

# NYC COVID-19 Modeling Update

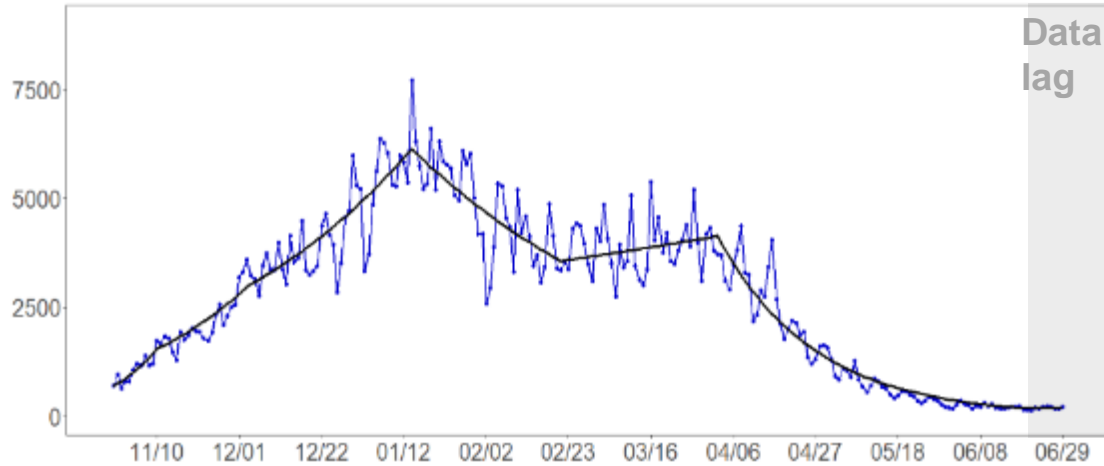
*July 15, 2021*

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# COVID-19 cases, hospitalizations, and deaths are at low levels, but cases are rising

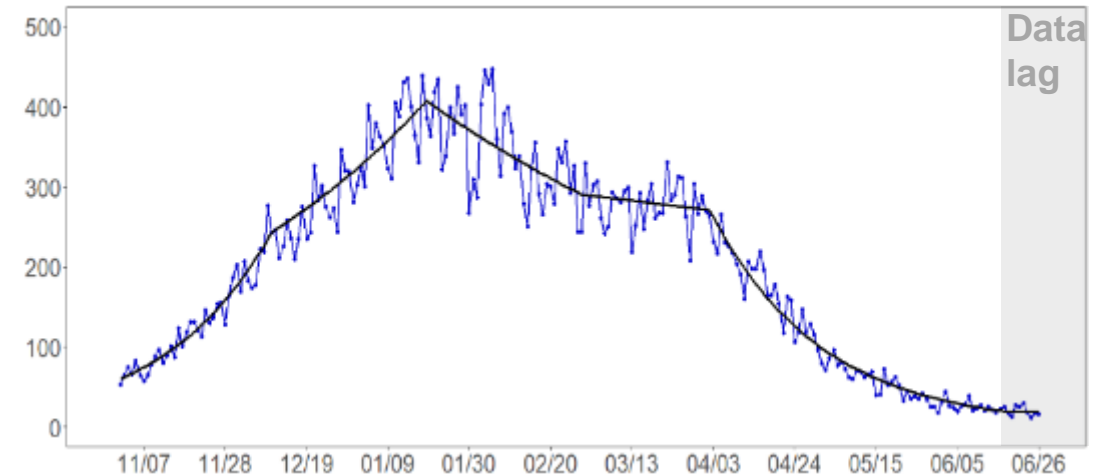
## NYC daily COVID-19 cases

Levelled out in mid-June at ~200/day but recently increased to ~400/day



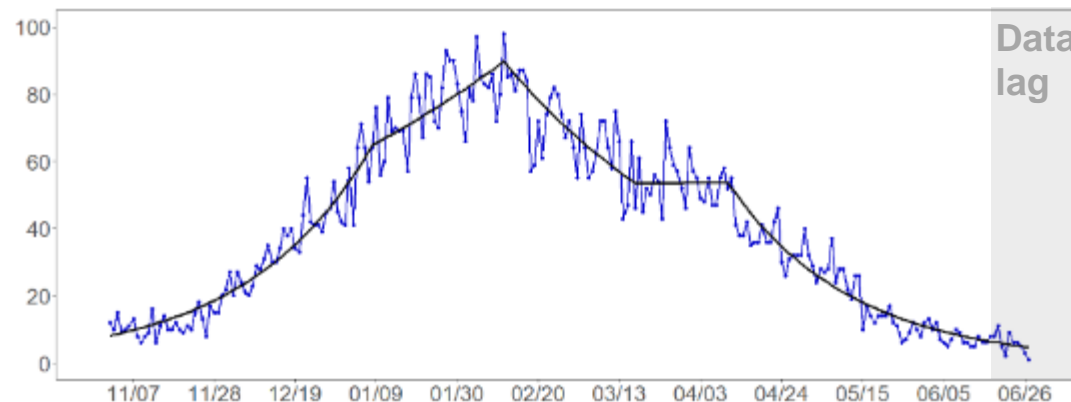
## NYC daily COVID-19 admissions

Declined since early April by **3.5%** per day but levelled out in mid-June at ~20/day

