Round 2: Debrief group notes

- Report interesting facts relevant to immunity/herd immunity
- Important risk considerations
- Important timeline considerations
- Relevant costs associated with pandemic treatments
- Details to share with larger group

Wed/Fri

Team name	Notes

Team Antibody:If	• Herd Immunity: If certain amount of pop. gets vaccination, then population as a whole will get an immunity (~70%) -> COVID eradicated/ controlled
	  ○ Experts say that by April, 2021, U.S. can establish herd immunity.
	  ○ 15% of children cannot be vaccinated, so 90% of healthy adults need to be vaccinated to reach 70% herd immunity goal.
	  ○ Depending on R0 value, the population percentage needed for herd immunity could differ.
	• Vaccination: different vaccination available
	  ○ Options: mRNA (human ribosomes code spike protein from mRNA), adenovirus (viral vectors), inactivated COVID, protein-based, etc.
	  ○ Costly ($3-37 currently, could be more expensive later when government purchased doses run out). Individuals not responsible for cost. Government has given billions to vaccine manufacturers (1-2 billion each) for research, production, and purchase of doses
	  ○ Illness will continue to be endemic b/c of mutation to avoid vaccines, waning immunity, and poor vaccine distribution
	• Immunity through Infection:
	  ○ Reinfection can't achieve herd immunity even those their body produce protective antibodies
	  ■ Vaccines may be able to
	  ○ Those who are re-infected will most likely be asymptomatic
	  ○ Only 3/1400 were Reinfected in one of the studies.
	  ○ Infection offers comparable immunity to vaccine (~90% effective)
	  ○ Unknown how long immunity from infection lasts, but at least several months
	  ■ Approximately 6months
	• Therapeutic Antibodies:
	  ○ Bamlanivimab: This therapy was only useful for COVID-19 patients with mild to moderate symptoms in terms of reducing hospitalization rates. The

	opposite was true for patients with severe symptoms (i.e. require oxygen therapy), which is a risk consideration. ■ What it is: monoclonal antibody that is specifically directed against the spike protein of SARS-CoV-2, ■ hospitalizations and emergency room visits occurred less frequently for those treated with Bamlanivimab: 3% of bamlanivimab-treated patients vs. 10% in placebo-treated patients. ■ Cost: $1,250 ■ Created by Elli Lily ○ Combinatorial therapies (combining 2+ monoclonal antibody treatments) have been effective in limiting hospitalizations and deaths of high-risk Covid-positive patients, but aren't widespread b/c limited access, limited safety data ■ Created by Regeneron
Team B cell:	● Herd immunity for COVID-19 is around 70% because the R0 value is 0.33 ● WHO suggests that vaccine immunity may not last over a year ● Some experts suggest that herd immunity may be closer (April) ● mRNA vaccines from Moderna and Pfizer, J&J has one shot adenoviruses, inactivated viruses have lower efficiency ● For herd immunity, the percent effectiveness has to balance out; lower efficiency would not work ● Therapeutic Antibodies: only authorized for certain groups of people. If used in unauthorized groups, it would worsen severe cases. Only to the people who would benefit from it. ● The antibodies have to be administered through IVs so that creates barriers for people. ● Immunity through Infection: Once you've had COVID, you can be 90% immune for 6 months (maybe more?). Comparable to vaccine immunity. Reinfection rate: 0.3%, which is 10x less than primary infection rate. And those who were reinfected were asymptomatic. ● The infusion time for the combination therapy initially took 1 hour (by IV), but was reduced to 16 minutes. This introduced a barrier for some people who couldn't dedicate this time. ● This therapy was only useful for COVID-19 patients with mild to moderate symptoms in terms of reducing hospitalization rates. The opposite was true for patients with severe symptoms (i.e. require oxygen therapy)
Team CDR:	● Herd immunity depends heavily on the R0 value and is calculated based on R values (number of people that we expect a sick person to infect)

