

COVID-19 AGENT-BASED SEIRD MODEL: EFFECTS OF CONTROL MEASURES RELEVANT TO MIGRANT AND SEASONAL FARMWORKER COMMUNITIES



Lorena Morejon-Lasso
07/21/2020

Farmworkers in the COVID-19 Pandemic

- Challenges include:
 - Barriers to healthcare
 - Difficulty social distancing
 - Insufficient testing of workers
 - Overcrowded housing



The Model: Susceptible, Exposed, Infected, Recovered, Deceased

COVID-19 SEIRD Model: Effects of Various Control Measures Relevant to Migrant and Seasonal Farmworker Communities Lorena V. Morejon, 07/16/2020

Population

initial-population 1000 Humans

initial-infected 10 Humans

initial-recovered 0 Humans

risk-group-proportion 0.5

symptomatic 60%

transmission-rate 0.11

recovery-time 14 Days

Healthcare

barriers-to-healthcare 0.0

healthcare-quality 1.0

hospital-capacity 2 Beds

Control Measures

days-to-control-measures 14

infectious-detection (testing) 5%

isolate-infected? On Off

high-touch-areas? (shared housing) On Off

disinfect? On Off

protection-level 0.5

following-measures-proportion 0.5

mobility (mimic social distancing) 1.0

R0
4.5044

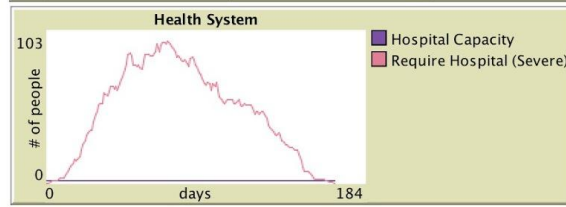
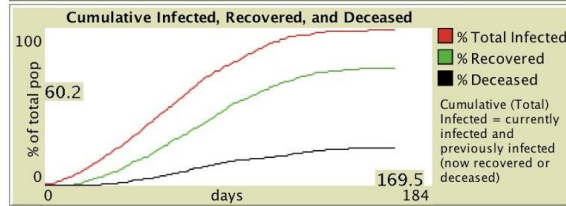
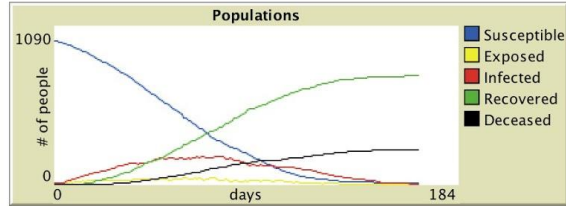
clear use-new-seed setup

To run the model:
1. Press USE-NEW-SEED
2. Press SETUP
3. Press GO

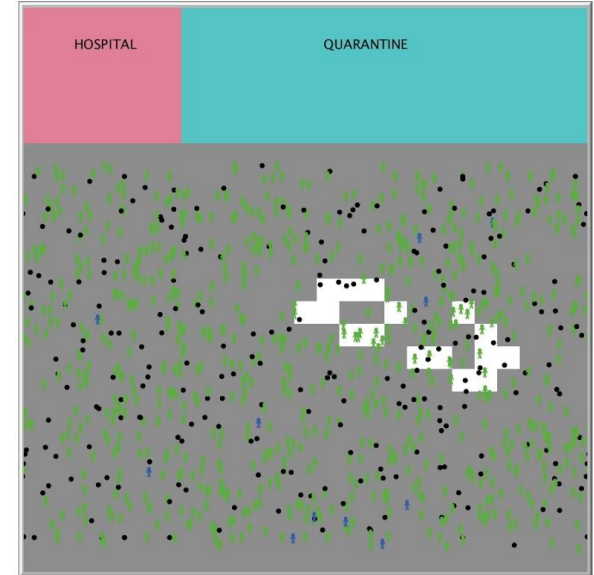
To reproduce a run:
1. Press USE-SEED-FROM-USER
2. Type in the seed from the run to reproduce (look in the output area)
3. Press SETUP
4. Press GO

