Where Have We Come With Face-Masks?

Hierarchy of Epidemiologic Study Design

Laboratory Experiments

Case reports

Case series

Ecologic studies

Cross-sectional studies

Case-control studies

Cohort studies

Randomized controlled trials

Generate Hypotheses

Establish Causality

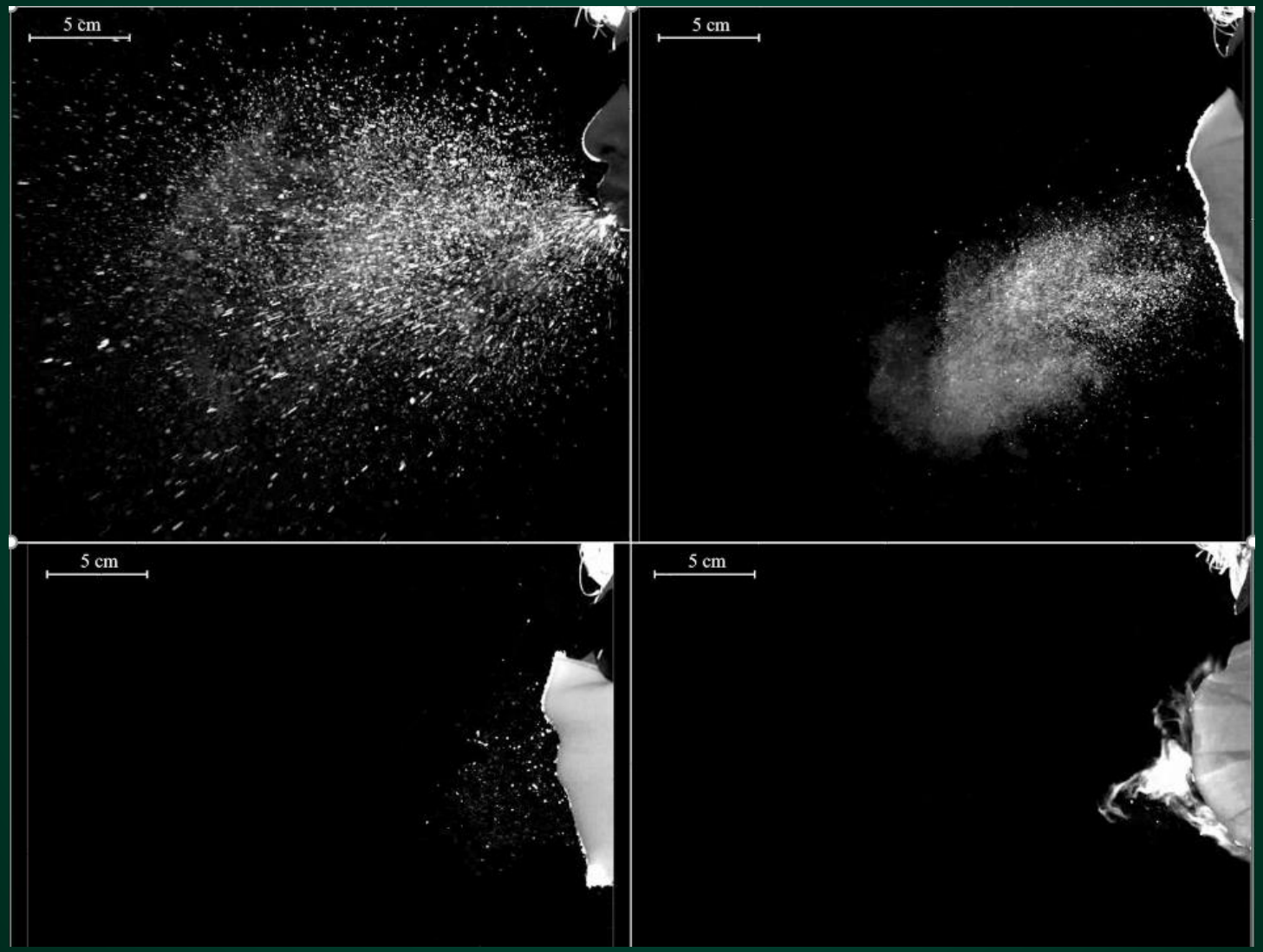
Table. Studies of the Effect of Mask Wearing on SARS-CoV-2 Infection Risk[a]

