بسم الله الرحمن الرحیم

مدلسازی بیماری Covid-19 در استان آذربایجان غربی تا شهریور ماه ۹۹

Mohammad Heidari

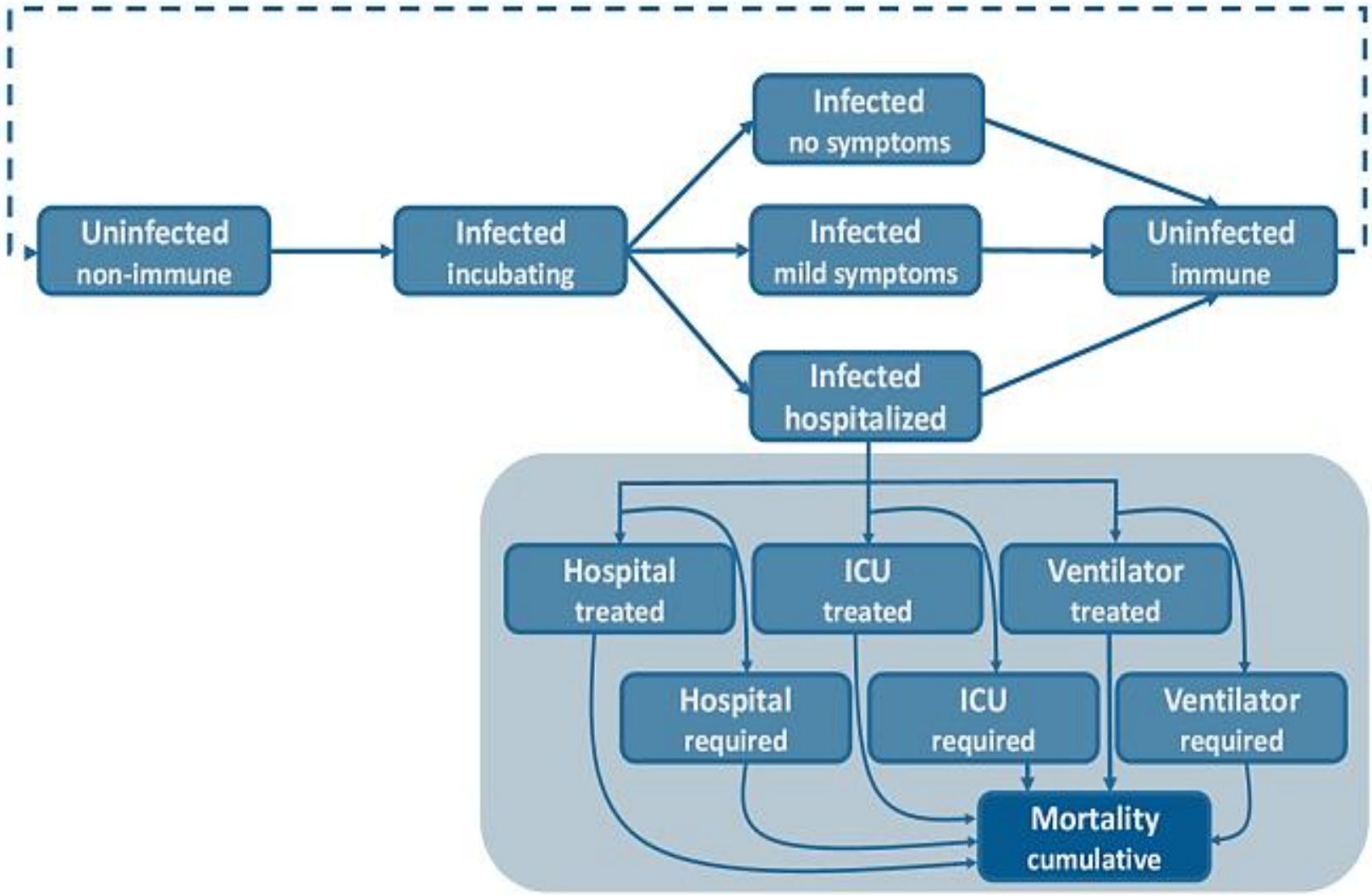
Ph.D in Epidemiology

Department of Epidemiology & Biostatistics, School of Medicine , Urmia University of Medical Sciences

مقدمه:

- مدلها دنیای واقع را ساده می کنند
- مدلهای ریاضی ساده و پیچیده دارند
- اعتبارخروجی مدلها به صحت پیش فرض ها و داده های ورودی بستگی دارد

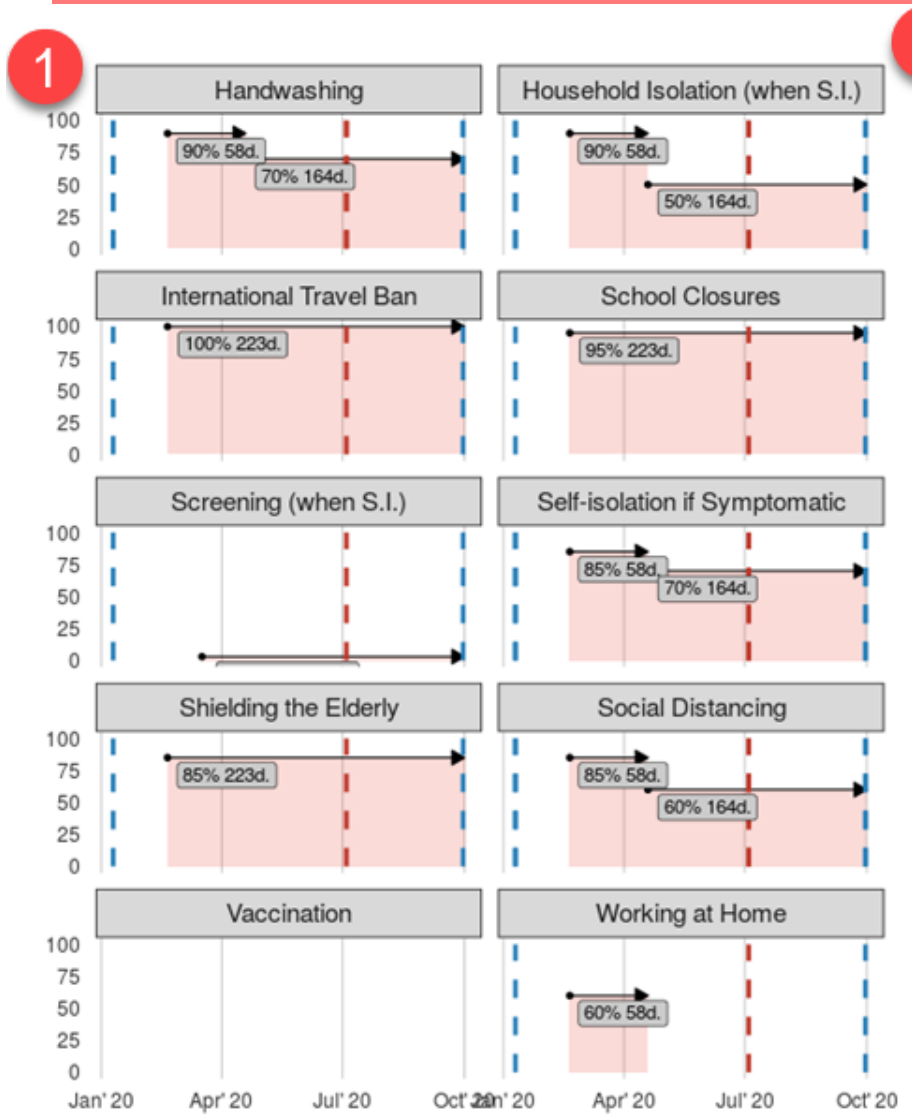
- Age structured SEIR model
- Infected compartments stratified by symptoms, severity, treatment seeking and access