To refresh:
Press CLEAR use-seed-from-user go

Generated seed: 2014855022



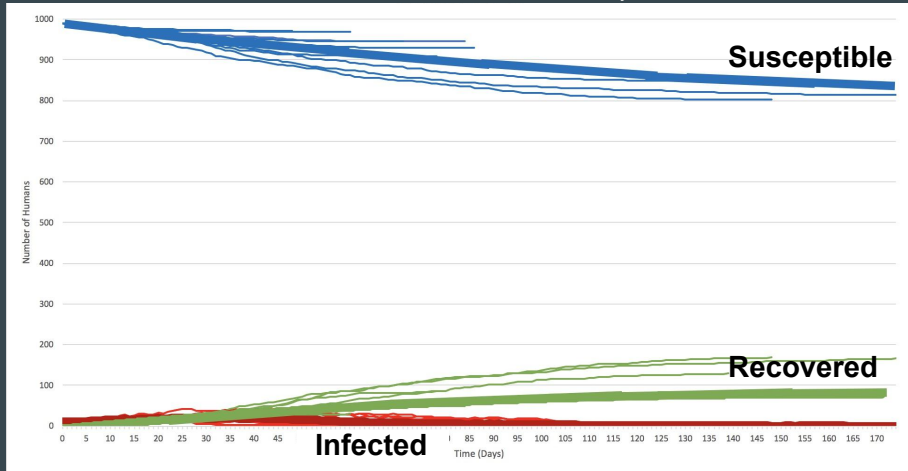
Mortality (% total)	Mortality (% infected)	Mortality (% symptomatic)
23.9	24.16582406471183	39.635



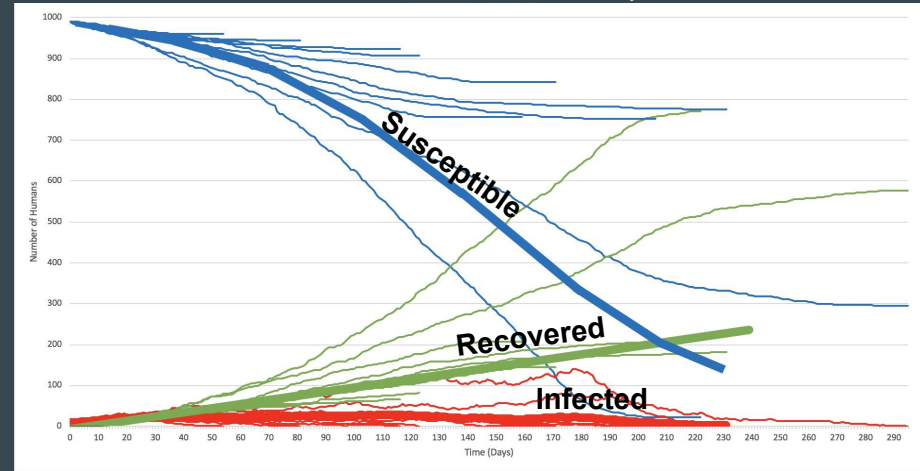
Population	Susceptible	Exposed	Infected	Recovered	Deceased
1000	11	0	0	750	239
Following Measures	Risk Group	Symptomatic	High-Touch Contact Infections		
500	500	603	95		