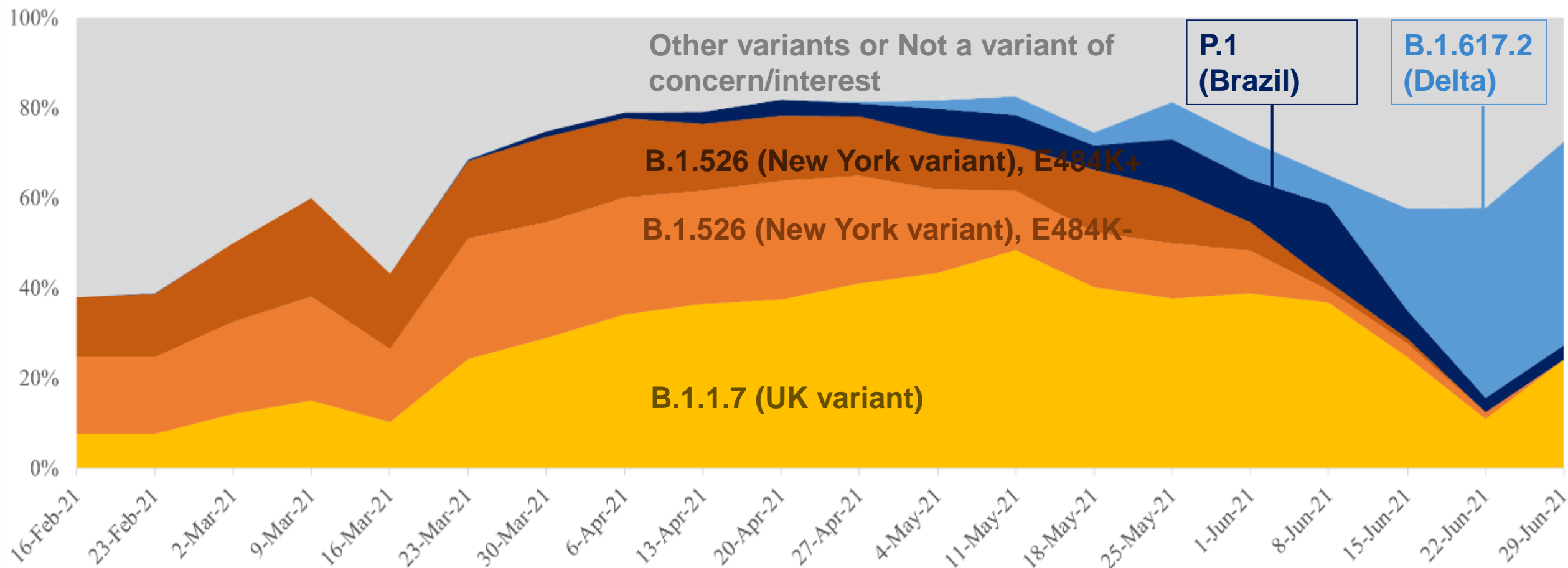


## NYC daily COVID-19 deaths

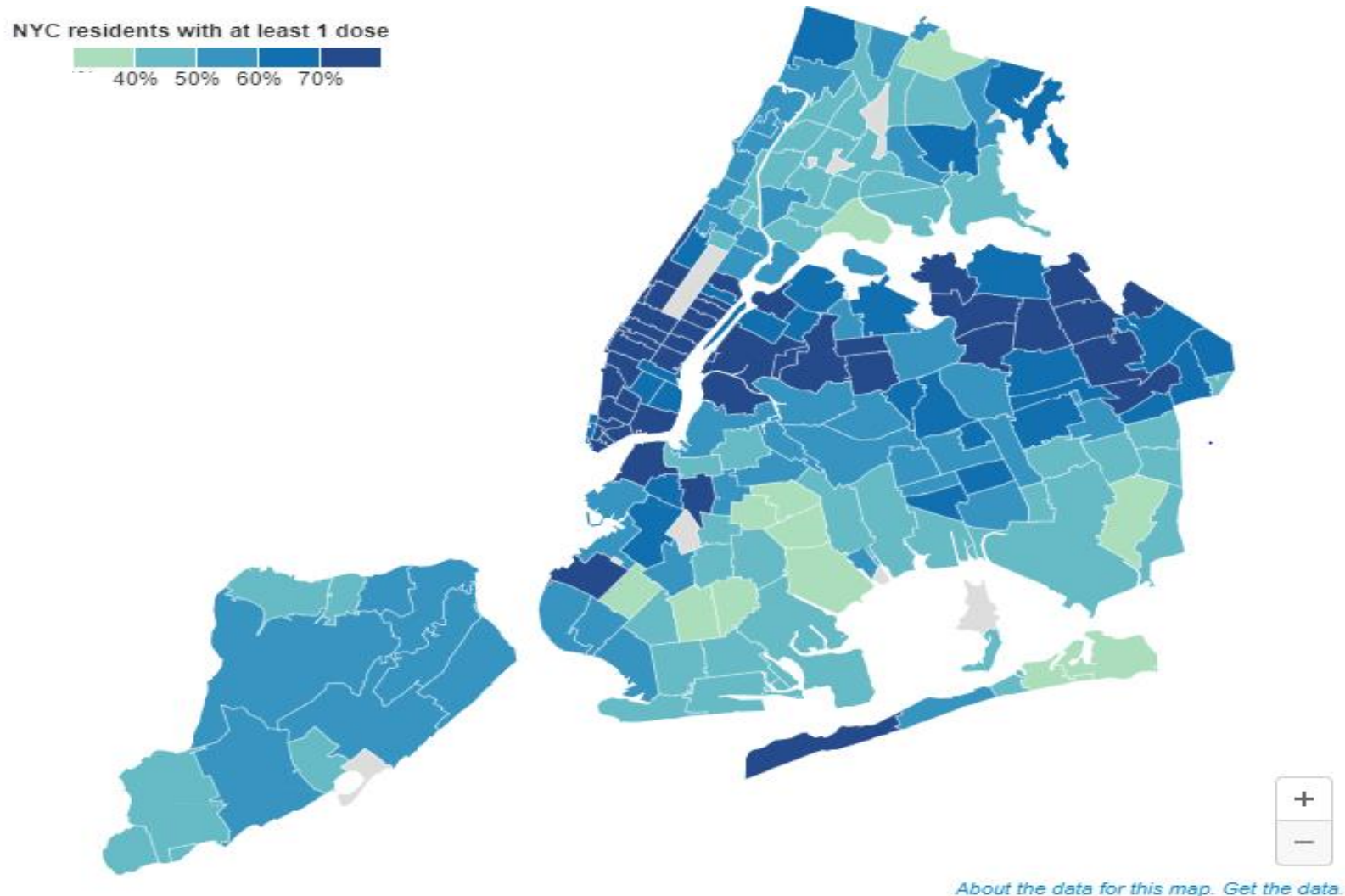
Declining since early April by **3.1%** per day



# Rapid expansion of Delta variant (B.1.617.2)



# Cumulative vaccine coverage (at least one dose) by ZIP code



# What will Fall 2021 look like? NYC model assumptions

## Re-opening

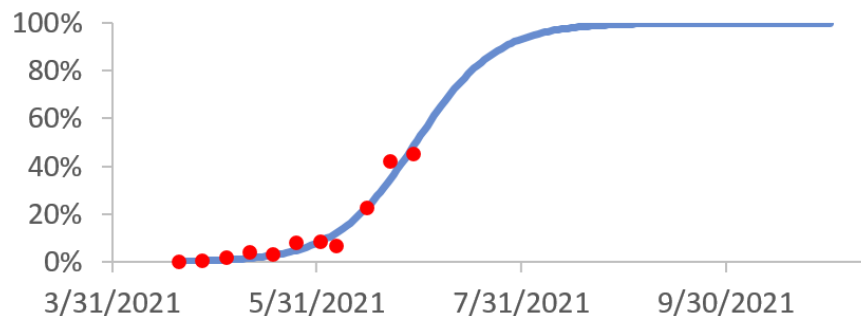
- Return to normal behavior by September 13<sup>th</sup> (first day of school)

## Seasonality

- Transmissibility ( $R_0$ )  $\uparrow$  by 20% between mid-September and end of year
  - Based on last year's winter season

## Delta variant emergence

- Overtakes in late summer
  - Timeline fit to trends so far:

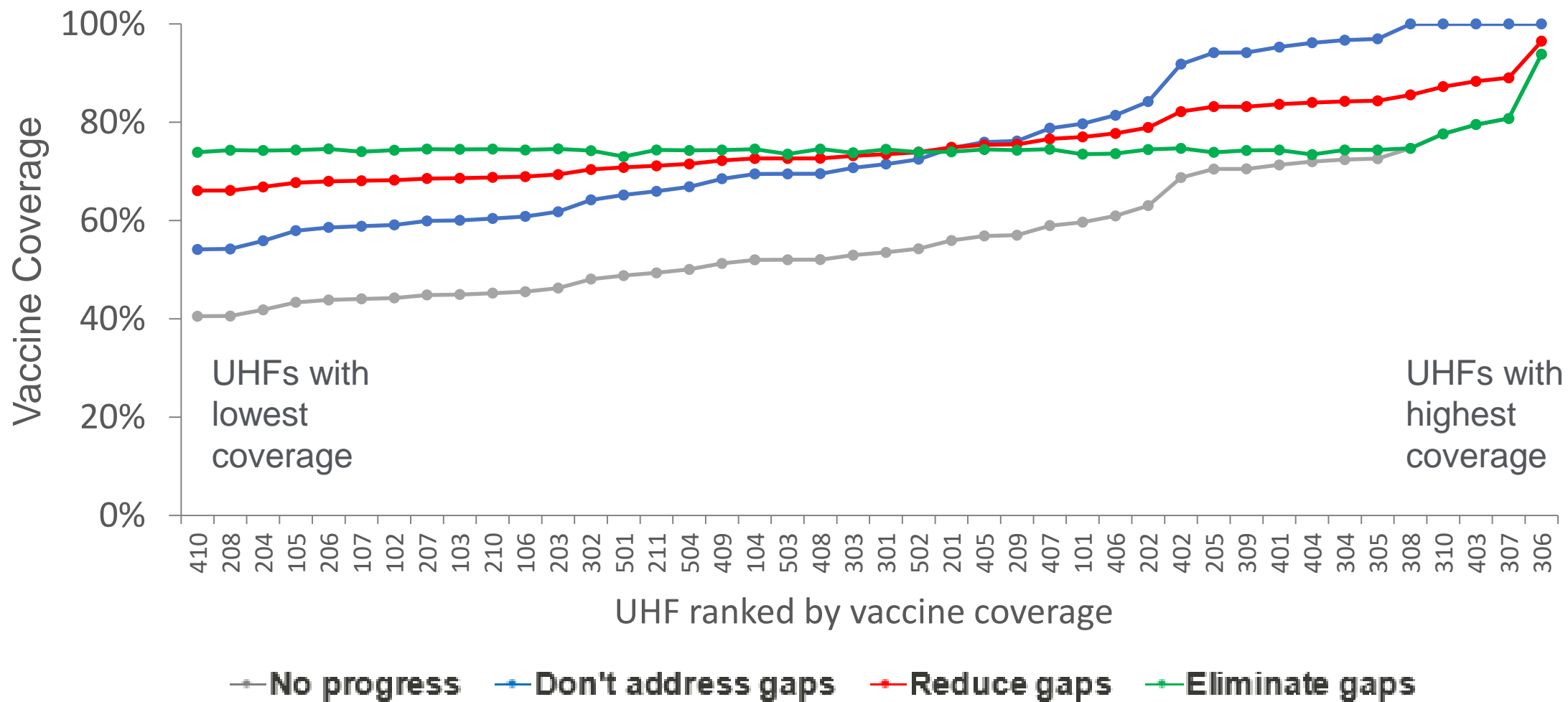


- Transmissibility ( $R_0$ )
  - $\uparrow$  by 150% for non-B.1.1.7 lineage
  - $\uparrow$  by 60% for B.1.1.7 lineage
- Vaccines remain effective

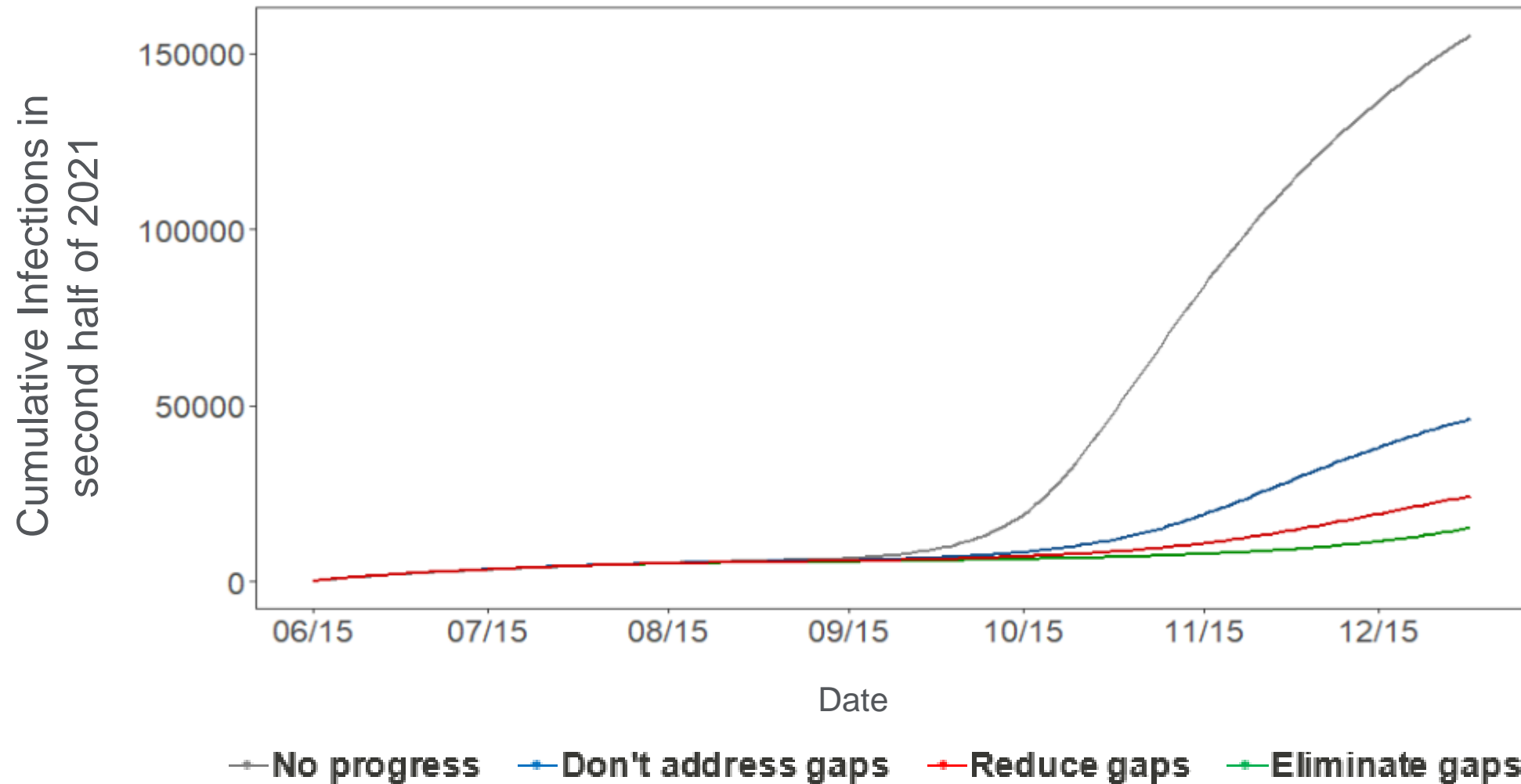
## Vaccination

- Up to 75% are willing to be vaccinated citywide
- Up to 44,000 doses can be delivered per day
- Past vaccination
  - based on DoHMH data by 42 United Hospital Fund (UHF) neighborhoods
- Future vaccination scenarios
  - No progress: No more vaccination
  - Don't address gaps: reach 75% city-wide average with each UHF increasing in proportion to current coverage
    - Example: UHF 1: 60%  $\rightarrow$  66%
    - UHF 2: 70%  $\rightarrow$  77%
  - Reduce gaps: reach 75% city-wide average with each UHF closing its coverage gap in proportion to current gap
    - Example: UHF 1: 60%  $\rightarrow$  70%
    - UHF 2: 70%  $\rightarrow$  77.5%
  - Eliminate gaps: all UHF reach 75% vaccine coverage