Source	Location	Population studied	Intervention	Outcome
Hendrix et al	Hair salon in Springfield, Missouri	139 Patrons at a salon with 2 infected and symptomatic stylists	Universal mask wearing in salon (by local ordinance and company policy)	No COVID-19 infections among 67 patrons who were available for follow-up
Payne et al	USS Theodore Roosevelt, Guam	382 US Navy service members	Self-reported mask wearing	Mask wearing reduced risk of infection by 70% (unadjusted odds ratio, 0.30 [95% CI, 0.17-0.52])
Wang Y et al	Households in Beijing, China	124 Households of diagnosed cases comprising 335 people	Self-reported mask wearing by index cases or ≥1 household member prior to index case's diagnosis	Mask wearing reduced risk of secondary infection by 79% (adjusted odds ratio, 0.21 [95% CI, 0.06-0.79])
Doung-ngern et al	Bangkok, Thailand	839 Close contacts of 211 index cases	Self-reported mask wearing by contact at time of high-risk exposure to case	Always having used a mask reduced infection risk by 77% (adjusted odds ratio, 0.23 [95% CI, 0.09-0.60])
Gallaway et al	Arizona	State population	Mandatory mask wearing in public	Temporal association between institution of mask wearing policy and subsequent decline in new diagnoses
Rader et al	US	374 021 Persons who completed web-based surveys	Self-reported mask wearing in grocery stores and in the homes of family or friends	A 10% increase in mask wearing tripled the likelihood of stopping community transmission (adjusted odds ratio, 3.53 [95% CI, 2.03-6.43])
Wang X et al	Boston, Massachusetts	9850 Health care workers (HCWs)	Universal masking of HCWs and patients in the Mass General Brigham health care system	Estimated weekly decline in new diagnoses among HCWs of 3.4% after full implementation of the mask wearing policy
Mitze et al	Jena (Thuringia), Germany	City population aged ≥15 y	Mandatory mask wearing in public spaces (eg, public transport, shops)	Estimated daily decline in new diagnoses of 1.32% after implementation of the mask mandate
Van Dyke et al	Kansas	State population	Mandatory mask wearing in public spaces	Estimated case rate per 100 000 persons decreased by 0.08 in counties with mask mandates but increased by 0.11 in those without
Lyu and Wehby	15 US states and Washington, DC	State populations	Mandatory mask wearing in public	Estimated overall initial daily decline in new diagnoses of 0.9% grew to 2.0% at 21 days following mandates
Karaivanov et al	Canada	Country population	Mandatory mask wearing indoors	Estimated weekly 25%-40% decline in new diagnoses following mask mandates

[a] See the Supplement for the complete table.

Effect of Varying Masks on Emission of Respiratory Droplets During Sneeze

No Mask



Single Layer Cloth

Double Layer Cloth

Surgical Mask

https://www.youtube.com/watch?v=DNeYfUTA11s

UNSW SYDNEY

Compelling Case Report #1

- Flew from Wuhan to Guangzhou, then 15 hr flight to Toronto
- Early symptoms and coughing the entire flight

CMAJ April 14, 2020 192 (15) E410; DOI: https://doi.org/10.1503/cmaj.75015

- Wife developed cough next day after landing. Both tested +
- 350 passengers
  - 25 within 6’
- NO TRANSMISSIONS
- Masked the entire flight

CMAJ April 14, 2020 192 (15) E410; DOI: https://doi.org/10.1503/cmaj.75015

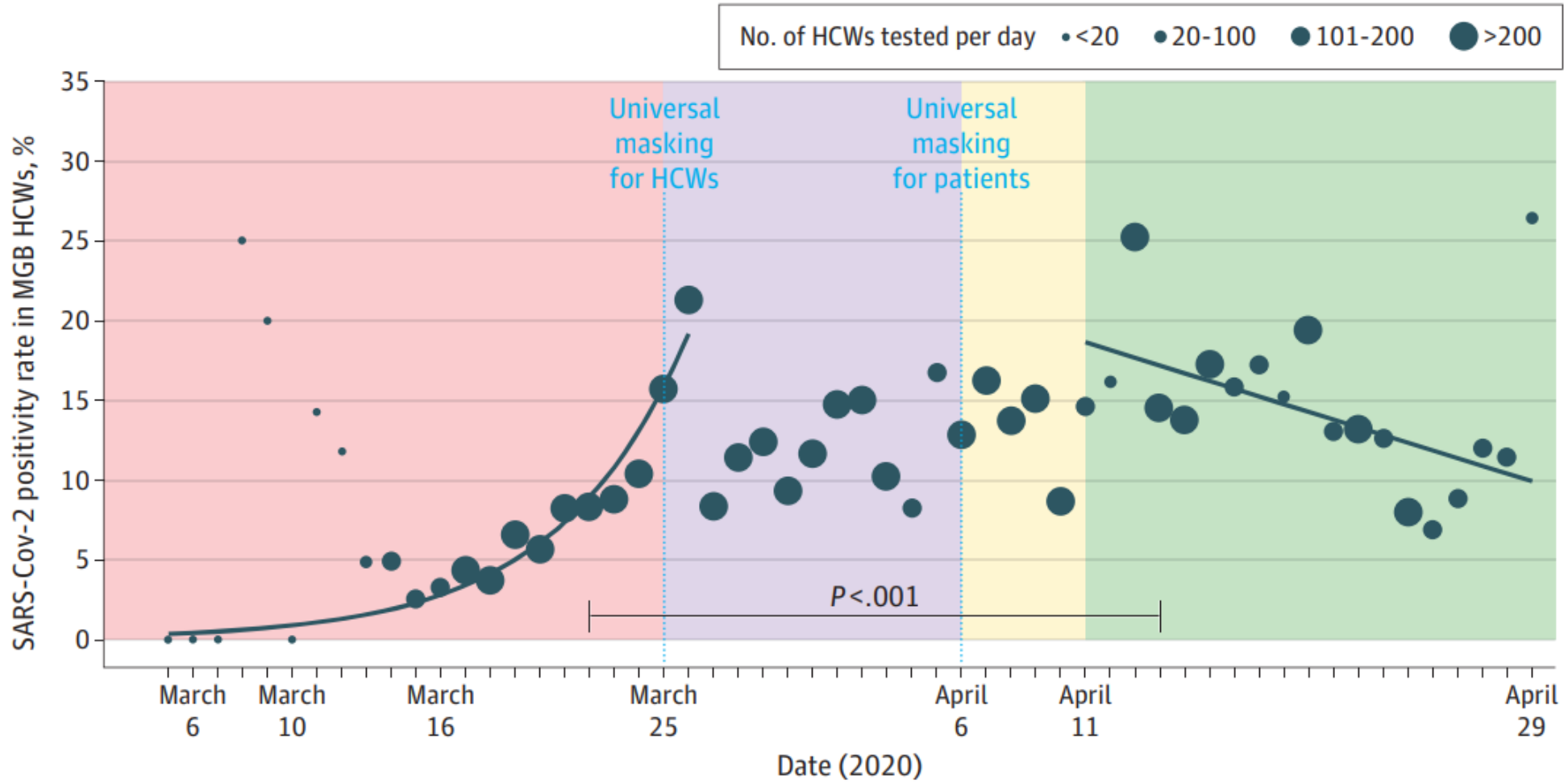
Compelling Case Report #2 - MO Hairdressers

