First, ask,

Do the results from the experiment provide an answer for the research question?

If the answer is "No" or "I don't know," the experiment, as it was designed, was probably inappropriate for the question. Think about the question and redesign the experiment.

If the answer is "Yes," ask,

Do the results support the hypothesis?

Whether the answer to this question is "Yes" or "No," there is an answer for the research question. Use the evidence from the experiment to defend that answer.

Weights of Infant Mice from Strains A and B over Time

Weights of Strain A Infant Mice over Time

Mouse	Weight (grams)								
	Week 0*	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
1	1	5	9	17	21	25	29	29	29
2	1	6	9	17	23	27	30	30	30
3	1	7	11	16	21	26	30	30	30
4	1	4	10	14	20	25	30	30	30
5	1	4	9	15	21	24	31	31	31
6	1	4	11	16	19	25	33	33	33
7	1	5	12	17	19	25	32	32	32
8	1	7	9	18	23	23	28	28	28
9	1	4	10	15	23	25	28	28	28
10	1	4	10	15	20	25	29	29	29
Average weight	**1**	**5**	**10**	**16**	**21**	**25**	**30**	**30**	**30**

* The experiment began the day the mice were born. The first week of the experiment was called "Week 0."

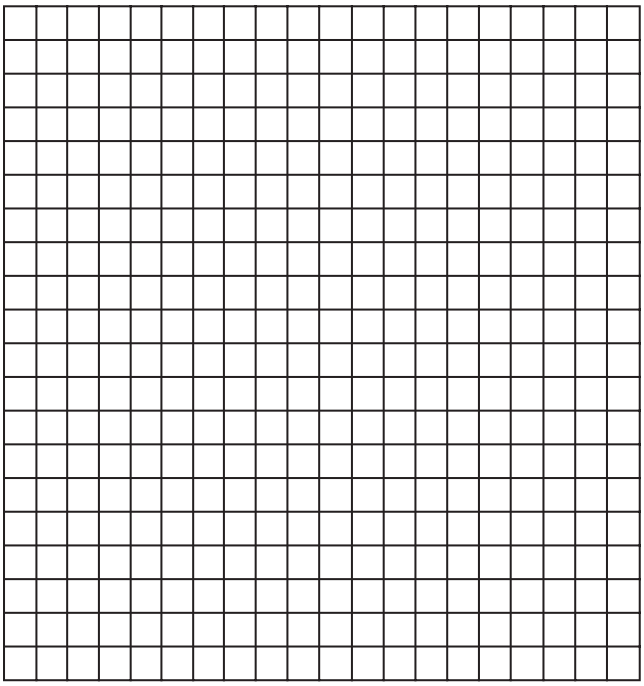
Weights of Strain B Infant Mice over Time

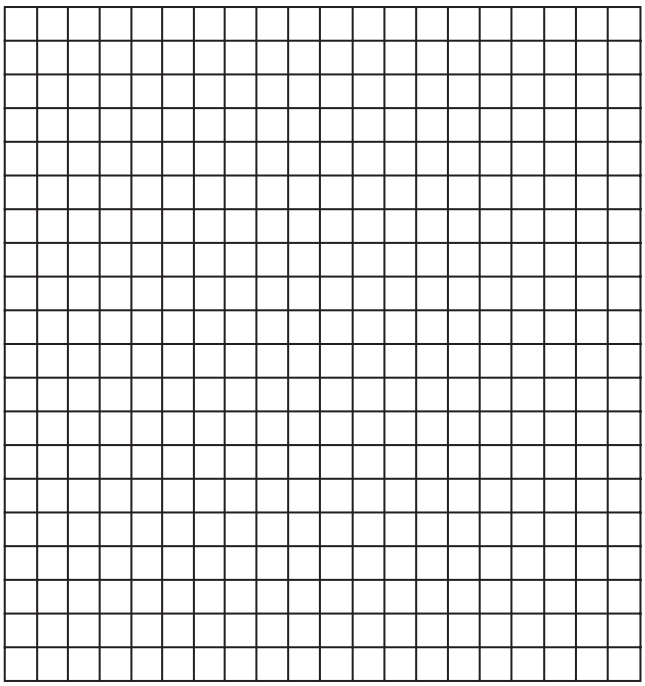
Mouse	Weight (grams)								
	Week 0*	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
1	1	5	13	18	24	30	36	36	36
2	1	6	12	19	24	29	35	35	35
3	1	4	11	19	24	29	36	36	36
4	1	8	13	19	25	30	36	36	36
5	1	6	11	18	23	27	33	33	33
6	1	5	11	21	26	31	35	35	35
7	1	6	13	20	23	28	33	33	33
8	1	7	14	19	24	29	35	35	35
9	1	6	10	18	22	27	35	35	35
10	1	7	12	19	25	30	36	36	36
Average weight	**1**	**6**	**12**	**19**	**24**	**29**	**35**	**35**	**35**

* The experiment began the day the mice were born. The first week of the experiment was called "Week 0."