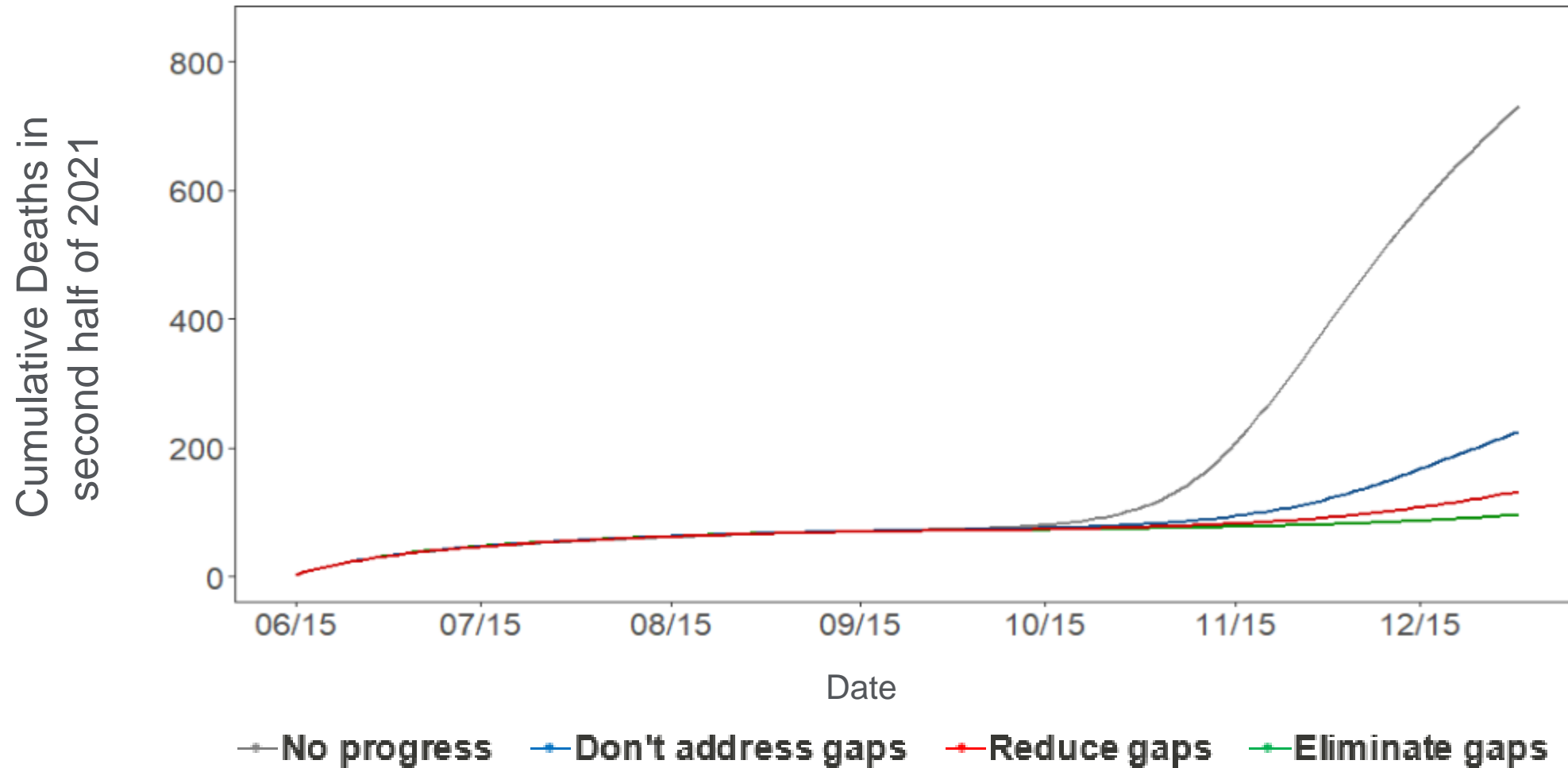
# Input: Vaccine coverage by UHF (mid-Sept 2021)



# Result: NYC Cumulative Infections in second half of 2021



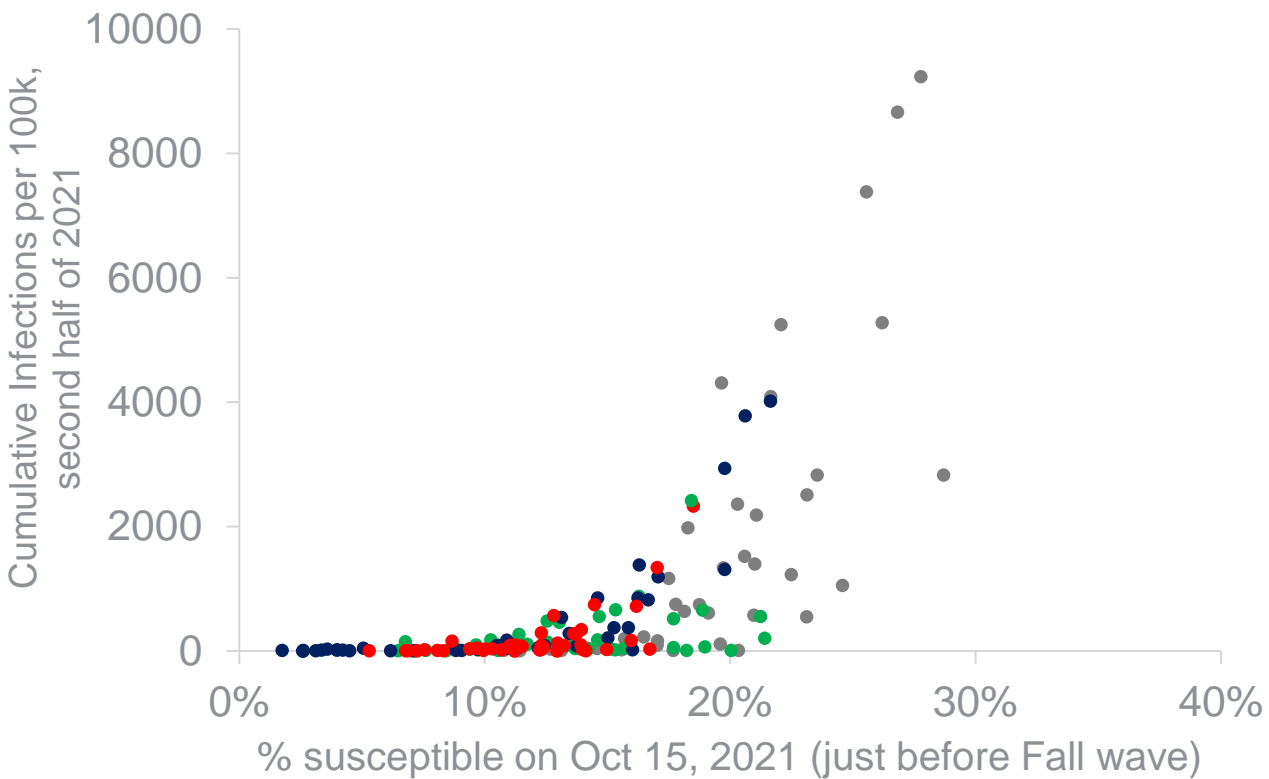
# NYC Cumulative Deaths in second half of 2021