	○ Herd immunity value heavily dependent on infectivity of the disease ● For a vax that's 90% effective you need to reach at least 55% of the population. That number changes depending on how effective the vaccine is. ○ For a vaccine that's 95% effective, we add that remaining 5% to the baseline herd immunity ● Risks: ○ Antibody treatments/infusion: potential health risks from infusions as long as 1 hour, but has now been reduced to 16 mins, but people still view as risky ○ Antibody treatment is shown to be better than the placebo but it is still potentially unsafe due to the accelerated timeline and emergency authorization from FDA ○ Herd immunity: what about people who cannot afford to get sick (are immunocompromised) ● Vaccine administration is the most ethical to minimize suffering. ○ Some potential issues include the fact that vaccines are not approved for children and certain people cannot receive the vaccine. → requires that healthy adults (90%) get the vaccine but it's hard to ensure compliance (*health officials generally need to overshoot to get the numbers they want) ○ Additionally, the supply of the vaccine is currently limited. Don't know how long immunity lasts after administering the vaccine. ● Neutralizing antibodies are less able to recognize variants, while vaccine antibodies are more able to recognize a wider variety of variants. ● Timeline: ○ Naturally occurring antibodies remain in the ○ Herd immunity is projected by April and that things will be mostly "normal" by Christmas (given that we reach the immunization percentage by the summer). There is a lot of difference in projections. ○ Natural immunity is higher than we think because our data is an underestimate of the number of cases/people infected. ■ Also accessibility issues -- many barriers to testing for low-income populations that have a high risk of being infected ← significant portion of the population unaccounted for ○ Trying to get antibody therapies out as soon as possible. ○ COVID will become endemic over time. Infection levels will be very low in some places and much higher in other places. ● Costs:

	○ Antibody treatments are very expensive ($1250 per dose). Company struck a deal with the government to provide the doses. The company wants it to be free but it generally is not. ○ Drug is given to positive cases but not incredibly ill. Is it worth it to avoid going to the hospital or just risk it? ○ Cost of developing the vaccine and distributing the vaccine (not generally accounted for). Pfizer vaccines need to be refrigerated and it is unclear who pays. What about training faculty? Currently the vaccine is free but for how long? ○ How will we be able to sustain the economy as the vaccine rolls out? The process of vaccination can be much longer than expected. ● Extra information ○ Focus on giving vaccinations to people who have never been exposed. Hold off vaccinating people who have gotten sick until all vulnerable seniors are vaccinated. That way you can maximize efficiency and immunity.
Team (Ab)Diversity:	● One article says herd immunity by April (and we actually don't know how many people have gotten COVID. Because of that, we are probably doing better than we think we are). Another article says that in Oregon, based on the current rate of vaccination, we won't have herd immunity until Christmas 2021. It really varies. Even to get to herd immunity, in Oregon, they probably need 90% of all adults to get the vaccine (yeah no). (tl;dr it's specific to where you live). Texas and Mississippi have already gone back to normal (herd immunity through everyone getting sick af). ● Immunity through infection: when you get infected, you test positive for 30 days and then levels drop. Immunity in England has lasted since six months ago. They are tracking the antibodies. They prefer the vaccine to be widespread. ● Most of the vaccines function how you inject into the body, which goes into cells. Then cells receive mRNA and build spikes on the outside of the cell. And then, if these vaccinated cells are killed, then the spikes break down and the debris goes out. ● Antibodies: we sort of have antibody treatments that have been approved for emergencies. Too expensive (only for mild or moderate cases to prevent from becoming severe), so only to prevent people from having to go to the hospital. We don't know a ton about side effects. It's also costly in regards to time. ● Risks: ○ Immunity through infection: people *have* to get sick. The risks don't need to be explained here. ○ Antibodies are new: side effects (? who knows)

	○ The second dose of some shots are pretty hella painful ● Timeline considerations: every place is different, how long will it take to reach herd immunity? As a country, it might seem to occur earlier, but in more rural areas where they haven't been hit too hard, the timeline is longer. ● Simply distributing the vaccinations is yikes. Especially for the two-dose ones like Pfizer and Moderna. J&J is one-dose which is better. ● Relevant costs: federally or not, most of the companies that are developing vaccines have put in $1 billion into development to make it speedier. They think a dose of whichever vaccine is aimed to cost around $3 to $37. ● Details: see above.