

Disclaimer

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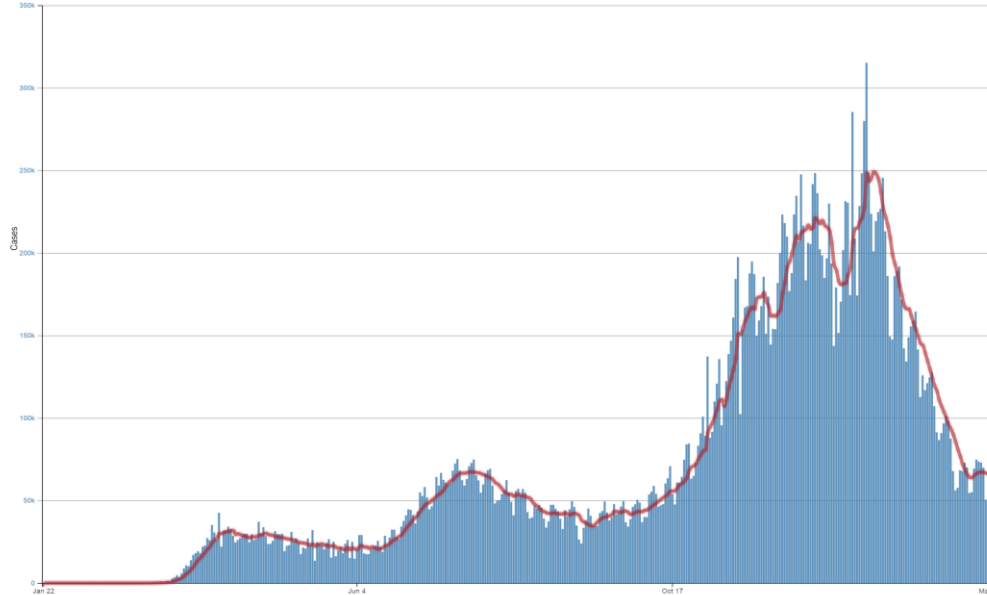
For questions, please contact Paul Benda, pbenda@aba.com

Agenda

- Virus
 - Current status
 - Strains
 - Transmission drivers
- Vaccine
 - Versions
 - Transmissivity
 - Prioritization
 - Production and Distribution Schedule
- Operational Impact of Vaccines

Virus – Status and Spread

Daily Trends in Number of COVID-19 Cases in the United States Reported to CDC



83.1 Million
Estimated Total Infections

70.4 Million
Estimated Symptomatic Illnesses

4.1 Million
Estimated Hospitalizations

Last Updated: January 15, 2021

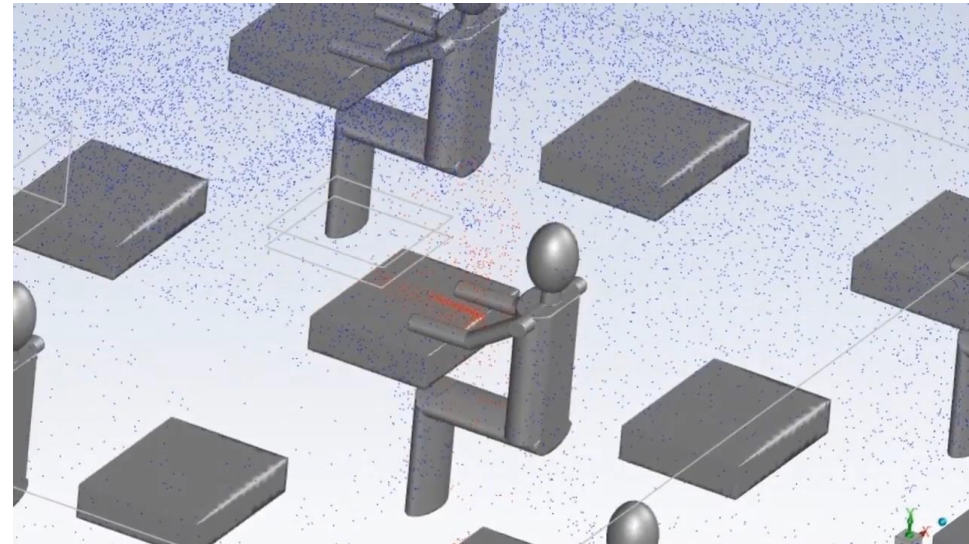
- CDC est. updated January 15th, 2021
 - Use proven model est. annual flu
 - 3/1 estimate **96.2M** adult infections
 - US population over 16 y/o ~266M
 - **36.2%** Adult population been infected
- ~43.9M First doses of vaccination administered as of 2/16/21
 - Use two weeks ago as Moderna/Pfizer provide 60-70%+ after 14 days
 - High estimate ~1/3 vaccinated were previously infected so newly acquired immunity from vaccine ~28.7M
 - Total currently immune = 28.7M + 96.2M = 124.9M or **47%**
 - Recovered and vaccinated immunity strong for D614G and B117 strains
 - Unknown level of recovered immunity from P1 and B1.351
 - **Potentially in beginnings of herd immunity**

