Bret and Heather 8th DarkHorse Podcast Livestream\_ The Steal...

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**SUMMARY KEYWORDS**

people, testing, infection, virus, paper, question, case, santa clara county, point, fact, cfr, trains, data, line, suggest, antibodies, subway, category, study, hypothesis

**SPEAKERS**

Bret, Heather

**Bret** 00:10

Hey folks, welcome to the Dark Horse podcast live stream. This is what our eighth sorry, this is our eighth live stream I am sitting with Dr. Heather hying, as has become our tradition, we have been fending off technical difficulties of many different kinds. And I would say at this point, aside from the audio, the video and our connection to the Internet, everything is going smoothly,

**Heather** 00:37

smooth sailing smooth, other than those other than those three issues.

**Bret** 00:41

I wouldn't call them trivial, but you know, they're part of it. Alright, so

**Heather** 00:46

we want to start with logistics on how we're going to be dealing with a Super Chat.

**Bret** 00:49

Yes. Why don't you take lead on?

**Heather** 00:52

We'll try. So we have been receiving many excellent and some not so excellent, but mostly excellent Super Chat questions. But it has become a bit onerous. And we are not, we're giving short shrift to too many of them. Because we have been trying to, we've been reading all of them. So this time, we are going to try another strategy, which is those super chat questions that come in, in this first live stream where we are just talking to each other, we will look at over the break between the two live streams and prioritize them based on both monetary amount and then try to do a very, very first pass at, you know what questions are particularly interesting. And we'll spend a half an hour only on those questions from the first they come in during this first live stream. And if we don't get to all of them, which we probably won't. That's that's unfortunate. And then we'll spend a half an hour on the Super Chat questions that come in during the next live stream, which we will probably have to take in as as they come in. So we're going to limit the second live stream the q&a to an hour and see how that goes. And this is a moving target. We're going to see how this goes this time and maybe modify it next time. It's a

**Bret** 02:04

learning process and a live fire exercise all wrapped into one. So in any case, also do let us know we don't see every comment, but do let us know what's working, what's not working. We discovered some sound problems last time. Hopefully, you will find that they have been successfully addressed this time. But every piece of information is useful to us. And we're working on it. And we're working on it alone because obviously nobody is coming to anybody's house to troubleshoot stuff. So

**Heather** 02:31

we being the two of us on screen, but mostly Brett and our wonderful now 16 year old son, Zachary Weinstein, who's doing the production end of things.

**Bret** 02:41

Zachary is on the production end and Toby is on the wall fishing and he's becoming an expert at wall fishing, which makes me very proud.

**Heather** 02:49

He keeps on assuring me you're doing no wall upstream, but I keep hoping we have not

**Bret** 02:52

been forced to wall lobstering. Alright, so I do have a not a correction. But an addendum. Last time I mentioned a paper that I thought was well worth people's time written by one of the founders of Instagram. And it's Kevin systrom. And we will put a link to the paper in the description. But the short version is he argues that the are not a term that people have become familiar with about how likely an individual case of the virus is to propagate to

**Heather** 03:23

the term is our not right, which reads is our zero? Well, I just I'm not always sure that that tract.

**Bret** 03:28

Yeah, so on paper, it looks like our sub zero are not. He argues that there is a more important term that we need, which is our sub t, which I think is just set r sub t, although it's not clear in the paper, which basically tracks the change in transmissibility based on the responses that people have the behavioral responses. And so this measure is important. For example, if we want to compare municipalities or something and see what's working and what isn't not just simply assigning an R naught to the virus but assigning an R sub t to the intersection between a virus and a population is very useful. So anyway, it's a good paper well written. I strongly recommend it and we will link it in the description. All right, I think that's all I have you have correct Yeah,