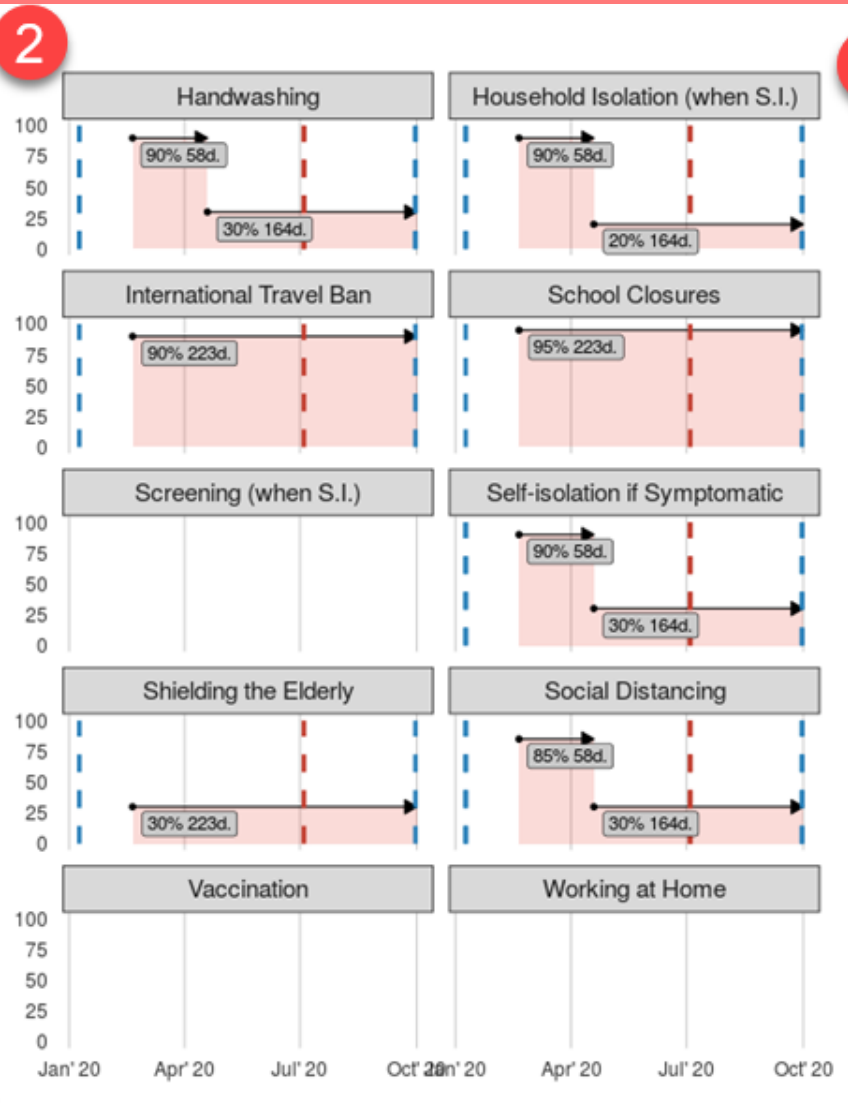
Model Inputs / Parameters

- Cases
- Severity-Mortality
- Population
- Virus Parameters
- Hospitalization Parameters
- Interventions

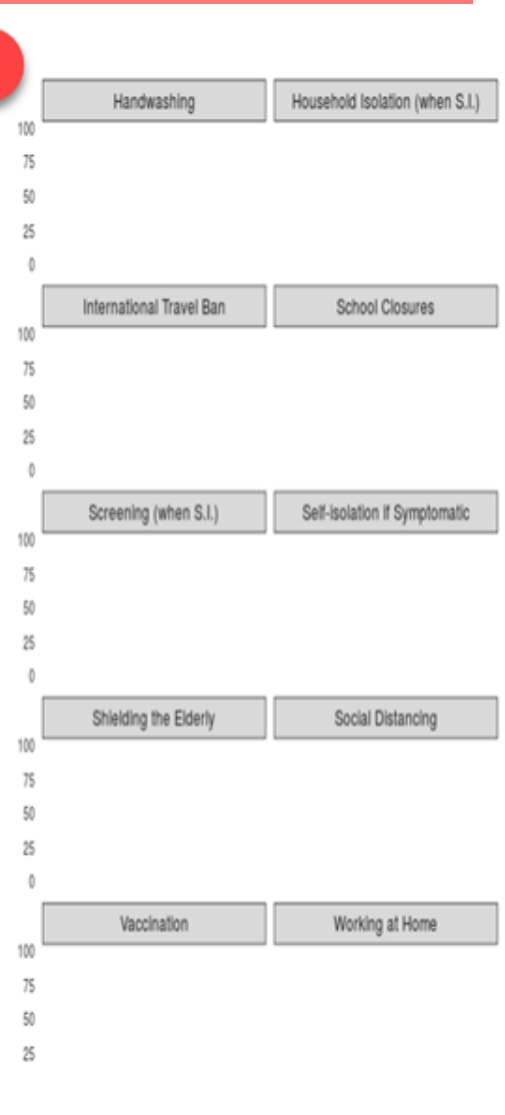
سه سناریوی فرضی:



مداخله موجود



مداخله ضعیف



بدون مداخله

37.7%

of the population infected during the range of simulation.

1,713

Covid-19 **attributable** deaths during the range of simulation.

1,716

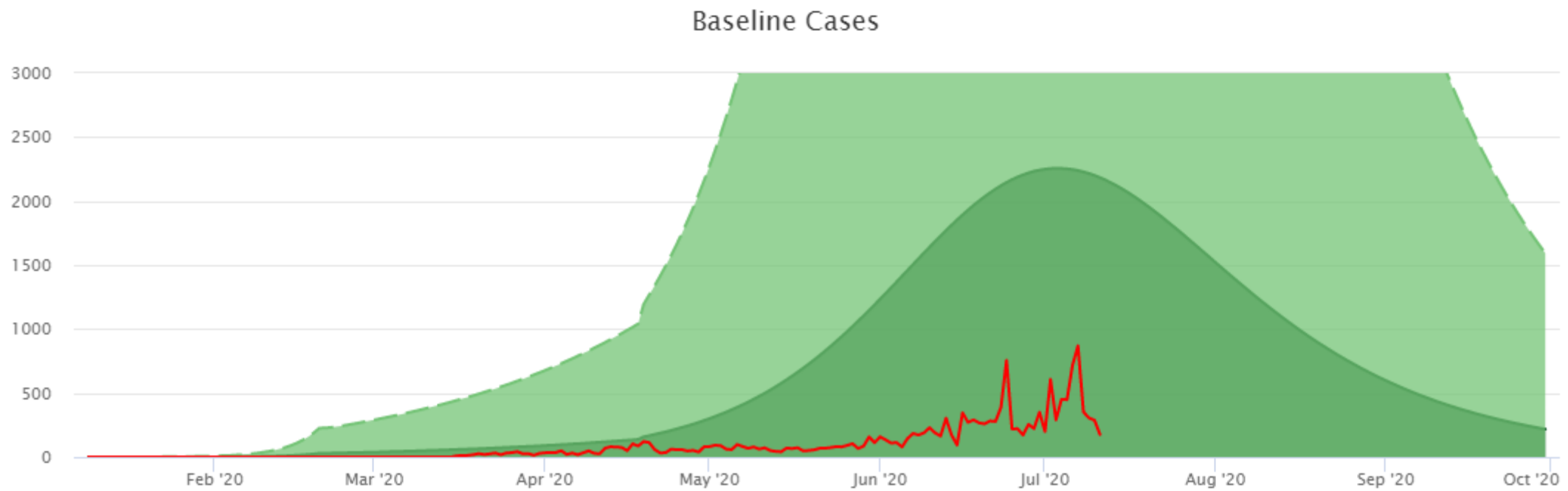
Covid-19 **reported** deaths during the range of simulation.