Virus – Strains

- Last year predominant US strain was D614G
 - US likely has multiple strains circulating – NY, CA, CO
 - Recently ranked 41st in world in analyzing strains – less than 1% samples
 - Reinfection rare but has been seen in VOCs
- Current Variants of Concern (VOC)
 - B117 - UK strain
 - More infectious ~ 50-75% but vaccines ARE effective
 - Meta study 10-12 UK studies showed higher mortality with caveats
 - FL/CA/TX have highest rates and is growing exponentially
 - Reasonable chance this could become dominant US strain
 - B1.351 S. African and P1 Brazilian
 - E484K mutation in receptor binding domain – does decrease efficacy of vaccines
 - May make those who have recovered susceptible
 - Israel has seen cases of reinfection from B1.351
 - B1.427/9 California strain – more infectious?

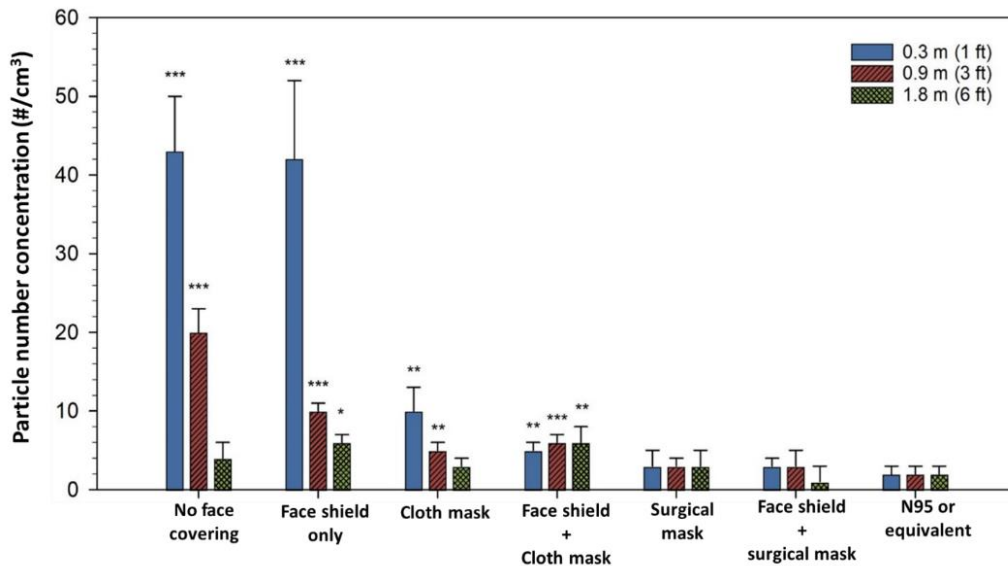
Virus – Transmission

- Schools appear to be safe – Multiple studies including Duke / UNC study on 100k students/staff
 - 32 cases in-school transmission over nine-week period
 - Masks 5 y/o and older and social distancing
 - No cases of child infecting an adult
- The amount depends on the person – India performed 575K person contact tracing study
 - 8% of people responsible for 60% of infections
 - 70% weren't linked to any new infections
 - No known way to know who is a super spreader
 - Illustrates why everyone must wear a mask



Do masks help?

