

### **Module 4C Questions:**

1. Researchers study whether **Activity (X)** predicts **Glucose12 (Y)** in mice. Both variables are measured using instruments that can introduce error.

**a)** Suppose the **glucose meter** (Y-measurement) is noisy and produces values that fluctuate by  $\pm 10$  mg/dL even when the true glucose level is stable.

How does **measurement error in Y** affect:

1. the **slope** of the regression line
2. the **strength of the association**
3. the **interpretation** of the relationship?

**b)** Now suppose the **Activity score** (X-measurement) is the noisy variable — the observer often miscounts movement or records the score inconsistently. How does **measurement error in X** affect:

1. the **slope estimate**
2. the **strength of the association**
3. your ability to use Activity to **predict Glucose12**?

**c)** Which type of measurement error (error in X or error in Y) causes **attenuation bias** in regression, and why? Explain using the mouse example.

**d)** If you had to improve the design of this experiment, which variable's measurement accuracy would you prioritize and why?

2. Why do studies in biology often have more than one explanatory variable?
  - a. Interactions; include blocking; cost efficiency
  - b. Interactions; impress funding agencies; control for confounding variables
  - c. Include blocking; cost efficiency; biologists need to justify their extra (field) work