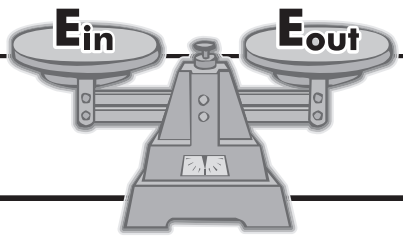
Graph Paper

Name: _____ Date: _____





Memo to the Director on Research Question 2



Energy Balance Institute

Memorandum

TO: Director of Research
FROM: Research Team # _____
RE: Analysis of Results from Experiment 2

Below, we describe the experiment to answer Research Question 2, our analysis of the results, and our conclusions.

Research question — Does the amount of food available affect weight gain in juvenile mice?

Our hypothesis — _____

_____

Experiment — We selected 10 3-week old mice from each in the following two conditions:

_____ Limited food, no exercise
_____ Limited food, regular exercise
_____ Unlimited food, no exercise
_____ Unlimited food, regular exercise

We weighed the mice at the beginning of the experiment and weekly thereafter for five consecutive weeks.

Results and data analysis — See attached graph.

Conclusions — Our hypothesis was SUPPORTED or NOT SUPPORTED (circle one).

Ways that unlimited food availability affected weight gain in juvenile mice: _____

_____

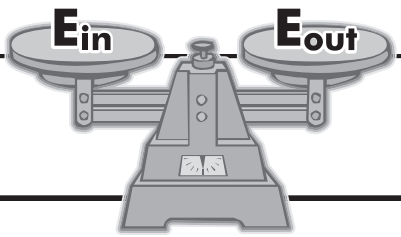
Ways that limited food availability affected the weight gain in juvenile mice: _____

_____

Our conclusion about energy balance from this experiment is that _____

_____

Memo to the Director on Research Question 3



Energy Balance Institute

Memorandum

TO: Director of Research
FROM: Research Team # _____
RE: Analysis of Results from Experiment 3

Below, we describe the experiment to answer Research Question 3, our analysis of the results, and our conclusions.

Research question — Does exercise in adult mice affect weight gain or loss?

Our hypothesis — _____

_____

Experiment — We selected 10 mice from each in the following two conditions:

_____ No exercise, limited food
_____ No exercise, unlimited food
_____ Regular exercise, limited food
_____ Regular exercise, unlimited food

We weighed the mice at the beginning of the experiment and monthly thereafter for five consecutive months.

Results and data analysis — See attached graph.

Conclusions — Our hypothesis was SUPPORTED or NOT SUPPORTED (circle one).

Ways that regular exercise affected weight change in adult mice: _____

_____

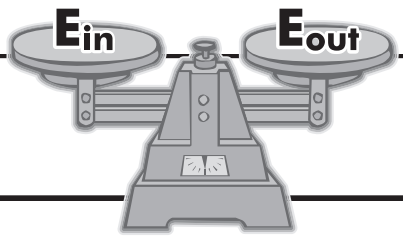
Ways that lack of exercise affected weight change in adult mice: _____