**Heather** 04:22

I wouldn't Well, not a correction exactly an addendum. I want to add or clarify to our discussion about essentials last time, where we spent a while talking about flooring, much to the chagrin of some people and much to the enthusiasm of others. We were specifically making an argument about why flooring, which has been included in the list of prohibited purchases in Michigan, stay at home order might be considered an important psychological tool for people in such times and in times of lockdown, giving them something useful, productive and creative to do. We didn't speak to the more obvious things on the list things like seeds and nursery supplies, because a we've alluded Added to those in the past and it just it's a it's a really easy argument to make, that people should be allowed to buy seeds with which to potentially grow their own food, especially as supply chains come to be at risk. So I'd like to reframe the discussion slightly, without spending a lot more time on it. That the concept of essentials we were arguing basically is a category problem. But it speaks to pre existing category problems. Nobody's being prohibited from buying anything like anything that they might eat. Actually, you can buy flank steak, and blueberries, you can buy mangoes and whole chickens, and you can buy tofu and kale to list six things that we've bought during during lockdown, right? So long as you can find them in the stores, you can buy those. You can also though, at the moment, if you can find them in the stores buy Cheetos, and Pepsi and pop tarts and Twizzlers and red ball and doughnuts. Not only are none of those things in the second list essential though, they're actually bad for human health, which by now everyone knows even those, even those of us who eat those things sometimes. So nobody's attempting to draw that line between the things that we ingest that are arguably Good for you. And the things that we ingest that are quite obviously not, if you can ingest it, you're allowed to buy it. And the because the fact that humans need to take in calories is is understood, in part because it is so easy to quantify. And it's easy to quantify, in part because everything alive does it. And what we were trying to do by getting at the issue of flooring is get at those things that are essential to being human, that are much harder to quantify, but that are qualifiable necessaries. Right. So because every evolved life form is taken energy somehow, if you're photoautotrophic, a plant, you convert sunlight into energy into sugars. And then if you're a heterotrophs, like us, you either steal that energy directly from the audit trails, when you eat plants, or you steal it from second order autotrophs when you eat other animals, and we can we can look at it, we can count it. And sometimes we count the wrong things. And certainly we have been counting many of the wrong things. But it allows for this reductionist approach. And no one is trying to draw the line between that which you can take into eat, which is necessary and that which you can take in. And it's not necessary. But staying alive isn't the only goal here is it, nor is keeping one justice, nor is keeping the economy intact. The only goal. If we emerged from this disaster, having mitigated it with fewer deaths, and there would have been had we not more or less stayed in place while hopefully getting outside with fewer deaths. But we emerged broken and empty. This will be a large scale depression, that will be more than economic that will affect a massive part of humanity that will be far harder to emerge from.

**Bret** 08:02

Yes, and I would also point out, we have kids who are growing up facing this unprecedented thing. And I know one of the things that gave me a lot of insight into where we are, was in the early part of the lockdown our oldest son Zack, who is manning the equipment here. said in passing, he asked me something to the effect of how often this has happened in my lifetime. And I looked at him and I, I said, This has never happened in my lifetime, or really ever. This is unprecedented. And it changed the way he saw things. But of course, you know, a child who's seen a much shorter slice of history, doesn't know how to calibrate this. And the reason I raise it is, I can imagine a lot of frivolous things, things that really, truly are frivolous that might be actually arguably necessary in some parent child relationship to keep a sense of normalcy. And so the point I made last livestream was I defy you to draw that line? Well, it's not that there isn't a line. But the point is, that line actually has a lot of richness between individuals and special cases. And, you know, if there's some candy that is, you know, a child's favorite, and some parent is trying to deliver that normalcy and the fact that the candy was suddenly off limits would be jarring. I mean, I can easily see an argument for it, even if, on balance, the candy is probably a negative with respect to its effect on immunity, for example. Yeah,

**Heather** 09:35

so really, we're pointing out the difficulty of drawing lines for which there are no easily quantifiable hard borders. We're not saying that lines don't need to be drawn, some of them do 100%. This is in part in large part what government is for, and we are fans of good government. But, but the lines that some of the lines that have been being drawn are patently bad. The closing down of of beaches, when people are maintaining social distancing is bad policy.

**Bret** 10:05

It's bad policy. And in fact, it emerges fairly strongly, I would say this week in several different papers, one of which we're going to get to, but there is stronger evidence that the circumstances that are dangerous, our indoor close quarters, circumstances. And so in some sense by telling people, you can't go to the beach, or you can't go for a hike, we have been denying people something that they might do in favor of pushing them in the direction of Yeah, all right, you're not out at the, you know, nightclub, but you are in close quarters, probably indoors, where this thing is being transmitted. So in some sense, we have to be very cautious. We don't yet know how this thing functions and telling people you shouldn't do that, because it stands to reason that you might get sick in a public park, when in fact, the data ultimately reflect the unlikeliness of that scenario is, is a problem.

**Heather** 11:09

And it also serves to create snitches out of people, right, which we are also beginning to see that people are being encouraged to tell on their neighbors if they perceive that they are going out too much. And, in fact, as I understood the mostly good faith orders that were coming down early, early on, there were no attempts to keep people in place. It was you know, shelter in place, but go out for exercise for fresh air. And, you know, people with dogs have this easy excuse, which is, which is itself very interesting. Why is it now that we understand that our dogs need to get out and move, but we are less likely to understand that we do as well.

**Bret** 11:51

Yeah. So the whole idea of having bureaucrats do this from something other than a place of caution is, I think, legitimately frightening. And it's resulting in backlash, which I think is itself frightening, terrifying the backlash against the idea of controlling the virus through, you know, wearing a mask or avoiding social contact, or all these things that backlash is obviously a danger to human health. And even an individual who chooses to flaunt the rules is putting everybody who might be downstream of them epidemiologically at risk, and some of those people are going to die. So it's not a minor question. But nonetheless, the incoherence of the policy is raising people's hackles with respect to governmental overreach and all of these things. And so anyway, some sort of caution is clearly necessary. Indeed. All right. Did you have a next topic you wanted to move to?

**Heather** 12:53

Well, ultimately, we're going to be talking about that. That Santa Clara County serology testing paper, but it doesn't have to happen first. But as you like, actually,

**Bret** 13:03

let's start there. Many people will have seen this paper Do you want to introduce?