- YES
- If you can reduce the source term, the amount of viral particles someone puts into the air, you reduce the risk for everyone
- Several studies put the efficacy of masks at 75-90% or higher depending on material used (<https://www.nature.com/articles/s41598-020-72798-7>)



Counting (1 to 10)

How do I Travel and Eat Out Safely?

- Driving is relatively low risk
 - Surface contamination at gas stations relatively low
 - Time spent inside getting food/water is relatively low
 - Bathrooms are largest potential risk
- Flying
 - Wear a high-quality mask in the airport and on the plane and wear it continuously
 - Choose an airline that blocks the middle seat
 - Sit in the window seat
 - Have overhead air continuously blowing on you
 - Be careful in the bathroom

- Restaurants

- Indoor dining is a risk
 - Random bad luck could have you downwind of super spreader
 - Viral loads will build and HVAC systems will move virus around
 - Korean coffee house woman infected multiple people
- Outdoor eating with appropriate social distancing and mask wearing staff is relatively low risk – low viral concentration



Vaccines – A (very rudimentary) Primer

- Fundamentally vaccines work by tricking the body into mobilizing its natural defensive capabilities
- Two types of immunity
 - Sterilizing immunity – antibody response completely overwhelms the pathogen and stops infection
 - Effective immunity – prevents severe illness but does allow mild or asymptomatic infections – this is the threshold COVID vaccines must meet
- Immune system defensive measures
 - Antibodies – bind to viral proteins and block infection – they are produced by B-cells – active when immune system challenged
 - B-cells – multiple types – produce antibodies and memory B cells can persist for years and re-activate defenses and produce more antibodies
 - T-cells – multiple types – activate B-cells and also have “killer” T cells that seek out and destroy infected cells
- None of the vaccines can cause COVID

Vaccines - Review

- Pfizer/Moderna
 - Uses mRNA technology – two shot regimen
 - 44,000/Pfizer and 30,000/Moderna - person trial
 - 95% efficacious against **symptomatic** COVID B117 and D614G strains
 - Moderna Phase III trial took swabs **prior** to 2nd dose showed **61.5% efficacy against asymptomatic** infection
 - Recent Israeli study showed Pfizer **90% against asymptomatic infection** 7-days after 2nd dose
 - VOCs not endemic during their US trials
 - Pfizer trial for 12-15 y/o is fully enrolled potential results by June with second study for 5-11 y/o in a couple months and 5 and under by year end
 - Moderna completed 12-17 y/o enrollment and start younger children soon
- Johnson and Johnson
 - Uses AdVac to deliver DNA instructions – more robust / single shot
 - 19,302 US (44%), 17,905 Central/S. America (41%), 6,576 S. Africa (15%)
 - **66% overall** / 72% US / 66% Latin America / 57% S. Africa

Vaccines - Review

- Johnson and Johnson – cont.
 - 85% effective against severe COVID and **increasing over time**
 - Required medical interventions tracked (hospitalizations) and showed 75% decrease after 14 days and **100% after 28 days**
 - Importantly in S. African trial **95% of participants had B1.351 VOC**
 - **81.7% effective** against severe forms of COVID in South Africa
 - No anaphylaxis was observed
 - Follow on trial testing 2 dose regimen 2 months apart due May/June
 - Expected to start adolescent trials in April
- Astrazeneca
 - Adenovirus based like JNJ vaccine – 2 shot regimen
 - A lot of questions – UK / EMA / WHO have approved
 - Appears effective against B117 but questions about VOC
 - US trial underway – unclear whether FDA will approve – results expected in March/April

Vaccines - Review

- Novavax
 - Actually grows and harvests COVID spike protein to create a nanoparticle with spike proteins that is injected along with Soapbark Tree compound that helps immune response
 - Two shot regimen
 - Over 15,000 in UK Phase 3 and 4,400 in S. Africa Phase 2b
 - **89.3% in UK** – 50% of B117 variant
 - **60% in S. Africa** – 93% B1.351 variant
 - 1/3 of trial participants were previously COVID positive and preliminary data suggests there was no difference in subsequent infection rates with B1.351 variant between previously and not infected individuals
 - Potential Phase III results mid/late April and approval in May