_____

Our conclusion about energy balance from this experiment is that _____

_____

Summary of Research Findings



Energy Balance Institute

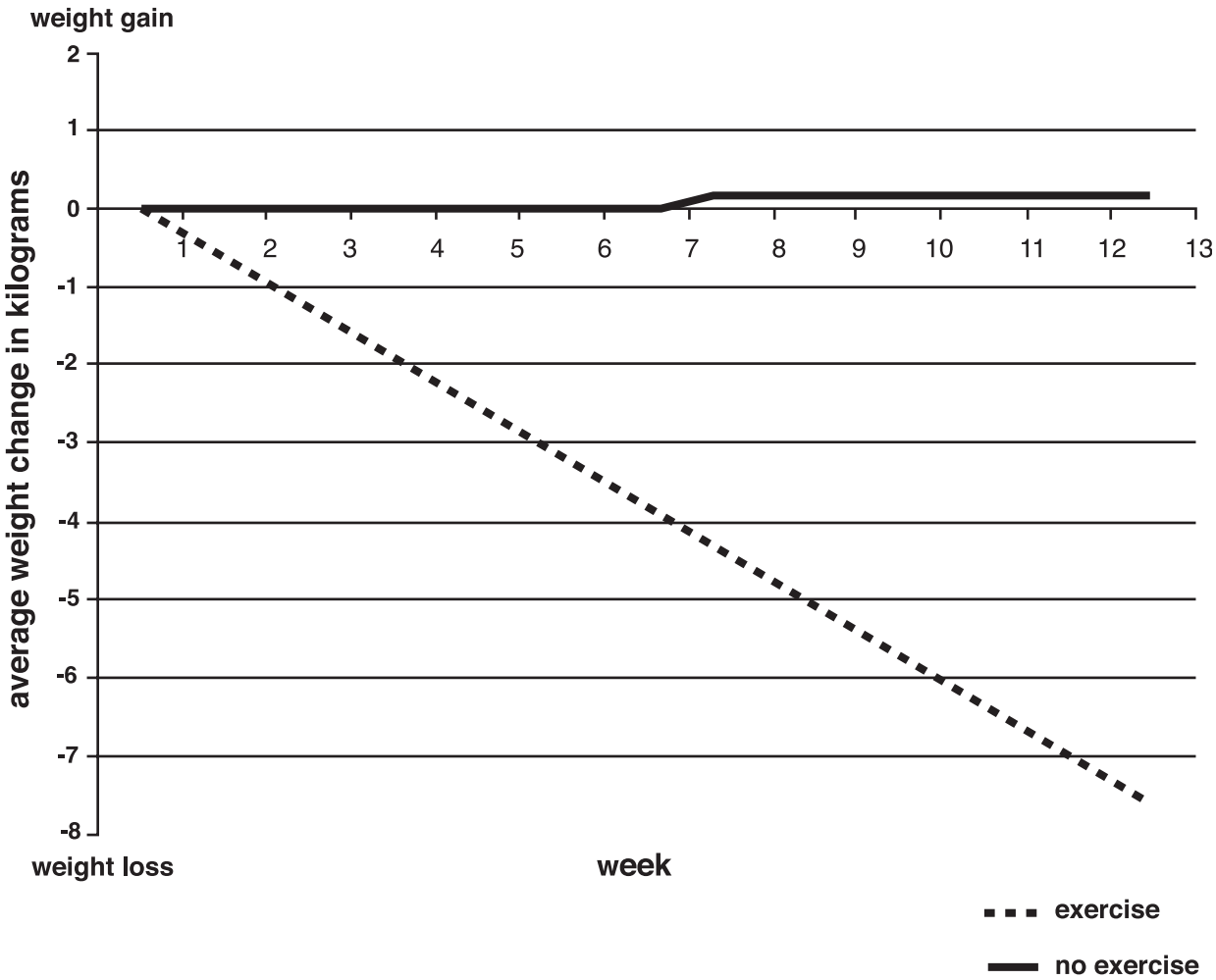
The Research Questions

1. Does genetics have an effect on weight gain in healthy infant mice?

2. Does the amount of food available affect weight gain in juvenile mice?

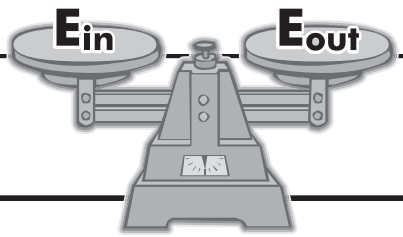
3. Does exercise in adult mice affect weight gain or loss?

Impact of Exercise on Weight of Overweight Adult Males



Source: Ross, R. et al. 2000. Reduction in obesity and related comorbid conditions after diet-induced weight loss or exercise-induced weight loss in men. *Annals of Internal Medicine, 133*(2): 92-103.

Next Research Assignment



Energy Balance Institute

Memo

TO: Research Scientists
FROM: Director of Research
RE: Next Assignment

Excellent work everyone! Thank you for conducting the experiment and data analysis to answer Research Question 1. Let's move on to the final research questions.

Even-numbered teams, please work on Research Question 2:

2. Does the amount of food available affect weight gain in juvenile mice?

Odd-numbered teams, please work on Research Question 3:

3. Does exercise in adult mice affect weight gain or loss?

Once again, I greatly appreciated your hard work. I look forward to hearing about your next results.