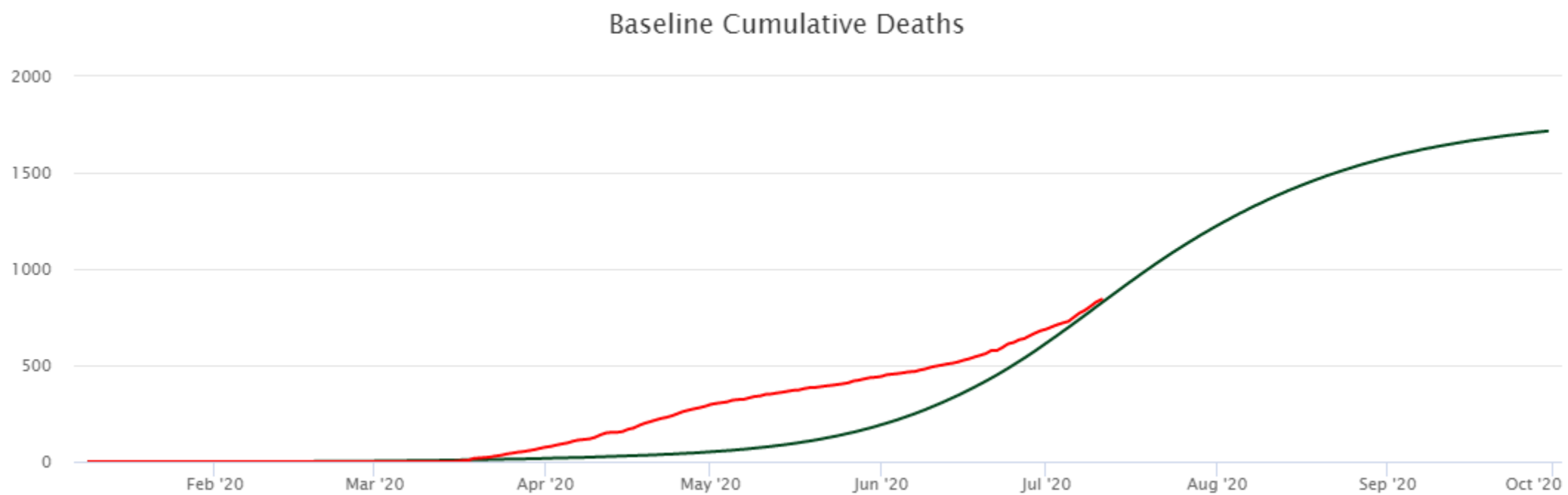
4.68 days

to double the number of infections at inception.

Focus on:

○ Observed ◉ Predicted Reported ○ Predicted Reported + Unreported



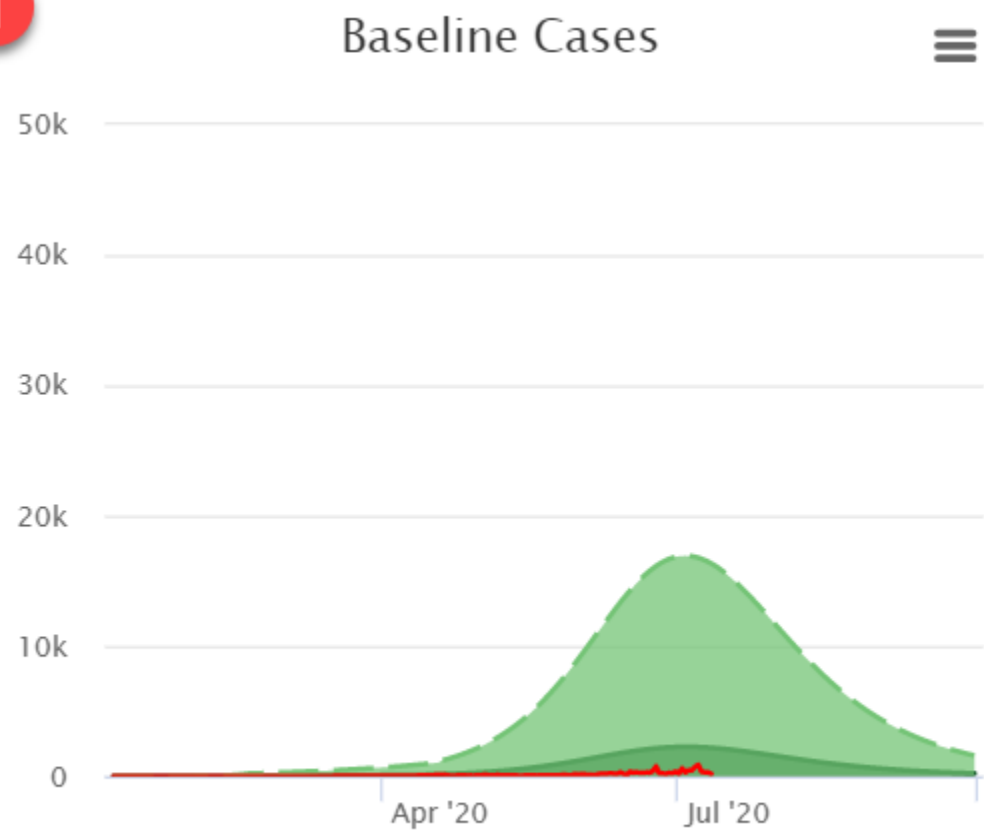

Baseline Cumulative Deaths
2000
1500
1000
500
0
Feb '20
Mar '20
Apr '20
May '20
Jun '20
Jul '20
Aug '20
Sep '20
Oct '20

Baseline 1	Hypothetical Scenario 2
37.7% of the population infected during the range of simulation.	51.3% (13.6%) of the population infected during the range of simulation.
1,713 Covid-19 **attributable** deaths during the range of simulation.	3,216 (1,503) Covid-19 **attributable** deaths during the range of simulation.
1,716 Covid-19 **reported** deaths during the range of simulation.	3,223 (1,507) Covid-19 **reported** deaths during the range of simulation.

