COVID Information Commons (CIC) Research Lightning Talk

Transcript of a Presentation by Dinesh Bojja (Yale University) September 23, 2024

Title: Sufficient COVID-19 quarantine and testing on international travelers from China

YouTube Recording with Slides

September 2024 CIC Webinar Information

Transcript Editor: Lauren Close

Transcript

Slide 1
Thank you everyone, for being here today. My name is Dinesh Bojja. I'm an undergraduate at Yale University. Today, I'm happy to be presenting my project: "Sufficient COVID-19 quarantine and testing on international travelers from China." As mentioned before, I've been working on this project with the Townsend Laboratory at the Yale School Public Health and I'm excited to be presenting it today.

Slide 2
As I'm sure we're all aware, the SARS-CoV-2 pandemic has left a lasting impact on our global society. As of September, there have been over 776 million cases of COVID-19 that have been reported, with the true prevalence of infection potentially being even higher, with many cases not being reported by any government agencies.

Slide 3
One particular response to the COVID-19 pandemic that was particularly interesting was in China, where they used what was called the Zero COVID policy. The Zero COVID policy was meant to mitigate the effects of the SARS-CoV-2 pandemic using strict lockdowns, contact tracing, and mass testing of all Chinese citizens. While China did report fewer cases than other nations using this policy, due to food shortages, economic damage, and social strain, many Chinese citizens were discontent with the rollout and started protesting. As such, in December 2022, China completely repealed all of the policies regarding zero COVID, leading the country back to where it was before.

Slide 4
However, many scientific journals and news outlets began to question whether that this was the right move, suggesting that potentially by repealing the Zero COVID policy, China had maybe caused more damage than it did before.

Slide 5
Accordingly, in December 2022 and January 2023, China had seen hundreds of millions of cases of COVID-19. With fear that this increase of infection within China would translate to an increase of infection within their own borders, many foreign countries imposed harsh travel restrictions on Chinese travelers, requiring testing and quarantining and even banning Chinese travelers altogether. We wanted to determine whether this strict quarantine was actually necessary for some of these countries, which may already have a high prevalence of infection within their own borders.

Slide 6
To analyze this we use what was called the Sufficient Quarantine Model.

Slide 7
The Sufficient Quarantine Model aims to find this optimal quarantine and we define the optimal quarantine as a minimum duration such that the number of infections with travel and without travel are completely equalized. This model, developed in my Lab in a paper published by Wells et al, defines a more quantitative public health modeling method to determine what this quarantine should be rather than justifying quarantines through political, social, and economic means.

Slide 8
To break down what this model really looks at - it takes a country- for example, some origin Country B, and looks at a destination Country A. We want to see what quarantine that Country A should place on travelers from Country B so that the number of infections within the destination country (Country A) will make sure that there's no increase of infection of the travel, not necessarily to mitigate the most infections possible.
We start defining where these infections are coming from, whether they're coming from people who live in Country A, from travelers from Country B, or from travelers mixing between the two countries overall. By determining where these infections are coming from and determining what quarantines will affect which specific cases, we're able to find a graph like this.

Slide 9
This model provides us on the X axis the quarantine duration and on the Y axis the imminent infections (the number of new infections per day and the destination). This graph particularly

looks at Italy and and what would happen if it placed quarantine on Chinese travelers, which we'll get into a little bit more later - the country specifics. What this model really shows us is the effect of such quarantine would have on different nations. Importantly, this red line (horizontal) represents the number of infections in a country at baseline, or if there was no travel whatsoever. It makes sense that this line is horizontal, as an increase in quarantine duration with no travel would really have no effect on the imminent infections. The rest of the lines represent some sort of testing regimen using RT-PCR, rapid antigen, or no testing whatsoever, and have a decreasing trend. This also makes sense, as an increased quarantine duration would mean that all the individuals who are in quarantine would be cured of their disease and would go into the country and: 1) transmit few infections and 2) have natural immunity which would increase that herd immunity and decrease the susceptible population. In essence, what we're looking for in this type of graph is where these testing regimens intersect with this horizontal red line. In this specific case, there is an intersection at 10 days. That tells us that a sufficient quarantine would be about 10 days for Italy against Chinese travelers. Any stricter, and Italy would be placing too strict of a quarantine, wasting resources that could be used for more beneficial methods. Any less strict, and they would potentially be increasing the number of infections within their own borders.

Slide 10
Now that we understand how this model works, we can look at what type of data we need. Frankly, it's pretty simple and able to be done by pretty much anyone. All that's necessary is: the vaccination rate, the total population, immunity level prevalence, and the travel between the countries.

Slide 11
With this simple data, we're able to find out what the sufficient quarantine would be for different countries.

Slide 12
We specifically focused on China after the Zero COVID policy was repealed. Looking at the week of February 12th in 2024, we can see in both European countries and East Asian countries, the minimum sufficient quarantine varies significantly.

Slide 13
Looking at England, we see that some countries, like Scotland, England, and Germany require a low sufficient quarantine to prevent an increase of infection. Countries like France and Italy require a much stricter quarantine.

Slide 14
Similarly, we can see a trend with Japan, Singapore, and South Korea, which sometimes require no days of quarantine to prevent an increase of infection, whereas Vietnam, Thailand, and the

Philippines require a strict quarantine. This really shows that geographic location doesn't have as much of an effect as we thought with regards to the increase in quarantine. Rather, it's more based on the specific statistics that we'll go into more detail about soon.

Slide 15
We are able to also bring this graphical data into a table format, which makes it easier to see what this intersection looks like. We are able to stratify between what the different testing regimens are, whether we're using no test, an RT-PCR, rapid antigen on exit, or rapid antigen on entry and exit. The chart is split between how we're getting this prevalence data for trends. Specifically, whether we're using the World Health Organization or self-reported data. A really important characteristic that we'll get into when we start talking about the implications is that the self-reported data suggest a higher quarantine level than the World Health Organization data. Additionally, all these different testing regimens seem to have a slightly different suggested quarantines, implying that different countries need to examine what type of regimen they're putting on different travelers in order to make the best public health decision they can for their constituents.

Slide 16
We see a similar trend here, as some countries (like Vietnam and Thailand) have different suggested quarantines depending on the type of testing regimen that they're using.

Slide 17
The important thing about this model is not just the quarantine it suggests, but also the implications it has on policy and what characteristics we need to examine for this and future pandemics. This will enable us to make a really educated and informed decision moving forward.

Slide 18
By far, the most important characteristic on determining the minimum sufficient quarantine are going to be travel metrics, the volume of travelers, how long they're staying, and how many people are traveling as a whole. Countries with a really high rate of travel like Vietnam and the Philippines are obviously going to need a much harsher quarantine, which is why they even suggest no travel whatsoever. This is because there's just such a high volume of people coming in - they need to protect their constituents by having a stricter quarantine. Countries with fewer people traveling, like Scotland, don't need as strict of a quarantine because there's just such a small volume overall. Prevalence of infection within the destination country also has a really strong impact as a high prevalence in the destination actually means that they need a lower quarantine. This is because, for example in Japan or South Korea, they have so many people who already are infected, any new infections coming in is like a drop in the bucket. It really doesn't make that big of a difference. Finally, the vaccination rate. This doesn't have as much of an effect as we expected originally. This could potentially even have a counterbalancing effect. A softer

quarantine could be necessary with a high vaccination rate because, well, there's going to be more people who have immunity within the destination country. A high vaccination rate could also necessitate a stricter quarantine because if the destination has, per se, 100% vaccination, any incoming travelers could actually increase the susceptibility rate by introducing people who don't have this immunity. So there's this counterbalancing force that makes it really important for us to have a quantitative method to determine what the sufficient quarantine should be rather than going off of this political or social methodology.

Slide 19
Second, as we alluded to earlier in this presentation, it's important for us to have accurate and timely data to make effective public health interventions. There were some reports that suggested that the World Health Organization's statistics for prevalence of COVID in China may not have been representative of the true infection rate. The World Health Organization statistics suggested a prevalence of about 0.006% which is significantly low considering that China was the epicenter of the COVID pandemic and many citizens within the country had reported a lot more COVID than was suggested. One specific article by Novazzi et al suggested that the prevalence might be as high as 22.7%, looking at Chinese travelers to flights in Milan. We opted to use a middle ground estimate from a paper by Fu et al which looked at self-reported infections by Chinese citizens, which gave an prevalence of about 0.1%.

Slide 20
When we look at this different data, looking at the World Health Organization versus the self-reported metric, we see that there's a significant change in the suggested quarantine. For Scotland, for example, with an RT-PCR, the World Health Organization suggestion gives about zero days of quarantine, whereas a self-reported data suggests three full days. This means that countries need to have accurate and timely data so they can make a strong public health decision. If not, they might be inviting more infection than they would have otherwise or might be making incorrect judgment calls. Without this accurate data, countries really have no bearings on what type of public health interventions are necessary.

Slide 21
Finally, the minimum sufficient quarantine model really provides a helpful tool not only for this pandemic but for future pandemics as well. It's very easy to use and is able to help use all the data that different individuals have - from the government level to the citizen level - to determine what type of quarantine is actually necessary. It can be adapted to future pandemics as well and for different pairs of countries, making it truly versatile and use and usable in a prophylactic setting as well. The model is, by nature, very conservative, suggesting the strictest possible quarantine that a country could possibly need to prevent an increase of infection specifically due to travel. This allows other resources that could be used in quarantine to instead be used for other methods, like case finding and tracing. This will allow countries to best allocate their resources.

Slide 22
Thank you again for listening and I'm happy to take any questions.