- 2 hairdressers worked after starting to have symptoms for 5-8 days. Tested (+)
- Exposed 139 clients, all followed, 67 tested
- All were masked throughout encounters per city ordinance
- **NO TRANSMISSIONS**

MMWR. ePub: 14 July 2020

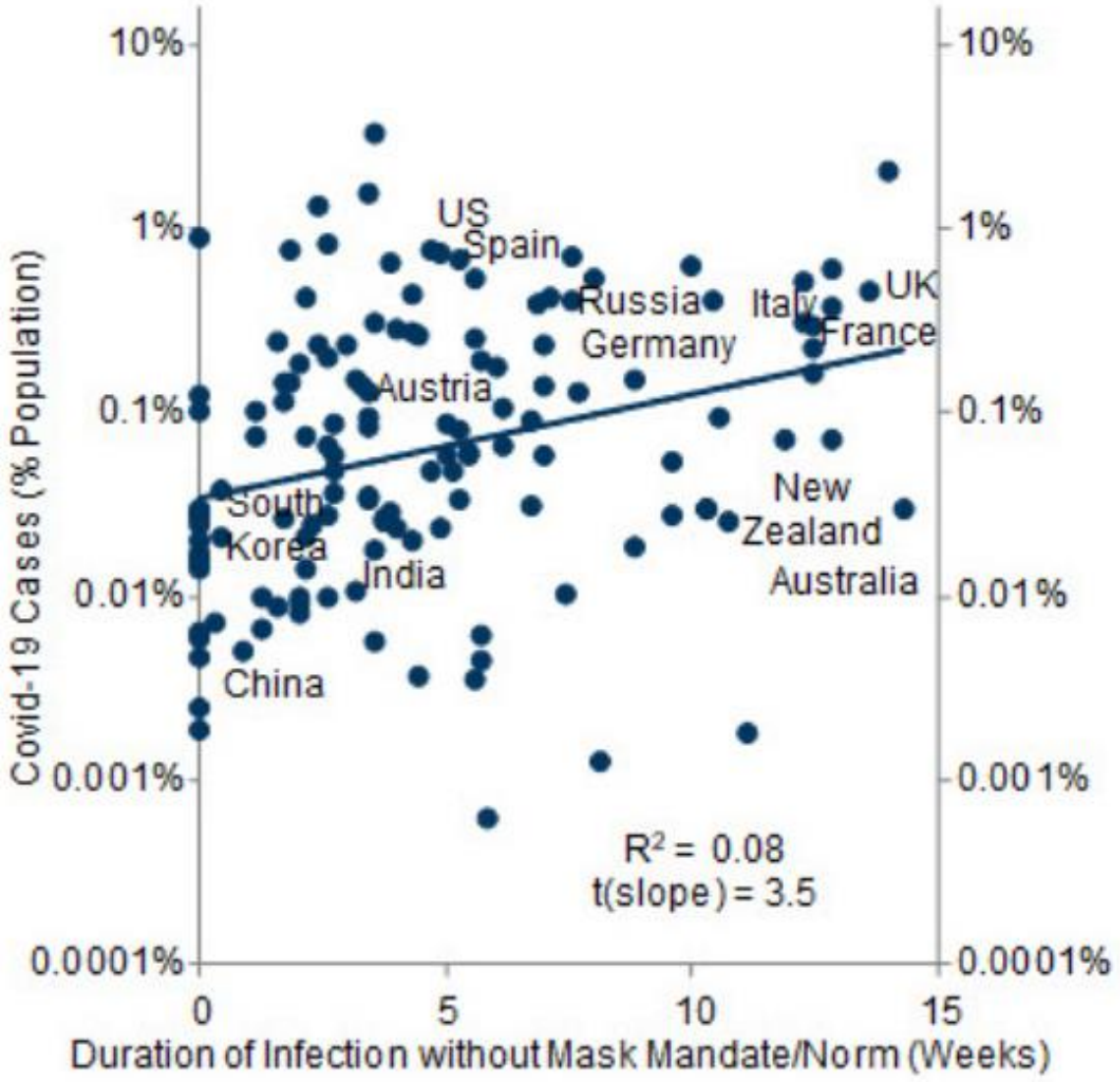
% Positivity in HCWs After Universal Masking

