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Math III p1
Cuttler
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Great analysis so far. Missing: 3D graph (this must have 2 independent variables, i.e., death as a function of time and hygiene)

D.C.S.:

Prevention through Education

In the fall of 2025, a new disease infected over 1,800 individuals out of the 2,000 living in the dorms at the local college. 629 of these cases resulted in death. In efforts to prevent such tragedies from reoccurring, doctors and epidemiologists have pooled their information on the disease to prevent future outbreaks through education about the nature of the disease.

Preliminaries:

D.C.S., Deoxygenation of Central Systems, or just DeeCees, is a mutation of the common cold. In its early stages, infected person show no symptoms of anything more serious than the disease's previous strain, with congestion, or the "sniffles." This soon degenerates into a painful cough, causing contagion to spread like wildfire. Mucus buildup in the lungs prevents adequate oxygen intake, and the patient eventually falls comatose. Death comes via asphyxiation, mainly oxygen starvation in the brain, and from this DeeCees gains its name.

The first cases of DeeCees were dismissed as colds, or other similar seasonal illnesses. It was turning out to be a cold, wet winter, and the rise in colds and coughs was to be expected. The dorm at the local college were full of runny-nosed, coughing, sneezing students, all 2,000 of them striving to recover, stay healthy, or keep up with coursework as the midterm crunch began. In such close quarters, many people took ill too. But when students were failing to recover in a timely manner, and some of the earliest carriers succumbed, it became apparent that we were dealing with something other than just the common cold, or a cough. Traditional medicines and over-the-counter drugs were unable to cure the sick, and there was no time to develop and test a functional, effective vaccine. The entire dorm was placed under quarantine, a single doctor on duty at all times to cover the three different wings and, hopefully, save lives.

Analysis:

Part I: Introduction

As an epidemiologist, it fell unto me to record information about this disease, so as to help prevent such epidemics in the future. Were my data to be off by just a fraction, the results would be catastrophic: if the disease were to be underestimated, the public guard would be down, and citizens might fail to take precautions to avoid infection. Were I to overestimate the disease, the public could be driven to a panic-induced frenzy and flee the country, quite possibly causing unintentional spread of the epidemic, or fall prey to scam miracle-cures and vaccinations whose only true purpose would be as a placebo. Any computer models I run must be carefully designed and tested to ensure that the information they give me is relevant and true to the disease.

Part II: Disease Analysis

With this in mind, I carefully documented the epidemic as it swept through the college dorms, illustrated by the first graph, titled "D.C.S.," at the end of this packet. The first detail I noticed was the three different periods of increase in the number of infected. These oscillations were caused by the three different wings of the dorm. Individuals living in the same building come in closer contact with one another than with someone in a different wing, meaning that DeeCees spread through each dorm in turn. As the infection lulled in one wing, it moved to another, causing three separate peaks at approximately 300 ticks, 500 ticks, and 100 ticks.

You should decide what ticks stand for (hours? days? weeks?)

I further analyzed this trend in my models, and discovered something interesting: quarantines can cause huge fluctuations in the death toll of a disease by limiting how far an infected person can travel. While running tests to find a trend between higher hygiene and a lower rate of death, I was distressed by the variations in data (graphs 2 and 4; graph 4 illustrates the disparity between three different trial runs). While there is an overall downward trend in death as hygiene increases, it made me curious. The same tests were run, only this time without a quarantine (graphs 3 and 5; graph 5 illustrates the consistency in data between trial runs), and, not only was the overall death rate elevated, higher hygiene had less of an impact than the combination of a quarantine and higher hygiene rates. Thus, we can safely say that increased hygiene along with isolation of infected individuals is the best way to control outbreaks.

Part III: Model Parameters and Limitations

In all graphs, infectiousness was set to 40%, fatality rate at 35%, hygiene at 25%, and Days-To-Recover at 21 days. There were 2,000 people and 1 doctor. Movement was constricted by the "Travel Limit: On" feature with 2 openings. No medication or vaccines were available, in keeping with the real-life situation.

As with any computerized model, there are limitations to my predictions. The "doctor" in the simulation is impervious to the disease, whereas a human doctor can fall ill just as easily as his patients, if not more so due to his proximity to infection. The model fails to take into account infection left by bodily fluids, such as mucus, and can only spread the disease from one person to another by direct contact, as well as the corpses of the dead. It can also only work with a maximum of 2,000 simulated people, making it unable to handle large populations such as cities. Truly, the only worth of the model is its ability to show overall trends, such as the effect of an increase in hygiene to death tolls, or the variations in data something as simple as a quarantine can add to one's data.

Conclusion:

Thus, although the first attack of D.C.S. on the community was devastating, studies show that extra precautionary measures to reduce contact to infected materials and persons and overall hygiene can dramatically increase one's likelihood of never contracting the disease. Computerized models, while not serving as useful predictors of exact details, are able to show us overall trends.