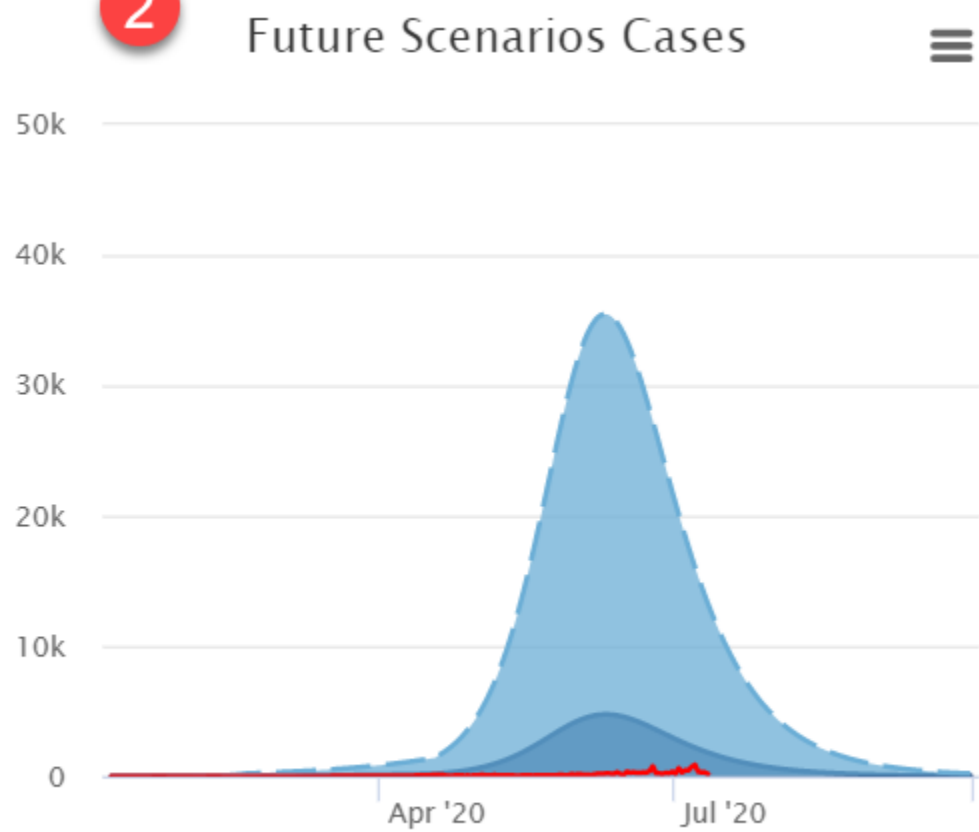
مداخله موجود

مداخله ضعیف

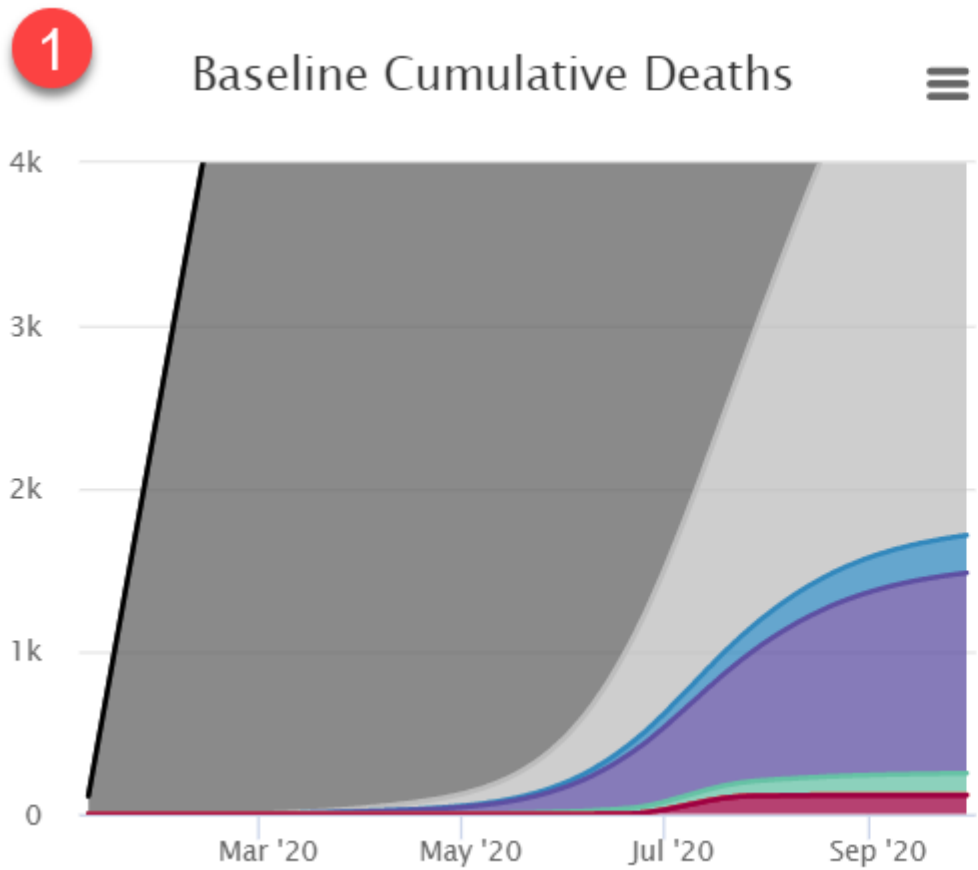
1


Baseline Cases
50k
40k
30k
20k
10k
0
Apr '20
Jul '20

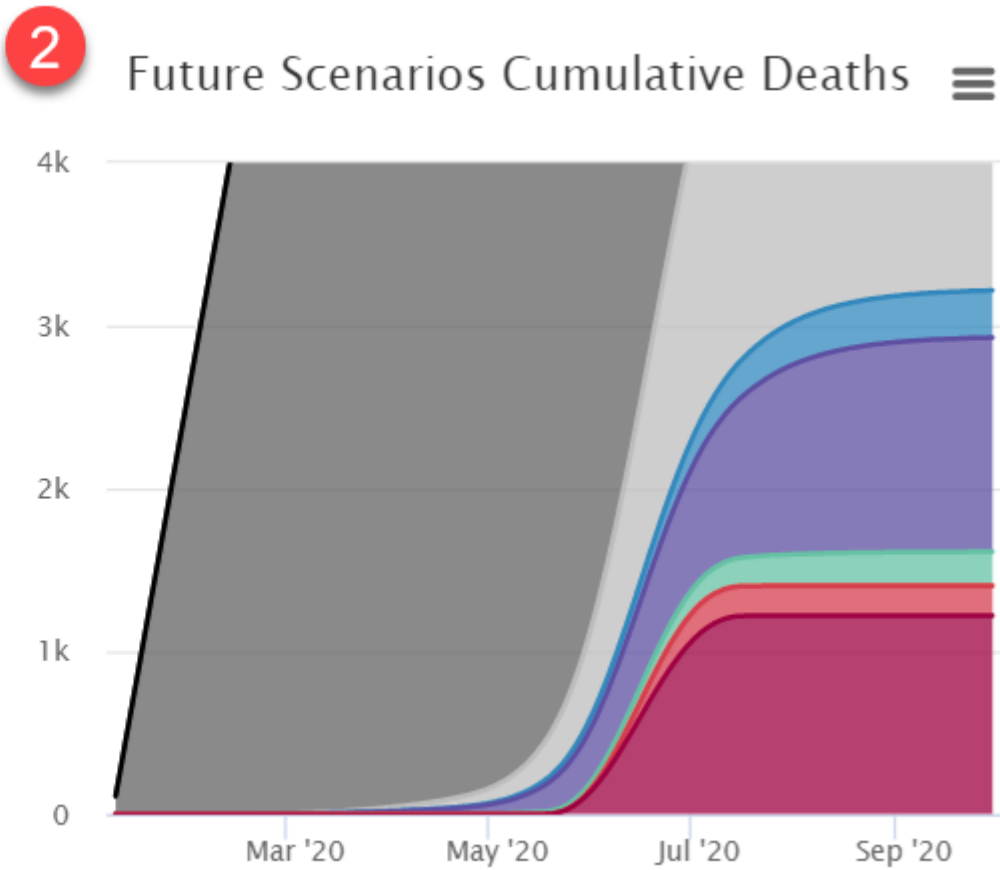
2


Future Scenarios Cases
50k
40k
30k
20k
10k
0
Apr '20
Jul '20

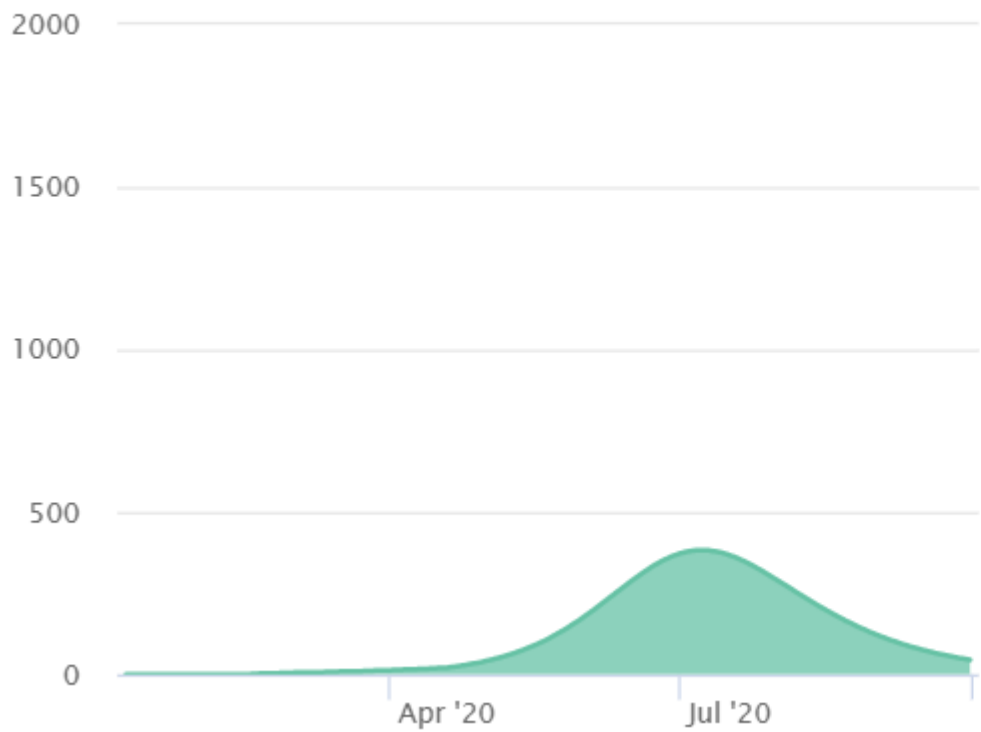
1


Baseline Cumulative Deaths
4k
3k
2k
1k
0
Mar '20
May '20
Jul '20
Sep '20

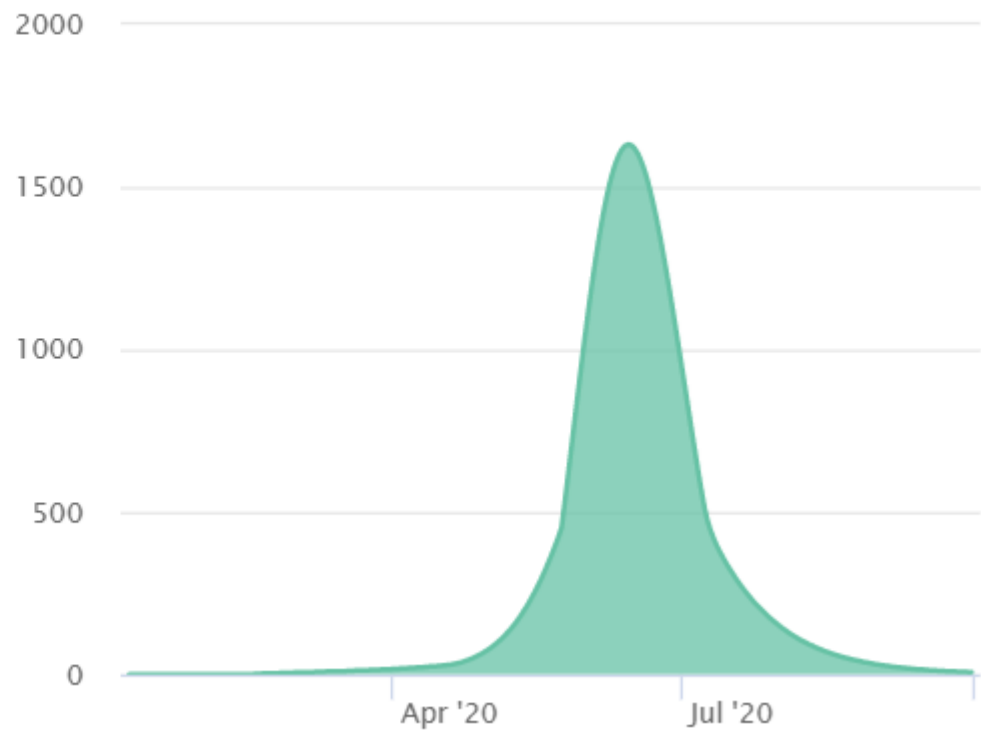
2


