PATIENCE LEARNING · FREE 1-DAY CASE

Day Three

A free single-session case from the world of **The Outbreak**, the 15-day epidemiology simulation.

GRADES 9–12 · BIOLOGY (EXPONENTIAL SPREAD & PUBLIC-HEALTH DECISIONS) · ~45 MIN · 1 CLASS PERIOD

It's Day 3 of a new respiratory outbreak in your county of 185,000. The data is thin, the hospital has one ICU, and two of three commissioners must vote yes before you can act. Wait for certainty and you may be too late. Act too soon and you may cry wolf. Your students are the county health task force — and the clock does not stop.

TEACHER QUICK-START

Objective: Students model exponential case growth against a fixed hospital capacity, then decide whether to recommend an emergency declaration under uncertainty — weighing the cost of acting early against the cost of waiting.

Standards tie-in: NGSS HS-LS2-1/2 (carrying capacity, factors affecting populations) and quantitative reasoning with exponential growth (CCSS F-LE.A); science-informed argument from evidence (SEP-6, SEP-7).

What you need: Just this packet. Print the student pages (works individually or in teams of 3–4). Calculators optional. No prep.

1. Set the scene (5 min). “You're the county health task force. It's Day 3. Here's everything you know — which isn't enough. Decide anyway.”

2. Read the evidence (8 min). Teams read the situation report and the two advisors' competing views.

3. Model & decide (20 min). Project the case count against ICU capacity, then commit to a recommendation and defend it.

4. The reveal (8 min). Walk the answer key. The point: under exponential growth, waiting for proof is itself a decision — usually the most expensive one.

5. Reflection (4 min). Each student answers the reflection question.

STUDENT PAGE 1

The Situation Report — Day 3

You are the Kellam County Emergency Health Task Force. A new respiratory illness appeared three days ago. Here is what you know this morning — and what you don't.

WHAT YOU KNOW

Fact	Detail
Severe cases needing ICU care	6 today. It was 3 on Day 0 — the count has doubled in 3 days.
Hospital capacity	Kellam County General is the ONLY hospital: 14 ICU beds, normally 58% full.
To act	An emergency declaration needs 2 of 3 commissioners' votes. It unlocks a $425,000 fund + state help. Without it: voluntary measures only.
What you DON'T know	The exact transmission rate, whether Day 0 was truly the start, or if today's 6 is the real total (some sick people haven't come in yet).

THE TWO ADVISORS (they disagree)

Commissioner Harmon (wait): “Six cases in a county of 185,000? Declaring an emergency over SIX people will panic everyone and burn our credibility. Get me real proof this is spreading before you cost us $425,000 and the public's trust.”

Dr. Okafor (act now): “I can't prove where this ends — nobody can on Day 3. But look at the doubling. I'd rather explain why I acted early than explain fourteen people we couldn't admit.”

STUDENT PAGE 2

Your Call (Decision Sheet)

Team name: _____ Period: _____

Step 1 — Free beds. The ICU has 14 beds and is normally 58% full. How many beds are actually open for new patients today?

14 × (1 – 0.58) = 14 × 0.42 = _____ beds (round DOWN — you can't use part of a bed)

Step 2 — Project the spread. Severe cases have doubled every 3 days: 3 → 6 today. If that pace holds, fill in the next steps.

Today (Day 3)	Day 6	Day 9
6 severe cases	_____	_____

Step 3 — The collision. Compare your Day 6 and Day 9 numbers to the open beds from Step 1. On about which day do severe cases exceed the beds you have? _____

Step 4 — The trap. Commissioner Harmon wants to wait for “real proof.” If you wait until the ICU is actually full to declare the emergency, why is that too late? (Hint: how long does the doubling take, and how long would setting up help require?)

_____

Step 5 — Your recommendation. Declare the emergency now, or wait? Write your decision and defend it with your numbers. Be honest about what you do NOT know:

_____

_____

_____

ANSWER KEY (for the reveal)

Step 1 — Free beds:

14 × 0.42 = 5.88 → **5 open beds** (round down). The buffer is tiny — this is the whole problem.

Step 2 — Projection:

Day 6 → **12** severe cases. Day 9 → **24** severe cases. (Doubling: 6 → 12 → 24.)

Step 3 — The collision:

With only 5 open beds, you're over capacity somewhere between Day 3 and Day 6 — by **Day 6 (12 cases)** you already need more than double the beds you have.

Step 4 — Why waiting loses:

Exponential growth doubles in 3 days, but standing up an emergency response (staff, transfers, state help) takes longer than that. If you wait until the ICU is full to act, the cases already in the pipeline keep doubling *while* you scramble. By the time "real proof" arrives, the decision has been made for you — badly.

Step 5 — The judgment:

The strong recommendation declares now (or takes a low-cost preparatory step now) and says plainly: "I cannot prove where this ends, and I may be wrong — but the math of doubling against 5 beds means the cost of acting early is small and the cost of acting late is people we can't admit." Note the honesty: acting early might waste money and look foolish. That's a real cost — it's just smaller than the alternative.

The big idea:

Harmon isn't stupid — waiting for evidence is normally wise. But exponential growth breaks that instinct: by the time the evidence is undeniable, it's too late to matter. Under a doubling clock, **demanding certainty is the risky choice.**

REFLECTION (graded on thinking, not the "right" answer)

"You had to act without proof. What made waiting feel safe — and what in the numbers told you it wasn't?"

SCORING THE THINKING

	3 — Strong	2 — Developing	1 — Beginning
Quantitative work	Beds and doubling both correct	One correct	Not computed
Sees the collision	Names when cases exceed beds	Mentions it	Misses it
Decides under uncertainty	Acts AND admits what's unknown	Decides, ignores unknowns	Waits for certainty
Explains clearly	A reader can follow it	Partly clear	Unclear

READY FOR THE FULL SIMULATION?

This was Day 3. The Outbreak is fifteen.

In the full 15-day simulation, four-person teams split the roles — epidemiologist, resource director, communications, policy — and each sees only part of the picture. Interventions take days to bite, punishing both panic and paralysis, and every choice moves public trust, the budget, and the case count. Graded on reasoning, never on whether the outbreak ends well.

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