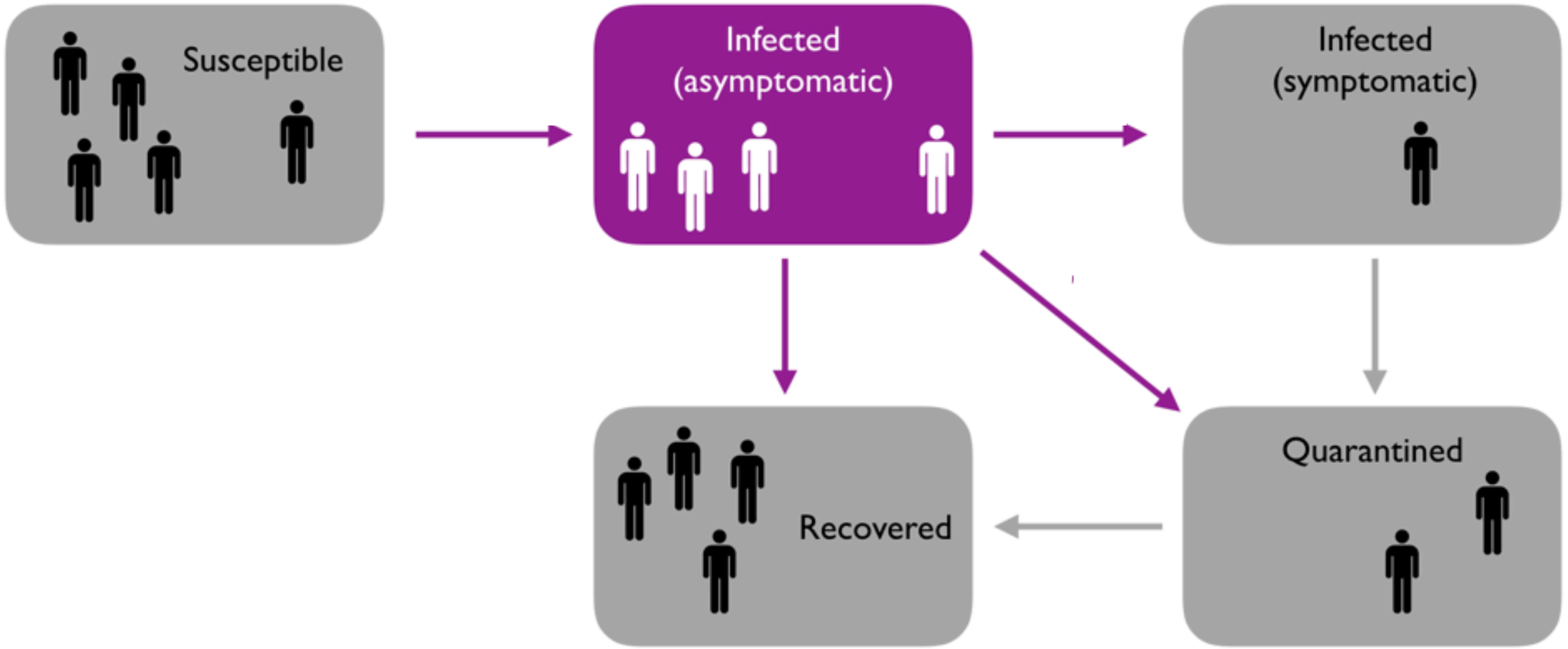
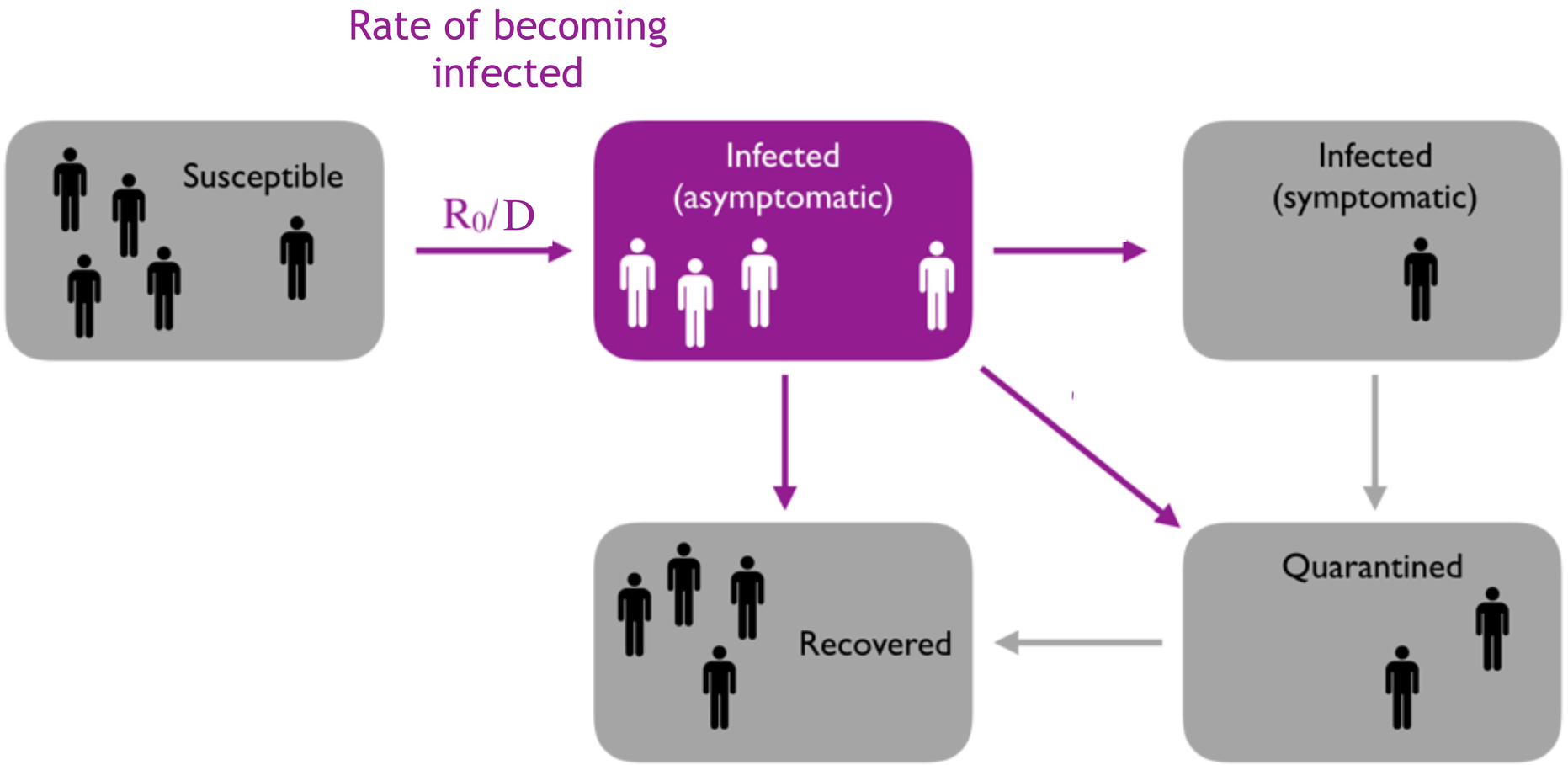
https://idss.mit.edu/research/idss-covid-19-collaboration-isolat/