**Heather** 13:07

Yeah, so Zack, maybe? Can you pull up the I don't know how to pronounce his name. Actually, Ben divvied at all. 2020. What's up? Let's see if I can do what I for the first time today. I have stuff in front of me. Let's see. I may have it here, Zack. Except I can't see my No, hold on. Boy, no, I don't I don't have it here. Zack. If you can pull it up. It's the one on the first page been divvied at all 2020 right below the break would be great. Okay, so this came out at this point. I think it came out the day before we were supposed to do our live stream. So it must be three days ago, maybe the tight I don't I don't see Are you going to be able to show it to us? Okay, because I will, I will need to see it. We're going to talk about it. Because the the message is basically this is directly from the discussion, quote, the most important implication of these findings is that the number of infections is much greater than the reported number of cases. Title of the paper being COVID-19 antibody seroprevalence in Santa Clara County, California. So what these authors did, was solicited via Facebook, people to come to be tested for antibodies, which is to say past infection, not current infection, it will not find current infection. And then they had drive through testing. They were looking they tried to control for three demographics. So they tried to get equal representation to match the demographic background data. The link doesn't work. It doesn't go. Okay, well,

**Bret** 14:52

we will find the link and put it in there I think. So this

**Heather** 14:55

is the Santa Clara County benefited all 22 Any paper that is widely discussed right now. So they, they were looking specifically at I think, age, race and ethnicity and zip code as the three parameters that they were trying to match to the background demographics of Santa Clara County. And we're no shutdown accepting applications for this or allergy testing when they got too many from certain zip codes or too many from maybe certain races or ethnicities. And, and then the drive to test and they also let people come with up to one child from a household so there was some non independence among their among their data. And let me just say that there so their conclusion is that, like, like I said, that they have that incentive Santa Clara County Anyway, there's a far higher background rate of infection. In fact, I think the numbers they have, since I can't see the paper now, I can't actually pull up the specifics 50 to 85 times, the actual numbers that are being reported from the more standard testing in Santa Clara County, which means if true, if those results are true, then the case fatality rate, which is defined from the dictionary of epidemiology, as the proportion of cases of a specified condition that are fatal within a specified time, the CFR the case fatality rate, would be far lower than is reported. And this is consistent with things that we've been saying for, you know, well over a month at this point, right, that the CFR is likely to be lower than it's being reported. But that does not change most of the things that we are that we need to do in order to control this. But let's just focus for a moment on the actual study, you want to start by talking about a little bit? Well,

**Bret** 16:51

let me just say, you're going to raise some concerns about how the study functioned. Yeah, it does mirror data we're seeing from elsewhere, it's actually a fairly close match for the data from Scotland. And then there's another study, I believe, from Denmark, that says the same thing, which is that the rate of infection is actually far higher than we know that when you test a population, instead of testing people who come through the door, for one reason or another, you test the population at large to see how many people show signs of past exposure, you get a very high number, which doesn't change the number of people who have died of the condition. And so what we find is that the transmissibility is higher than we think. But the mortality rate is lower. And so it would not be surprising if Santa Clara County reflected this very same pattern. On the other hand, it doesn't make the study viable if the study has methodological flaws, whether or not it comes to a conclusion that's mirrored elsewhere. You know, it's flawed. So the question really is, what are the flaws? And how vital are they in terms of the conclusion that was reached? That's it valid? Is it just noisy or is it misleading in some way? Okay,

**Heather** 18:05

good. So there are there are several approaches that I could take to sort of critiquing to and some, some of them bordering on nitpicking. But I think there's two classes of of critique of this paper that are large enough to warrant discussion here. One is biases in the subjects. So as I said, the methods by which volunteers for psychology testing were chosen was through ads on Facebook. And those selected arrived at testing centers by car for drive through testing. This means that those who are included in the study had both means and interest. Let's take those one by one means First, you have likely to be over selected for relatively wealthy people. At the very least you're not including any homeless people, if you can only get testing when you can show up with a car at a testing site. So this this though, so this, this is going to miscount in maybe both directions simultaneously, which looks like noise, right? So if you if you don't get some people in lower socioeconomic classes who haven't been tested because they didn't have previous means to get tested, and specifically homeless people, you will have, you will have missed a large number of people who were positive and thus this could be actually an undercount. Right, yep. The i can i can see an argument for going the other way but it seems most likely that this means bias goes goes one way and actually is suggest that these results in this paper are conservative if everything else is correct. With regard to interest though, it clearly goes in the other direction that those people who respond to a Facebook ad a are looking at Facebook at home that is to say they again this is a question of means they have the means to have to to have a computer at home through which to look at Facebook, but it see it's still to reason that those people who think they might have been infected in the past will have more interest in going to be tested than those who have no reason to think that they've been infected. And, you know, other than an excuse to get outside, why is it that they're going to go and potentially put themselves at risk for for such a study? So given that, given that interest was a, a driver? I can't you know, it's impossible to quantify how large a driver but a driver of how it is that the subjects got selected for this. That is that is going to suggest that that's going to go the opposite direction of the way I think the means question would, which is to say, it's going to have driven the number of positives up compared to the background population, which suggests that the case fatality rate that they're reporting is actually too high, and that it should be lower. So those that's, that's the first large class of critique that I have about the paper, I'm gonna say anything about that, or