Future Scenarios Cumulative Deaths
4k
3k
2k
1k
0
Mar '20
May '20
Jul '20
Sep '20

1


Baseline Hospital Occupancy
2000
1500
1000
500
0
Apr '20
Jul '20

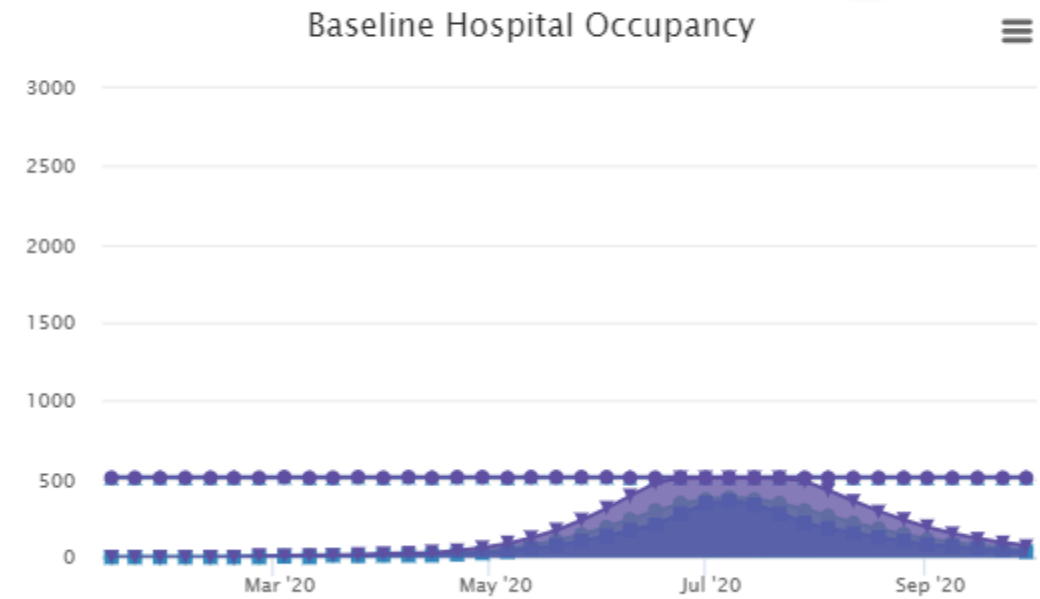
2


Future Scenarios Hospital Occupancy
2000
1500
1000
500
0
Apr '20
Jul '20

Focus on:

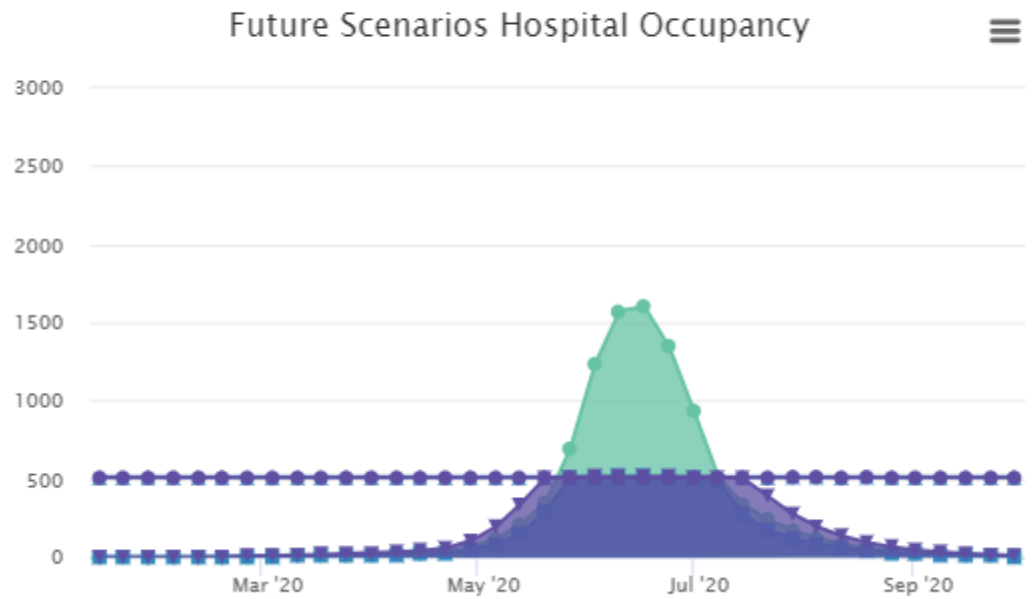
(•) No Focus ( ) Hospital Beds ( ) ICU Beds ( ) Ventilators

1



ICU

2



Baseline

1

37.7%