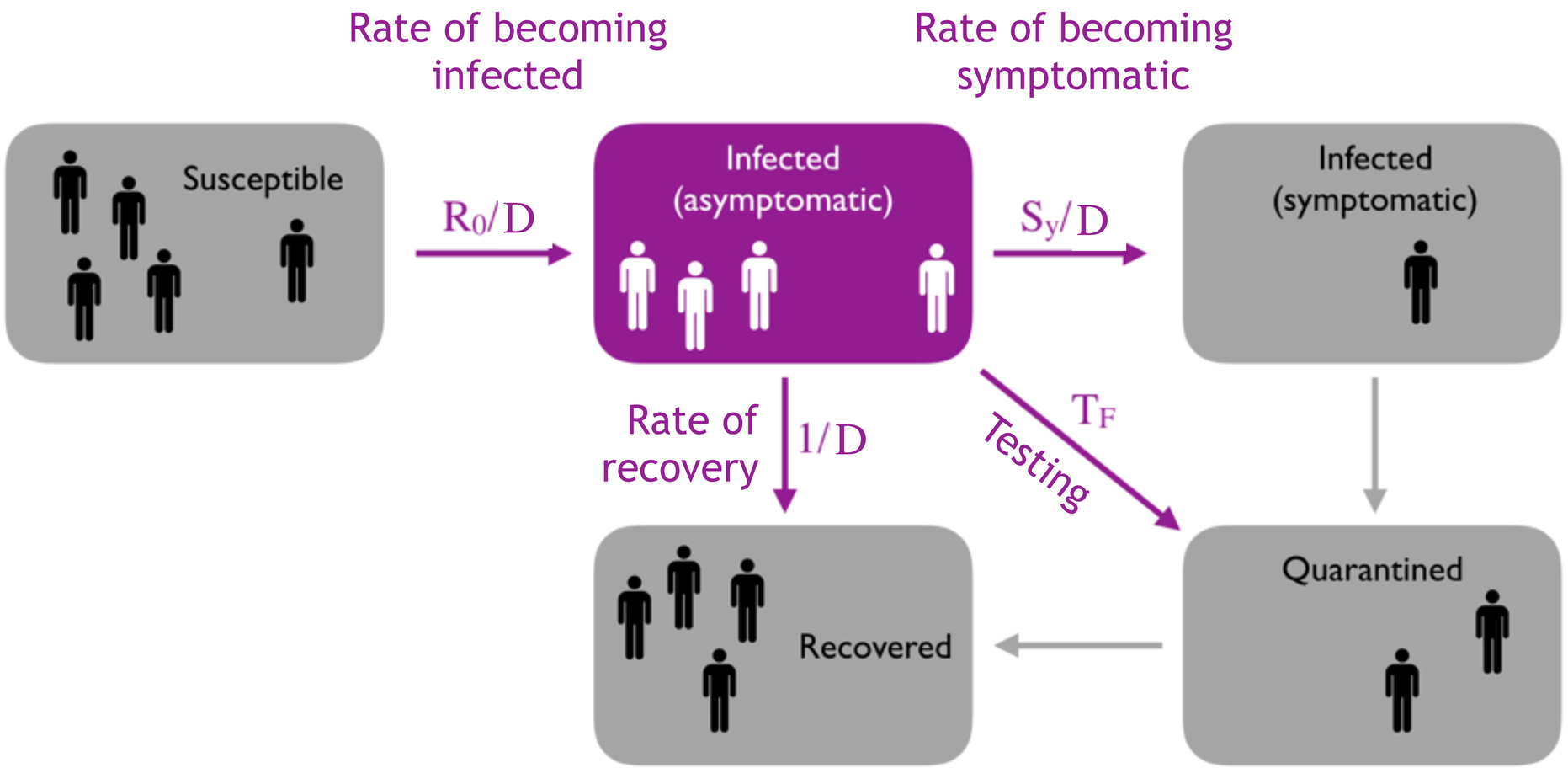
Counting exercise



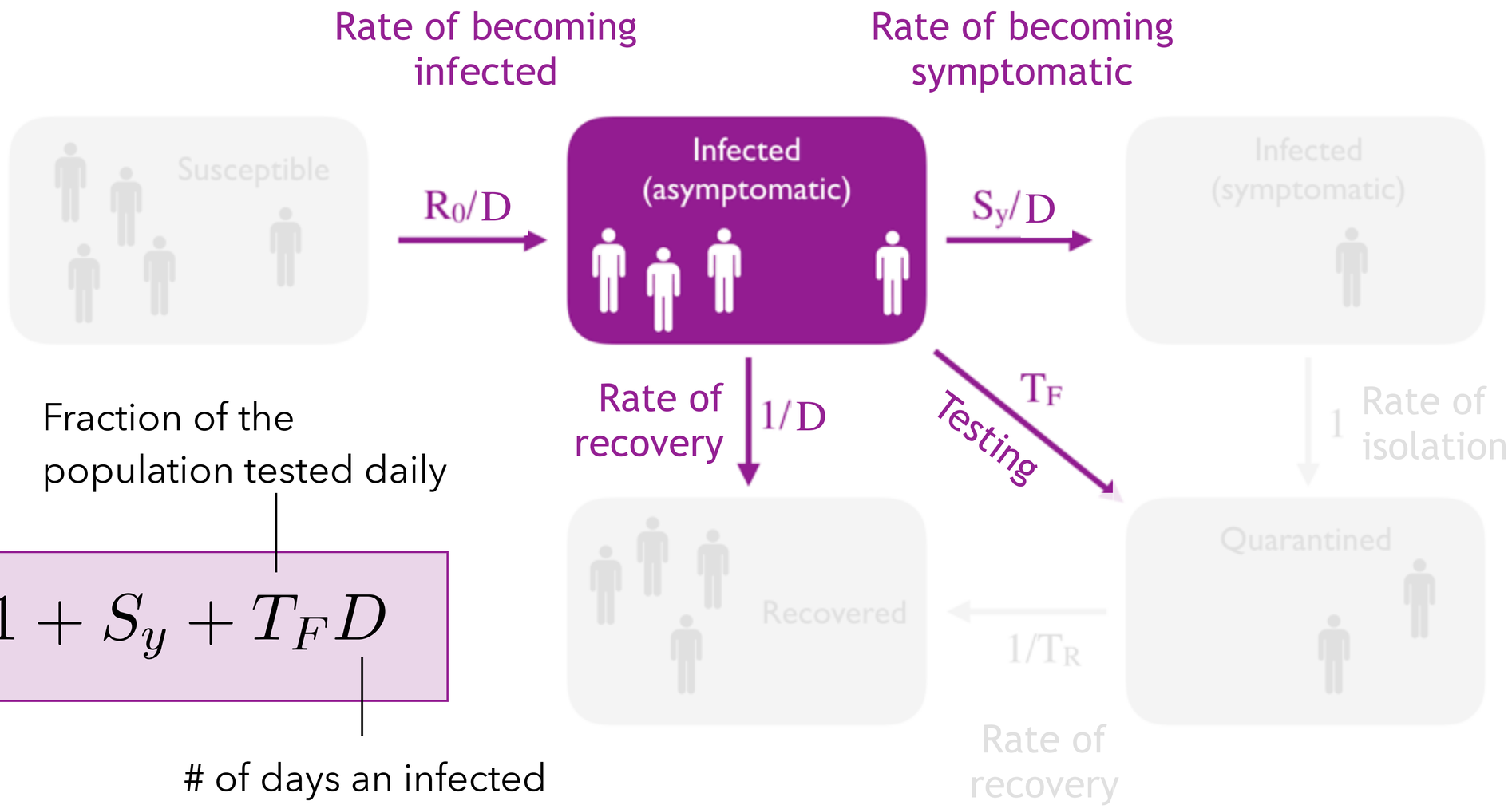
Counting exercise



Counting exercise



Counting exercise



(To account for the sensitivity of the test, s, multiply TF by s)

Fraction of the population tested daily

