SARS-CoV-2 hotspots in NYC: Risk of city-wide resurgence and impact of policies

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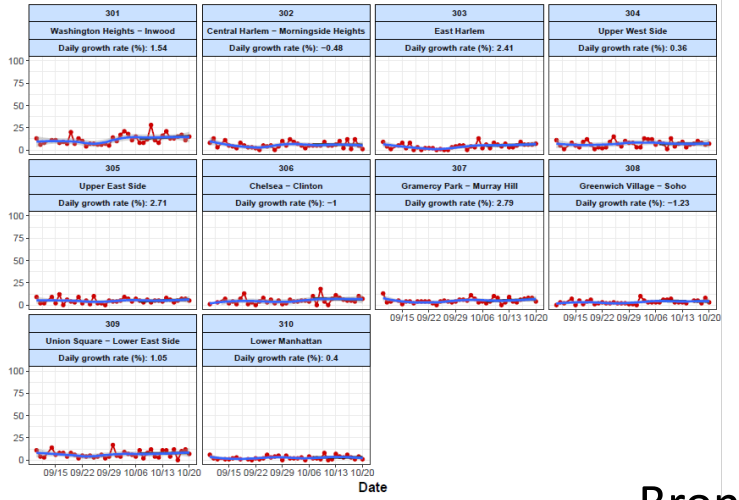
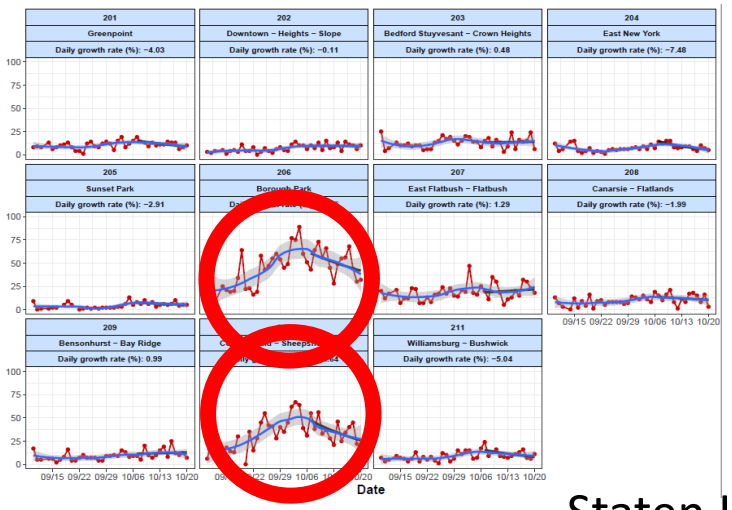
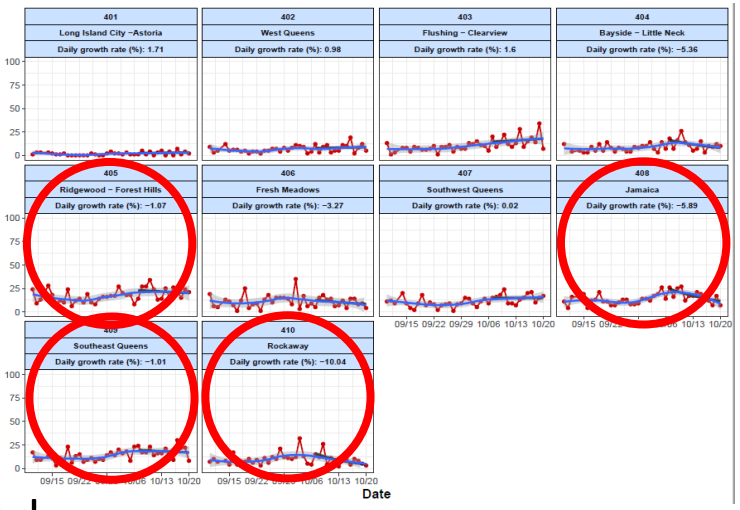
Exponential growth in cases has abated in neighborhoods with hotspots, but cases remain elevated above summer levels

