



PROSE | SUMMER 2021

EPIDEMIOS: With apologies to Plato

By Daniel Albert

Glaucon: Have you heard of the disease that is ravaging the country called COVID-19?

Socrates: Of course, why do you think I am wearing a face mask?

Glaucon: So, you believe in social distancing?

Socrates: There is much data to support that view.

Glaucon: Socrates, what data are you referring to?

Socrates: Many countries have instituted social distancing and reduced the spread of the disease, including China, South Korea, and others.

Glaucon: So, you are generalizing from specific instances to a principle?

Socrates: Yes, we can say with some degree of confidence that any country that imposes social distancing would reduce the spread of the disease.

Glaucon: I would agree.

Socrates: Good, we have our pupil Aristotle to thank for this form of reasoning. He calls it inductive inference.

Glaucon: But some people don't believe it is caused by a virus. They think it is a government plot.

Socrates: Yes, but the virus has been isolated from sick people and not from healthy individuals.

Glaucon: That is so, Socrates.

Socrates: So, you would agree that if the virus infects a person, they will develop the illness?

Glaucon: It would seem so.

Socrates: Again, we must thank Aristotle for this form of reasoning he calls deductive inference.

Glaucon: Can we then say that the virus is the cause of the disease?

Socrates: Well, it appears to be a necessary factor, but since many individuals have the virus and are not sick, it appears not to be sufficient to cause the disease.

Glaucon: It would appear so.

Socrates: We call this causal inference.

Glaucon: Is it a form of deductive or inductive reasoning?

Socrates: Now you are asking a very difficult question for which there is no easy answer.

Glaucon: What would Pythagoras say?

Socrates: I think he would prefer a deductive approach, as a mathematician typically prefers. However, a practical person might simply point out the regularity of the occurrence of the virus and the illness.

Glaucon: What would we call this kind of reasoning?

Socrates: This is typically referred to as statistical inference.

Glaucon: But many other factors must play a role since not all infected patients get sick.

Socrates: Yes, statistical inference requires many other factors, such as an appropriate temporal sequence, and cohesion with other principles of disease, so it is never 100% accurate.

Glaucon: Yes, our colleague David Hume has pointed this out.

Socrates: If that is the case, can we ever be sure of anything?

Glaucon: It would appear not.

Socrates: Then you would agree that a person with the virus could be both alive and dead.

Glaucon: I would not go that far.

Socrates: So, some principles remain true?

Glaucon: Yes, some things are either true or not true. Don't you agree?

Socrates: We call that the law of the excluded middle.

Glaucon: So, some treatments for the disease will be effective and others may not be?

Socrates: That is true of all conditions, is it not?

Glaucon: I would need to ask Hippocrates.

Socrates: Hippocrates has voiced the principle of “First, do no harm.”

Glaucon: But some people were told to drink bleach, and they got sick or died.

Socrates: Since bleach can kill the virus on surfaces, unscrupulous healers have advocated drinking it.

Glaucon: Yes, much harm has resulted from thoughtless politicians advocating false remedies.

Socrates: I know I will be forced to drink hemlock by politicians because I will not renounce my search for the truth.

Glaucon: But if bleach kills the virus on surfaces, why can we not reason that drinking it would help?

Socrates: Knowledge extensions to unknown areas need to be carefully reasoned to include benefit and harm. Sometimes science will help deciding how to maximize benefit and reduce potential harm. What we know of the virus suggests that it requires host factors for a successful infection, including a cell surface receptor (Angiotensin-converting enzyme 2 receptor, or the ACE2 receptor) for binding, then several biochemical reactions to allow it to replicate in the cell.

Glaucon: Then it would appear that interfering with one or more of these steps might inhibit the virus infection.

Socrates: Yes, but the reasoning will only get you a hypothesis. You must test the hypothesis to determine if it is true.

Glaucon: I see.

Socrates: For example, hydroxychloroquine and chloroquine inhibit viral binding and thus infection in the laboratory, but there is very little evidence that they are effective in patients.