Transmission Probability SIR Model

Transmission Probability = 0.1



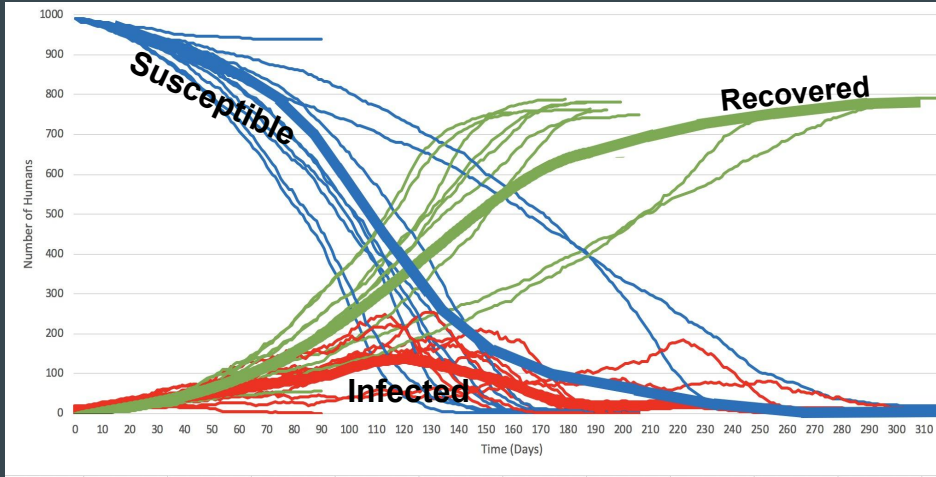
Transmission Probability = 0.11



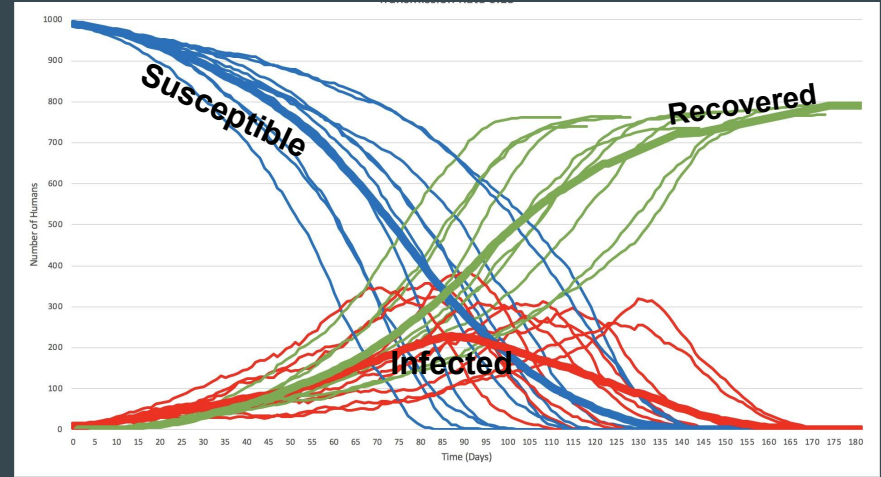
Pearson Correlation Coefficient for Transmission Probability and R_0 (Basic Reproductive Number):
 $R=0.8905$, $R^2=0.793$, significant at $p<.01$

Transmission Probability SIR Model

Transmission Probability = 0.13



Transmission Probability= 0.15



Pearson Correlation Coefficient for Transmission Probability and R_0 (Basic Reproductive Number):
 $R=0.8905$, $R^2=0.793$, significant at $p<.01$

Key Results

Mean Value	Barriers to Healthcare (0=no barriers to 1=complete barriers)	Mobility (0=stationary to 1=unrestricted)	Infected Detection (1, 5, 10, 20%)	High-Touch Areas (True/False)
Total Mortality	~ 5-25% R=0.6339	~ 1-6% R=0.3066	~ 0.5-19% R=-0.6288	~ 5-23% r=0.8725
Infected Mortality	~ 14-26% R=0.6376	~ 9-14% R=0.2959	~ 11-21% R=-0.5505	~ 14-24% r=0.7923
Symptomatic Mortality	~ 23-43% R=0.6518	~ 15-23% R=0.2906	~ 16-34% R=-0.5898	~ 23-40% r=0.8019
R0	~ 1.33-4.10 R=0.6254	~ 0.88-1.42 R=0.2705*	~ 0.74-5.28 R=-0.606	~ 1.33-4.26 r=0.8397

*not statistically significant at $p < .05$

Conclusions

- Challenges faced by farmworker communities may have impact on mortality and spread of virus — further inquiry and adequate protections needed
- Future models could incorporate real-world data, potentially using GIS to model a specific farmworker community