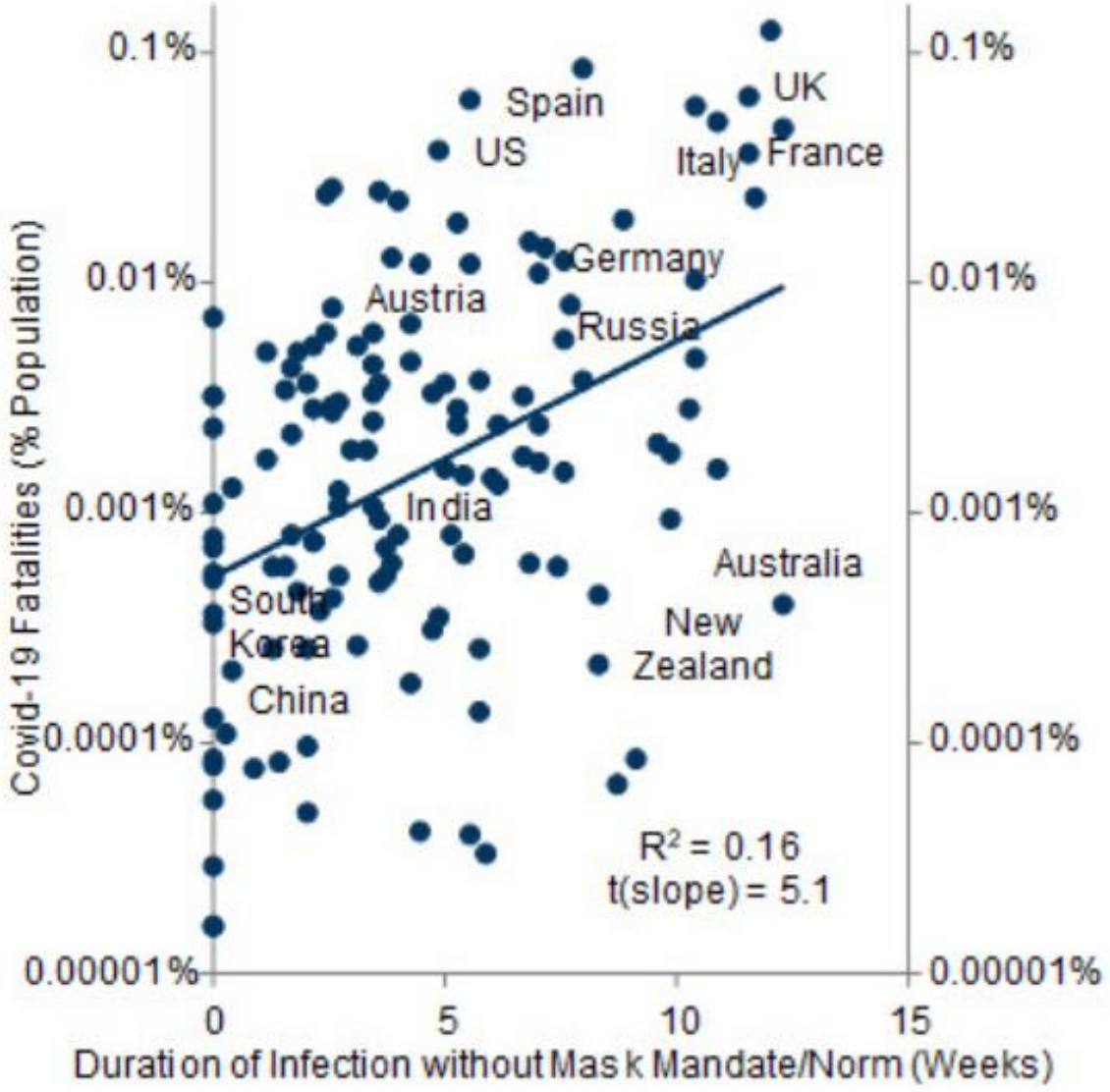
Figure. Temporal Trend in Percentage Positivity of SARS-CoV-2 Testing Among HCWs