**Bret** 20:59

I would add one thing to it, which is a different kind of critique altogether. And it may well be that this is so well understood epidemiologically, that it's a non issue. But there is a question in my mind given. And I have studied immuno biology, albeit a long time in the past. But there's a question about whether or not the antibodies necessarily reflect a history of infection, or do they reflect a history of exposure, and my guess would be that the level of antibodies that is being detected would reflect a cleared infection. That is to say, the immune system goes into a pattern where it becomes good at recognizing the invader that it's already seen. And that that is what is being detected, in which case it would reflect an infection. But it is conceivable to me that, especially in light of how much doesn't make sense about this virus or not. Doesn't make sense. But let's say surprising lis about this virus, one thing we have to ask ourselves is what happens to somebody who has a high level of exposure, but doesn't contract an infection. So it just worth it's worth asking the question, and I would love it if somebody knows the answer. And it is clear that these antibody tests are necessarily reflecting an infected person know their infection has cleared up that would be

**Heather** 22:27

useful when in fact, it raises the question of high level of exposure without contracting an infection. What would the antibody test read? What then does asymptomatic mean? asymptomatic is a category? That could mean either of those two things, actually, if they're, in fact distinct?

**Bret** 22:43

Yeah. So anyway, maybe somebody in our audience can, can clue us into what we need to see.

**Heather** 22:50

Yeah. So the other the other concern, the other major concern that I had about the the scientific validity of this paper, even though again, and we'll talk about this more later, I, I tend to believe that the results are more true than the other results that we're seeing that show a very, very low background infection rate in populations. The authors demonstrate they go through, you know, a fair bit of statistical song and dance about explaining how they assess the actual rate of false negatives and false positives. And these tests and their other people online have assessed whether or not they think that those those are well done. But they don't seem to deal with the problem that with a low base rate of infection in the population, even the higher rate that they report here, it's like the higher rate that they report is up to close to 5%. It's still very low, right? So with a relatively low base rate of infection, the population false positives, potentially outnumber true positives in test results. So I'm at considerable risk of losing a lot of the audience, I'd like to walk us through just a couple of made up numbers just to just to make this point, because I think a lot of people have been saying this, but with some made up numbers that are simple. It might, it might stick for people. So let's imagine a population of 103 people. And again, this is just to make the numbers easy, in which so let me say first that the authors of this paper claim a false positive rate, while a confidence interval and specificity between 98.3 and 99.9%, which is staggering. So that would be a false positive rate of point one to 1.7%, which is very, very low. Most of the tests we're seeing suggest about a 5% false positive rate. So just for ease of doing some some fake math here, I'm going to use this 5% so in a population of 103 people, we're only three people have been infected that's based on this generous background infection rate of 3% or 2.9%, if the false positive rate is 5%, for the test, that is the test tends to give a false positive one of 20 times 5% of the time. Maybe the three here actually positive test positive, the flip flip is here that false negatives will be pretty rare in such a situation. So the three in the population of 103, will actually test positive. The remaining 100, though, all of whom are actually negative five out of those 100 will also test positive because you've got a 5% false positive rate. So in that case, with those very particular numbers that I chose for ease of communication, you'll get eight positive results, in which three are actually positive and five are not positive, which means the majority of people who show up as positive are actually not. So that's that's obviously difficult to wrap your mind around. And let me just one more one more mathematical thing, and then I'll drop the numbers, if you take the same population, and the background infection rate is now 15%. Rather than what I said before 3%. Now you have 15 people out of the population of 103, who are actually positive, only four people out of the 88 remaining people who are actually negative, which means you got 19 positive results, only four of them only 20% or so are false positives. So as the background rate of infection in the population goes up, the risk that you're positive is a false positive goes down.

**Bret** 26:30

So I would also point out that there are two potential kinds of false positives here and which kind we're dealing with has a lot to say about how easily we can correct for this one is a false positive where the test comes up positive for no good reason. And a second test would suggest something was wrong. The second would be a false positive. I guess this would be the case. If people who had exposures but did not contract the infection had sufficient antibodies to trigger the test. And we regarded them as it as having cleared an infection. They would test positive each time they had the test, even though they have never had the infection. So it is possible. And I

**Heather** 27:09

would argue that those are people we want to include in, you know, they've got immunity. Oh, we want to include them?

**Bret** 27:14

Well, I don't know if they have immunity in this iPod in this hypothetical situation. But let's put it this way. It's not that that situation would be uninteresting. It's that it's a signal for a category that we either are or are not counting. So we need to be very careful not to assume people into a category. They are not necessarily in and a lot depends, you know, it may be that experts on Coronavirus infections know very well what particular titer of antibodies implies. And so they've ruled it out for good reason. Or it may be that things are so novel here that we may discover that there was a category that we had lumped with another category and changed the interpretation in a way that was misleading.