Experimental Design for Research Question 2

Team: _____ Date: _____

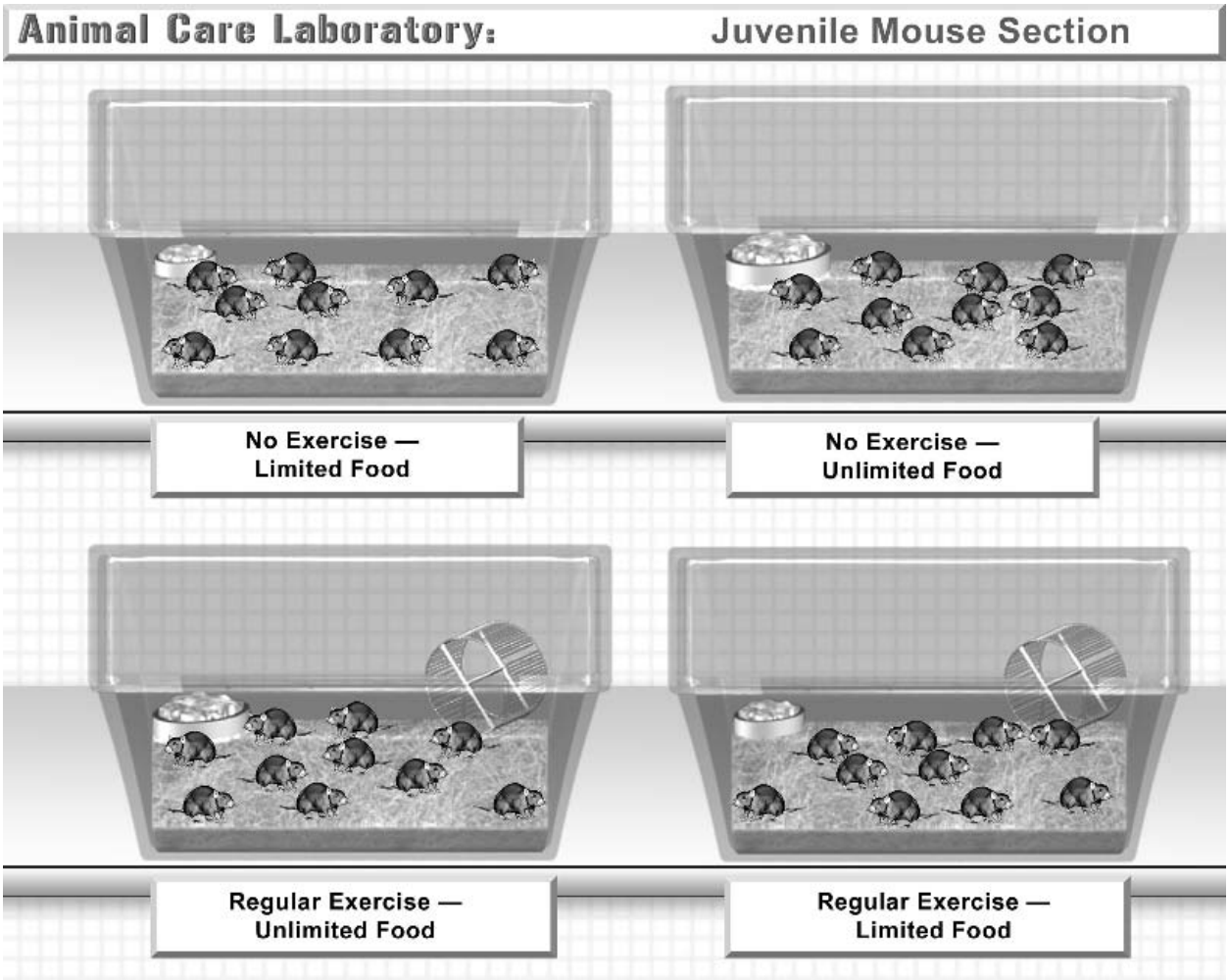
Experimental Design

Question: Does the amount of food available affect weight gain in juvenile mice?

Hypothesis: _____

_____

Procedure: Ten three-week-old mice from each of the two groups circled below were selected and raised under the conditions indicated. They were weighed once a week on the same day at the same time for a total of five consecutive weeks.