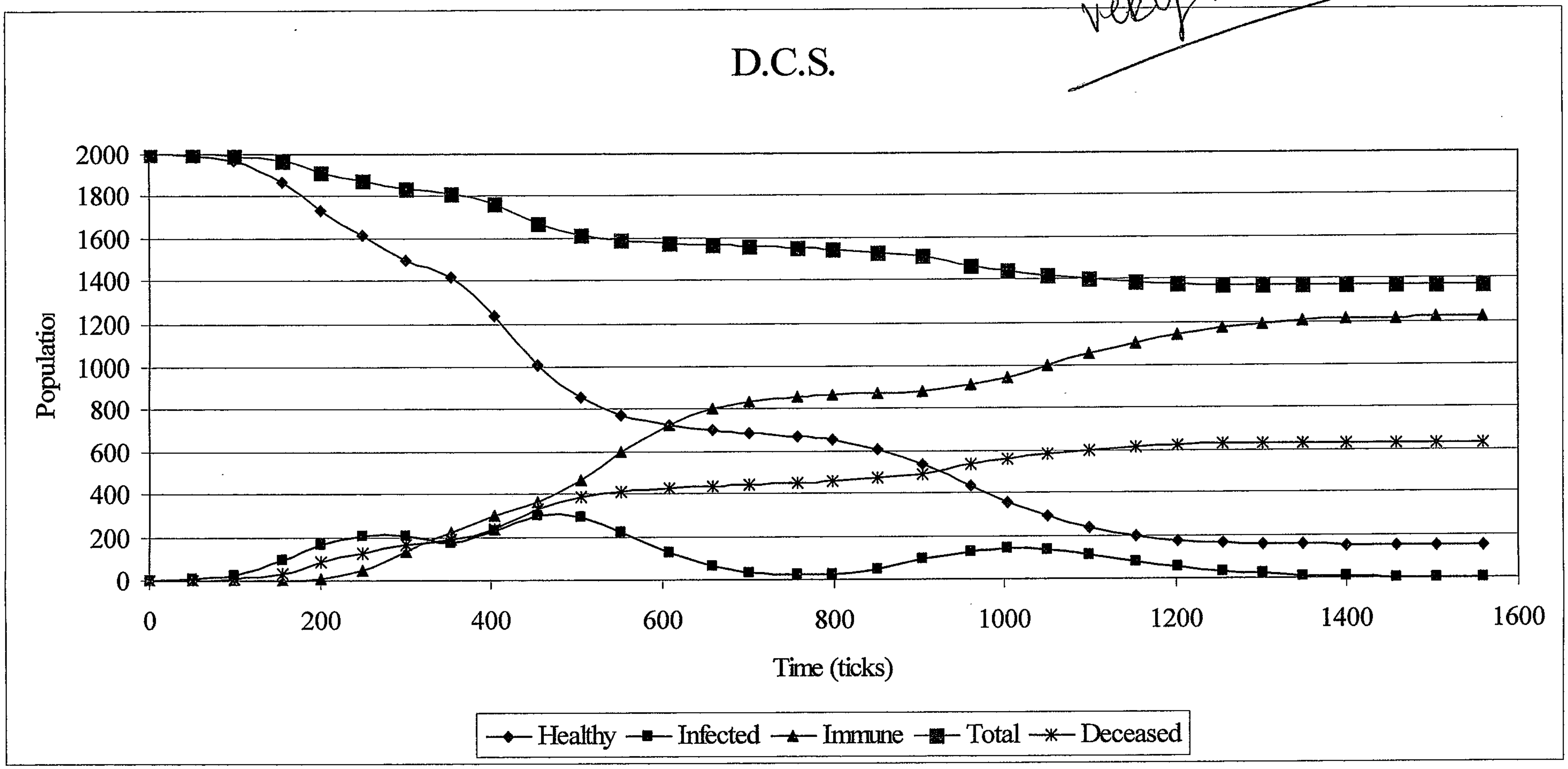
FOR "limitations" section, you should run the model with one of the parameters slightly changed and look at the effects. This might give you an idea of how sensitive the model is to errors (which are inevitable, in real life) on the part of the epidemiologist.