Vaccines – Effect on Transmissivity

- Big question – If someone is vaccinated can they still spread the disease?
- All COVID vaccines are evaluated on **effective immunity** not sterilizing immunity
- Some promising data that vaccines do decrease transmission
 - Moderna took swabs **day of 2nd dose** and showed **61.5% reduction in asymptomatic** infections
 - Recent Israeli study showed Pfizer **90% against asymptomatic** infection 7-days after 2nd dose
 - Multiple studies now showing lower viral loads in vaccinated individuals with range of 4 to even 10 times less (mRNA and Adv vaccines)
 - Reduction in infections and lower viral loads should **decrease transmission by ~>90%** for B117/D614G

Vaccine Production – Previous Rate

- Averaged vaccination rates in February
 - Averaging 45-50M administered per month
 - Commercial pharmacies claim can administer 50M a month alone
- CDC recommended Financial Sector be in Phase 1c
 - Phase 1a – 24M / Phase 1b – 49M / Phase 1c – 129M
- Vaccine distribution governed by State distribution plans and county implementation strategy

	Actuals and Est.Administration		First Shots Given in a Month	Cumulative One Shot	% One Shot Vaccinated	Two Shot Cumulative	% Completed Vaccination
	2 shot vax	1 shot vax					
December	3.3		3.3	3.3	1.2%		0.0%
January	29.0		25.7	29.0	10.9%	3.3	1.2%
February	45.0		19.3	48.3	18.1%	29.0	10.9%
March	45.0	10.0	25.7	84.0	31.6%	58.3	21.9%
April	45.0	15.0	19.3	118.3	44.5%	99.0	37.2%
May	45.0	15.0	25.7	159.0	59.8%	133.3	50.1%
June	45.0	15.0	19.3	193.3	72.7%	174.0	65.4%
July	45.0	15.0	25.7	234.0	88.0%	208.3	78.3%
August	45.0	15.0	19.3	268.3	100.9%	249.0	93.6%
September	45.0	15.0	25.7	309.0	116.1%	283.3	106.5%

Vaccine Production – Potential Rate

- Pfizer – 120M March, 100M May and 100M July
- Moderna –100M March, 100M May, 100M July
- Johnson and Johnson – 20M March total 100M by June
- Vaccines delivered by end of February is 100M
- Planned deliveries allow **distribution of 90-140M a month**

	Actuals and Est.Administration		First Shots Given	Cumulative	% One Shot	Two Shot	%
	2 shot vax	1 shot vax	in a Month	One Shot	Vaccinated	Cumulative	Completed Vaccination
December	3.3		3.3	3.3	1.2%		0.0%
January	29.4		26.1	29.4	11.1%	0.0	0.0%
February	48.4		22.3	51.7	19.4%	26.1	9.8%
March	76.0	20.0	53.7	125.4	47.1%	68.4	25.7%
April	90.0	40.0	36.3	201.7	75.8%	162.1	61.0%
May	90.0	20.0	53.7	275.4	103.5%	218.4	82.1%
June	90.0	20.0	36.3	331.7	124.7%	292.1	109.8%

Vaccines – Effect on Operations

- Vaccines protect the individual
 - Still allow infection and potential transmission of the virus
 - In mixed (vaccinated and unvaccinated) environments will need to maintain some forms of mitigation measures
- All have proven very effective at minimizing hospitalizations and deaths
- This is the new normal and will need to figure out long term strategies on how to operate
- Potentially different rulesets for vax vs unvax
 - Allow unmasked meetings at work in isolated conference rooms
 - Allow travel for vax staff members
- Potential to restart conferences in late Q2/Q3
 - Role of testing
 - Hybrid events
 - Will vaccination status be checked/used?

Where do we go from here?

- Cases have plateaued – race between variants and vaccines
- Questions
 - Impact B117 will have
 - Impact other VOC on reinfection rates
 - Vaccination efficacy and transmissivity with VOCs
- Trendlines over the next 2-4 weeks appear to be critical
 - Plateau due to strains, COVID “fatigue”, Presidents Weekend travel?
 - Potential that VOCs cause reinfections and lower vaccine efficacy creates ongoing slow burn
- Perspective from 1.2M person Israeli Pfizer vaccination study
 - 3.7 out of 100,000 after 2nd dose hospitalized with COVID
 - 150 out of 100,000 are hospitalized with flu each year
- FDA published guidance for booster shot trials
- Good news hospitals are catching their breath and most staff vaccinated