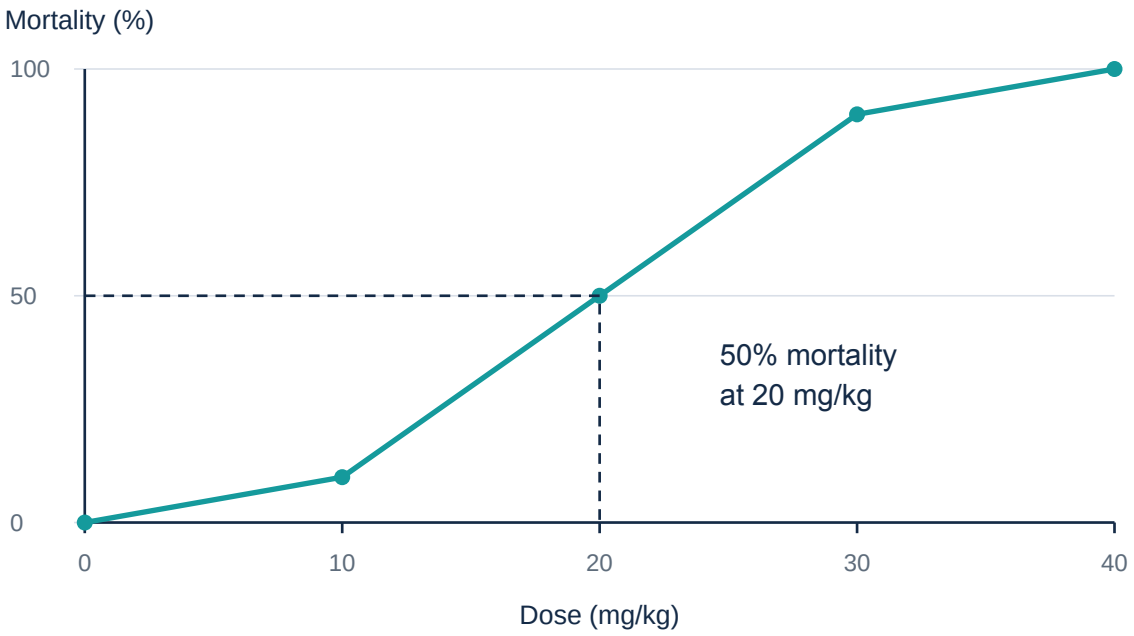
Read the axes before the curve

A dose-response curve links the amount received to a measured biological effect. The response may be an effect in an organism or the percentage of a population affected.

1. A MORTALITY EXAMPLE: FICTIONAL DATA

Same test species, exposure route and observation period at each dose.



2. READ IN EITHER DIRECTION

Given a dose, move up to the line and across to read the response: 30 mg/kg gives 90% mortality in this example. Given a response, move across and down: 50% mortality corresponds to 20 mg/kg, the estimated LD_{50}.

3. CHECK WHAT THE PERCENTAGE MEASURES

If 40 of 80 exposed organisms die, mortality = (40 / 80) × 100 = 50%. That means half the population died, not that each organism lost half its function. A graph of growth reduction would have a different endpoint.

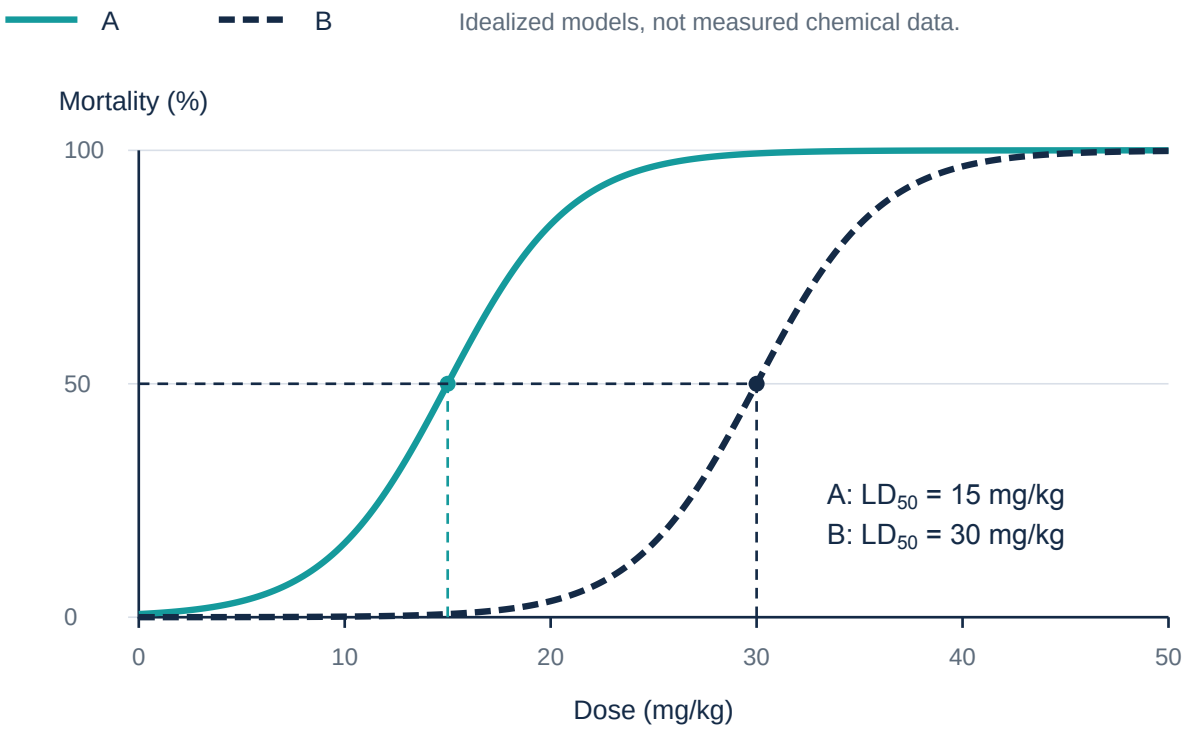
Dose and response: College Board APES CED, EIN-3.B.1.
LD50 interpretation: CCOHS, What is a LD50 and LC50?

