Addendum Needed on COVID-19 Travel Study

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Kiang et al. (2021) "Routine asymptomatic testing strategies for airline travel during the COVID-19 pandemic: a simulation study"¹ is one of very few studies available to inform policy makers in Hawai'i on the efficacy of different testing and quarantine strategies for preventing new introductions of SARS-CoV-2 variants into the island populations.

Their primary endpoint—the cumulative number of infectious days—is proposed to measure the population-level risk to the destination population from importation of infection due to travel. However, their tallies include infectious days *prior to travel*, which do not expose the destination population. To count only exposures to the destination population, the tally should start on the day of travel. Such a tally is shown in Figure 1(A) which overlays graphics from their Fig. 1. Aligned are the curves for No Testing and Strategy 1 ("PCR test within 3 days of departure") so as to start the count of infectious days on the day of travel. By this measure, the 3-day pre-travel test reduces the days of exposure to the destination population by only 20% relative to no testing, less than the reported 36% reduction which counts pre-travel exposure days.

Another confusion comes from the tally of infectious days during the 5-day postarrival quarantine simulations. Figure 1(B) overlays their Strategy 1 with Strategy 2 ("PCR test within 3 days of departure and PCR test on day 5 after arrival, with 5 days of quarantine upon arrival"). It shows that quarantine has no effect on the cumulative days of exposure until day 5 and after. For some reason they include the travelers' infectious days during 5 days of quarantine in the cumulative count even though these days are not exposing the destination population. If the infectious days during the 5 day quarantine period were excluded, the reduction in exposure to the destination population under Strategy 2 would be far greater than the 70% reported in the study.

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It would be helpful for all those who need to evaluate different testing and quarantine strategies to reduce the importation of SARS-CoV-2 into island populations if the authors would produce an addendum in which the exposures of the destination population were explicitly counted, which would require (1) cumulative number of infectious days be counted only starting the day of travel and afterwards, and (2) infectious days during the 5 day post-arrival quarantine be excluded from the count since they are not exposing the destination population. Most helpful would be to add a table that shows, for each strategy, the number of infectious people on each day of travel.



Figure 1: Overlays of graphics from Kiang et al.¹ Fig. 1: (A) No Testing versus Strategy 1, offset to start count on Day 1. (B) Strategy 1 versus Strategy 2. Strategy labels and day 5 line and label in green added.

Extended Section

In lieu of a Strategy \times Day table as mentioned above, additional quantities can be extracted from the graphics in Fig. 1 from Kiang et al.¹

The values at the 7-day mark are of interest because a mode at 7 days was found for the duration of visits to Hawai'i by the departure study by Hou et al.² A measurement at the 7-day mark is added in Figure 2 for the cumulative days of exposure to the destination population. It shows that **Strategy 1** reduces cumulative exposure by 27% at the 7-day mark compared to an untested traveler population,

which is not greatly different from the 20% reduction measured at the 14-day mark. Comparison of the 7-day and 14-day values of the curve of **Strategy 1** shows that the cumulative exposure to the destination population at day 7 is 60% of the cumulative exposure by day 14.



Figure 2: The same overlay of graphics from Kiang et al.¹ as shown in Figure 1, but with measurements of the curves at day 7 added. It shows that **Strategy 1** reduces exposure to the destination population at day 7 by 27% relative to no testing. Under **Strategy 1** the cumulative exposure by day 7 is 60% of the cumulative exposure by day 14. All additions to the original graphics are colored green.

The effect of adding 5 days of quarantine and a second PCR test on the exposure of the destination population is estimated in Figure 3. It shows an overlay is made of No Testing, Strategy 1, and Strategy 2. The offset of Strategy 1 is as in Figure 1 so that the count begins on the day of travel. Strategy 2 is offset so that during the 5 days of quarantine, no infectious days are added to the exposure of the destination population. This is done by moving to the green 0 baseline the point at which the curves of Strategy 1 and Strategy 2 first diverge in Figure 1(B).



Figure 3: Overlays of graphics from Kiang et al.¹ Fig. 1 to include No Testing, Strategy 1, and Strategy 2. They are offset so that (1) the count of exposure to the destination population starts on the day of travel, and (2) no infectious days are counted during the quarantine period for Strategy 2. All additions to the original graphics are colored green.

With these offsets, the measurement of the curves shows that Strategy 2 (5 days of quarantine and followed by a second PCR test) reduces the exposure of the destination population by 83%. Without any offsets, the original quantity from Strategy 2 reported in Kiang et al.¹ was a 70% reduction relative to no testing or quarantine.

It would be ideal if the authors provided an addendum with a table of these quantities, which would obviate the need to resort to graphical overlays as was done here. These re-calculated values for the effects of Strategy 1 and Strategy 2 do not change the qualitative conclusions reached by Kiang et al.¹ In fact they amplify them:

We found that the addition of post-travel testing and abbreviated quarantine of 5 days could provide further benefit at the public health level by reducing importation and ongoing transmission in the destination city, especially if travelling from high to low incidence settings.¹

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References

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