Manhattan

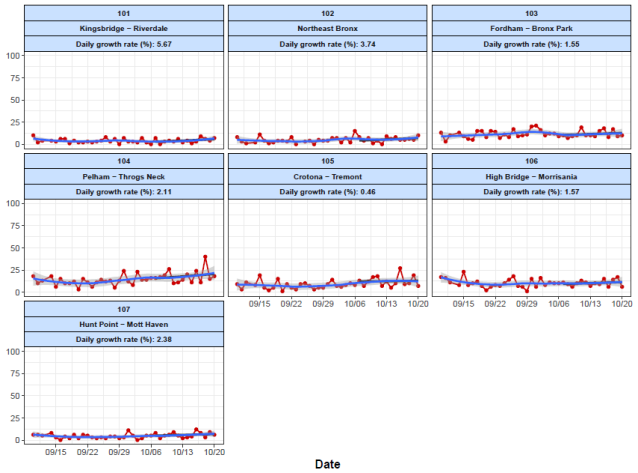




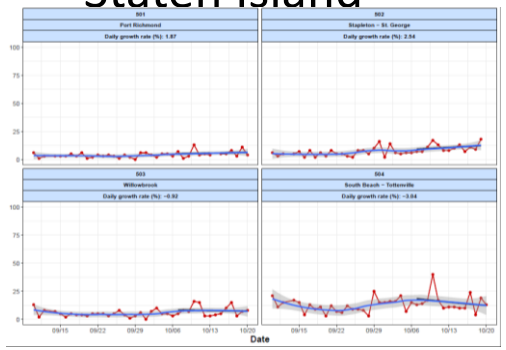
Queens



Bronx

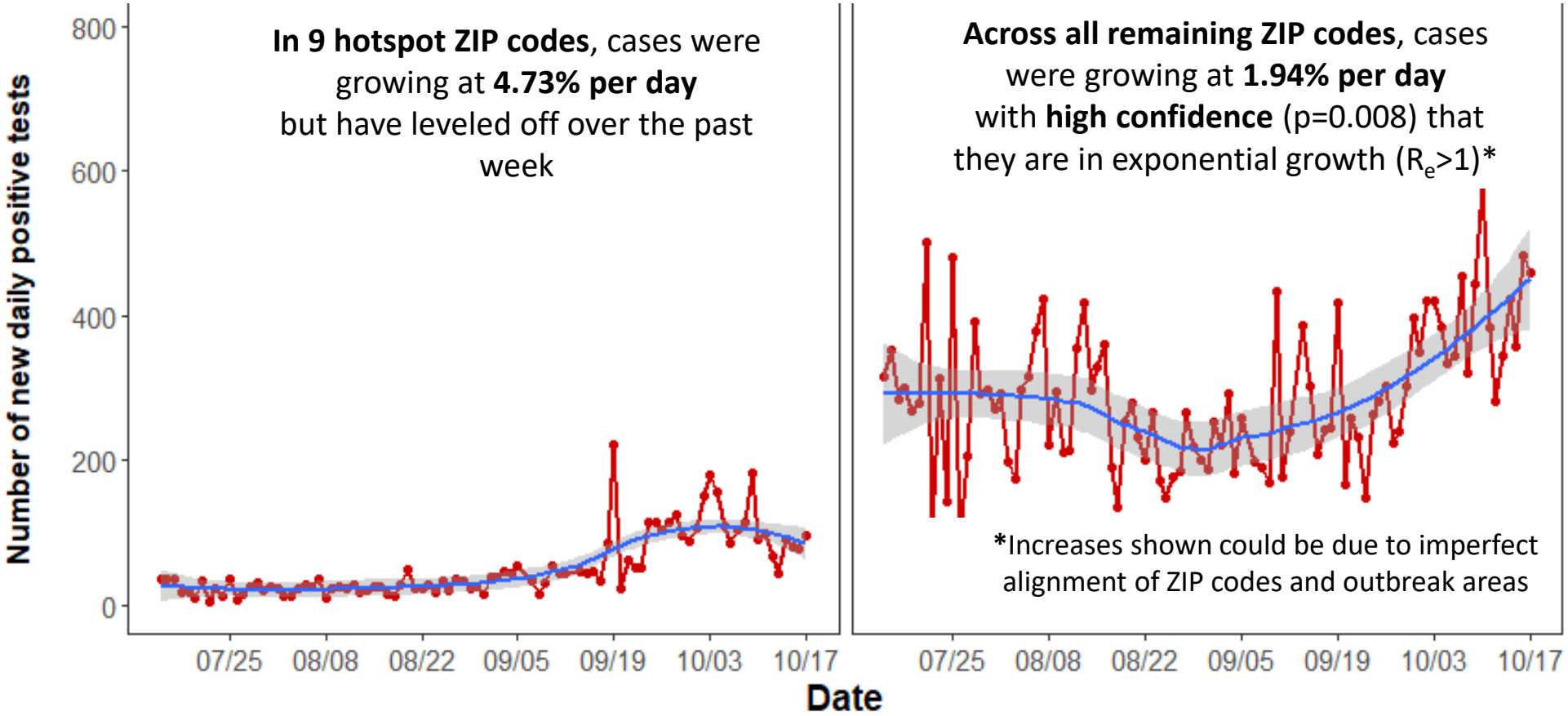


Staten Island



Unclear whether entire city is primed for exponential growth

- City-wide cases growing at 1.9% per day
- Pattern is distinct from summer ups and downs
- R_e could increase to autumn weather, waning immunity, social/work/education activities