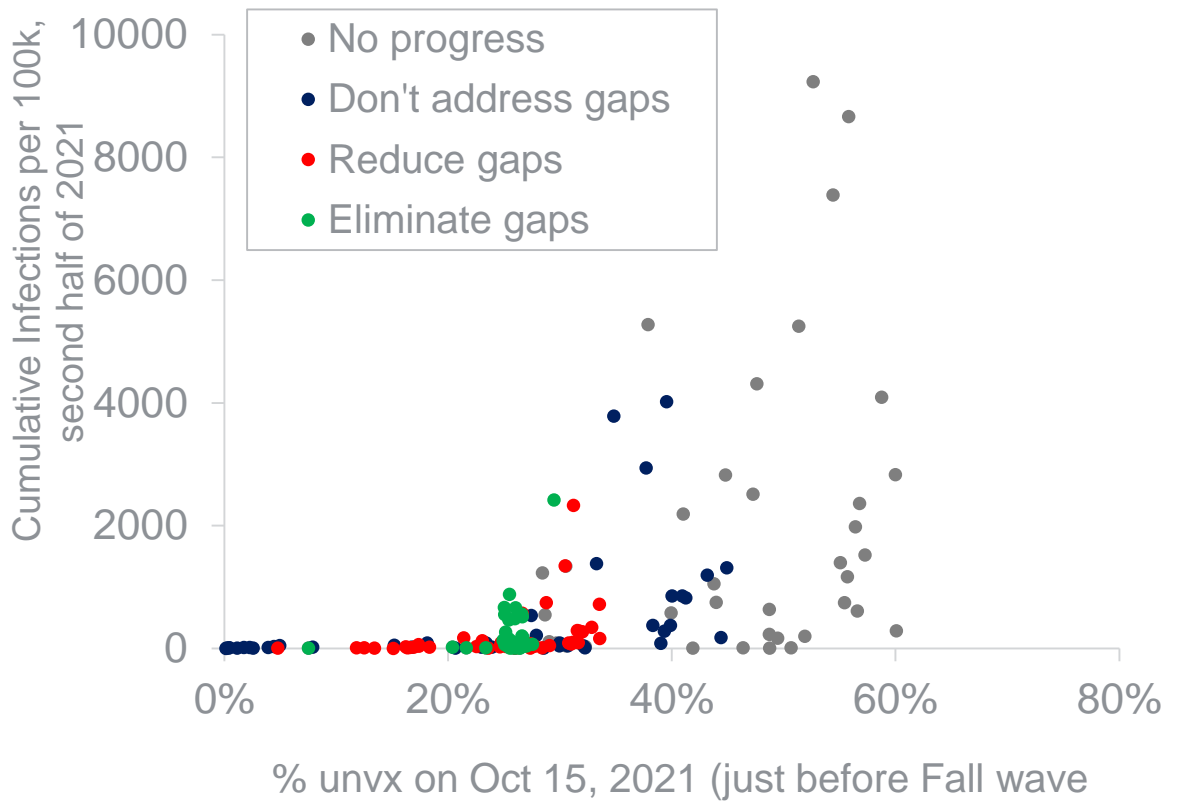


# Hard-hit UHFs are those with low immunity, usually due to vaccination gaps

% Not Immune

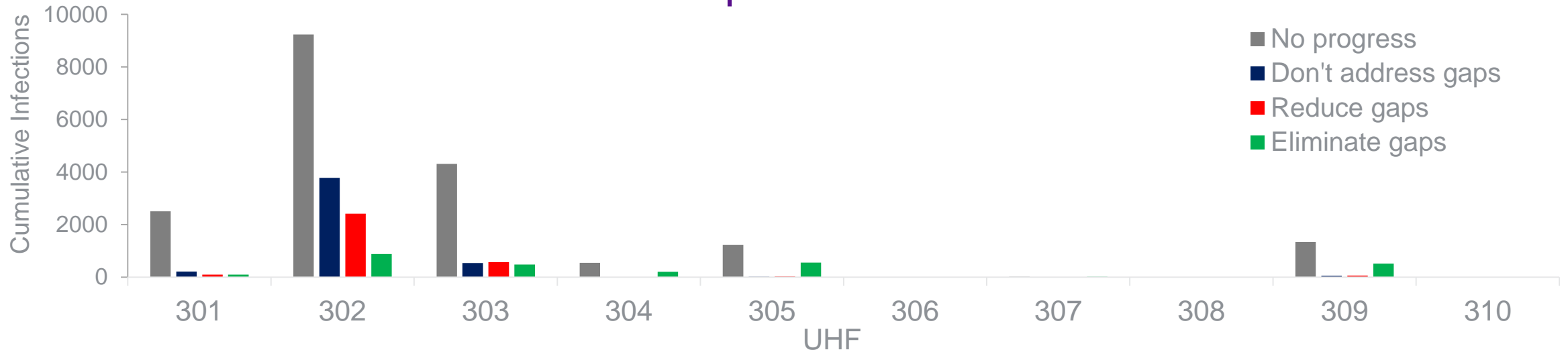


% Unvaccinated

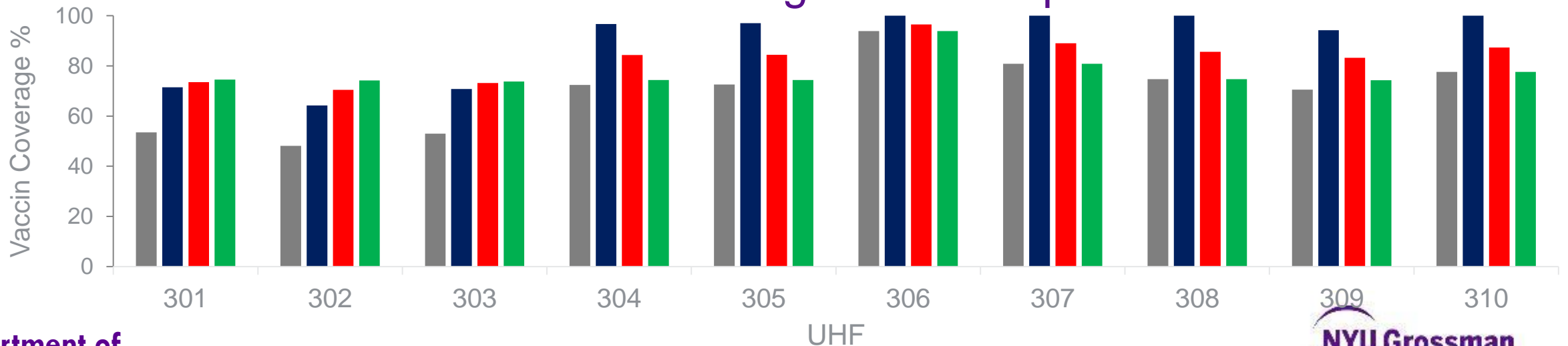