JAMA Published online July 14, 2020

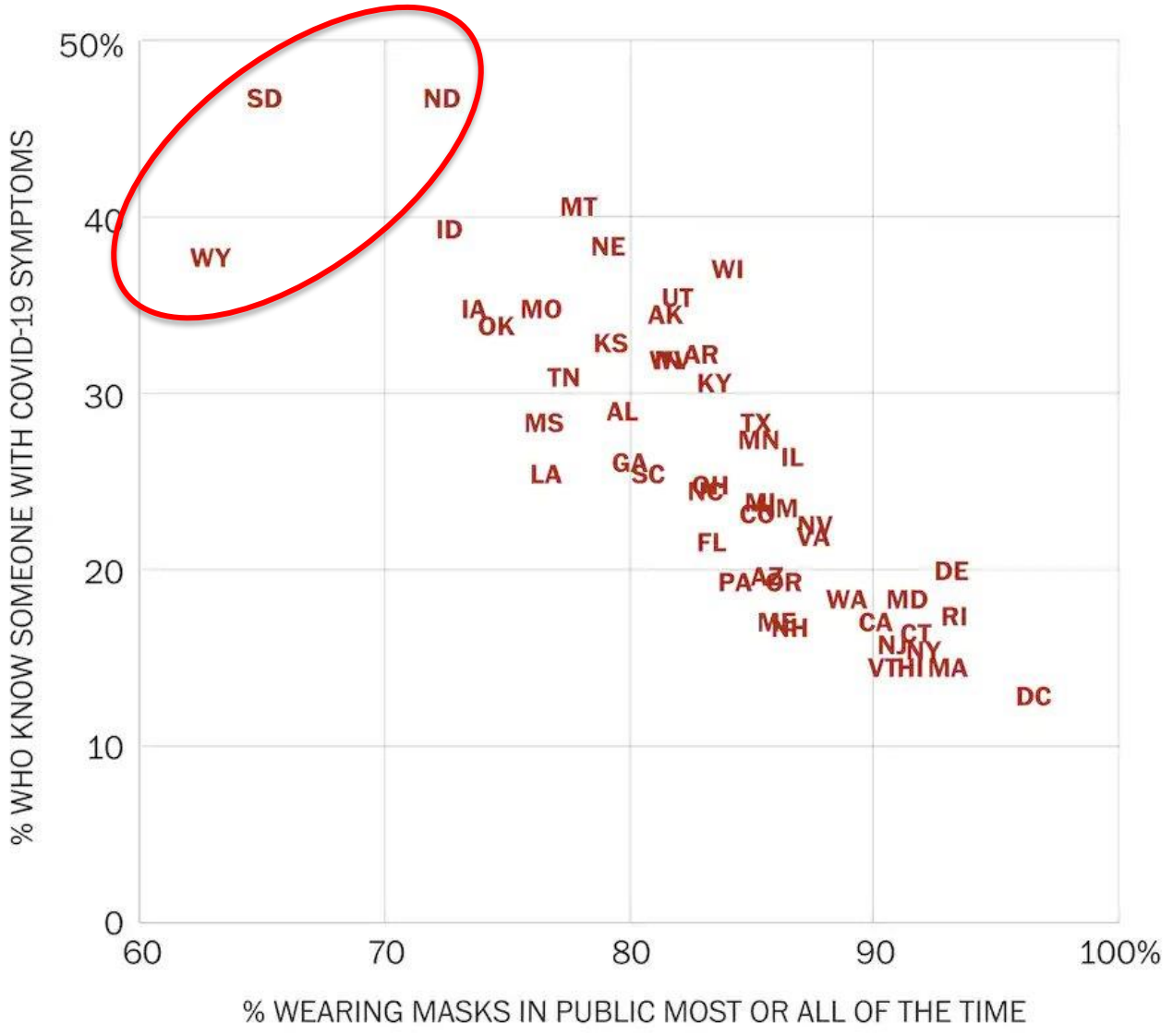
Exhibit 6: Countries Which Took Longer to Reach Widespread Mask Usage Experienced More COVID-19 Cases and Fatalities