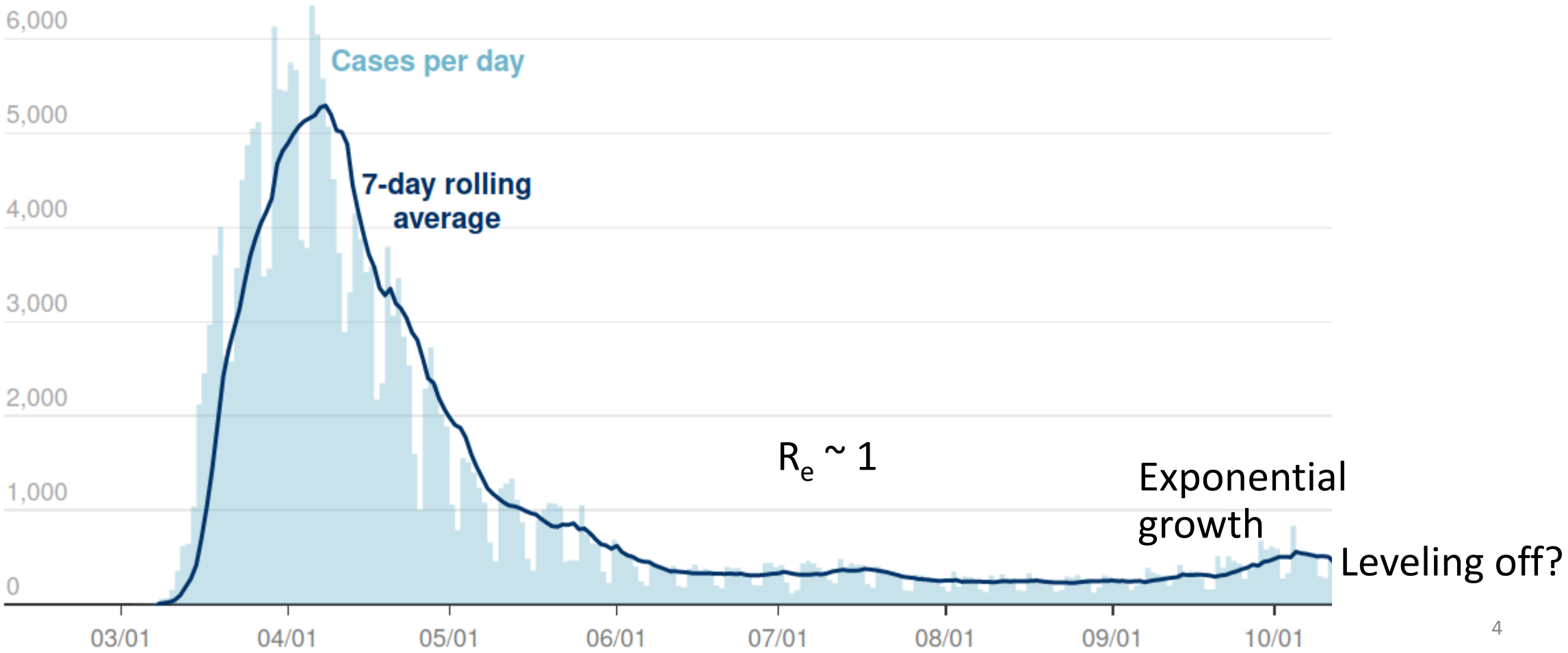


Probability of a transient uptick consistent with summer, when excluding 9 hotspot ZIP codes:

Date	Probability*
2020-10-11	0.018
2020-10-12	0.293
2020-10-13	0.208
2020-10-14	0.030
2020-10-15	0.141
2020-10-16	0.129
2020-10-17	0.008

Second wave, blip, or new setpoint?

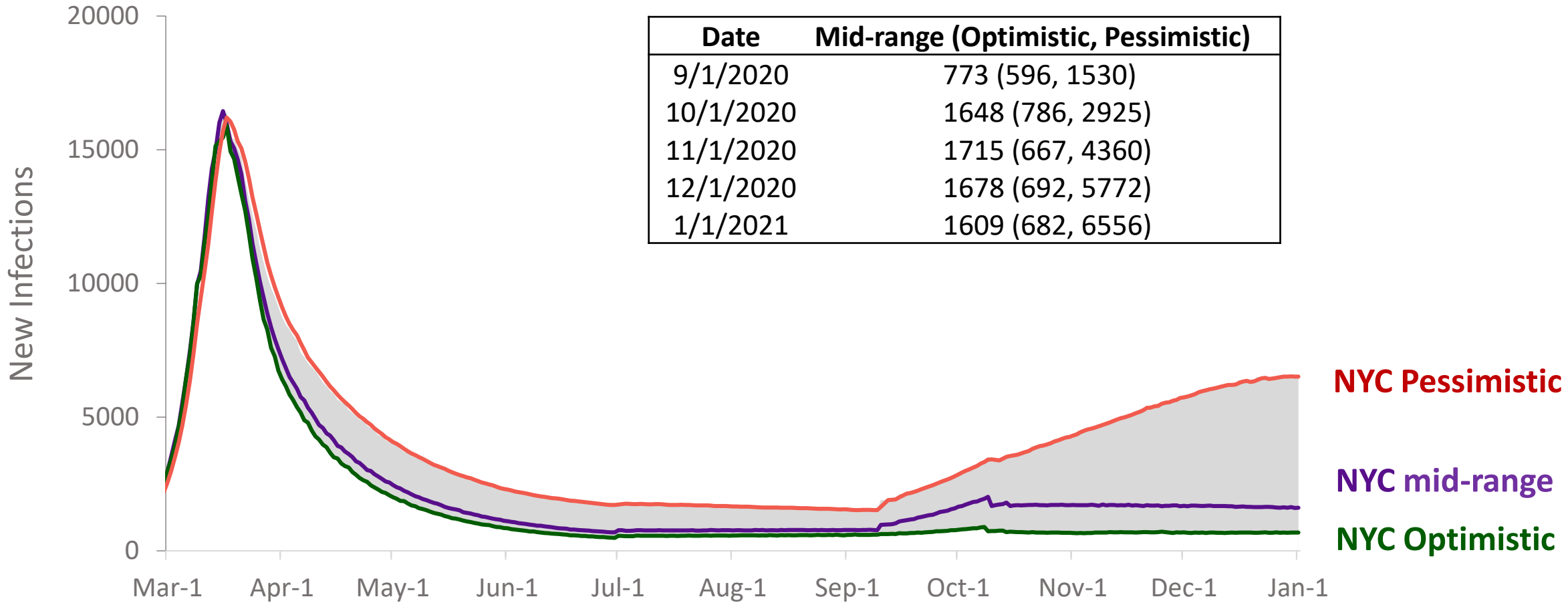
- Increase in NYC cases may be leveling off at a higher setpoint
- Optimistic outlook: hotspots decline to previous baseline
- Pessimistic outlook: entire city primed for outbreaks, exponential growth