# Manhattan:

## Cumulative Infections per 100k in second half of 2021

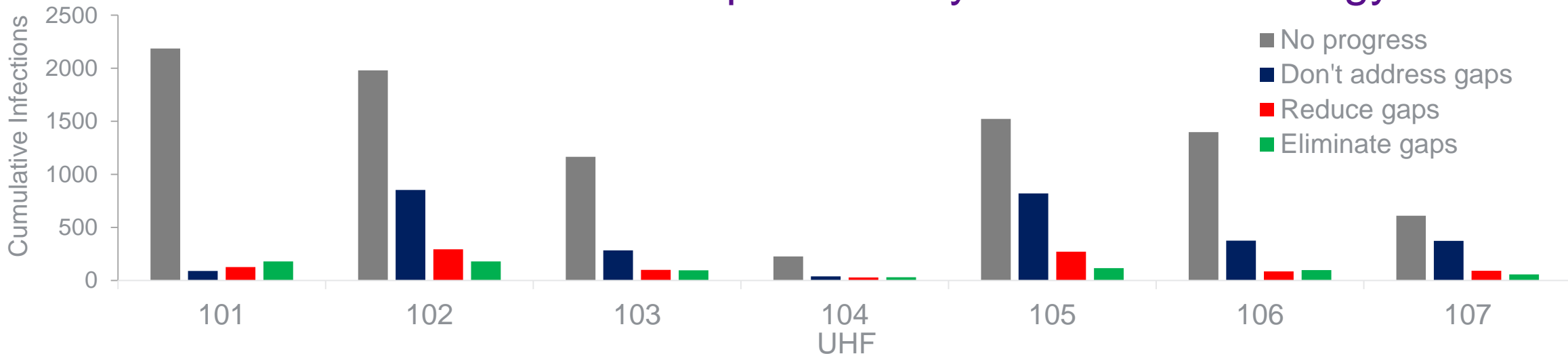


## Vaccine coverage in mid-Sept 2021

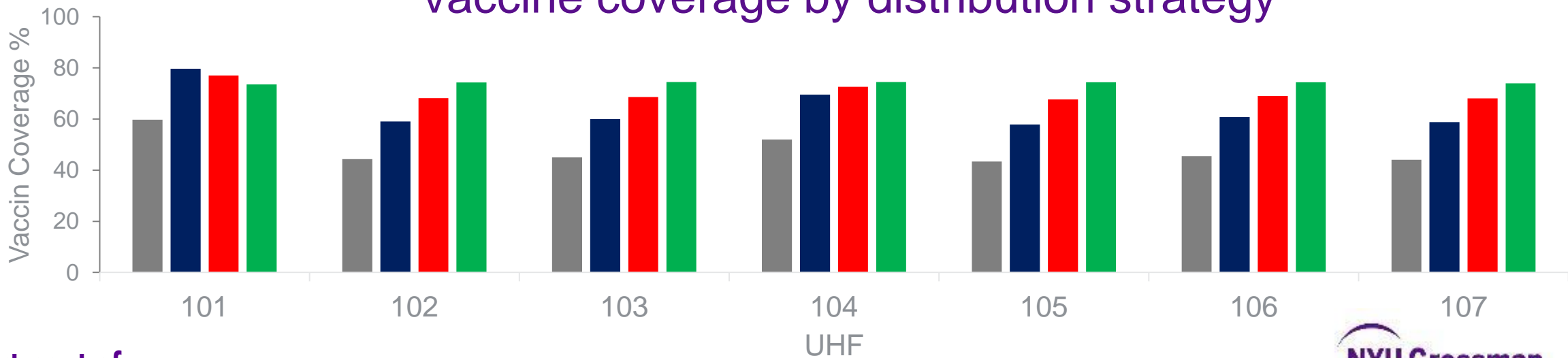


# Bronx:

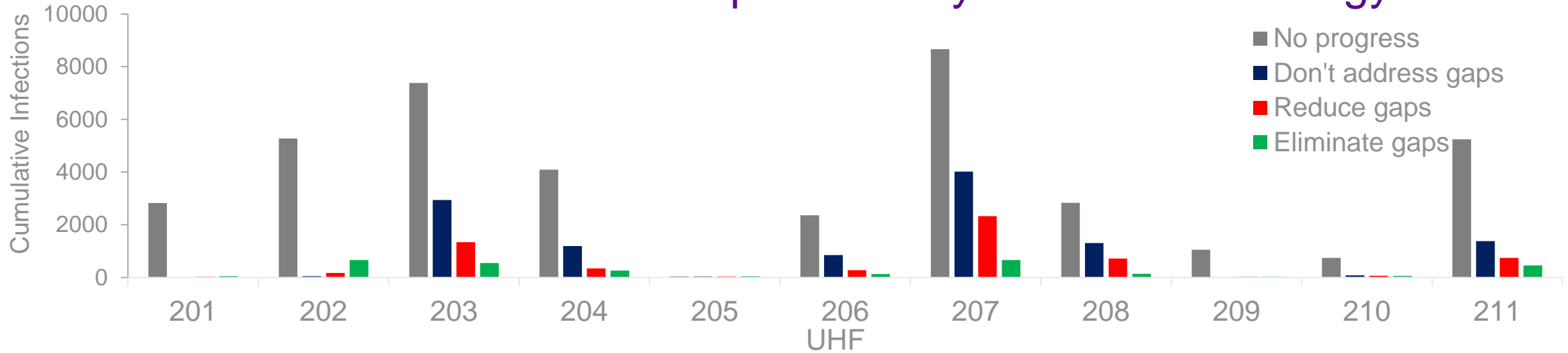
## Cumulative Infections per 100k by distribution strategy