Masking up

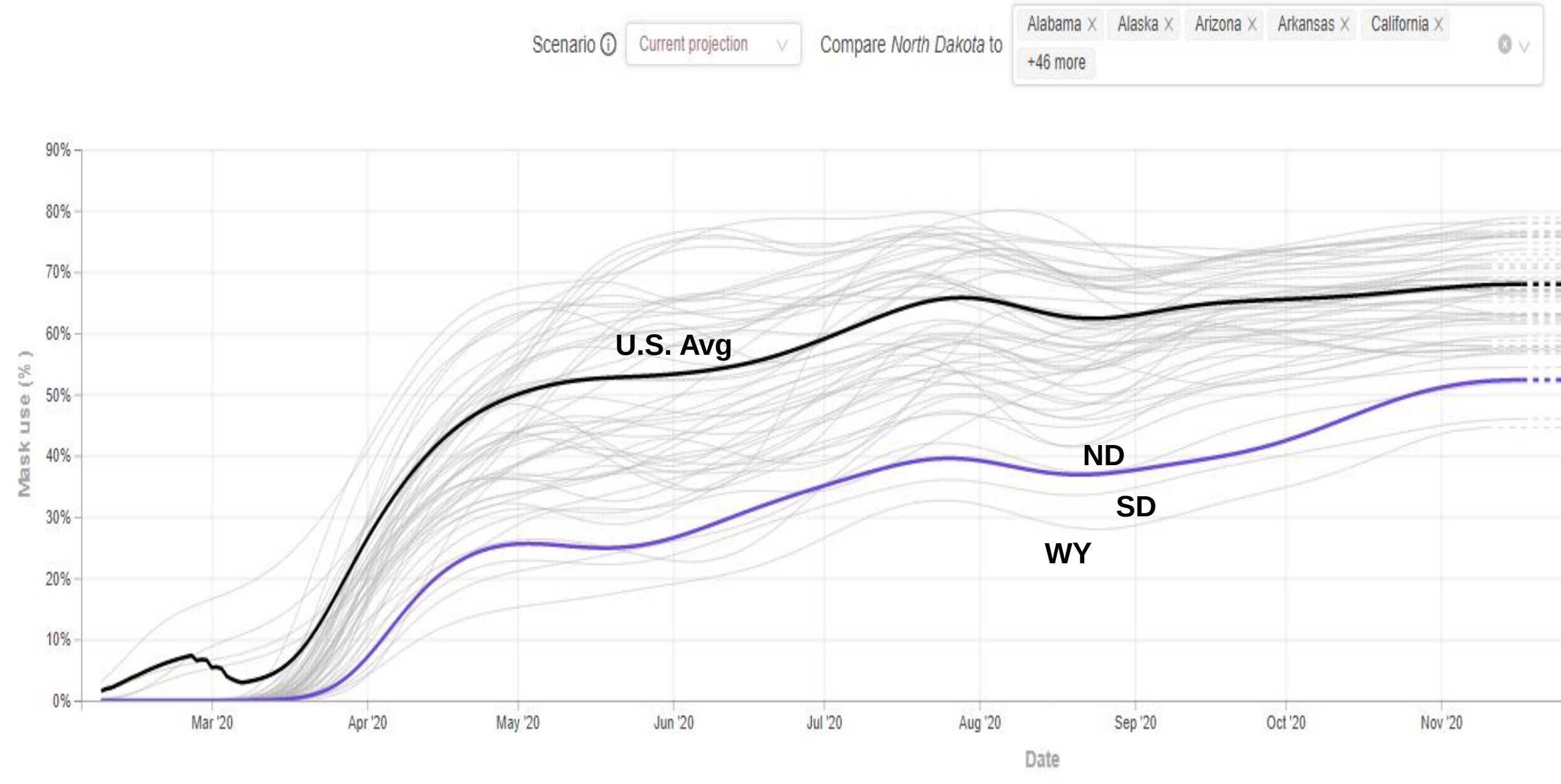
Fewer covid-19 symptoms reported in states with higher rates of mask use (data as of October 19, 2020)



Source: Delphi COVIDCast, Carnegie Mellon University

THE WASHINGTON POST

Mask Use


Scenario
Current projection
Compare North Dakota to
Alabama X
Alaska X
Arizona X
Arkansas X
California X
+46 more
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Mask use (%)
U.S. Avg
ND
SD
WY
Mar '20
Apr '20
May '20
Jun '20
Jul '20
Aug '20
Sep '20
Oct '20
Nov '20
Date

Outbreak on the USS Theodore Roosevelt: Evidence of Protecting the Wearer

- Overall, 28% of 4779 crew became infected
- Medical dept staff had lower attack rate (16.7%) despite more frequent contact (regular use of PPE)
- Later assessment of subset of 382 at Guam base found 60% were antibody positive
  - 70% lower likelihood if self-reported regular mask use

Kaspar M. NEJM Dec 2020
Payne DC. MMWR Jun 2020

Retrospective Cohort Study of Risk Factors for Secondary Household Transmission

- ≥ 1 member masked before sx onset in index
  - (no benefit if after sxs)