Glaucon: Yes, there was a small uncontrolled trial in France that led to the claim that these drugs were a “game changer.”

Socrates: Subsequent data was not supportive.

Glaucon: And we owe this form of reasoning to our colleague Francis Bacon.

Socrates: Yes, the scientific method.

Glaucon: What about the claim that antihypertensive medicines that block the ACE receptor would be harmful since the cell will produce more of these receptors?

Socrates: Again, a hypothesis that does not appear to be valid.

Glaucon: Why did this virus occur now?

Socrates: It appeared to be endemic in bats, in addition to other coronaviruses, but skipped to a new host, probably pangolins, which are trafficked for herbal medicine in China.

Glaucon: Is there reason to believe that viruses exist to infect people?

Socrates: Most people believe that evolution and evolutionary pressure are the major determinants of viral replication, and host-jumping is not purposeful behavior.

Glaucon: We have dismissed purposeful, or teleological, explanations, much to Aristotle's dismay.

Socrates: Like other epidemics, the disease seems to spread so quickly and almost randomly.

Glaucon: Like the plague. But, unlike the plague, people with this virus who are not sick can infect others.

Socrates: Yes, the infection of others is measured by its ability to spread, called R, which for this virus is about 3. This is moderately infective, meaning for every person with the virus, about 3 people will acquire it.

Glaucon: So, the infection can spread exponentially?

Socrates: Without any brakes, it will infect everyone.

Glaucon: Such a random event.

Socrates: Yes, we can call it a "Black Swan" event.

Glaucon: And the rapid spread?

Socrates: Can be modelled with chaos theory using fractal mathematics or fractal geometry.

Glaucon: Is there no remedy?

Socrates: Social distancing works to some extent for all infectious disease.

Glaucon: But no specific remedy. Can we not reason from other coronavirus infections?

Socrates: Coronaviruses are responsible for about 30% of common colds. However, there is no specific remedy for the common cold.

Glaucon: So, argument by analogy is not always helpful.

Socrates: But we do have medicine for other RNA viruses, like HIV.

Glaucon: Is this a useful approach?

Socrates: Many RNA viruses use the same biochemical steps to infect a host cell, so perhaps a medicine already developed for RNA virus infection would be helpful.

Glaucon: Yes, you have mentioned this form of reasoning many times. Inference to the best explanation.

Socrates: We call it abduction—a pragmatic approach.

Glaucon: Can we not use that reasoning to treat the very sick patients with cytokine storm?

Socrates: Perhaps, but another approach is to use a shortcut method called a heuristic.

Glaucon: How does this work?

Socrates: Cytokine storm is present in many overwhelming immune responses, such as macrophage activation syndrome, hemophagocytic lymphohistiocytosis, CAR T response, and sepsis.

Glaucon: Yes, they all seem to be mediated by interleukin 1 and 6, or IL1 and IL6.

Socrates: So, the heuristic is that all cytokine storms can be treated by IL1 and IL6 blockade.

Glaucon: It is worth a try.

Socrates: But since it is an infectious disease, in theory, a vaccine could be developed.

Glaucon: Yes, Socrates, you have taught me this is a tautology.

Socrates: Perhaps, but even tautologies have exceptions. For example, the statement “all bachelors are unmarried men” has exceptions.

Glaucon: Yes, there are widowers, transgender folks, and others who break the equivalence.

Socrates: However, the best solution to the COVID-19 pandemic remains an effective vaccine.

Glaucon: Many people believe so. However, non-believers who refuse the vaccine may permit the virus to continue to ravage the population.

Socrates: Well, enough talking, we have much work to do.

Glaucon: Yes, Socrates, what is clear is that thoughtless recommendations, lack of commitment to responsible behavior, inadequate planning and foresight, poor resource allocation, and poor leadership result in the worst management of this crisis in all of the developed nations. Fortunately, now that we have effective vaccines that are being widely distributed, and more of the population is getting vaccinated, there is hope that we can control this catastrophe.

Socrates: It would appear so.

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