**Heather** 27:56

Yeah, in fact, what I'm seeing is too much of the time and this is just, this is forced by the fact that this is such a fast moving, fast emerging pandemic, that categories are being split into two that we are making binary categories that really warrant many more many more subdivisions. And so in general, I think, tighter, you know, countable titer of antibodies counts as a yes. And if you can't see it at all accounts as a no, and that's obviously not a fine enough line to get at some of the questions that that you and we are raising. But there's also there's so much there's so much important work to be done. And this will seem like nitpicking why we are Why aren't they splitting into the into more categories? Well, then you have this question, just like we were talking about with regard to what's essential of where to draw the lines. So is there any, are there any antibodies present? versus are there no antibodies present? is at least a line that everyone can agree on? That's quantifiable? Yes, or no. But, but binary situations that are actually in which you can have zero and you can have some to a lot, that's actually a continuum. And it's, it warrants a different kind of statistical analysis that we just don't have, I think the time or the means for it yet.

**Bret** 29:10

And at the very least, we can say that the the phenomenology of these infections is so varied and so confusing, that we know there are features of this that are utterly continuous and leave you scratching your head. So whether the infection itself in the test we're using are truly testing binary circumstances or whether their categories are missing is an important question. So have you gotten where you wanted to go with the Santa Clara County?

**Heather** 29:46

I guess. Let me just say I'm in this this is probably a decent segue to I don't know where you're going next. But I suspect it's a decent segue. So all all of those critiques and again, I have more, which I'm not going Make your all those critiques of this study do not mean that I think that the overall conclusion is likely wrong. And this is based, as you suggested on some of what we're seeing elsewhere and on what we understand to be a high transmission right? In, in places like hospitals and nursing homes and such. So I don't find that this study demonstrates its conclusion to any high scientific standard. But that said, a low CFR, even even if the the case fatality rate really is quite low, you know, a lot of people are saying less than 1%. Meaning doesn't mean no CFR doesn't mean it's not killing people. And deaths are quite high in some places. So that begs the question is the CFR higher in places like New York City and Lombardi, I don't know, or background rates of infection higher? And you know, what, what is it? We don't this, this is where we need the excellent epidemiology and it's just moving so fast, it's really hard to get to.

**Bret** 31:07

So some of the other studies that have reflected a similarly high base infection rate and therefore low CFR rate were done with very different methodologies. And blood from blood donors, for example, was tested, and that doesn't have the same bias of soliciting people who can drive in from a Facebook app. So it does suggest that there is reality to this interpretation, whether it varies by location, we don't know and, you know, the study is some sort of data is compromised by methodological flaws.

**Heather** 31:42

Absolutely. So I guess I mean, there's there's a lot more to say here. But the main thing I would say is, case fatality rate gets deaths. And it may well be that the biggest lingering effect, health effect put aside the economic effects. But the biggest lingering effect, health wise of this virus is among the survivors that we have. We are seeing increasingly now. And of course, we don't have any long term data because this isn't a long term situation yet. But that people who survive, have respiratory problems, have lung problems, have cardiac problems may have neurological problems, that there are it's it's affecting all of the systems in the body. And of course, why wouldn't Why would we assume that this, that this respiratory virus, this virus that we have named a respiratory virus would only affect respiratory systems, there's really no reason to assume that. And so focusing only on the case fatality rate, as if that is a good measure of the effect on human health and well being is is not wise.

**Bret** 32:54

Yeah, it's, it's a hazard. I'm particularly troubled by the fact that we don't have any good resolution on the so called asymptomatic cases, whether they have damaged or not. And if you have followed the discussion here, and on Eric's podcast about telomeres, the thing to remember is that, in effect, damage pushes you closer to some threshold from which you cannot repair. Right? So that threshold at which you cannot repair some vital tissue is death, right? You have a vital tissue, it's gonna fail, you can't live without it. So things that damage you, push you in the direction of death. Now, a low CFR reflects people who have not died. yet. It does not mean they were not shoved in the direction of death by 15 years. It also leaves open questions which increasingly I hear circulating about whether a this is a virus that can recur, right without having to be reinfected. Whether it be you have immunity once you've had it, or it's going to behave more like colds and flu, where versions of it will reinfect you periodically. So to the extent that this is a virus that clearly gives many people enough of a shove to push them across the threshold where they can't get back. It's presumably giving many more people who do get back a shove in the direction of mortality. And then what is it doing to the people who had a low symptom or no symptom infection? What will they be like 15 years from now or something like that. So anyway, all of these things are important questions.

