Studies on environmental noise and human health have uncovered associations with cardiovascular disease and diabetes. New research is delving further into possible metabolic effects of noise—specifically a possible link to weight gain. Investigators report that exposure to traffic noise at home was associated with body composition outcomes such as larger waist circumference and higher body mass index (BMI).

The cross-sectional study used data from the Danish Diet, Cancer, and Health Cohort, assessing 52,456 Danes between the ages of 50 and 64. The study tracked each participant’s residential address history for the previous 5 years. The authors used noise-mapping software to estimate exposures from road traffic, railways, and air traffic for each address based on the most noise-exposed façade of the home. Four measures of body composition were recorded for each participant—BMI, waist circumference, body fat mass index (BFMI), and lean body mass index (LBMI).

Residential exposure to traffic noise has been associated with measures of weight gain. The body’s response to both stress and lack of sleep may help explain why.

After adjusting for potential confounding factors (socioeconomic status, age, sex, and exposure to railway and aircraft noise), the researchers found that all measures of adiposity were significantly associated with road traffic noise. Each 10-dB increase in average road traffic noise exposure over 5 years was associated with an average increase in waist circumference of 0.35 cm and an average increase in BMI of 0.18 points. BFMI and LBMI also showed small but statistically significant increases in association with greater road traffic noise exposure. Co-exposure to railway noise louder than 60 decibels appeared to heighten the associations with BMI, waist circumference, and BFMI.

“The linear association we observed was consistent throughout the exposure range,” says lead author Jeppe Christensen, a PhD candidate in epidemiology with the Danish Cancer Society Research Center. This is in line with other studies of similar health effects.

The authors propose that noise may activate the hypothalamus–pituitary–adrenal axis and the sympathetic nervous system—the body’s “fight or flight” response. Evidence for this mode of action from other studies includes increased levels of cortisol associated with exposure to louder road noise. Noise may also disturb sleep, which is associated with increased food intake possibly due to dysregulation of hunger-related hormones, including leptin and ghrelin. Epidemiological studies have also reported that lack of sleep in children and young adults is associated with a higher percentage of body fat and increased waist circumference. A major strength of the study was its sheer size, and according to Bente Oftedal, an epidemiologist at the Norwegian Institute of Public Health, the results and conclusions matched the rigor of the performed analyses. “The main weakness is the lack of data on noise-related individual characteristics, such as noise annoyance and noise sensitivity,” she says. “Both characteristics may modify associations between traffic noise and health outcomes, representing vulnerable subpopulations to noise exposure.” Oftedal was not involved with the study.

“This is one of only a handful of studies investigating the association between exposure to noise in the environment and metabolic effects,” says Charlotta Eriksson, a researcher at the Karolinska Institute’s Institute of Environmental Medicine in Stockholm, who led one of the first studies to link aircraft noise with obesity. “The study by Christensen therefore adds valuable knowledge into this field of research.”
The estimated effects of noise are small, Eriksson adds, but she says this is to be expected because other risk factors, such as heredity and lifestyle factors, are much stronger predictors of obesity for the individual. "Nevertheless," she says, "since a large proportion of the population is exposed to road traffic noise, the public health impact may be substantial."

1. According to the passage, exposure to road traffic noise:
   A. is the strongest predictor of obesity in individuals.
   B. has not been associated with weight gain.
   C. may substantially impact public health.
   D. has been unequivocally linked to obesity.

2. The title suggests that:
   A. the association between obesity and noise is widely accepted.
   B. the scientific study of obesity and noise is a relatively novel concept.
   C. the author disagrees with the idea that noise can cause increased weight.
   D. the link between increased weight and noise is a long-standing concept.