of the population infected during the range of simulation.

1,713

Covid-19 **attributable** deaths during the range of simulation.

1,716

Covid-19 **reported** deaths during the range of simulation.

Hypothetical Scenario

3

79.5% (41.8%)

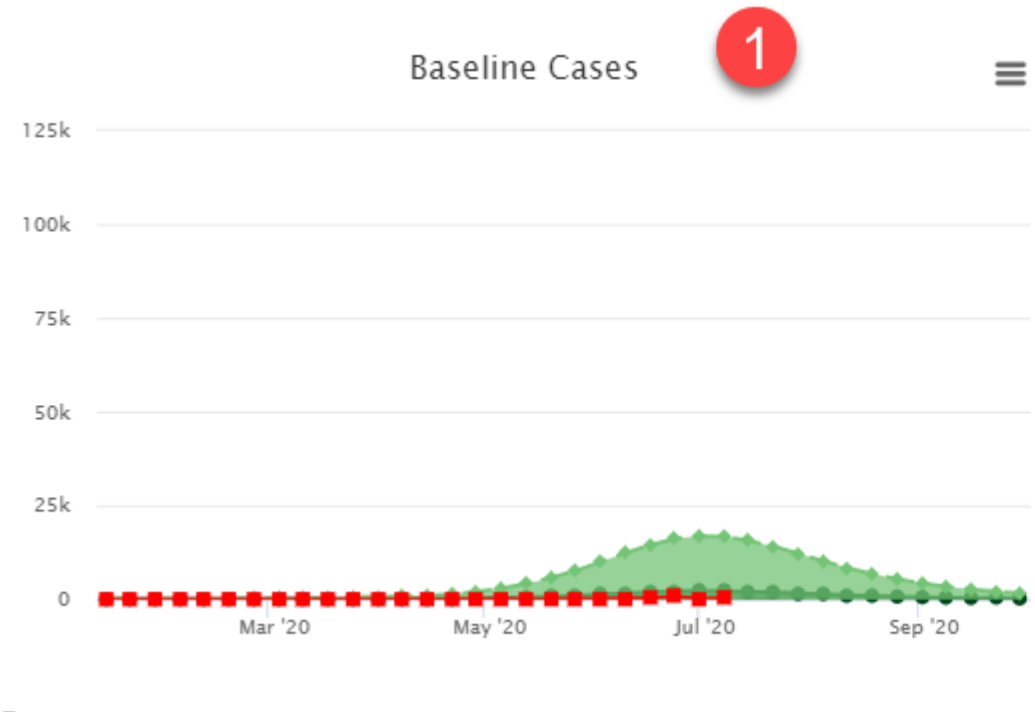
of the population infected during the range of simulation.

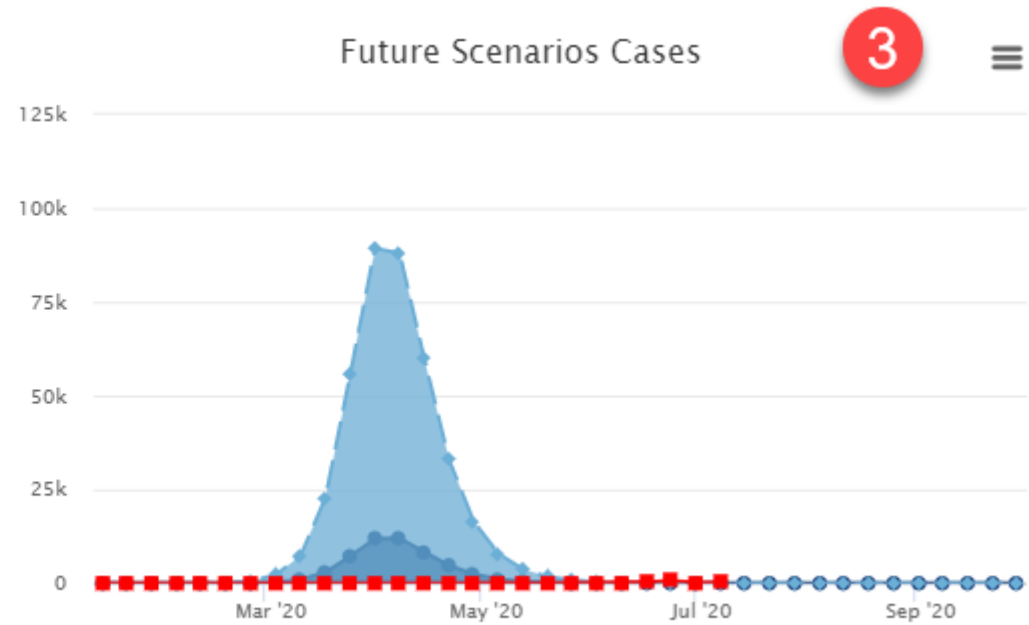
6,267 (4,554)

Covid-19 **attributable** deaths during the range of simulation.