$$R_0 \leq 1 + S_y + T_F D$$

# of days an infected person is contagious

Levers for control

Rate of moving people ***into*** the purple box

$$R_0 \leq 1 + S_y + T_F D$$

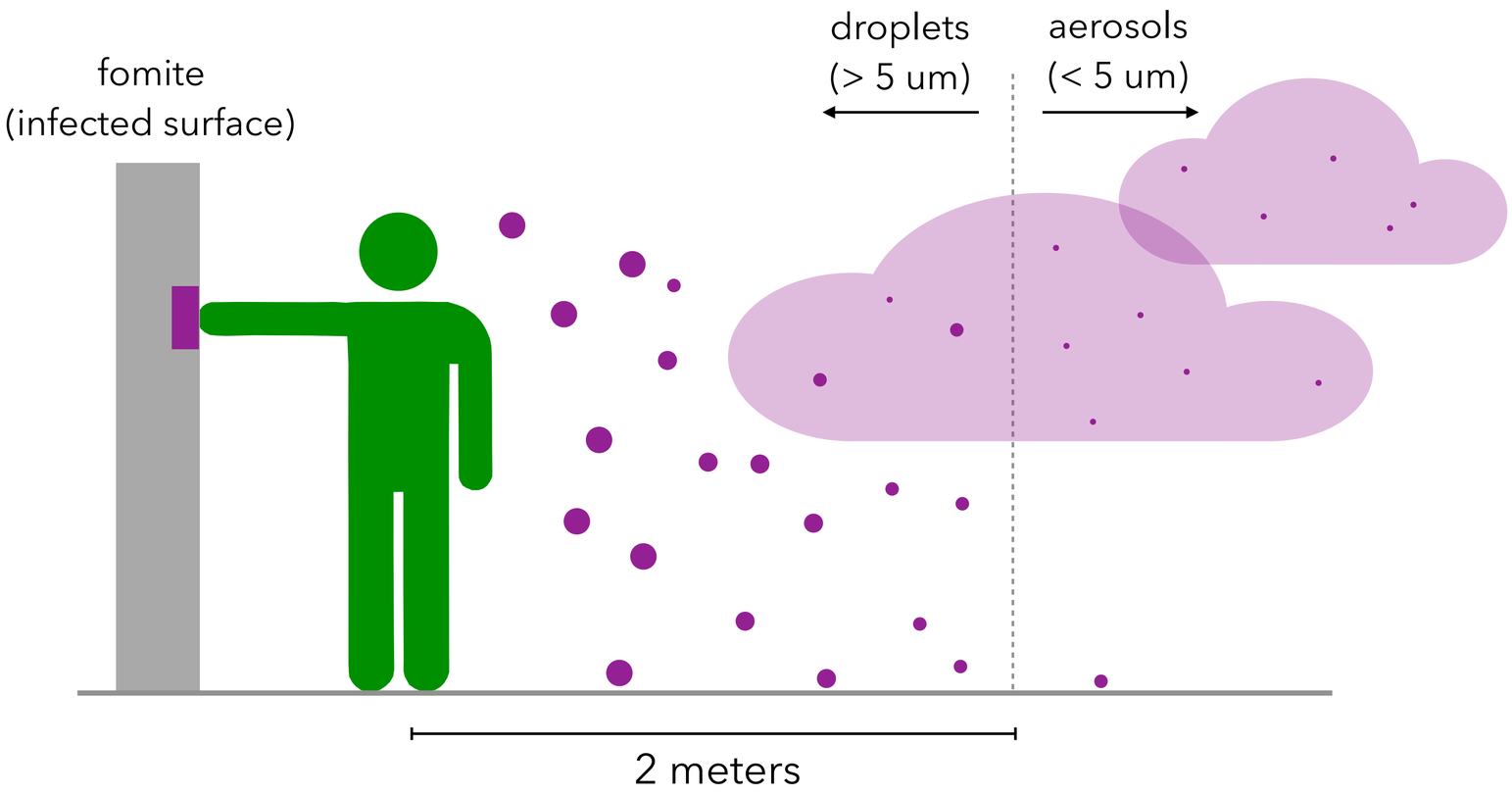
Rate of moving people ***out of*** the purple box

Social Distancing = reduce R_0

- De-densification
- Improve hygiene
- Masks
- Restrict movement/mobility

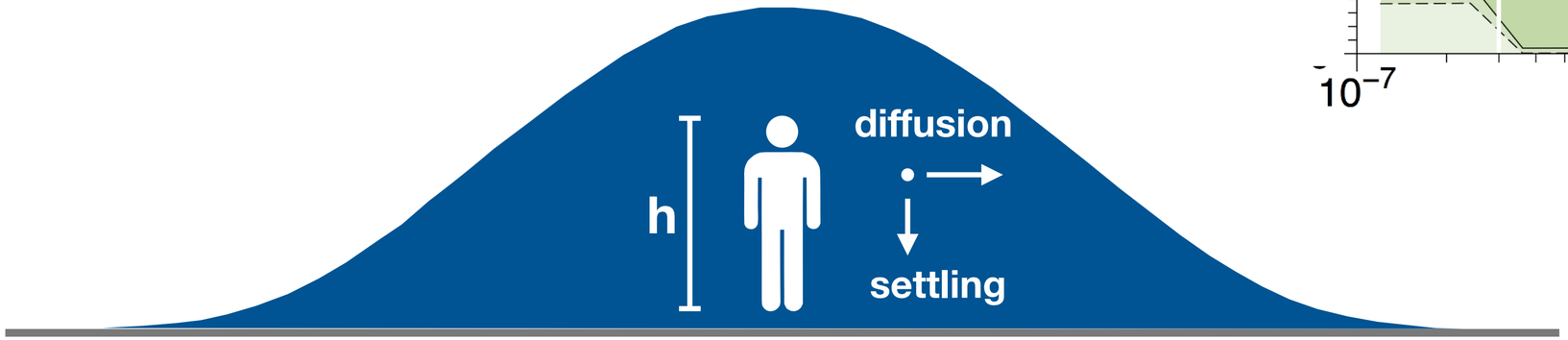
Testing + Isolating:

- Contact tracing
- Find high centrality people (people that infect many others)
- Find high centrality locations (hot spots)
- Health screening


droplets
(> 5 um)
aerosols
(< 5 um)
fomite
(infected surface)
2 meters

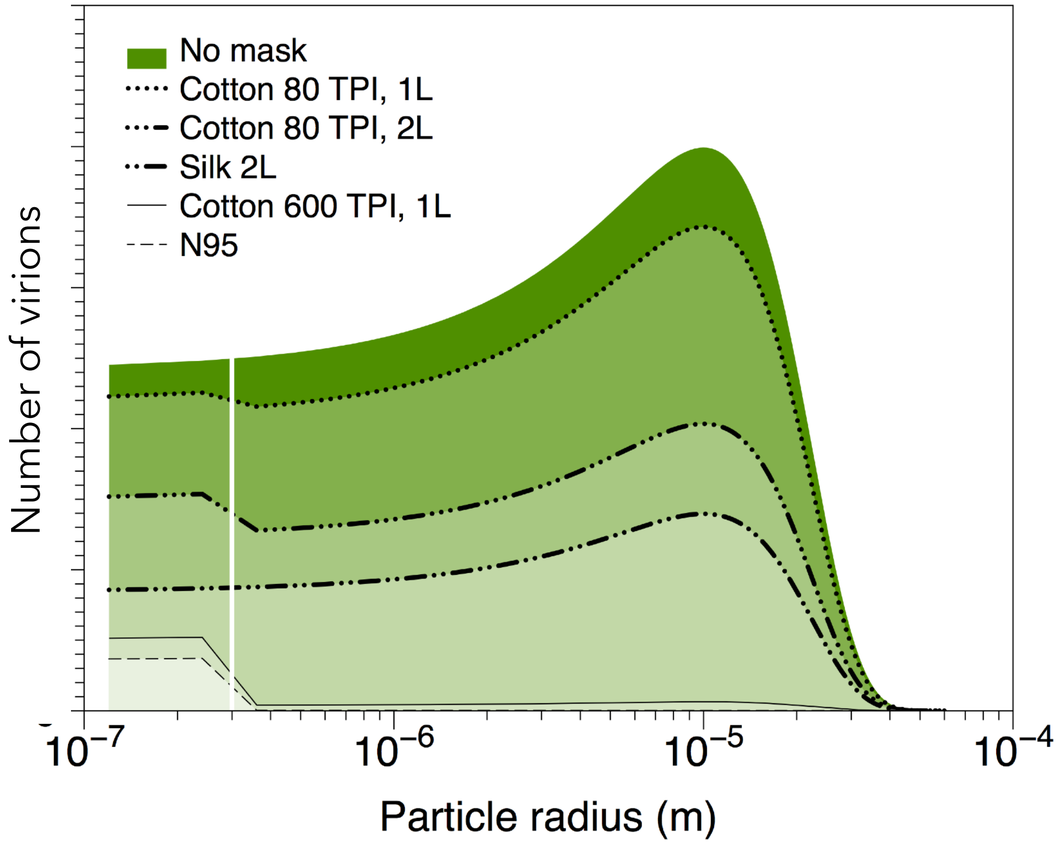
Mitigating spread via droplets

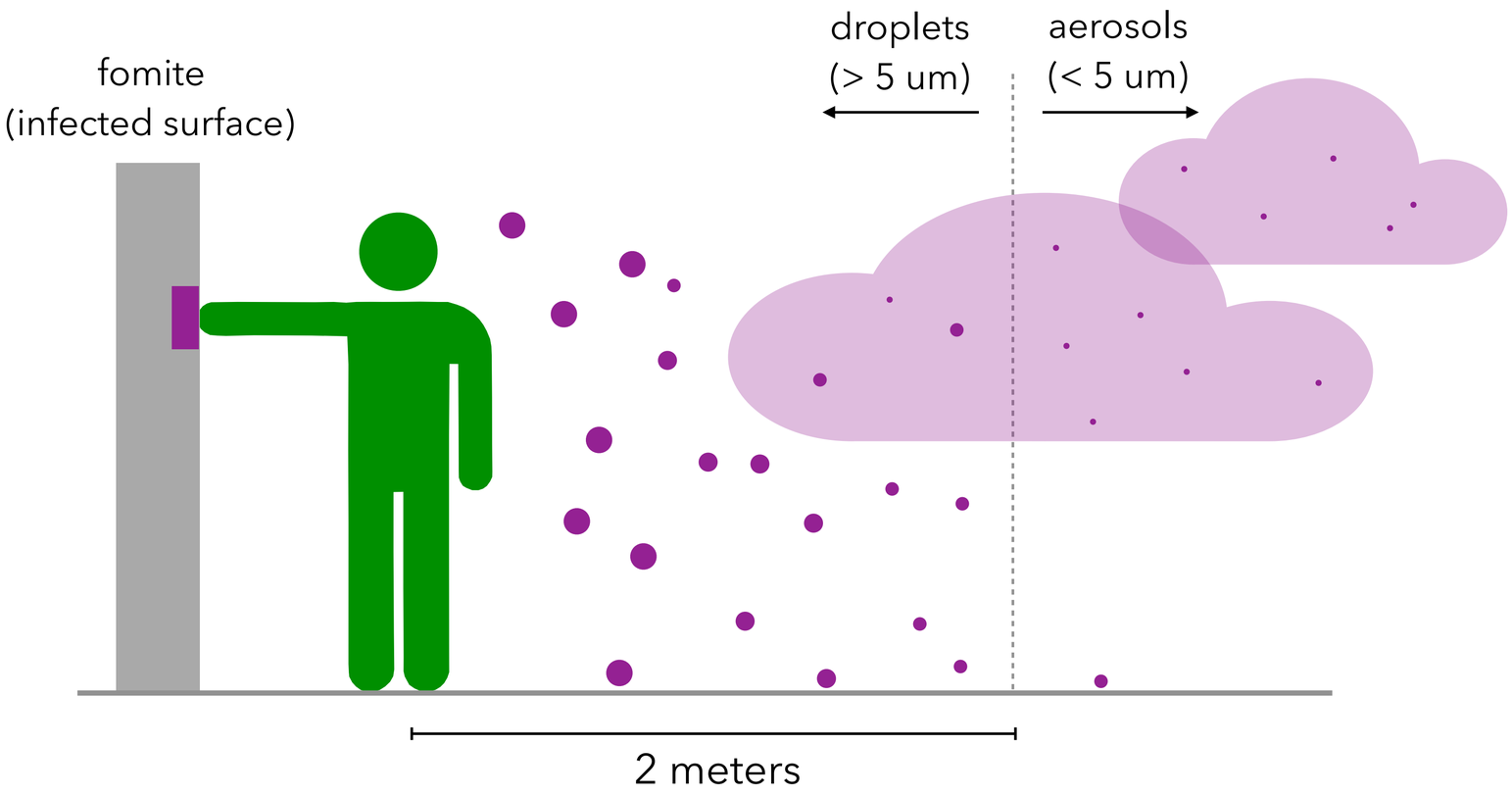
Masks (!) + social distancing



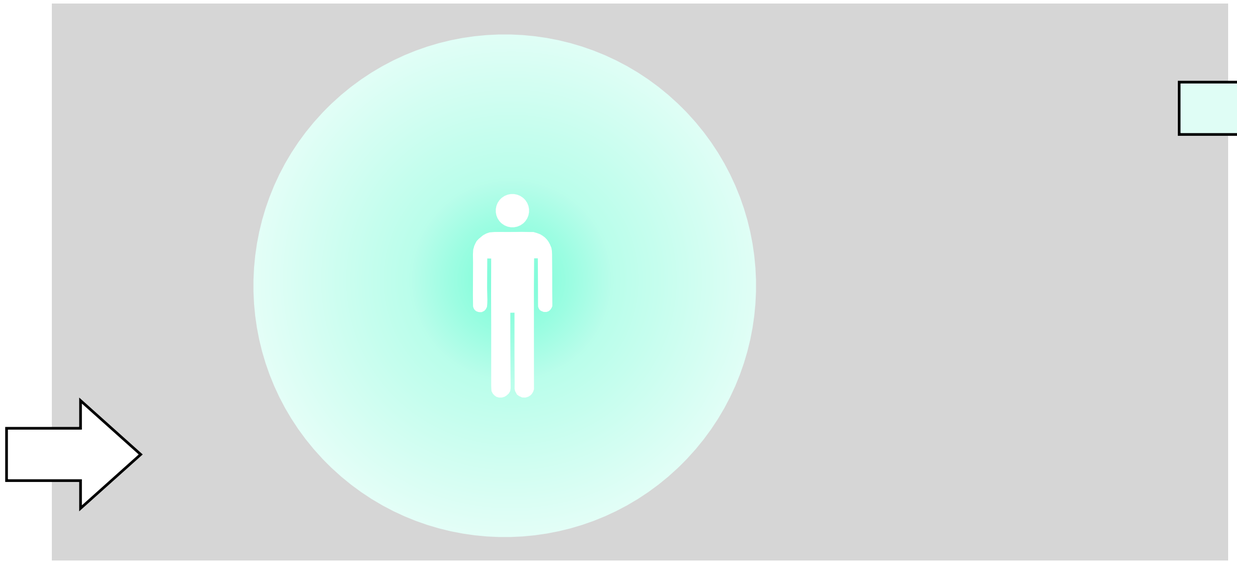
(See “Who was that masked man?” post for details)

(Filtration efficiencies from ACS Nano paper linked in “ … Masked Man?” post)



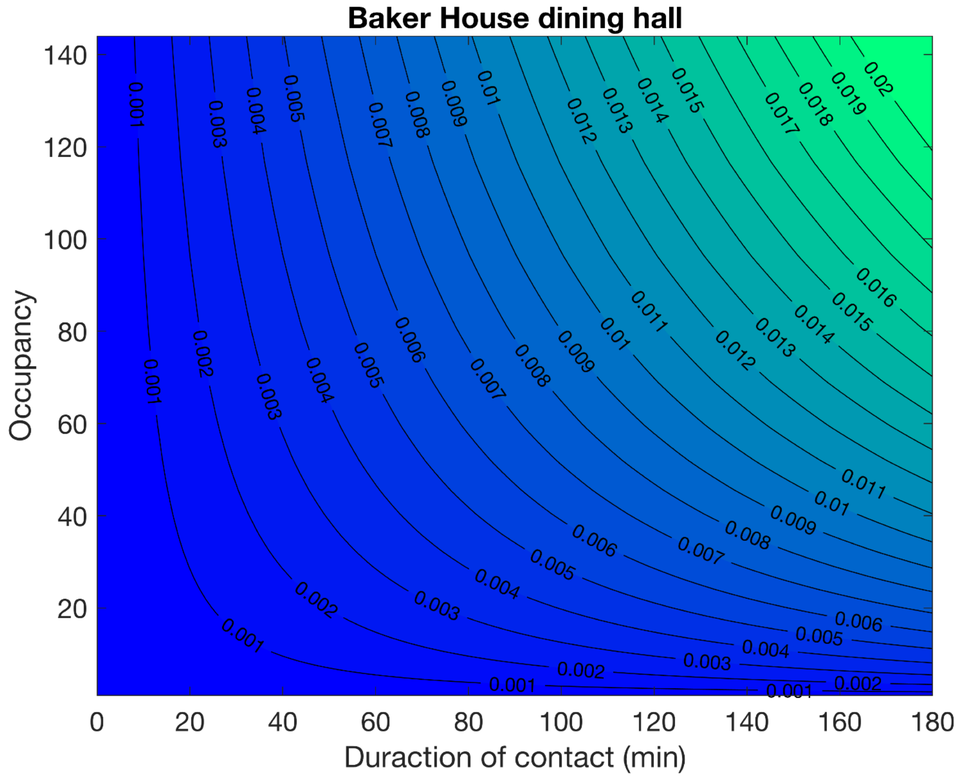

droplets
(> 5 um)
aerosols
(< 5 um)
fomite
(infected surface)
2 meters

Mitigating spread via aerosols



HVAC

Masks (!) + ventilation



Rate of virions emitted by an infected person

- Sitting quietly: 20 / min
- Talking: 200 / min
- Singing, shouting, or exercising: 2000 / min
- Sneeze: 200,000,000

(Note that Baker dining has excellent ventilation, ~12 AEH, so this might not be a typical case.)

Levers for control

Rate of moving people ***into*** the purple box

$$R_0 \leq 1 + S_y + T_F D$$

Rate of moving people ***out of*** the purple box

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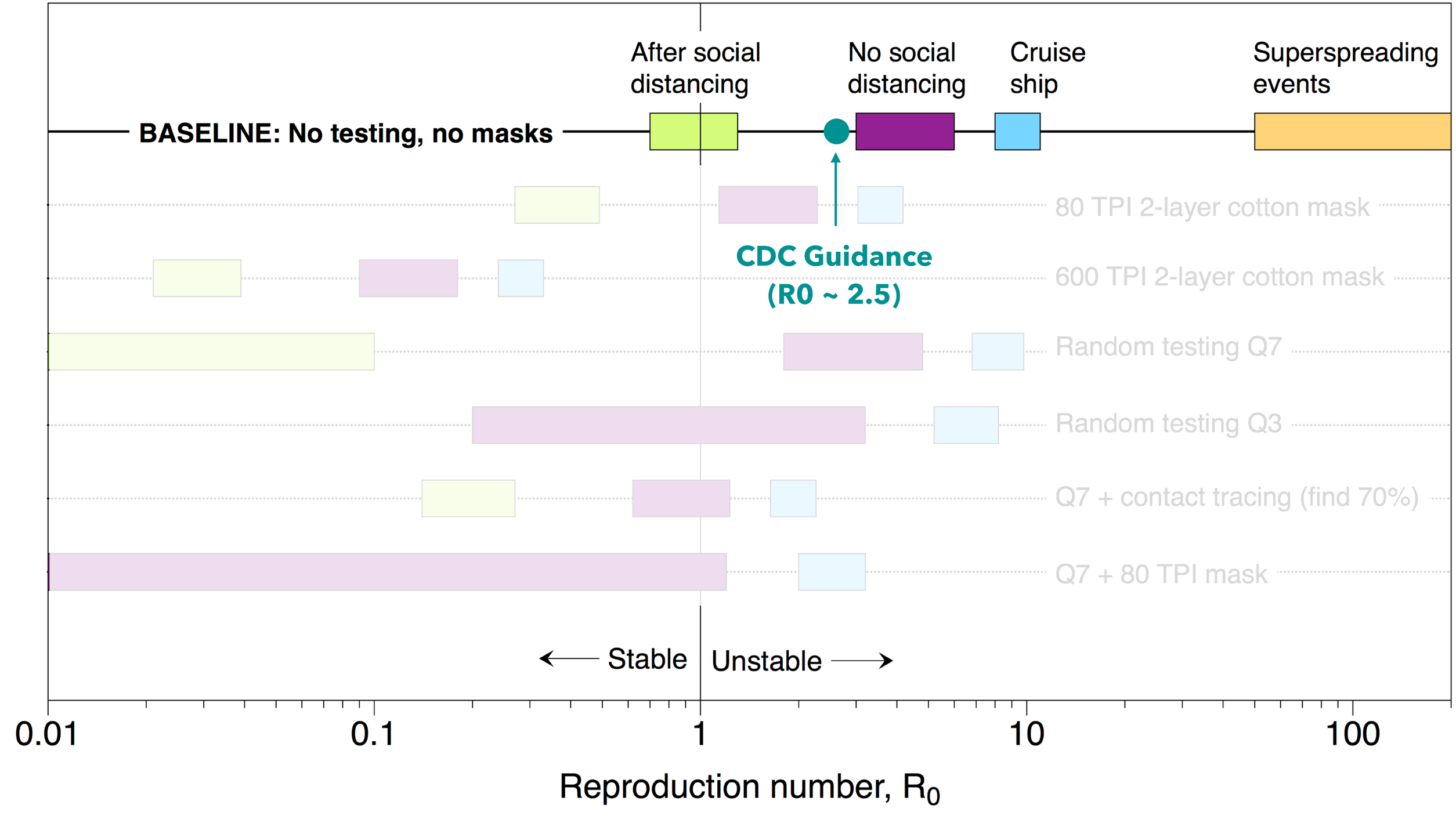
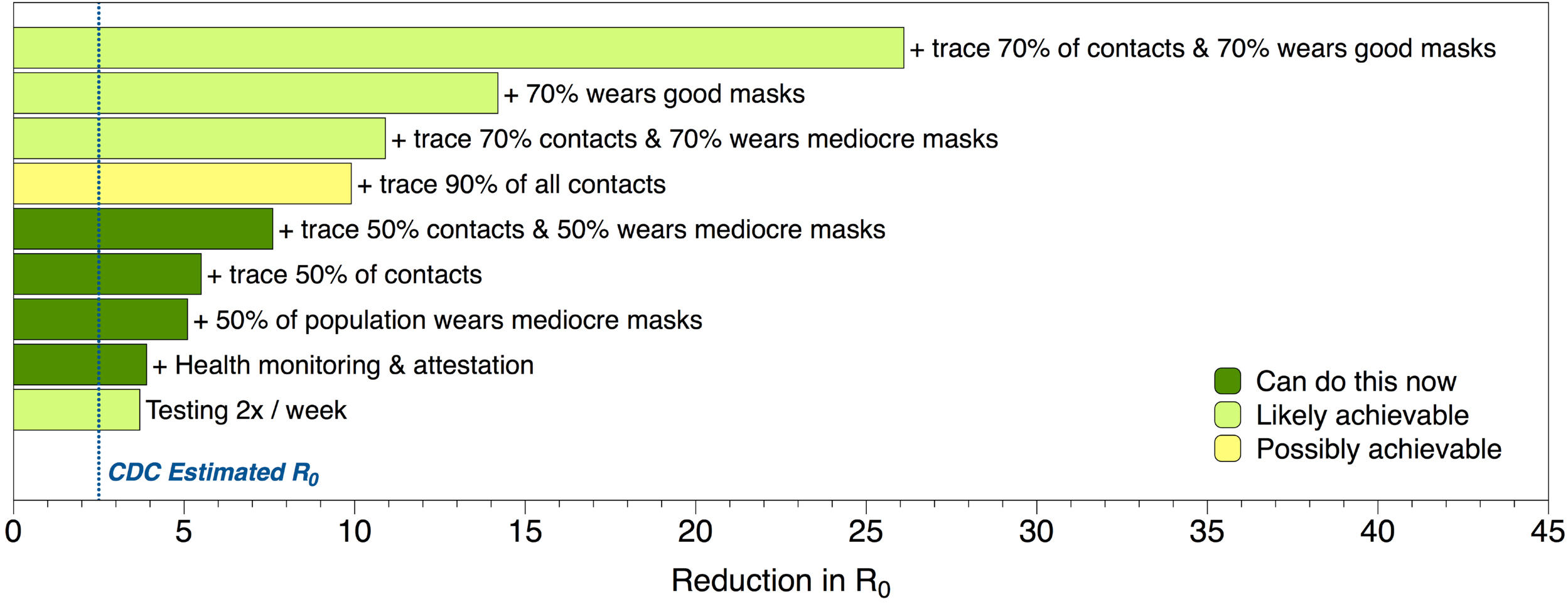
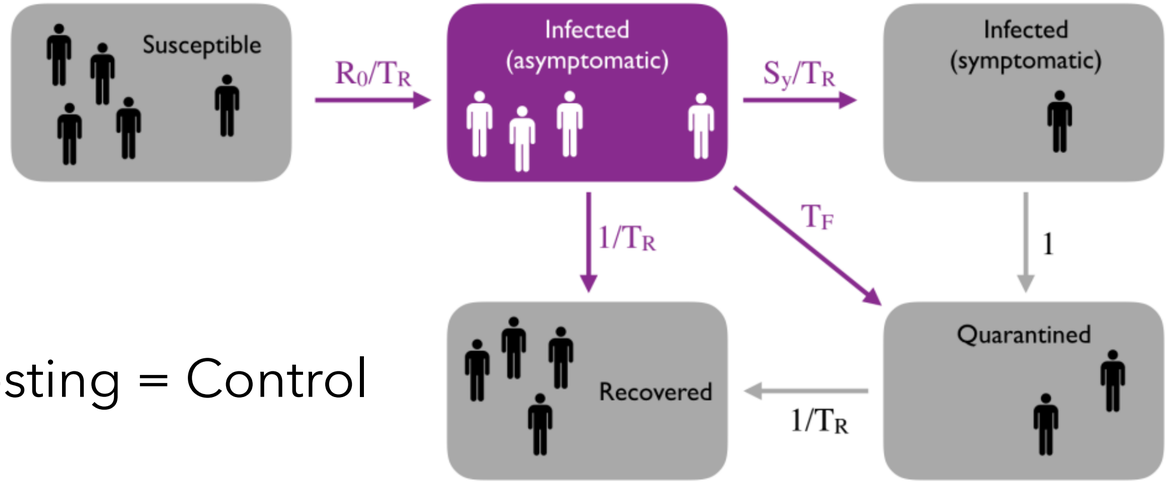

After social distancing
No social distancing
Cruise ship
Superspreading events
BASELINE: No testing, no masks
CDC Guidance
(R0 ~ 2.5)
80 TPI 2-layer cotton mask
600 TPI 2-layer cotton mask
Random testing Q7
Random testing Q3
Q7 + contact tracing (find 70%)
Q7 + 80 TPI mask
Stable
Unstable
0.01
0.1
1
10
100
Reproduction number, R_0

Assume test sensitivity ot 70%
Mediocre mask = filters 30%
Good mask = filters 70%

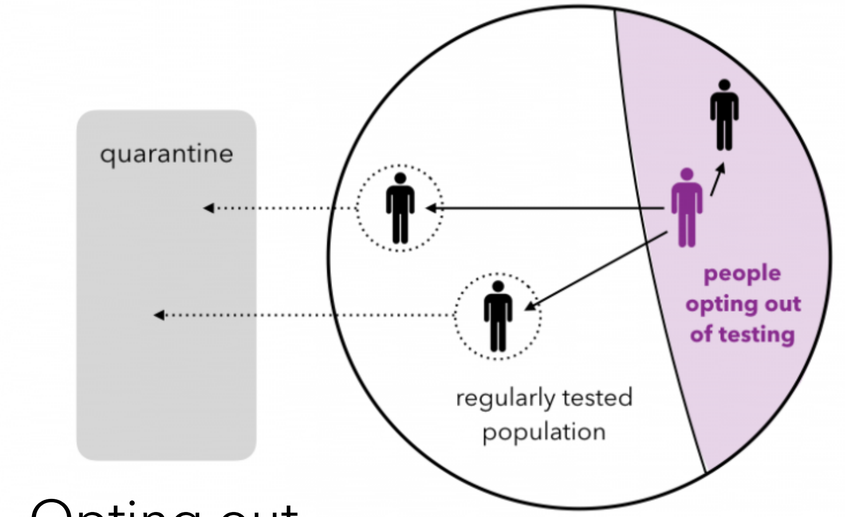


e.g. if 50% of the population wears mediocre masks, the reduction in R0 is about a factor of 5; so the effective R0, using the CDC baseline of 2.5, is R0,eff = 2.5/5 = 0.5 (which is safely below 1).

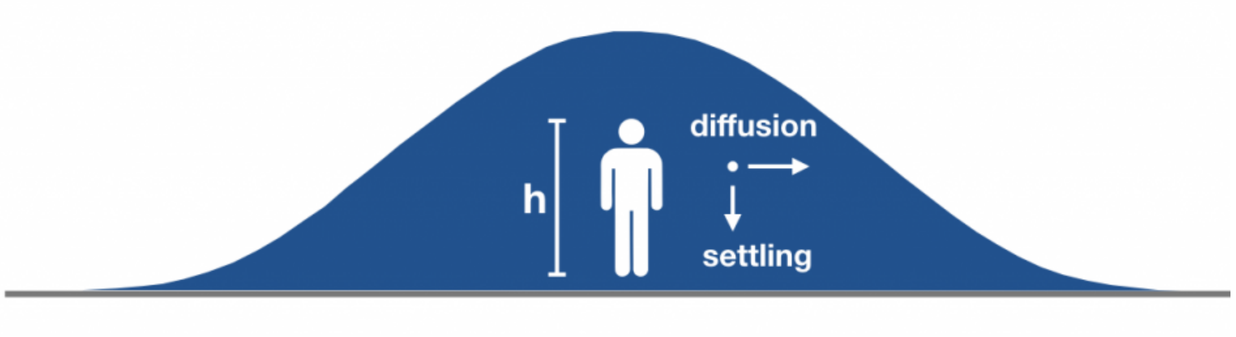
More info at: https://idss.mit.edu/research/idss-covid-19-collaboration-isolat/



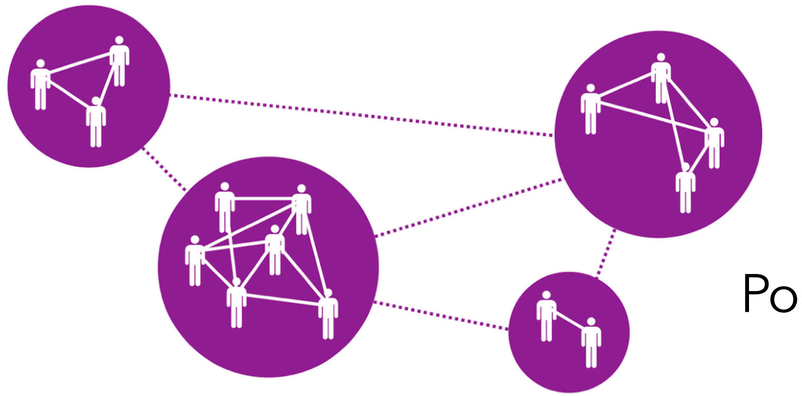
Testing = Control



Opting out



Who was that masked man?



Pod people