Experimental Design for Research Question 3

Team: _____ Date: _____

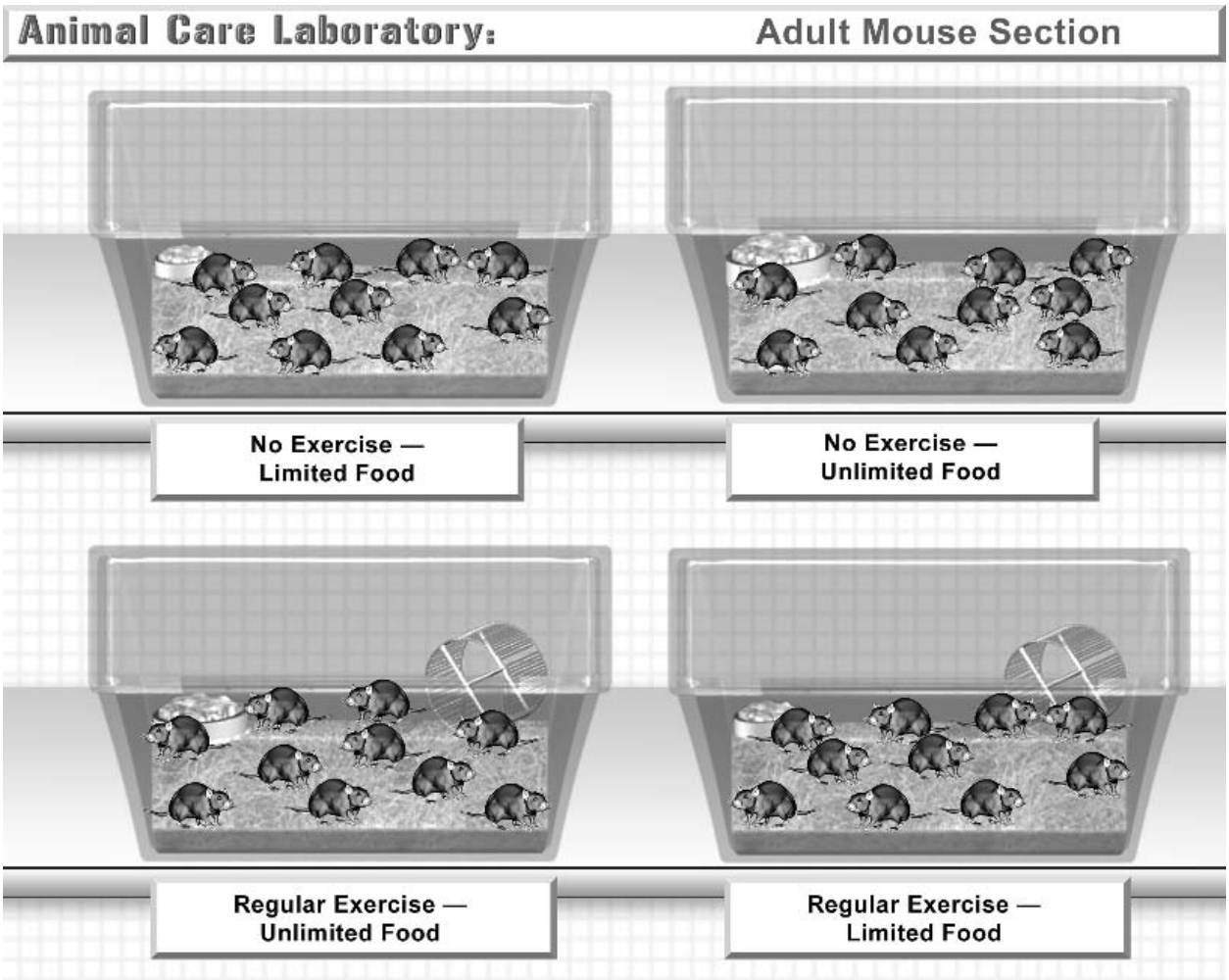
Experimental Design

Question: Does exercise in adult mice affect weight gain or loss?

Hypothesis: _____

_____

Procedure: Ten two-month-old mice from each of the two groups circled below were selected and raised under the conditions indicated. They were weighed once a month on the same day at the same time for a total of five consecutive months.



Weights of Juvenile Mice with Limited Food and Regular Exercise over Time

Mouse	Weight (grams)					
	Week 0*	Week 1	Week 2	Week 3	Week 4	Week 5
1	16	20	25	31	31	31
2	16	19	24	30	30	30
3	16	18	23	28	28	28
4	16	19	23	27	27	27
5	19	18	22	26	26	26
6	13	16	22	26	26	26
7	19	16	23	28	28	28
8	13	19	24	29	29	29
9	19	18	23	28	28	28
10	13	17	21	28	28	28
Average weight	**16**	**18**	**23**	**28**	**28**	**28**

* Mice were three weeks old at the beginning of the experiment, which was called "Week 0."