3. According to the article, what is one issue with the study?
   A. the absence of data on noise annoyance and sensitivity
   B. the small number of studies conducted in the field
   C. the lack of linear association throughout the exposure range
   D. the number of subjects involved in the study

4. Which is NOT identified as a possible reason that noise exposure can affect weight?
   A. activation of “fight or flight” response
   B. disruption of hunger-related hormones
   C. increased levels of cortisol
   D. heightened risk for diabetes

5. Which title would be an appropriate substitute?
   A. Noise and Obesity: A Definitive Link Unveiled
   B. Lack of Sleep and Larger Waist Size
   C. Noise Exposure and Weight-Related Diseases
   D. Study Uncovers Link between Adiposity and Noise Exposure

6. Which is NOT a measure of adiposity in this study?
   A. waist circumference
   B. body fat mass index
   C. body weight
   D. lean body max index
7. As used in context, *dysregulation* most nearly means:
   A. impaired response.
   B. normal development.
   C. genetic transmission.
   D. congenital defect.

8. What is the main idea of the first paragraph?
   A. Decreased exposure to environmental noise will result in better overall health.
   B. There is a definitive link between environmental noise and increased weight.
   C. Exposure to environmental noise is being explored as a possible cause of weight gain.
   D. Cardiovascular disease and diabetes risks increase with exposure to environmental noise.

9. As used in context, the phrase *metabolic effects* are:
   A. repercussions of environmental factors that affect cardiovascular health.
   B. outcomes of exposure to environmental factors that affect the regulation of weight.
   C. results of increased exposure to environmental factors that affect overall health.
   D. consequences of increased exposure to environmental factors that affect mental health.

10. Which statement contradicts information presented in the passage?
    A. Heredity and lifestyle factors have a minor impact on obesity.
    B. Exposure to traffic noise may increase the risk for obesity.
    C. Noise exposure is just one risk factor for obesity.
    D. Noise pollution affects a large part of the population.
PASSAGE 2 - ANSWER KEY AND EXPLANATIONS

1. **C.** The correct choice is supported in the last paragraph. Because so many people are exposed to traffic noise, the link between traffic noise and obesity can affect a significant part of the population. The information in **A** contradicts information in the last paragraph: “heredity and lifestyle factors are stronger predictors of obesity for the individual.” **B** contradicts the main point of the entire passage. **D** uses strong language (unequivocally) that eliminates it as the correct choice.

2. **B, A, C, and D** can be eliminated because they all contradict the wording of the title. **B** is the only choice that captures the idea that noise exposure is newly charted territory.

3. **A.** The quote from Bente Oftedal in paragraph 6 reveals that **A** is the correct choice. The other choices contradict information in the passage.

4. **D.** Although diabetes is mentioned in paragraph 1, it is a separate issue that has already been studied along with cardiovascular disease. Because it is often associated with obesity, background knowledge might lead you to choose the wrong answer. Remember to use the information in the passage only for these types of questions.

5. **D.** **A** uses language (definitive) that does not match the tone of the passage. The author uses terms such as possible and may. Definitive means conclusive, and the author definitely does not present the link between noise and weight gain as conclusive. **B** only addresses one point made in the passage; therefore, it would not make a good title. **C** is intended to throw you off with the term weight-related diseases. The article does not talk about the diseases associated with weight gain, just the link between noise exposure and increased obesity risk. **D** is the only choice that rewords the title but still keeps the original meaning and intent.

6. **C.** While background knowledge tells you that body weight is a measure of adiposity (obesity), the passage does not mention it as a measure used. Again, watch for this, and only use information in the passage.

7. **A.** Using knowledge of prefixes will help you here. It means abnormal or impaired. Think of other words you know that begin with this prefix (dysfunctional, for example). Knowing this will eliminate **B.** **C** and **D** both relate to something you are born with and can therefore be eliminated as well.

8. **C.** The first paragraph sets the stage for a research study on noise exposure and weight gain, making **C** the correct choice. **A** seems like a reasonable statement, but is not even a consideration because it has nothing to do with the first paragraph. **B** uses that word definitive again, and we know the link the study made is not that strong. **D** is inaccurate.

9. **B.** The first word of each choice is a synonym for effect. However, the qualifying information in the rest of the answer choices for **A, C,** and **D** is inaccurate. The passage refers to weight gain, making **B** the correct choice.

10. **A.** This is a key ideas and details question; therefore, the answer can be located within the text. **A** contradicts information presented in the passage while the rest of the answer choices mirror information presented in the passage.