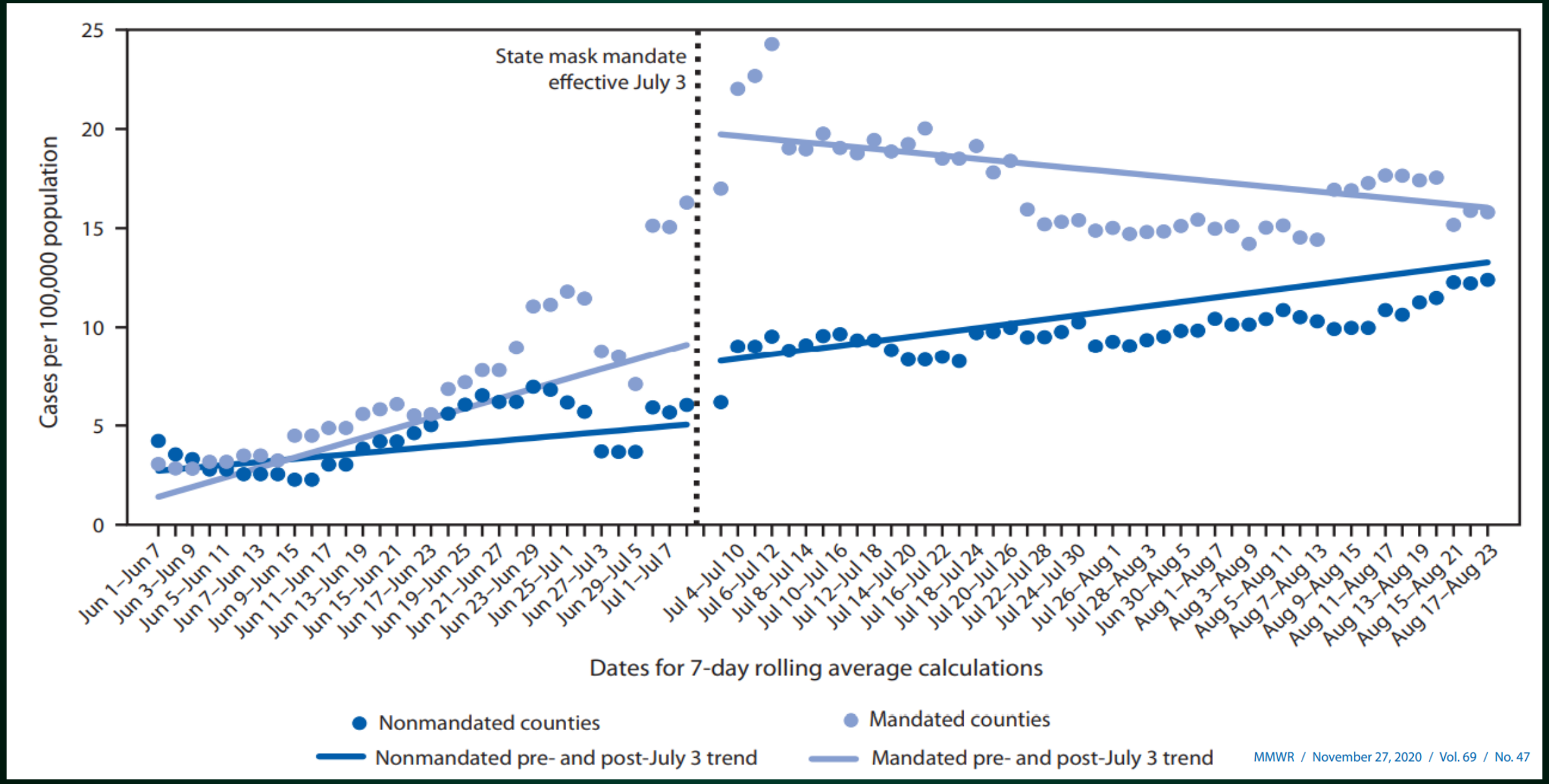
79% ⬇

41 households with 2^0 transmission
83 households with no 2^0 transmisson

Wang Y et al BMJ Global Health, May 2020

What About Mandates?