Master 4.13

Weights of Juvenile Mice with Unlimited Food and Regular Exercise over Time

Mouse	Weight (grams)					
	Week 0*	Week 1	Week 2	Week 3	Week 4	Week 5
1	13	23	28	36	36	36
2	13	22	27	36	36	36
3	13	24	29	36	36	36
4	19	26	33	41	41	41
5	19	25	33	40	40	40
6	16	24	30	38	38	38
7	16	24	30	39	39	39
8	13	23	29	37	37	37
9	19	24	30	37	37	37
10	16	25	31	40	40	40
Average weight	**16**	**24**	**30**	**38**	**38**	**38**

* Mice were three weeks old at the beginning of the experiment, which was called "Week 0."

Master 4.14

Weights of Juvenile Mice with Limited Food and No Exercise over Time

Mouse	Weight (grams)					
	Week 0*	Week 1	Week 2	Week 3	Week 4	Week 5
1	17	19	23	30	31	31
2	16	18	24	30	31	31
3	15	18	24	32	33	33
4	14	17	22	29	30	30
5	13	17	22	27	28	28
6	15	18	24	30	31	31
7	18	22	26	32	33	33
8	19	23	27	33	34	34
9	17	20	25	29	30	30
10	16	18	23	28	29	29
Average weight	**16**	**19**	**24**	**30**	**31**	**31**

* Mice were three weeks old at the beginning of the experiment, which was called "Week 0."

Master 4.15

Weights of Juvenile Mice with Unlimited Food and No Exercise over Time

Mouse	Weight (grams)					
	Week 0*	Week 1	Week 2	Week 3	Week 4	Week 5
1	14	24	31	41	41	41
2	15	24	32	39	40	40
3	17	26	35	41	42	42
4	16	26	33	42	42	42
5	18	28	33	42	44	44
6	13	22	28	37	38	38
7	15	25	31	39	40	40
8	16	25	33	37	39	39
9	17	24	31	38	40	40
10	19	26	33	44	44	44
Average weight	**16**	**25**	**32**	**40**	**41**	**41**

* Mice were three weeks old at the beginning of the experiment, which was called "Week 0."

Master 4.16

Weights of Adult Mice with No Exercise and Unlimited Food over Time

Mouse	Weight (grams)					
	Month 0*	Month 1	Month 2	Month 3	Month 4	Month 5
1	30	32	33	35	37	39
2	30	32	33	34	36	38
3	30	34	34	36	38	40
4	30	31	33	33	36	37
5	30	33	33	35	36	38
6	30	31	32	32	34	36
7	30	30	31	33	35	38
8	30	34	35	36	38	39
9	30	30	31	32	34	38
10	30	33	35	35	36	37
Average weight	**30**	**32**	**33**	**34**	**36**	**38**

* Mice were two months old at the beginning of the experiment, which was called "Month 0."

Master 4.17

Weights of Adult Mice with Regular Exercise and Unlimited Food over Time

Mouse	Weight (grams)					
	Month 0*	Month 1	Month 2	Month 3	Month 4	Month 5
1	30	30	29	29	29	29
2	30	29	29	28	27	27
3	30	29	29	28	27	27
4	30	30	30	29	29	29
5	30	29	28	28	28	28
6	30	30	29	29	28	28
7	30	29	28	28	28	28
8	30	30	30	29	29	29
9	30	30	30	29	28	28
10	30	29	28	28	27	27
Average weight	**30**	**30****	**29**	**29****	**28**	**28**

* Mice were two months old at the beginning of the experiment, which was called "Month 0."

** Rounded off to nearest whole number.

Master 4.18

Weights of Adult Mice with No Exercise and Limited Food over Time

Mouse	Weight (grams)					
	Month 0*	Month 1	Month 2	Month 3	Month 4	Month 5
1	30	30	31	32	32	33
2	30	30	31	31	32	32
3	30	30	31	32	33	34
4	30	31	32	32	33	35
5	30	30	30	30	31	31
6	30	29	30	30	31	30
7	30	30	31	32	33	33
8	30	30	29	30	30	31
9	30	30	31	31	33	33
10	30	30	29	30	32	33
Average weight	**30**	**30**	**31****	**31**	**32**	**33****

* Mice were two months old at the beginning of the experiment, which was called "Month 0."
** Rounded off to nearest whole number.