6,275 (4,559)

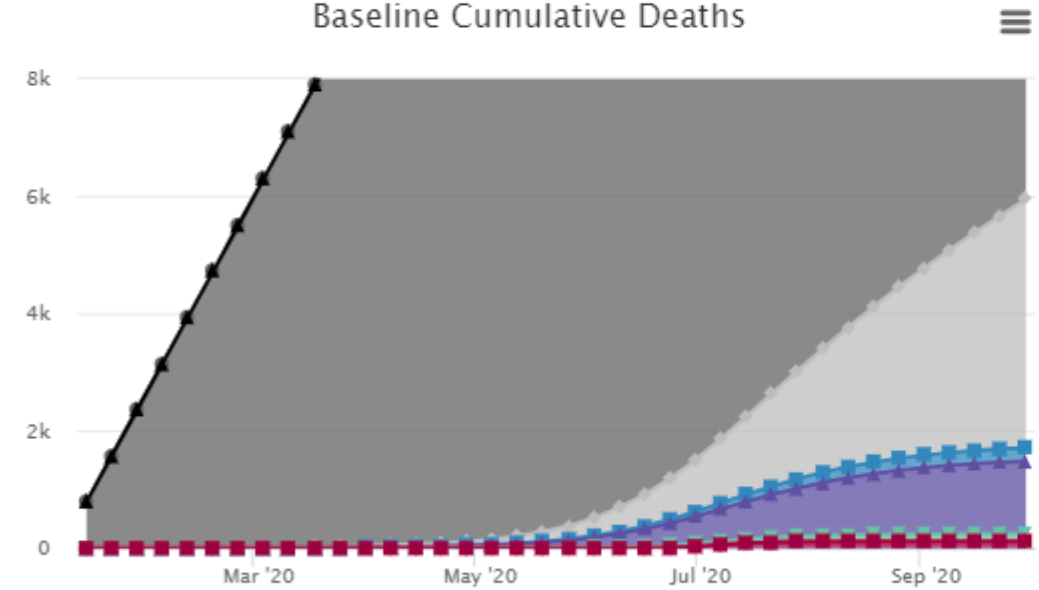
Covid-19 **reported** deaths during the range of simulation.