Model scenarios to examine today

- Middle scenario
  - Uses model's best fit to hospitalization, ICU, and deaths data
  - Assumes infections grew exponentially in hotspots and city-wide starting Sept 10th, but stopped growing on Oct 9th, establishing a new setpoint with $R_e \approx 1$
- Optimistic scenario
  - Uses model's fit to the lower bound on hospitalization, ICU, and deaths
  - Assumes cases grew exponentially only in hotspots, and then hotspots were extinguished by policy
- Pessimistic scenario
  - Uses model's fit to the upper bound on hospitalization, ICU, and deaths
  - Assumes infections will continue to grow exponentially in hotspots and city-wide

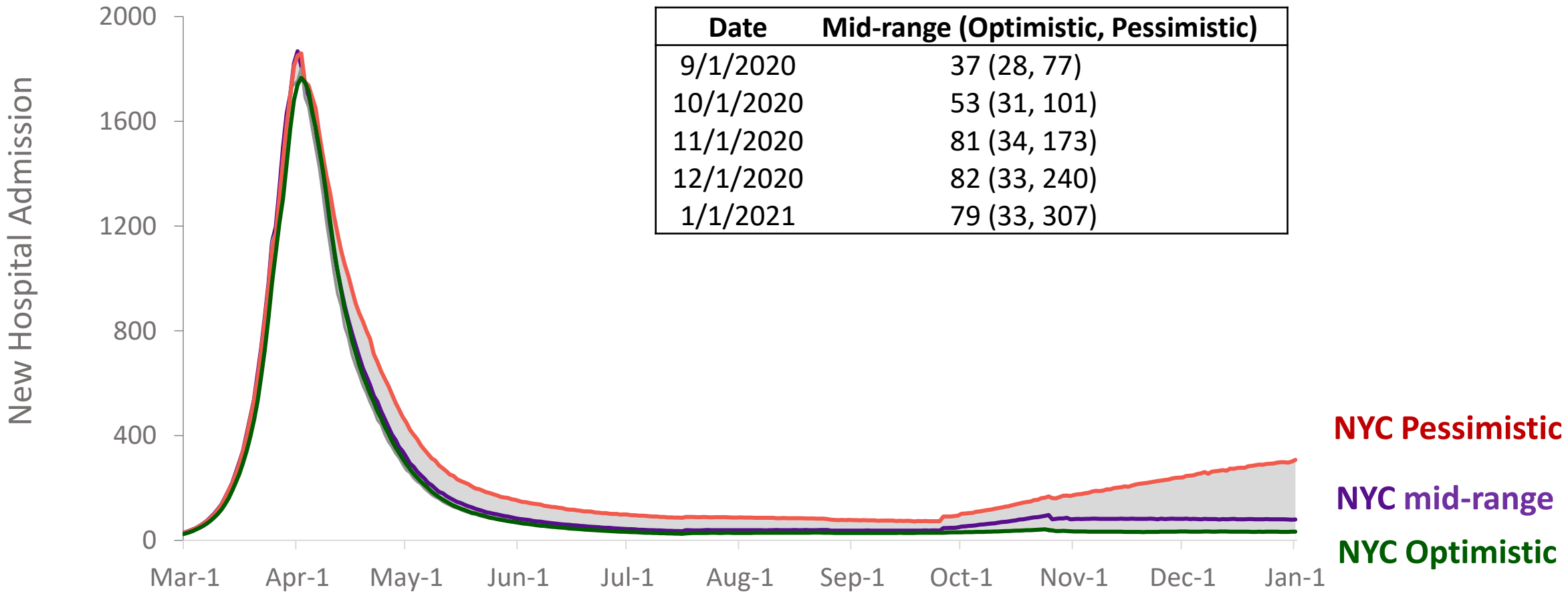
NYC Daily New Infections



Date	Mid-range (Optimistic, Pessimistic)
9/1/2020	773 (596, 1530)
10/1/2020	1648 (786, 2925)
11/1/2020	1715 (667, 4360)
12/1/2020	1678 (692, 5772)
1/1/2021	1609 (682, 6556)

R_e represents the current effective reproduction number of the epidemic. NYC mid-range represents R_e remains ~1, inferred from NYC mobility data together with NYC COVID data.

NYC New COVID Daily Hospital Admission



Date	Mid-range (Optimistic, Pessimistic)
9/1/2020	37 (28, 77)
10/1/2020	53 (31, 101)
11/1/2020	81 (34, 173)
12/1/2020	82 (33, 240)
1/1/2021	79 (33, 307)

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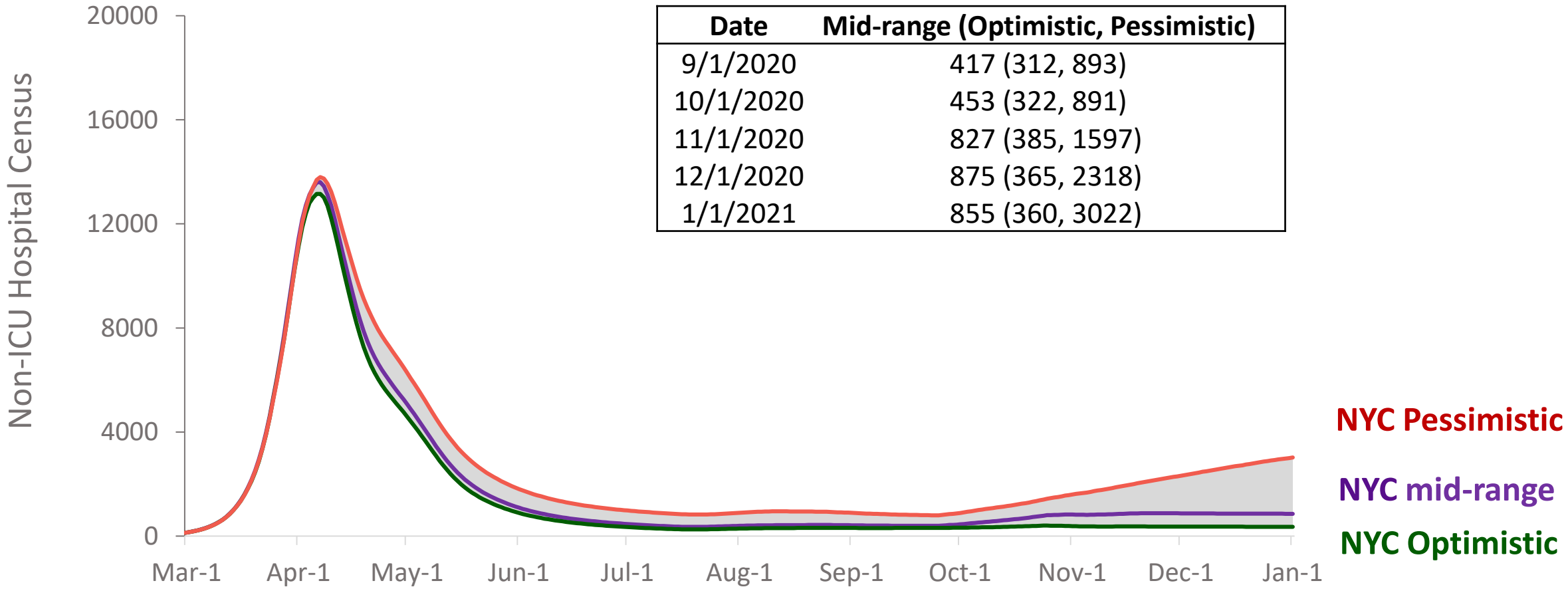
NYC Non-ICU COVID Hospital Census



Date	Mid-range (Optimistic, Pessimistic)
9/1/2020	417 (312, 893)
10/1/2020	453 (322, 891)
11/1/2020	827 (385, 1597)
12/1/2020	875 (365, 2318)
1/1/2021	855 (360, 3022)

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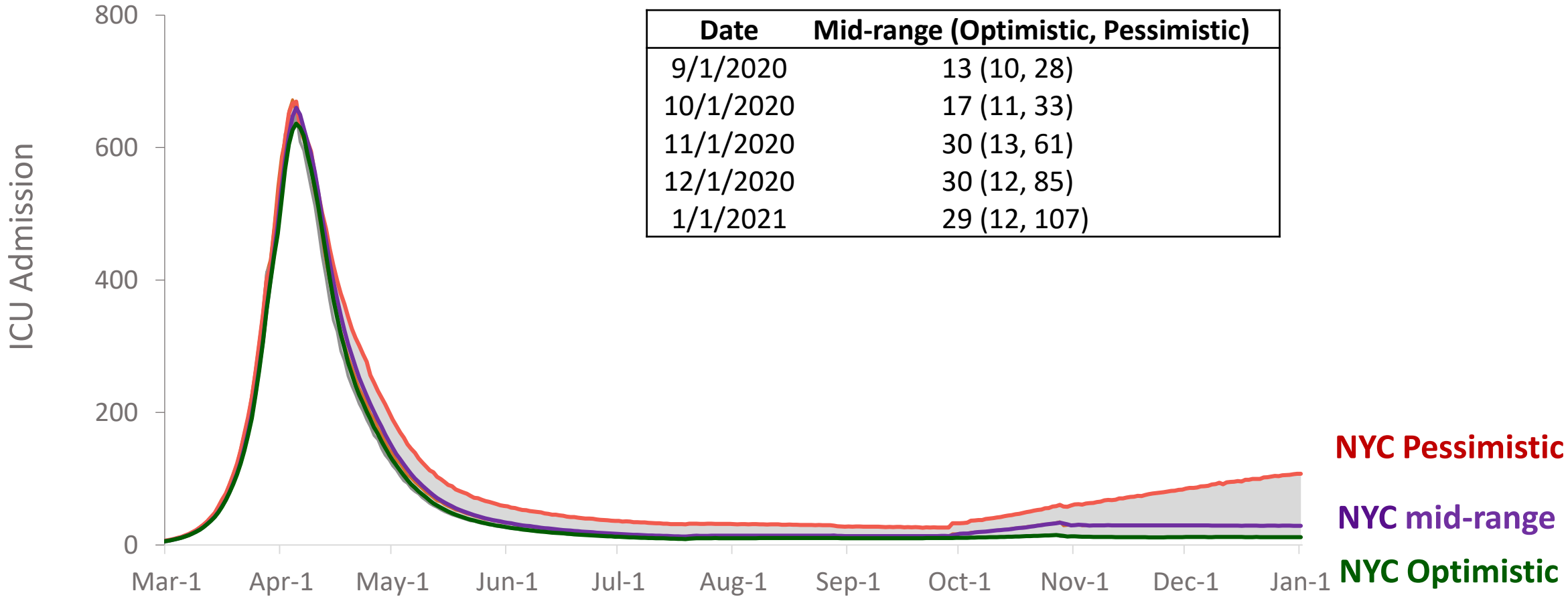
NYC ICU COVID Admission



Date	Mid-range (Optimistic, Pessimistic)
9/1/2020	13 (10, 28)
10/1/2020	17 (11, 33)
11/1/2020	30 (13, 61)
12/1/2020	30 (12, 85)
1/1/2021	29 (12, 107)

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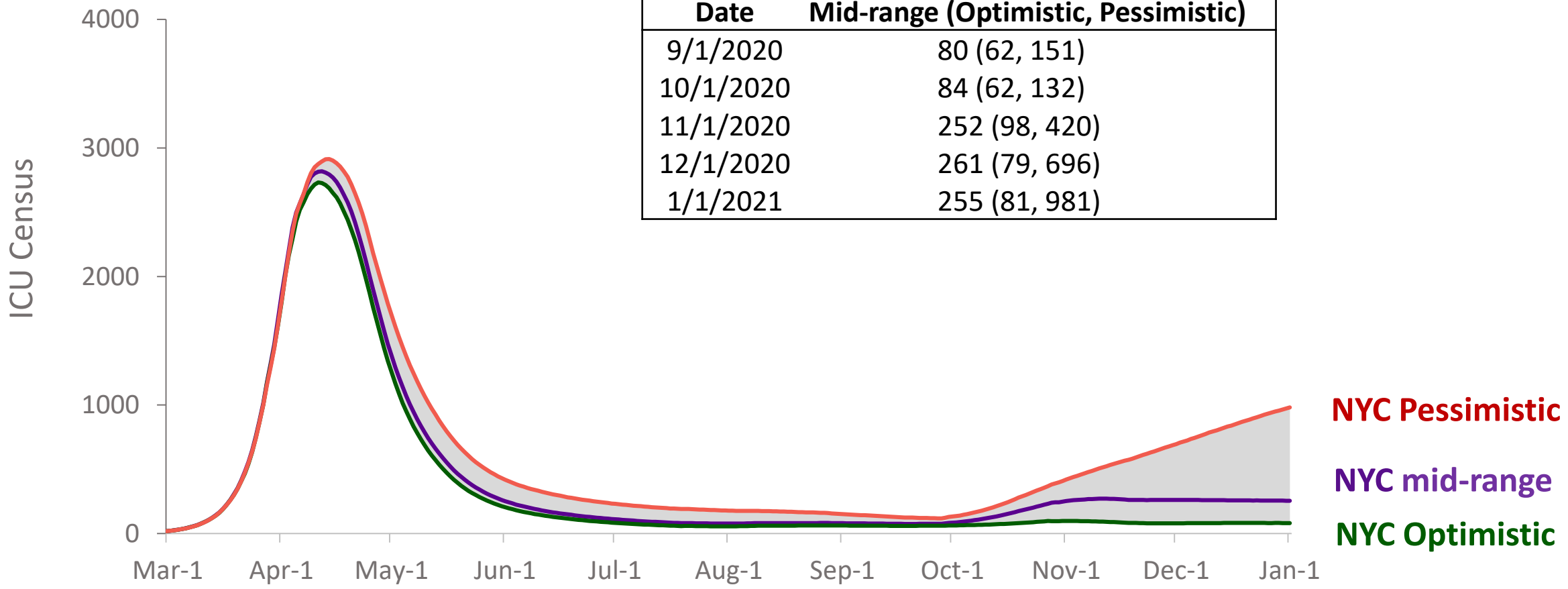
NYC ICU COVID Census



Date	Mid-range (Optimistic, Pessimistic)
9/1/2020	80 (62, 151)
10/1/2020	84 (62, 132)
11/1/2020	252 (98, 420)
12/1/2020	261 (79, 696)
1/1/2021	255 (81, 981)

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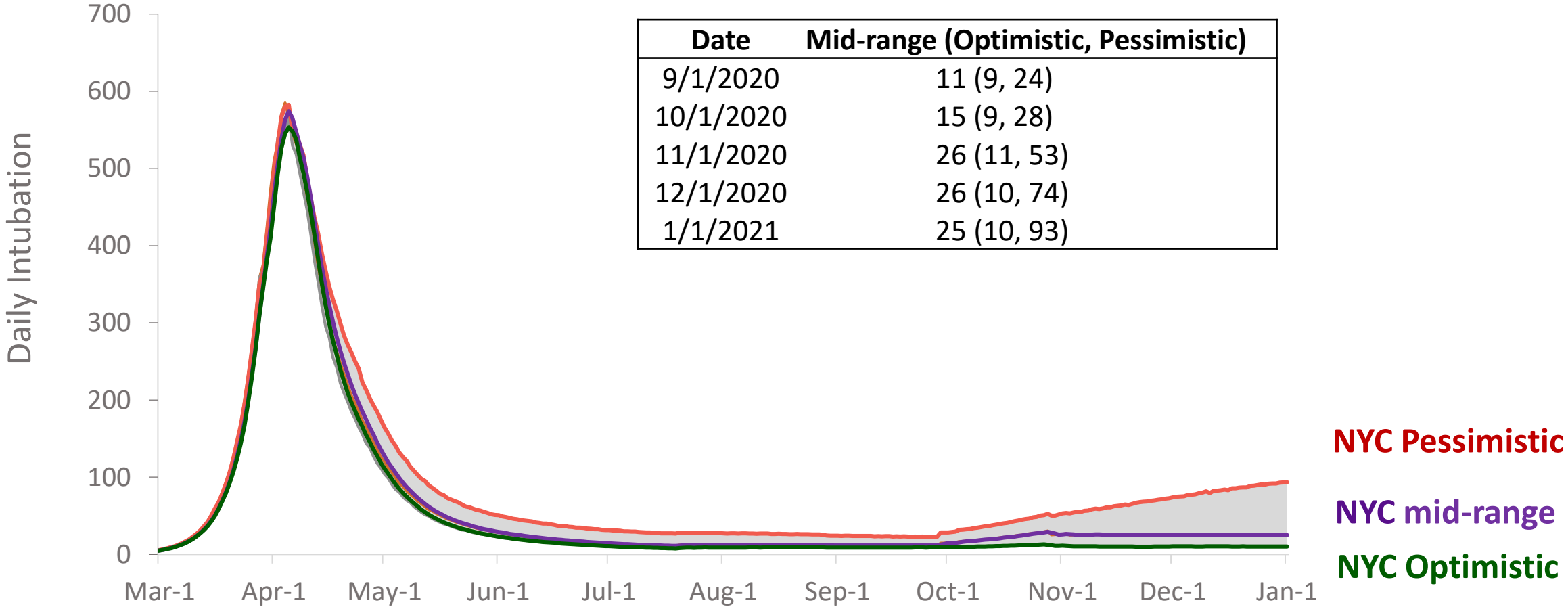
NYC Daily Intubation



Date	Mid-range (Optimistic, Pessimistic)
9/1/2020	11 (9, 24)
10/1/2020	15 (9, 28)
11/1/2020	26 (11, 53)
12/1/2020	26 (10, 74)
1/1/2021	25 (10, 93)

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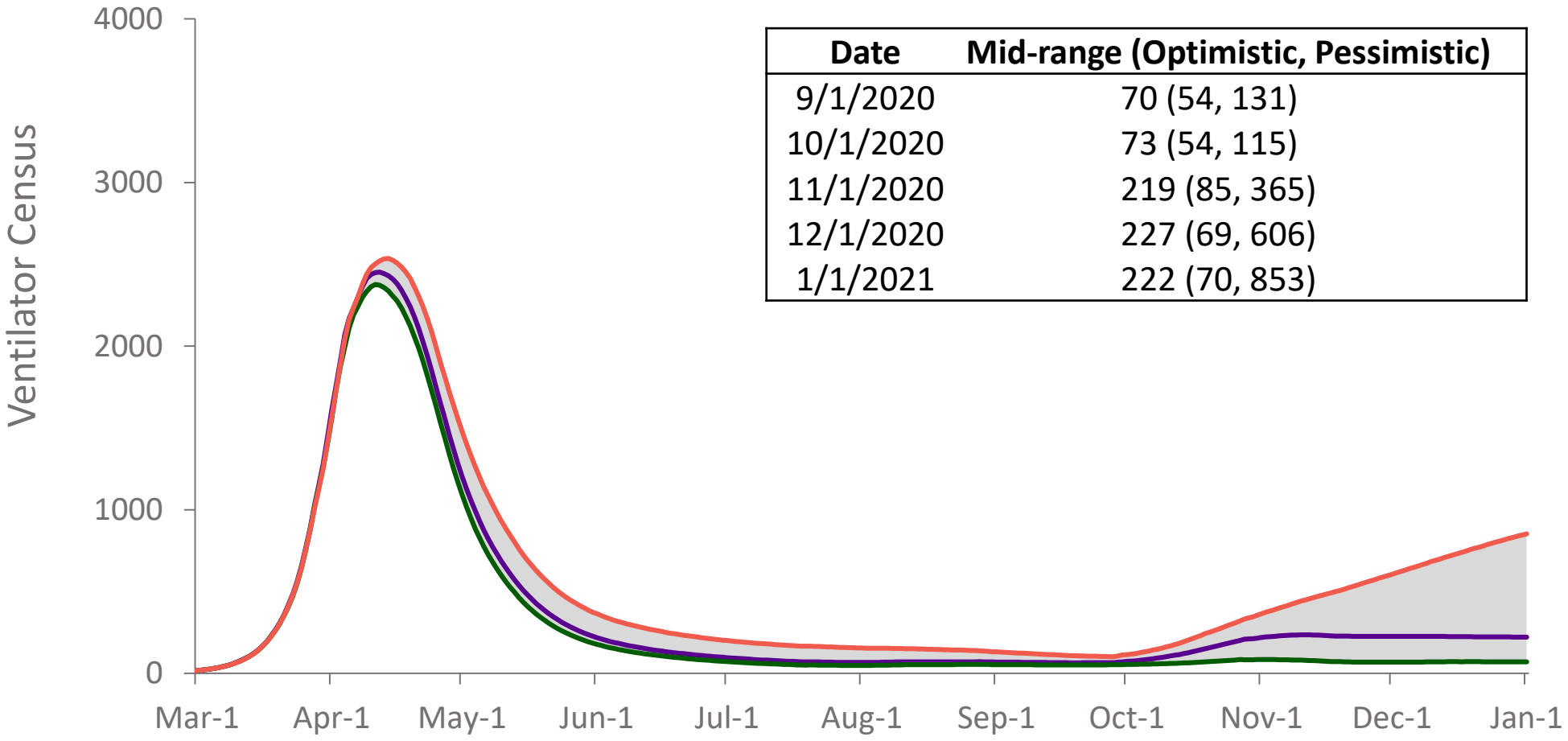
NYC Ventilator Census