Master 4.19

Weights of Adult Mice with Regular Exercise and Limited Food over Time

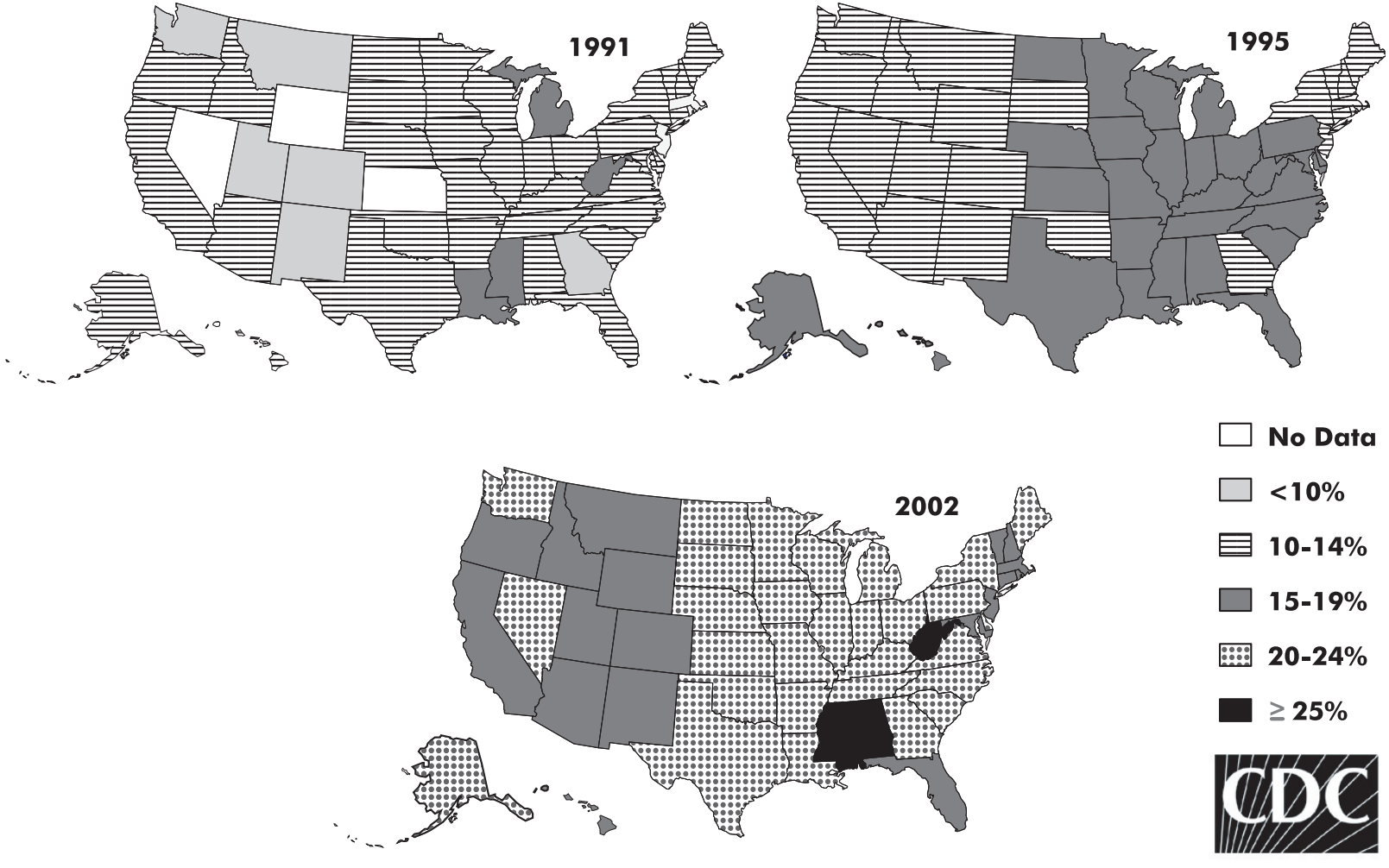
Mouse	Weight (grams)					
	Month 0*	Month 1	Month 2	Month 3	Month 4	Month 5
1	30	29	27	25	23	23
2	30	29	26	25	24	24
3	30	29	28	27	26	25
4	30	30	29	27	25	24
5	30	28	25	24	22	22
6	30	28	26	25	23	22
7	30	29	27	24	23	23
8	30	29	28	27	25	24
9	30	30	30	28	27	27
10	30	29	29	28	27	26
Average weight	**30**	**29**	**28****	**26**	**25****	**24**

* Mice were two months old at the beginning of the experiment, which was called "Month 0."
** Rounded off to nearest whole number.