**Heather** 34:42

And it points once again to the limitations of binary thinking dead or not, not a sufficient analysis

**Bret** 34:48

fully recovered is not fully recovered. And that's true for many, many phenomena, right? We medically miscategorized this or at least the story that we tell does. So I wanted to suggest a couple things. is where we're falling down. And in places where we're succeeding. Again, I am stunned by how vibrant, how interesting and how normal, the scientific discussion is this, everybody has been reduced to amateur status, even the experts who are experts at coronaviruses, or epidemiology or whatever, are novices with respect to this particular virus. So people are interacting in a way, that is, it's prone to error, I've seen lots of false starts lots of cul de sacs. But the fact is, the scientific apparatus is actually functioning in some ways better than I've ever seen it function before, right? And the fact that you can tune in that you're not being excluded, because you're not an expert enough to have access to the literature is wonderful. On the other hand, we are even I'll

**Heather** 35:53

say, not only is most of these papers going up on preprint servers, but Elsevier, you know, one of the biggest blocks to actually sharing scientific data out there, because it's one of the big publishers is making its COVID-19 related publications open at the moment,

**Bret** 36:08

yes, this has embarrassed publishers into behaving as good citizens, which you know, is all is extremely positive. The problem is we are hamstrung by the quality of what there is to be analyzed. And there are a couple of things that I would suggest here. One of them is that we are, unfortunately being hamstrung by the political apparatus, which has a perverse incentive. And I'm speculating here as to why this is the case. But the Trump administration, for example, has been very slow and reluctant about pushing testing, right? And there's a question about why would anybody not want more testing? How could information possibly be bad? And the answer is that there's a, there's a very reasonable, immoral argument for eliminating that data if you are a politician in a position of authority. And it has to do with what I call monkeying with the baseline. If you are in a position of authority, and you're going to make decisions, and those decisions are going to have life and death ramifications, they're going to decide whether or not we fall into a depression or don't. And you don't want to make a call and have it come back to haunt you, then leaving the data very vague, maximizes the opportunity to shift the narrative to push blame onto somebody else. So I remember, this first dawned on me after the Fukushima disaster, in which the Shinzo Ave administration in Japan began doing all kinds of bizarre stuff. Like there was waste that you couldn't burn because it was too radioactive. And there was a very clear legal standard about how much radioactivity caused something not to be viable for incineration. And they would they justified the adding of non radioactive material to this radioactive waste in order to get it below the threshold. Just no justification for this at all it does is add extra pollutants to the atmosphere, but they gained their own standard and then I remembered they were moving waste around the country to burn it in different places. And the only argument for doing this and I could see is that later on, if you wanted to find out how bad the Fukushima disaster was, you're gonna have to figure out what the baseline rate of all of these cancers was, well, if you're burning the radioactive waste in different parts of the country, then the baseline will be artificially high, which will make the Fukushima disaster look artificially okay. So anyway, monkeying with the baseline is one way to dodge responsibility. And I'm concerned that what we are facing is a political apparatus that is playing that game and blinding us scientifically, at a time when we need high quality vision more than ever,

**Heather** 39:09

they seem totally willing and capable of monkeying with the baseline. I like this phrase very much. Fukushima, of course, like Deepwater Horizon as well. was different from what's happening here in that while there was an event, presumably there was a patient zero, there was an origination of this virus wherever it came from, as we've talked about in past podcasts. Our awareness of it in much of the world was this rolling awareness right there was not an event of a tsunami or a burst gasline the case of Deepwater Horizon and it means that there was denial, followed by a possible embarrassment and then sort of late to the game I would think comes mucking with the baseline. Hey, we can be optimistic here and change what's going on like, it just doesn't it doesn't look like The monkeying with the baseline thing is what was happening earliest, at least not in the US not in the Trump administration, you know, maybe depending what was going on in China. That's possible. But it depends a lot on what was actually happening there?

**Bret** 40:11

Well, I think the problem is, I don't know how monkeying with the baseline shows up in the official discussions. But my sense is, it's going to happen everywhere. That responsibility is being apportioned. And, you know, I think it accounts for some of what we see in China, and a lot of what we see in the US, and when it first dawns on people that they don't want good data. I don't know. And it may be that that becomes a stance that you even recognize, as a general matter, that good data tends to put you in an awkward spot. And so cloudy data is preferable if you're in a political position of authority, but we who have to face the, the outcomes here, have an interest in forcing our political apparatus to do right by us. And so I was gonna make a suggestion for in addition to what you have been saying, since the literally moment one on this, which is testing, testing, testing, that is absolutely the first move here is to figure out how widespread this thing is. But people who have been paying attention to these live streams will remember we talked about the USS Theodore Roosevelt, the aircraft carrier that docked in Guam, because it had a infection spreading on board. And I remarked that this was a lost opportunity, because this had been an isolated population, which actually allows you to get good data about how this stuff is spreading, and what the rates of mortality and serious illness are per infected person. That ship has unsaved, as it were, that ship is docked. But what I what I realized, actually, in the middle of the night last night, was that what was going on, that is what was going on, is that military bases might actually provide the opportunity that we need. And I want to be very careful here, I am not suggesting that anybody experiment on the military, there is a very dark history of that sort of behavior. And I'm not advocating that but what I am suggesting is that military bases function as effectively, towns, they have their towns with a gate where you know, who comes in and you know, who leaves.