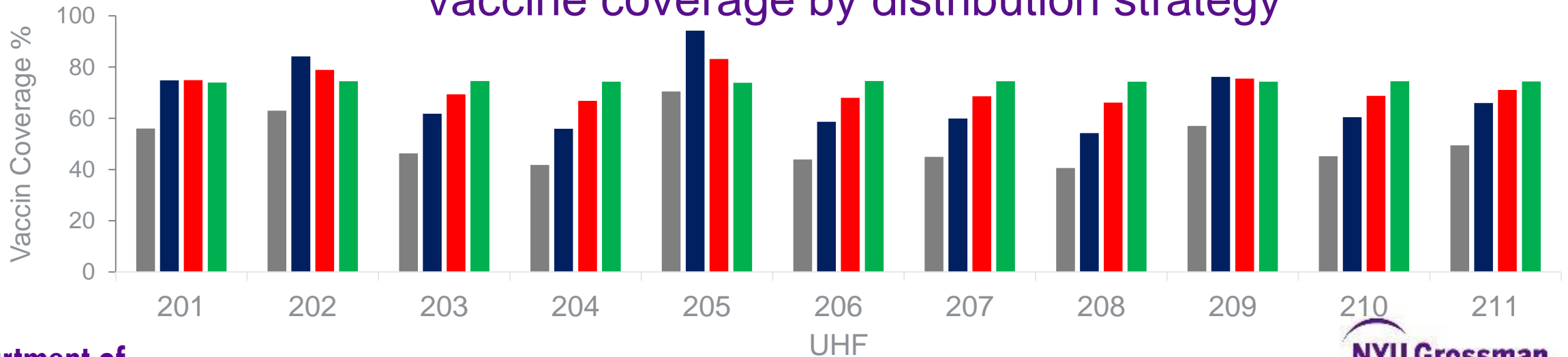
## Vaccine coverage by distribution strategy



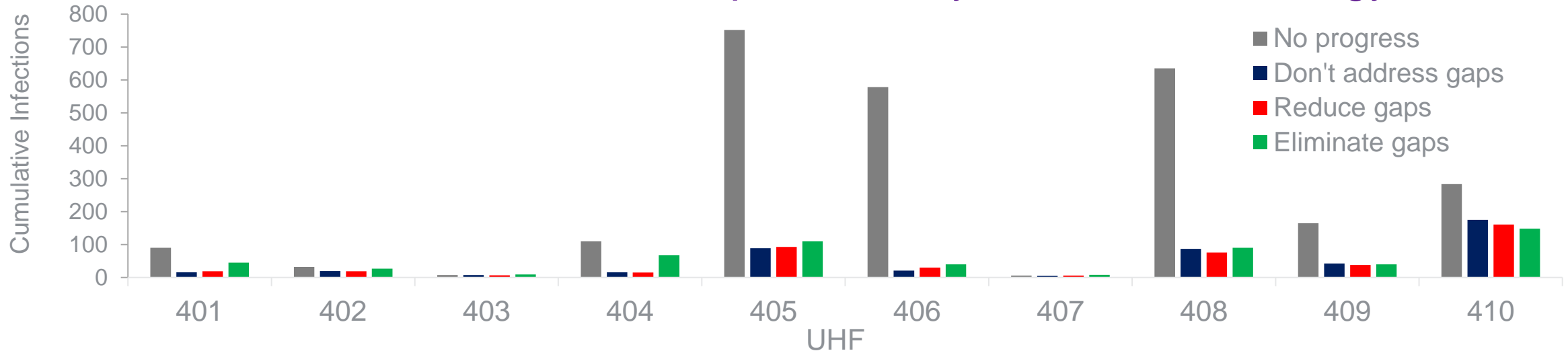
# Brooklyn: Cumulative Infections per 100k by distribution strategy



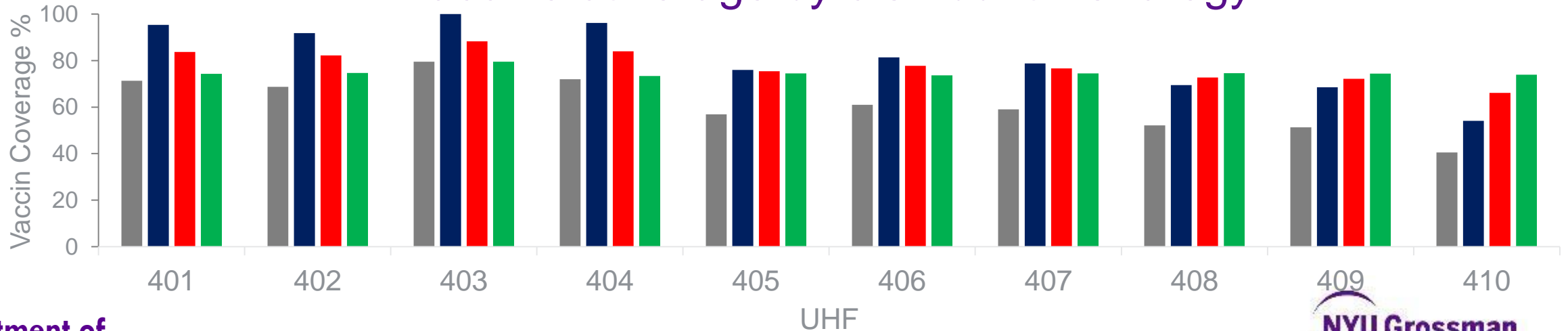
# Vaccine coverage by distribution strategy



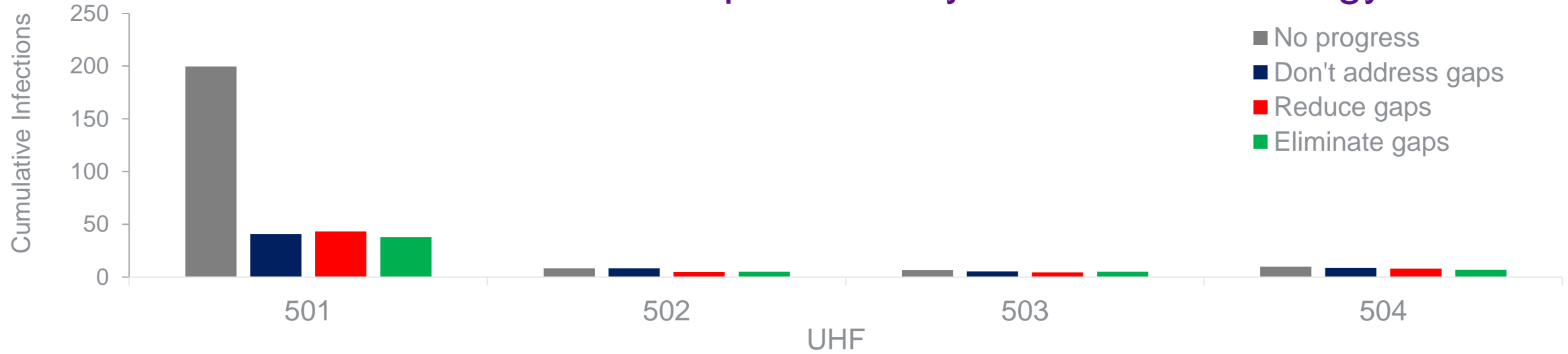
# Queens: Cumulative Infections per 100k by distribution strategy



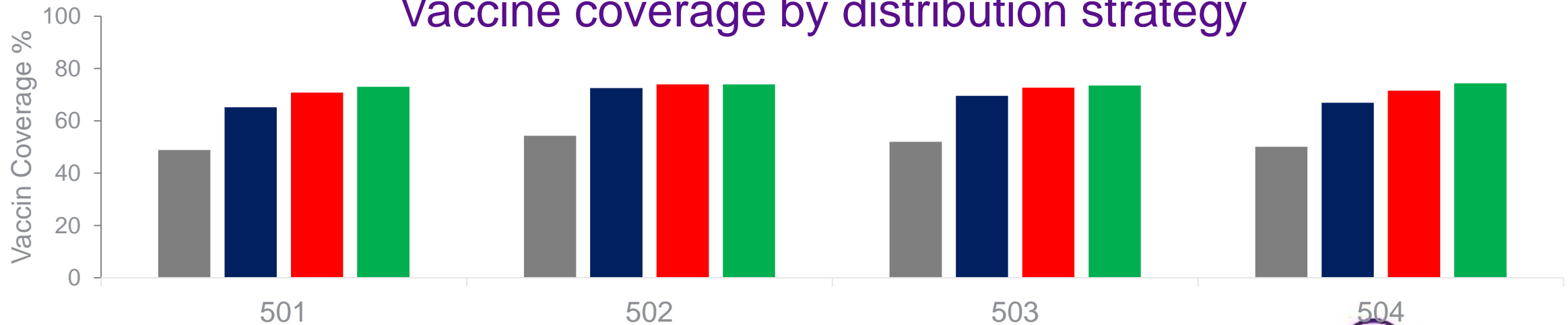
# Vaccine coverage by distribution strategy



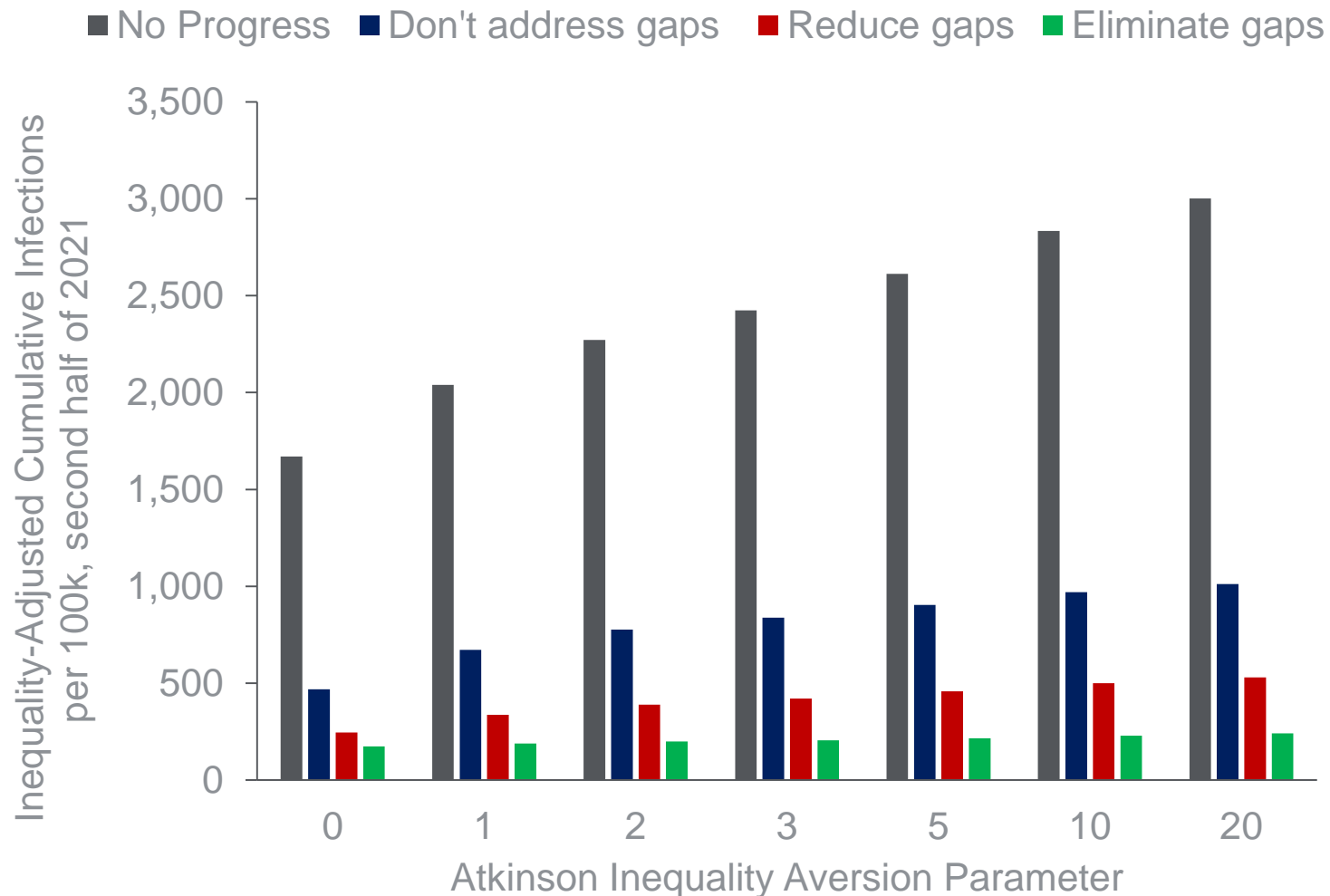
# Staten Island: Cumulative Infections per 100k by distribution strategy



# Vaccine coverage by distribution strategy



# Preference for “eliminate gaps” strategy is accentuated by inequality aversion



- Inequality aversion reflects how much aggregate benefit one would sacrifice to see it more equally distributed
- Typical levels of inequality aversion ( $\epsilon$ ) are ~3-6 (Canada) to ~10 (UK)<sup>1</sup>
- “Eliminate gaps” is best strategy even without inequality aversion
- Inequality aversion greatly increases preference for “eliminate gaps” strategy

<sup>1</sup>Robson, M., Asaria, M., Cookson, R., Tsuchiya, A., & Ali, S. (2017). Eliciting the level of health inequality aversion in England. *Health Economics*, 26(10), 1328-1334.

# Summary

- If current vaccination coverage does not improve, NYC could face a Fall 2021 wave due to combination of seasonality, re-opening, and Delta variant.
  - 155,400 cumulative infections and 732 deaths in second half of 2021
  - Small in magnitude relative to past COVID-19 epidemic waves
- Uniformly achieving 75% vaccine coverage across all UHFs by early September would minimize infections and deaths
  - 15,300 cumulative infections and 96 deaths in second half of 2021
  - Inequality aversion increases preference for a uniform strategy
- Proportionally closing vaccination gaps is almost as beneficial as achieving uniform coverage
  - 24,300 cumulative infection and 132 deaths in second half of 2021