Parameters (same for all graphs unless otherwise noted):

Int. Pop: 2000	Limit Travel: On	Hygiene: 25%	Medication: Off	Days-to-Recover: 21
Doctors: 1	Travel Openings: 2	Vaccine: on	Infectiousness: 40%	Fatality Rate: 35%

Graph 1:

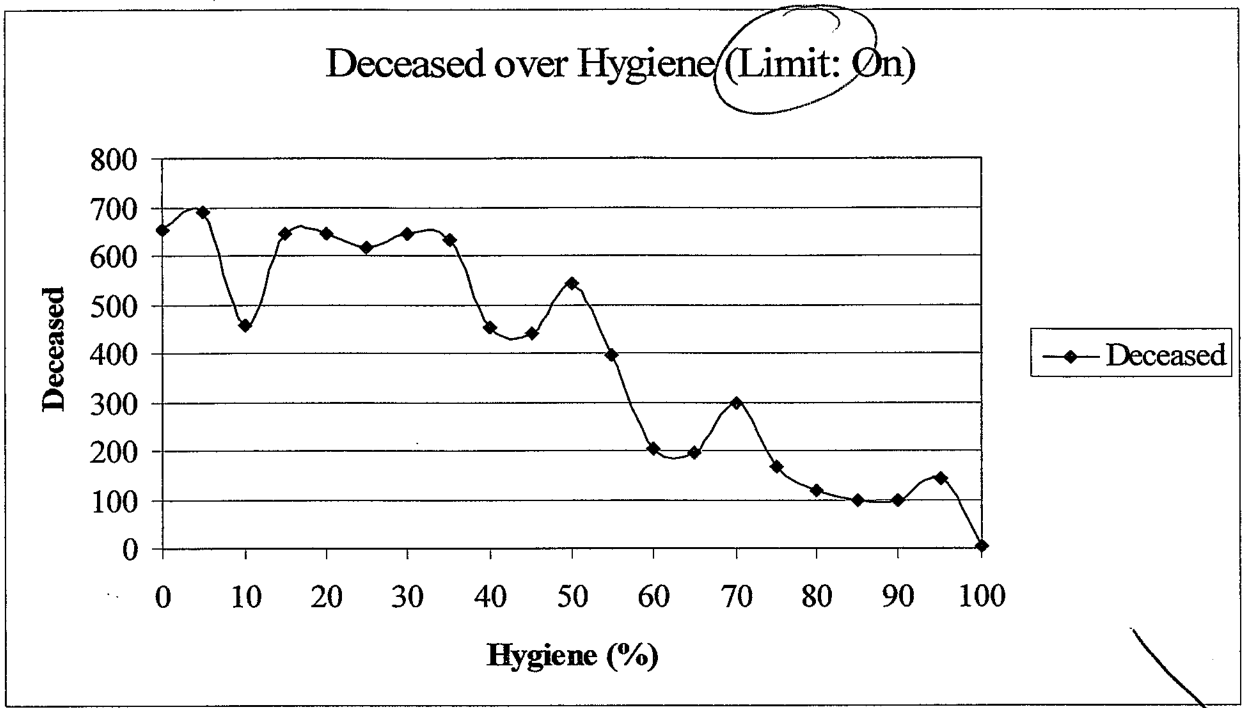
very nice



Graph 1 is the chart showing the entire time span of the first case of DeeCees.

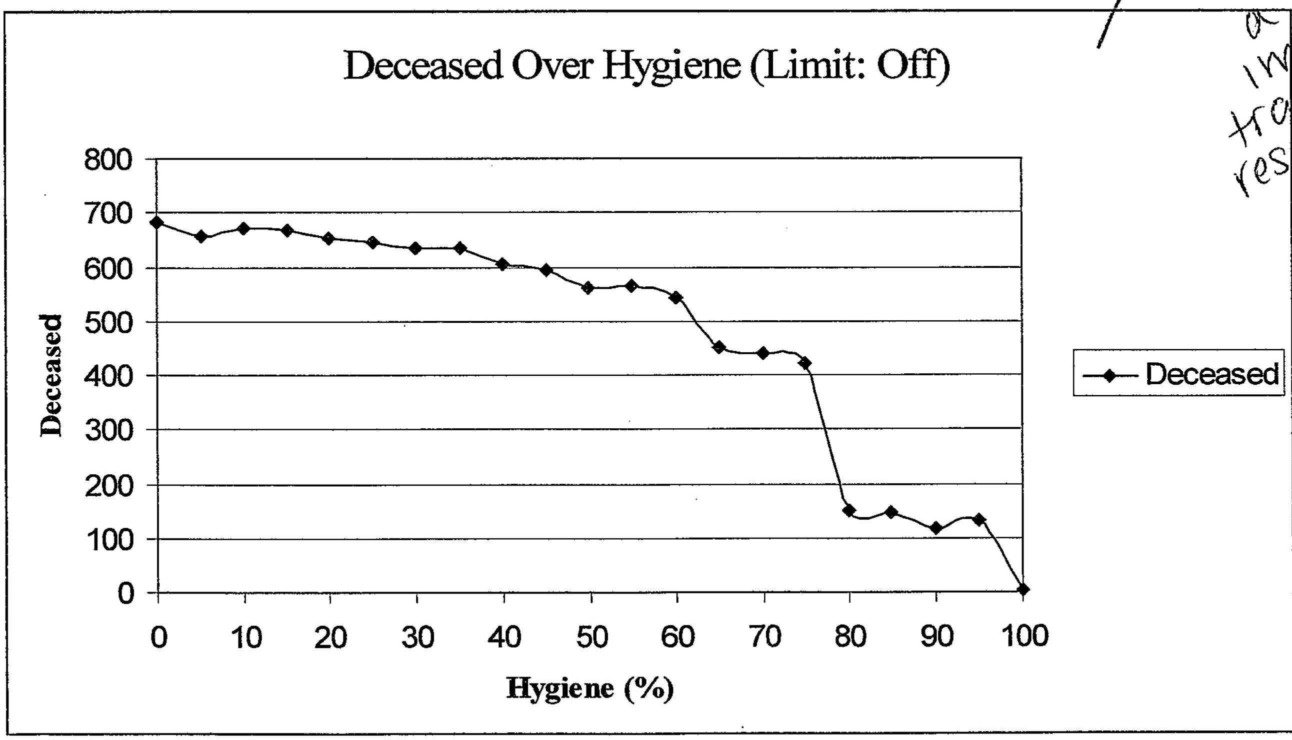
Graph 2:

Travel limit?

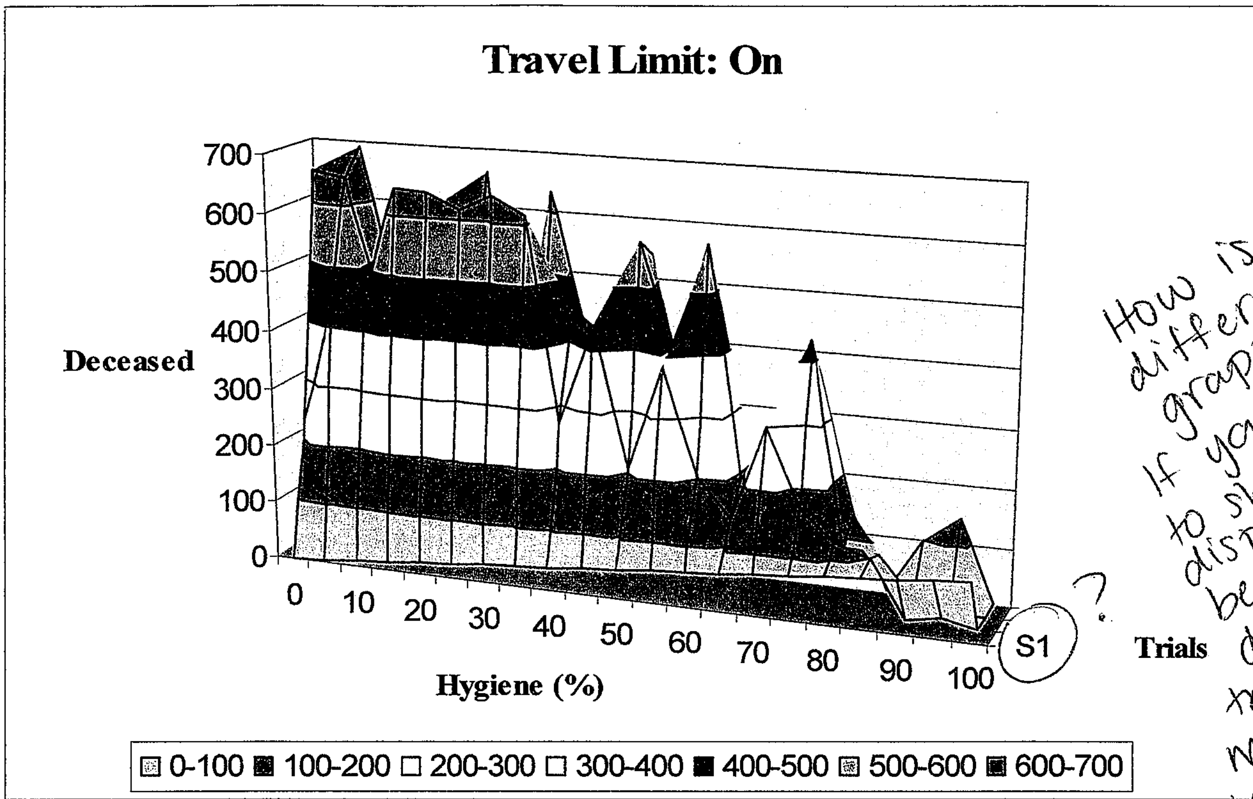


it looks like good hygiene has more of a positive impact if travel is restricted.

Graph 3:



Graph 4:



How is this different from graph 2? If you're trying to show the disparity between different trials, you might want to just overlay those graphs

Graph 5: