VaxImpact Simulator Case Study

A Data Driven Investigation of a School Outbreak

PHENOMENON • A SCHOOL OUTBREAK BEGINS

It started with a friendly greeting. On Monday morning, the student body president welcomed a group of students to the weekly health sciences club meeting. Within 24 hours, five students were home sick, two teachers had called out, and rumors about a viral outbreak had started circulating.

As part of the Emergency Student Public Health Task Force, you have been called in to assess the situation, conduct data modeling through a simulator, and present a response plan to the school board.

DRIVING QUESTION

How might vaccination coverage change the size and spread of this outbreak, and what should the school board do with the evidence?

Investigation pathway: Observe → predict → run repeated trials → graph results → evaluate the model → defend a response plan.

MODEL LIMITATION

This simulator simplifies a real school outbreak. Its results are evidence about the model under these settings, not a medical recommendation or a confirmed cause of the school outbreak.

Name _____ Team _____ Date _____

Part I — Explore the Simulator

EXPLORE AND ASK A TESTABLE QUESTION

Explore the VaxImpact Simulator at https://v0-vaxhield.vercel.app/. Spend a few minutes freely exploring. Pay attention to how quickly disease spreads, how many people become infected, whether outbreaks become smaller as vaccination rates increase, and whether vaccinated and unvaccinated individuals experience the outbreak differently.

Key features of the simulator

Feature	What it shows
Simulation Panel	A visual representation of disease transmission.
Simulation Controls	Inputs you can change to test different conditions.
Learn More	Descriptions of variables that influence transmission, above the main panel.
Epidemic Timeline	Currently infected, total infected, and susceptible cases over time. It appears once the simulation begins.

SCIENTIFIC SKILL

Developing and Using Models: Explore, then record one observation and a testable question about vaccination coverage.

Observation from your initial exploration

Testable question

What outcome will you measure to answer your question?

Part II — Plan & Carry Out a Controlled Investigation

BASELINE SETTINGS

Change vaccination rate while keeping the other simulator settings constant.

DISEASE TRANSMISSION

Vaccination changes susceptibility in this simplified model and may affect the size and pattern of transmission.

Setting	Value	Setting	Value
Population density	80%	Vaccine effectiveness	97%
Transmission rate	90%	Recovery time	14 days (2 weeks)
Mortality rate	1%	Independent variable	Vaccination rate

Hypothesis: If vaccination coverage increases from 65% to 95%, then... because...

Independent variable _____ Dependent variables _____

Controlled variables _____

Run three trials at each vaccination rate. Keep all other settings fixed. Select play and wait for the simulation to end automatically. Scroll to the Epidemic Timeline Panel for every value below. Calculate each average.

SCIENTIFIC SKILL

Planning and Carrying Out Investigations: Change only vaccination rate, repeat trials, and compare the same outcomes.

RECORD REPEATED TRIALS

Experiment 65% vaccination

Trial	Peak infections (most sick at once)	Total infected	% vaccinated sick	% unvaccinated sick
1				
2				
3				
Average				

Experiment 80% vaccination

Trial	Peak infections (most sick at once)	Total infected	% vaccinated sick	% unvaccinated sick
1				
2				
3				
Average				

Experiment 95% vaccination

Trial	Peak infections (most sick at once)	Total infected	% vaccinated sick	% unvaccinated sick
1				
2				
3				
Average				

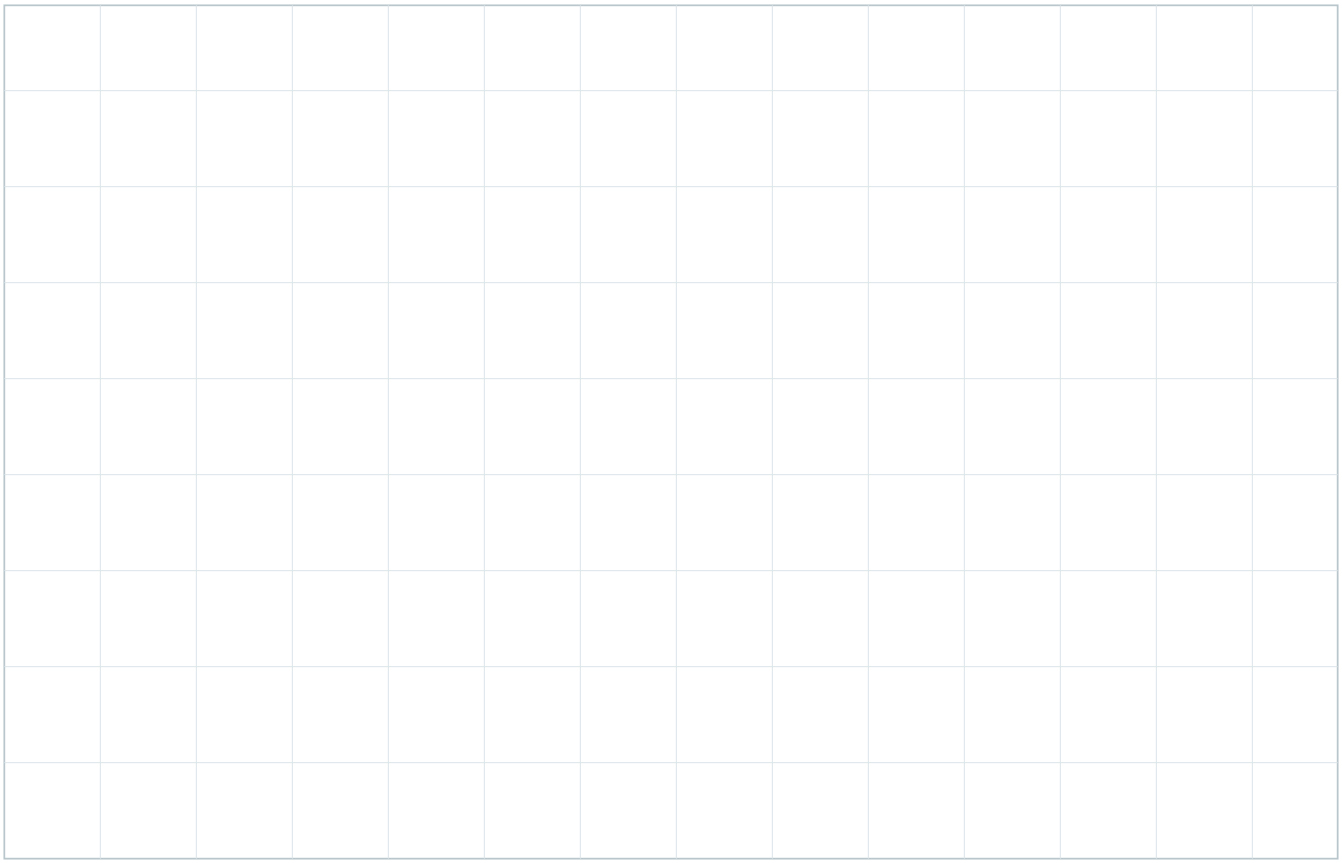
Part III — Graph and Analyze the Evidence

VISUALIZE THE TRIAL AVERAGES

Enter the averages from the 65%, 80%, and 95% vaccination trials. Graph vaccination rate against average total infected. Give the graph a title, labeled axes, and units.

Average outcome	65%	80%	95%
Total infected			
Peak infections			

Graph title _____



SCIENTIFIC SKILL

Data analysis: Use the graph and the three repeated-trial averages to describe the pattern before making recommendations.

PART III DISCUSSION • NO WRITTEN SUBMISSION

Work with your group to interpret the results of your investigation before developing your recommendation to the school board. Support each answer with evidence from your data whenever possible. This portion does not need to be written down and turned in, but it will help you prepare for your pitch.

SCIENTIFIC SKILL

Analyzing and Interpreting Data: Compare repeated trial results and use numerical evidence to explain patterns.

1. What patterns did you observe as vaccination rates increased?

a. What happened to peak infections?

b. What happened to the total number of people infected?

c. Which result best supports your conclusion?

2. Compare the outcomes for vaccinated and unvaccinated individuals.

a. Who experienced higher infection rates?

b. Why do you think this occurred?

3. Based on your results, explain herd immunity in your own words.

a. Use at least one observation from your simulation to support your explanation.

4. What are some limitations of this simulation?

a. How does the simulator relate to what happened in the contact demo?

b. How might a real outbreak differ?

c. Are there potential confounding variables that could also cause the trends observed in the scenario above?

SYSTEMS THINKING

Systems and System Models: Discuss which model assumptions matter when applying simulated trends to a real school outbreak.

Part IV — School Board Emergency Meeting

FIVE MINUTE TEAM BRIEFING

The superintendent has asked your team to brief the school board before classes resume tomorrow morning. Your group has five minutes to present your findings and recommendations. Every recommendation should be supported by evidence from your investigation.

SCIENTIFIC SKILL

Engaging in Argument from Evidence: Use a clear claim, evidence from the investigation, and reasoning when presenting recommendations.

1. What is your theory on how the outbreak started and spread?

2. What is your recommended action plan? (Include data from both the hands-on activity and the simulator.)

3. What would you say to students, staff, and families to reduce panic and misinformation?

School board role	Responsibility
Public Health Officer	Explain the scientific evidence from the simulator.
Principal	Recommend policies to protect students while keeping school running.
PTA Representative	Share questions or concerns families might have.
Student Body President	Represents students' perspectives and helps communicate recommendations.

Prepare your answers, support your plan with evidence, and be ready to present your recommendations.

Part V — Debrief and Reflection

BRIEF TEAM DISCUSSION

Discuss these questions as a team. No written responses are required.

• What did your team do well in communication, delegation, or creative problem solving?

• What was the hardest part of planning a response under limited resources, conflicting ideas, or time pressure?

• What would you change if you had more time or information? Which assumption would you test first?