**Heather** 42:22

And we've got built in track and trace, right built

**Bret** 42:25

in track and trace you have a system of authority in which people can actually be, you know, told, do this, don't do that. And the question is, Could these bases be used a as study locales, could we what I was thinking is that we would have two medical teams on a base you would have the team that was dealing with treating the patients, and unlike is happening in the world at large, you would have an entirely separate team dealing with understanding what's taking place, right. And that we could discover a how similar these these outbreaks are. Be you could potentially test different things like different basis could have slightly different rules about, you know, whether you're allowed to go to the park, and we could discover if in fact, going to the park is really a safe thing to do. And so anyway, I don't know how it would be done responsibly. But I do believe that there is a responsible way that would treat the members of our military with honor, but also allow us to take advantage of the fact that they already have these isolated communities established with all of the tools necessary for us to understand how you know, cause results in effect,

**Heather** 43:46

and potentially allowing for also iterated serology testing. You know, I'm just adding more and more to what I want out of the testing apparatus, but widespread antigen testing for current infection, widespread serology testing for past infection, which looks for antibodies, and at most I think people have been tested twice, or if they got better, and they maybe got sick again, maybe a third time. But in order to assess whether or not your first positive was a positive, maybe people you know, it was a false positive or a real positive, people get tested twice. But I would love to know what happens to those titers, what happens to the levels of antibodies over time, early estimates, were suggesting that it's a good seven to 10 days after active infection before you have any noticeable antibodies in your system. And that climbs for three weeks or so and then remain steady for no one knows. No one knows, as far as I can tell, in part because the tests are, are just missing an action. And this is partially due to errors in the early days, at least in the US on the part of the CDC and such but it's much more widespread than that. So I would love to see people who do show as having been infected I would like to know what happens to their antibody titers over time, which would then begin to give us a sense, possibly as to whether or not immunity lasts. and for how long?

**Bret** 45:11

Yep. So imagine you had a military base in which everybody was being tracked from some, you know, moment zero. Yeah. And you could simply say, Well, what do we know about asymptomatic cases? And whether or not they show the same kind of ground glass lung damage that shows up in severe cases? Well, that's an easy you could test that question. I would imagine in a few days, if you had a population where you could simply identify here are some people who match that description. Let's give them an X ray and find out how their lungs look and then you know, track them over time. So in some sense, I'm heartened by the way the scientific apparatus is functioning. I am disheartened by why we are scratching our heads over what seems like some of the most basic questions about the course of this disease even here you know many weeks down the road

**Heather** 46:07

Yeah, months even Yeah, yeah. I agree. Well, what else do you want to talk about today? We've got maybe 15 minutes left

**Bret** 46:14

I think we should talk about the subway study All right.

**Heather** 46:18

Now that I think I do have open here I think hold on Zack. Let me let me see if I can find that so you can put it on my put my computer screen on one Okay, so this came out of MIT I don't know this month I don't remember exactly when Oh very recently. So the subway is seated the massive Coronavirus epidemic in New York City is the title of the working paper

**Bret** 46:48

Geoffrey Harris who is an economist and this paper is a it's a very interesting paper basically it looks at New York and it tries to figure out why New York suffered the the rather impressive rate of infection that it has faced and as it says right up front it tested the hypothesis that

**Heather** 47:14

leading it down now Zack thinks that the virus

**Bret** 47:17

was being transmitted by the subway and it goes on to you know the paper is very careful it says look we don't know whether this is actually true because the subway is obviously a non random network of trains those trains are built to accommodate at least the historical understanding of where people needed to go from and to and so there are lots of other things that travel at the same you know, in the same pattern However, it does appear to be a very careful hypothesis test and you may have heard so the study is it says it's a correlational study but I believe it's actually a little too cautious on this front you

**Heather** 48:01

know that the correlation being he's mapped cases I believe it's just active cases known in various parts of in zip codes I think it is in New York City and also then looked actually maybe I can pull this up he's got he's got a lot of good maps. Okay, so I want to put this back up just so sorry to interrupt Brett but just so people can see what one of the things he's done is he's got new reported cases in Manhattan as the red dots here. And then the sky blue bars are turnstile entry so entries at turnstiles in the subway system from March 1 through April 4 I guess where you see that no structures were in place I believe that first week of March and then it starts to decline and it declines quite a lot and later in the paper he's got this divided up into the five boroughs and also looking at differences he does he does he uses up a lot

**Bret** 49:03

See if you can find the map he says actually particular lines are suspect in

**Heather** 49:10

this one I'm nowhere else when not yet sec. Keep going once a lot of fascinating maps in this paper also shall I shall say why are we that's one of them's This is one line. This paper is also very funny. Yeah, he uses humor in a way that you don't tend to see in academic papers usually, presumably it's peer reviewed out.

**Bret** 49:34

Yeah, I mean, I guess this is part of what I'm reacting to is that there is something that has become more honest about the way people are writing in this context. And so anyway, keep scrolling a little bit. I will just say in

**Heather** 49:48

you want a different map. Yeah, you want the map that intersects the two lines. Sorry, probably giving people vertigo.

**Bret** 49:54

Yeah, we are probably giving people vertigo. Yeah. So

**Heather** 49:57

okay, so Exactly. Show this one.