Master 4.20

Obesity Trends

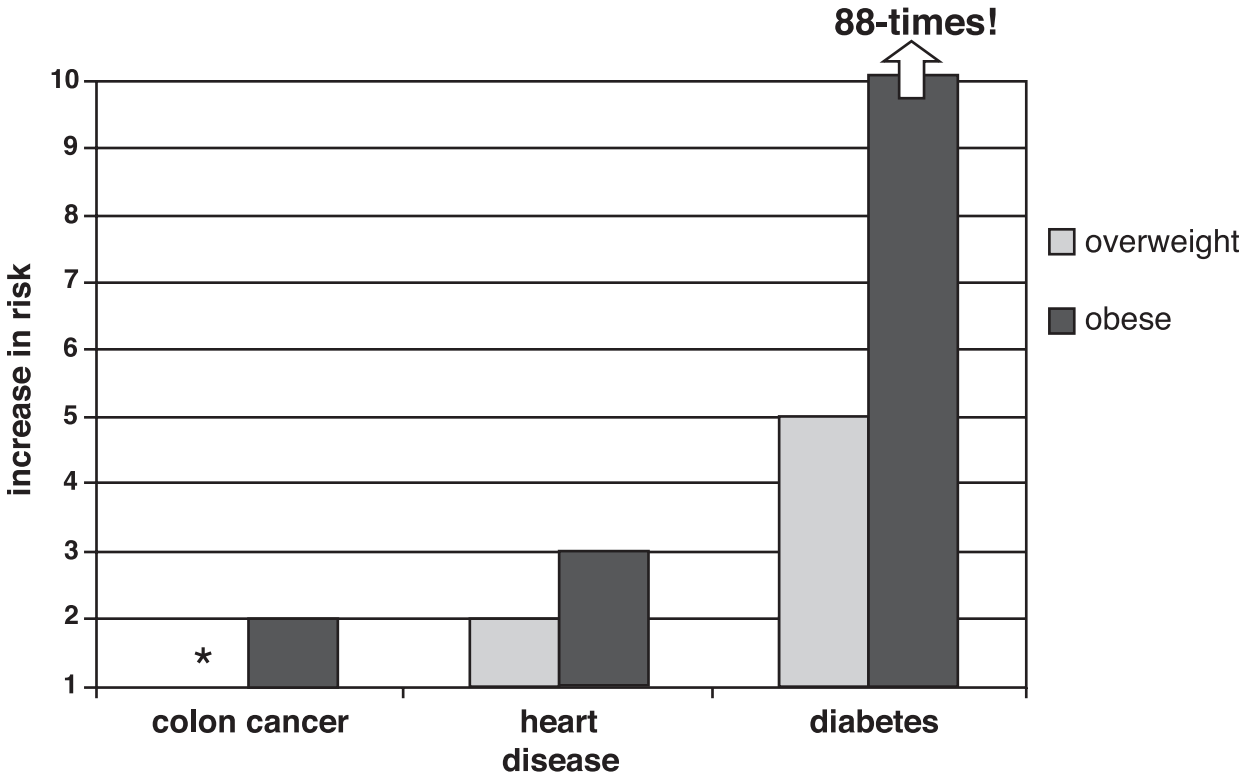
Obesity Trends Among U.S. Adults



Note: Data are for ages 18 years and over, based on self-reported weight and height via telephone interview. Obesity is defined as BMI ≥ 30.0.
Source: BRFSS, CDC. Mokdad A H, et al. JAMA 1999;282:16. Mokdad A H, et al. JAMA 2001;286:10. Mokdad A H, et al. JAMA 2003;289:1.

Increased Risk of Several Diseases with Overweight and Obesity

Increase in Risk of Disease in Overweight and Obese Adults Compared with Nonoverweight Adults



* No data available for overweight adults.

Letter to Myself

Name: _____ Date: _____

Dear Me,

Now that I am 40 years old, a healthy energy balance for me is . . .

because . . .

The challenges I am likely to have as an adult in maintaining energy balance are . . .

Strategies I can use to manage the calories I consume are . . .

Strategies I can use to manage the calories I use are . . .