Date	Mid-range (Optimistic, Pessimistic)
9/1/2020	70 (54, 131)
10/1/2020	73 (54, 115)
11/1/2020	219 (85, 365)
12/1/2020	227 (69, 606)
1/1/2021	222 (70, 853)

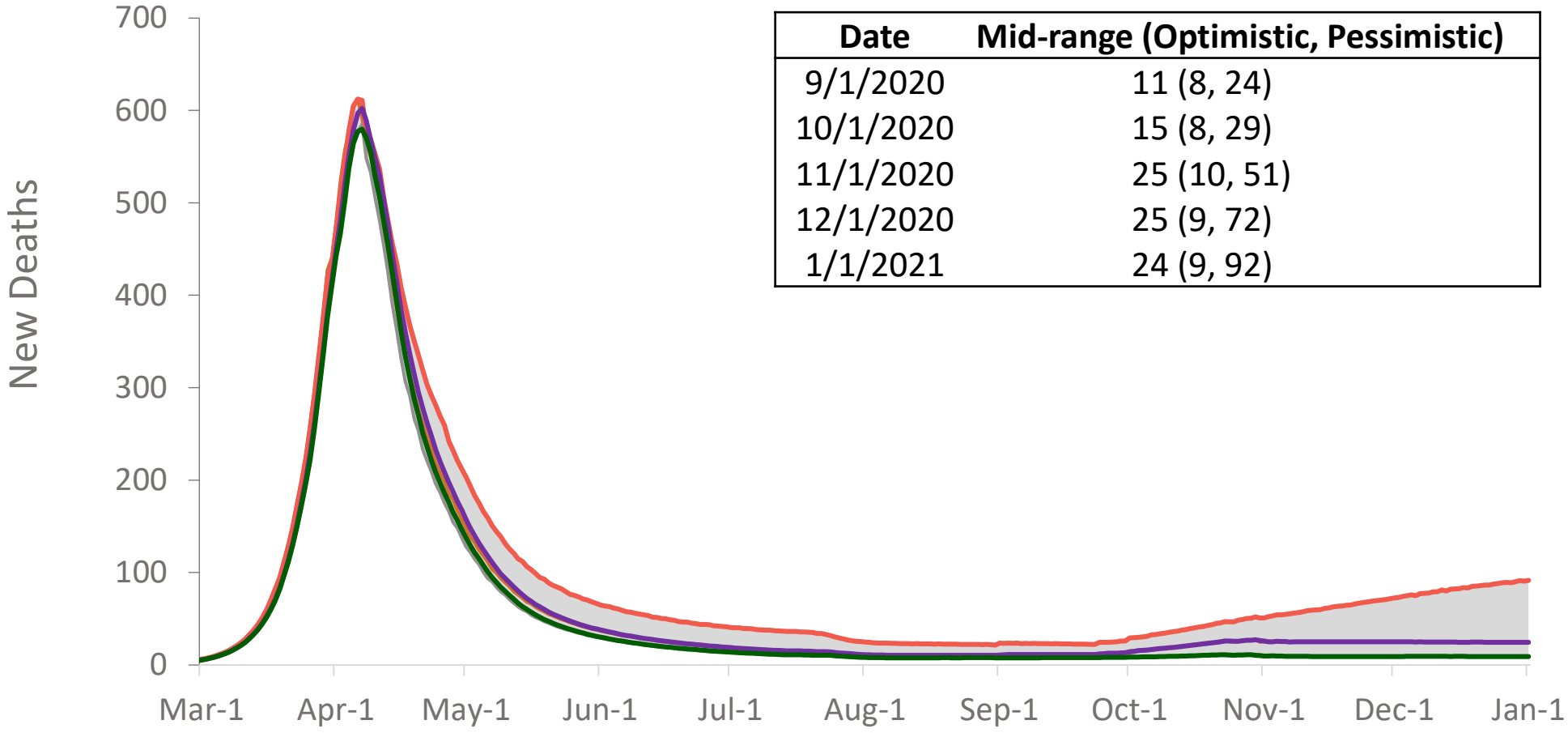
NYC Pessimistic

NYC mid-range

NYC Optimistic

R_e represents the current effective reproduction number of the epidemic. NYC mid-range represents R_e remains ~1, inferred from NYC mobility data together with NYC COVID data.

NYC New Daily COVID Deaths



Date	Mid-range (Optimistic, Pessimistic)
9/1/2020	11 (8, 24)
10/1/2020	15 (8, 29)
11/1/2020	25 (10, 51)
12/1/2020	25 (9, 72)
1/1/2021	24 (9, 92)

NYC Pessimistic

NYC mid-range

NYC Optimistic

R_e represents the current effective reproduction number of the epidemic. NYC mid-range represents R_e remains ~1, inferred from NYC mobility data together with NYC COVID data.

Conclusions

- Upticks in recent weeks are distinct from transient upticks seen throughout the summer.
- Sept-Oct growth in cases was confined to specific neighborhoods.
- Exponential growth appears to have abated, unless testing has declined.
- If hotspots can achieve summer-level R_e, the epidemic will stabilize at a higher level.
- If hotspots adhere to precautions with $R_e<1$, there will be only transient increases in SARS-CoV-2 in hotspots and city-wide, soon declining to pre-hotspot levels.
- If $R_e>1$ due to changes such as weather and school/work/social habits, outbreaks will become increasingly common, with epidemic growth expected on average.
- No scenario has a second wave that is as severe as the first wave by end of 2020.