Baseline Cases
1
125k
100k
75k
50k
25k
0
Mar '20
May '20
Jul '20
Sep '20

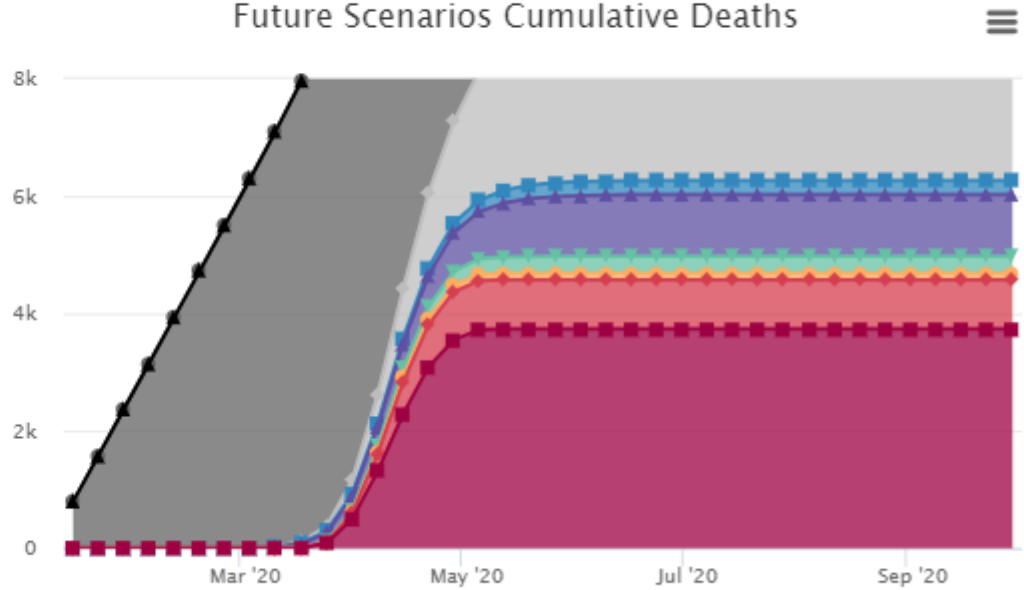

Future Scenarios Cases
3
125k
100k
75k
50k
25k
0
Mar '20
May '20
Jul '20
Sep '20

No Focus COVID-19 Deaths

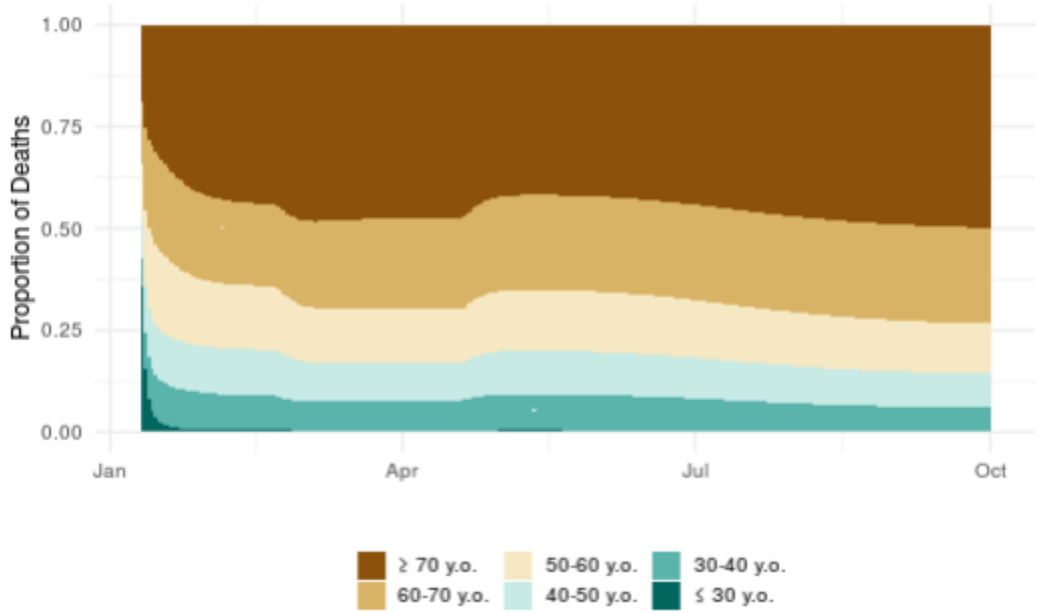
1



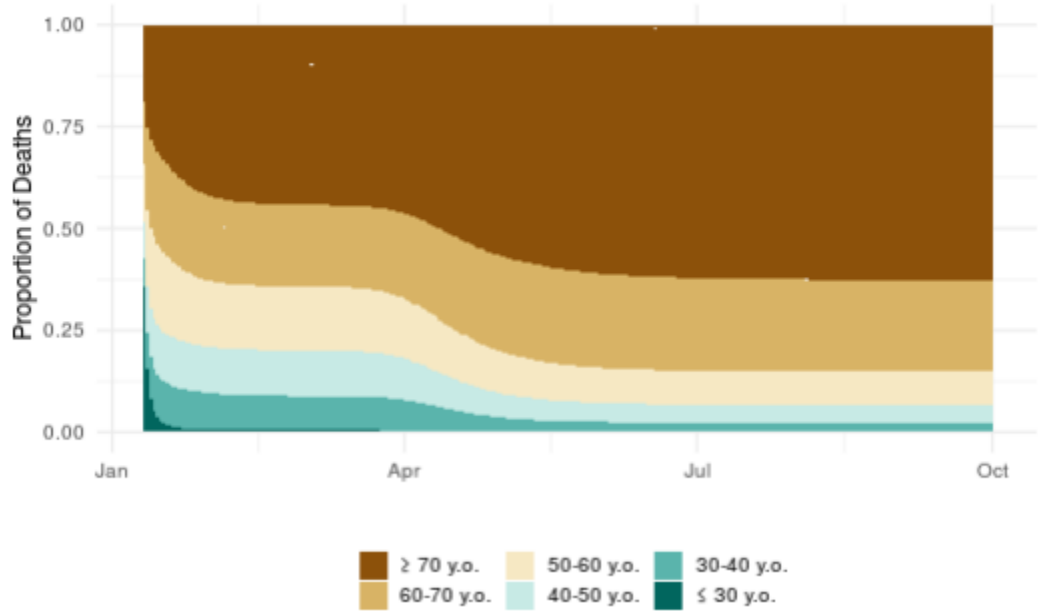
3



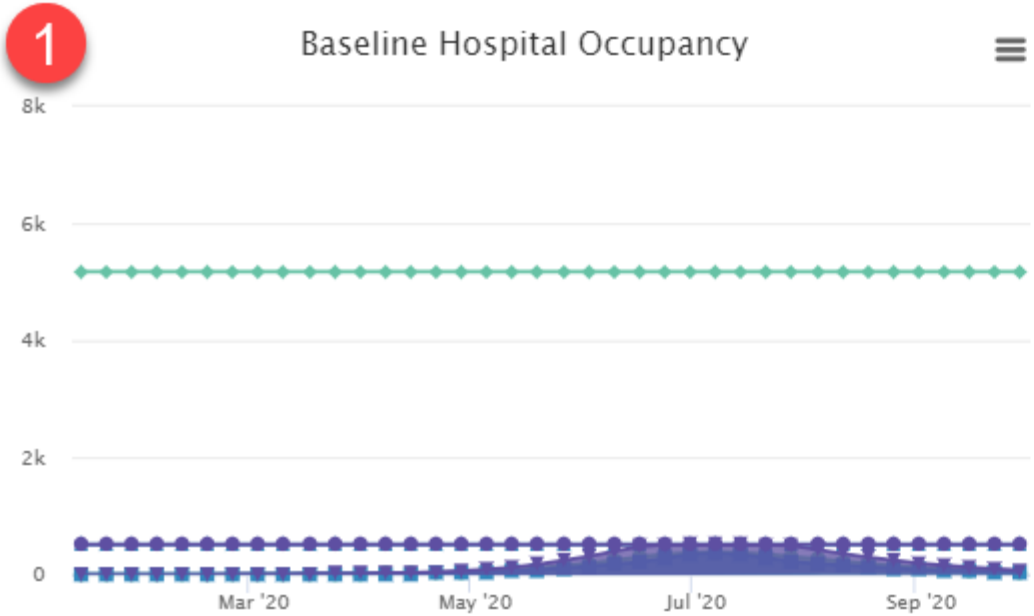
1


Proportion of Covid-19 Deaths per Age Category
Baseline
Proportion of Deaths
1.00
0.75
0.50
0.25
0.00
Jan
Apr
Jul
Oct
≥ 70 y.o.
60-70 y.o.
50-60 y.o.
40-50 y.o.
30-40 y.o.
≤ 30 y.o.

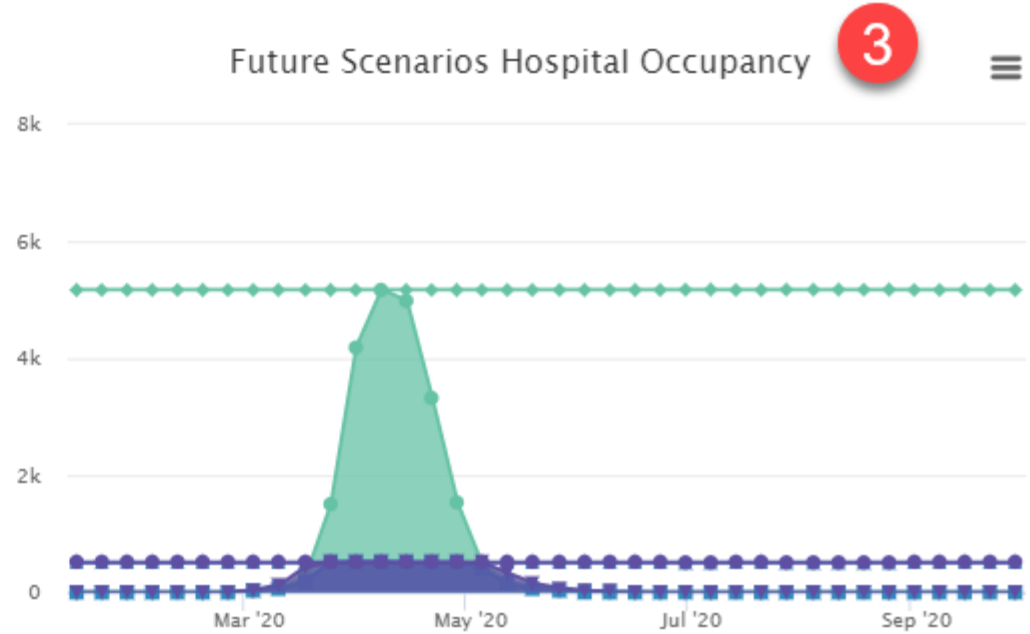
3


Proportion of Covid-19 Deaths per Age Category
Future Scenarios
Proportion of Deaths
1.00
0.75
0.50
0.25
0.00
Jan
Apr
Jul
Oct
≥ 70 y.o.
60-70 y.o.
50-60 y.o.
40-50 y.o.
30-40 y.o.
≤ 30 y.o.

1


Baseline Hospital Occupancy
8k
6k
4k
2k
0
Mar '20
May '20
Jul '20
Sep '20

3


Future Scenarios Hospital Occupancy
8k
6k
4k
2k
0
Mar '20
May '20
Jul '20
Sep '20