**Bret** 50:01

It's a little hard for me to parse which which map this is, but it doesn't really matter. The point is, we have a correlational study, you have probably been told that correlation does not imply causation. That is a lie. I am sorry, somebody hurt you that way. The truth is that correlation does imply causation when that correlation maps onto a pre existing hypothesis, as it does here, that does not say that this locks down the question that this is causal, but it does say that this is strong evidence of a causal link, because the hypothesis was being tested by the paper,

**Heather** 50:38

just with regard to correlation does imply causation when it maps onto a pre existing hypothesis, that does not require that the data didn't exist, at the point that the hypothesis was formulated. Without the person formulating the hypothesis was not aware of the data, exactly. The information was out there. This guy Harris said, I've got an idea, I've got a hypothesis, I think that it was about subway ridership. That that is related to that that was causing New York City to be such an epicenter of an outbreak. And that he then went having made the prediction into the data and use the data to effectively effectively test the hypothesis. Although he doesn't make such a broad claim here. Yep,

**Bret** 51:22

he's a little more cautious than I think he needs to be. But he even discovers patterns within that not only are particular subway lines, implication implicated, but the local trains are apparently a particular source of infection if this hypothesis is correct. And the reason is, basically, that local trains keep you in contact with other people longer. So a local drain is one that stops at each of the stations along the way. And so if you're going a long distance on a train, and there are no express trains, you get on the local train, and you're on it longer, because you're stopping at each thing, which also means you're being exposed to more people.

**Heather** 52:02

Maybe this is obvious to people. But you know, it wasn't to our children, we were talking about this last night, you know, if you're going from A to G and an express train takes you, you get on an A and it doesn't stop until you get to G that's quite different from a local train, where it'll not only take you longer, which is why people usually don't like the local trains, if they know they're going all the way to G. But if it stops at B, C, D, E, and F on the way, there are many more possible transmission points along the way.

**Bret** 52:26

Yep. And you will have been exposed to many more people. Right? That's

**Heather** 52:30

the transmission points. Transmission points. Okay. So blue points. Now,

**Bret** 52:34

in any case, what he concludes in this paper, is that the reaction of the Transit Authority doesn't blame them, because they didn't know what he what we now perhaps know. But he says the reaction was the wrong one, which was to make all trains local, and to reduce the number of trains to discourage ridership. And the point is, if the mechanism here is right, then the best reaction would have been to increase the number of trains and express trains beat local trains, because you're less likely to be infected in them. He also points out that the fact of trains interacting with the epidemiology here is also strongly suggestive of economic factors. And people have been trying to chase down what are the economic factors that have certain populations more afflicted than others? And here would be an obvious one mass transit. Yeah, if you're condemned to mass transit, and you have a job that you can't afford to not go to because you know, you're depending on it economically, week to week, then you have a recipe for disaster in some parts of town and not others. And apparently,

**Heather** 53:45

the Transit Authority started cleaning trains twice a day. His point also in the article is, you know, what, more trains? Still with the hope that there is no, that there is far reduced ridership over time. But at the end of each line, the train should be being cleaned completely.

**Bret** 54:04

Yep. Now, last point on this, I did read one report, which reflected something I had been wondering about whether somebody needed to invent this. And apparently, in Asia, there are already UV robots and sanitizers that are being used to do things like clean buses and things. So things like that could be very helpful. I also strongly suspect that h vac systems are going to turn out to be a major villain here and that's

**Heather** 54:35

100% we actually have begun already to see that that information, and it's not only predicted by the information from tuberculosis outbreaks from a century ago, but

**Bret** 54:45

and how easy a problem is that to solve right because basically, to the extent that air is being captured in one place and filtered through some system and then pumped back out elsewhere, that air is under your control and What you basically need to do is expose whatever passes through it to extreme enough circumstances that viruses can survive, be it UV light, be it electron, magnetic charge, whatever it would be.

**Heather** 55:12

Again then so we have mass transit, which now it's mostly subways and trains and buses. But before the massive lockdowns was obviously plants, we know that planes were the major transmission agent, at least between continents, and probably within states, between states as well. But yet one more reason. Go outside, be outside when you can, because your h vac systems are going to be pushing stuff around in ways that we do not we do not yet have control over

**Bret** 55:39

Yeah. So all of this suggests that there will be arbitrary features of life that differ between places that will have important epidemiological impact. And one way to think about it is that there are different kinds of reproduction for a pathogen, right? The fact that is it more true if this paper is accurate? Is it more true to say that, that SARS Cove two is transmitted largely through aerosolized particles or by subway? Right? The fact is it actually it's different scales of transmission, right? And a virus that's really successful like this one is one that is utilizing many different modes of transmission over many different scales. And yes, it always has to go from person to person, except in the rare case that it goes to some other creature, but person to person. When that person is in transit over and ocean is obviously its own. its own hazard. absolutely need to start thinking at these multiple scales simultaneously.

**Heather** 56:48

Yep. All right. Well, that's about an hour, right?

**Bret** 56:53

I think we've, we've done it and we'll be back.

**Heather** 56:57

Okay, we'll be back in maybe 15 minutes or so to do an hour of q&a addressing your super chat questions.

**Bret** 57:04

All right. See you then.