Scope: College Board AP Environmental Science CED, Topic 8.13, p. 172.

Compare the same response level

A curve farther left reaches a chosen effect at a lower dose. Use matched species, routes, exposure periods and endpoints before comparing substances or populations.

1. TWO ILLUSTRATIVE MORTALITY CURVES



2. USE NUMBERS TO SUPPORT THE COMPARISON

At the 50% mortality endpoint, A needs half the dose required by B: 15 versus 30 mg/kg. A therefore has greater acute lethal toxicity under these conditions. This comparison does not say that A creates twice the real-world risk; actual exposure also matters.

3. SLOPE AND POSITION ANSWER DIFFERENT QUESTIONS

Position shows the dose needed for an effect. A steeper segment means response changes more rapidly per unit dose over that interval. Steepness alone does not establish which substance has the lower LD_{50}; compare the doses at 50%.

Interpreting acute toxicity comparisons: CCOHS, What is a LD50 and LC50?
Dose-response relationships: NIEHS, Toxicology.

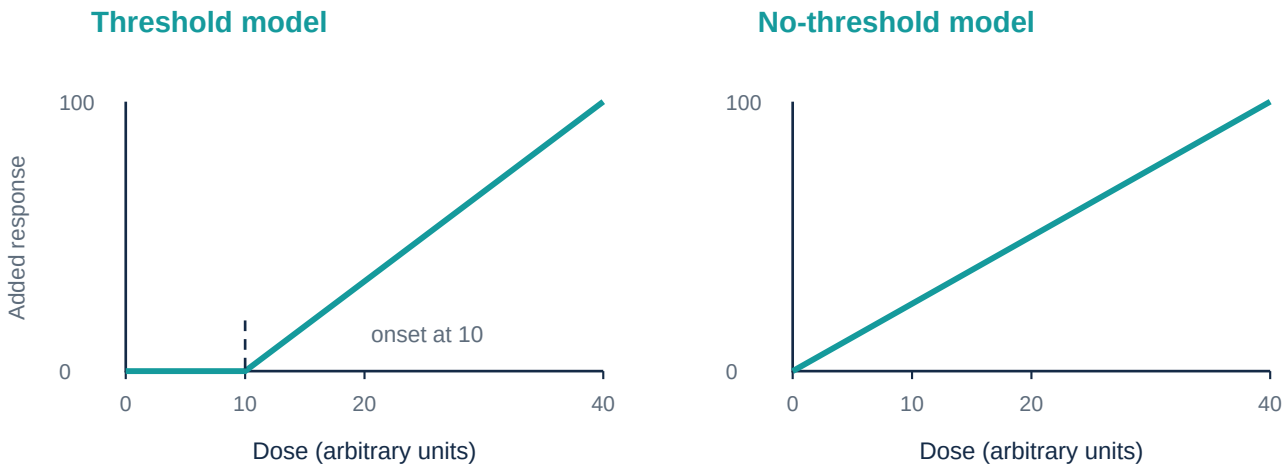
Scope: College Board AP Environmental Science CED, Topic 8.13, p. 172.

Describe the evidence, not certainty

Curves are specific to their endpoint and test conditions. A line drawn between observations is a model, and values outside the tested range require additional assumptions.

1. THRESHOLD AND NO-THRESHOLD MODELS

Supporting models: added response above baseline; arbitrary dose units.



2. A THRESHOLD IS NOT AN LD50

In the threshold model, the specified added effect begins above a dose of 10; 10 is not a 50% mortality dose. In the no-threshold model, every positive dose predicts some added response. A study finding no measurable effect at a low dose does not prove zero risk for every endpoint or population.

3. CHECK SCALE, RANGE AND SHAPE

Supporting graph skills: on a linear axis equal spaces mean equal additions; on a log axis they mean equal ratios. Read the ticks. Many curves rise and plateau, but not all have the same shape. A mortality plateau near 100% means nearly all organisms died, not that the substance became harmless.

Risk context: species, age, exposure route and duration can change responses. Combine toxicity evidence with exposure information; avoid treating one curve as a universal safety boundary.

Thresholds, extrapolation and risk: US EPA, Conducting a Human Health Risk Assessment.

Scope: College Board AP Environmental Science CED, Topic 8.13, p. 172.