Incidence of New Cases in Kansas Counties with and Without Mask Mandates



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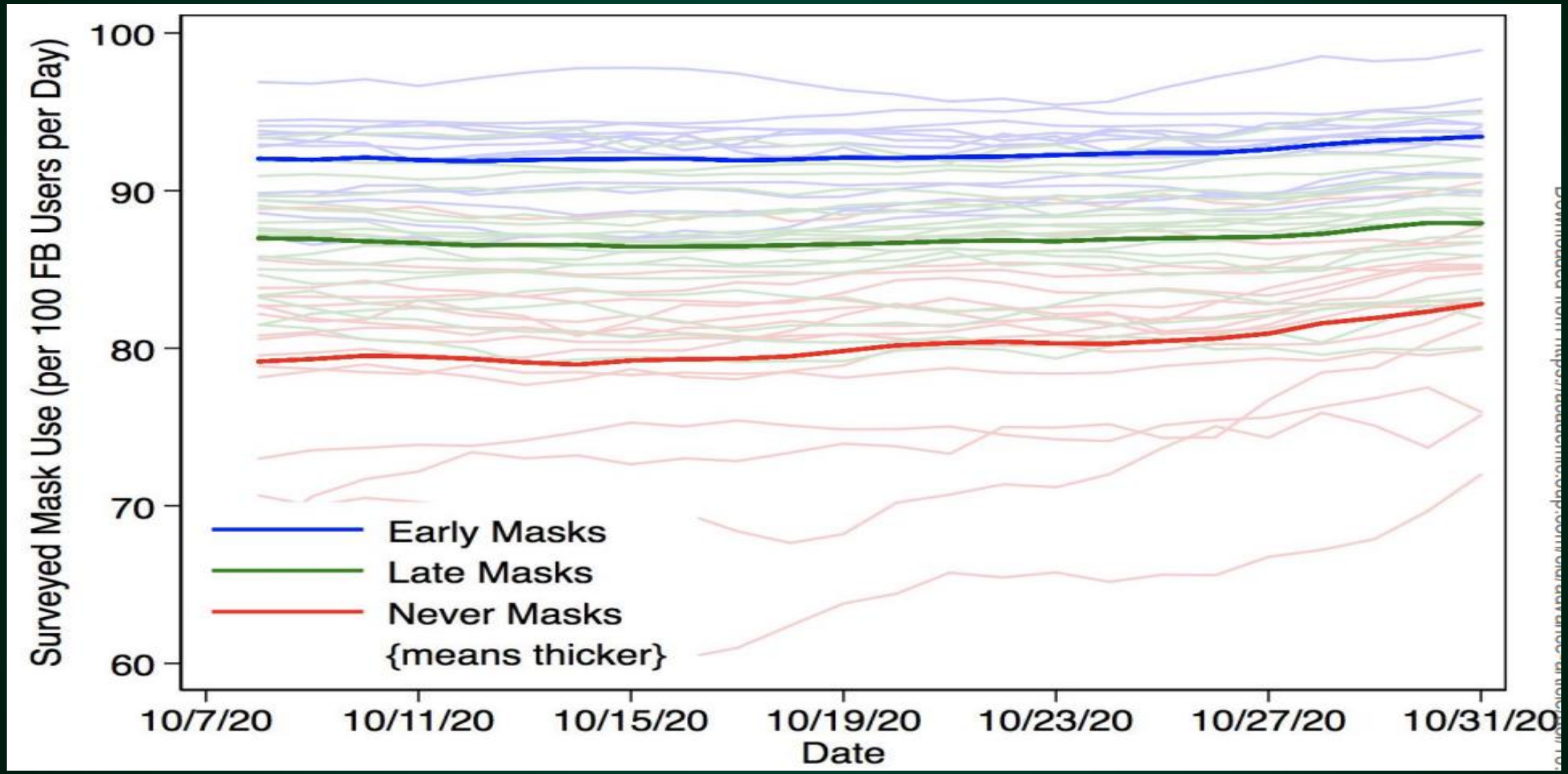
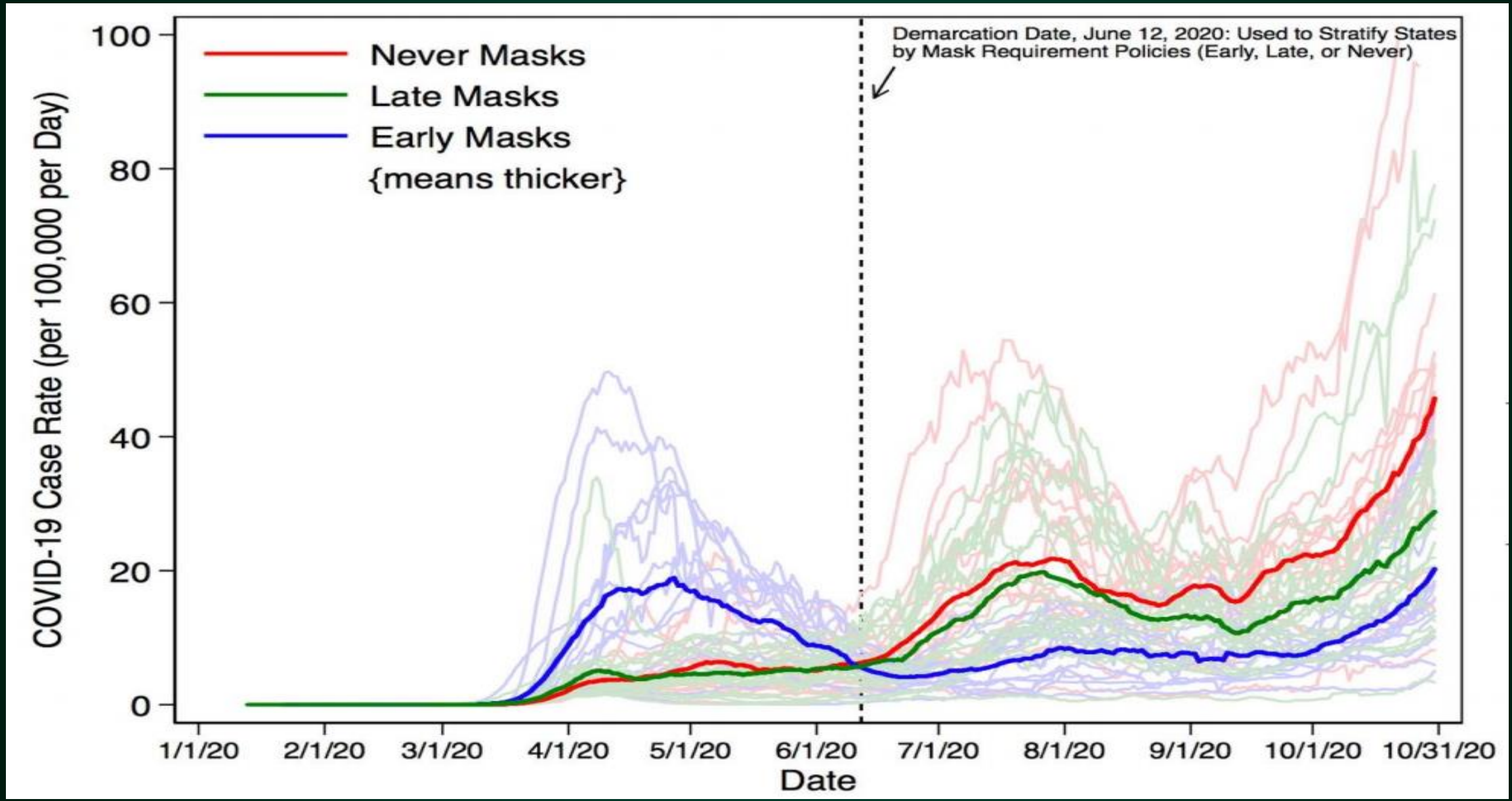
Higher Mask Usage Associated with Early State Mask Mandates



Rebeiro PF. CID Feb 2021

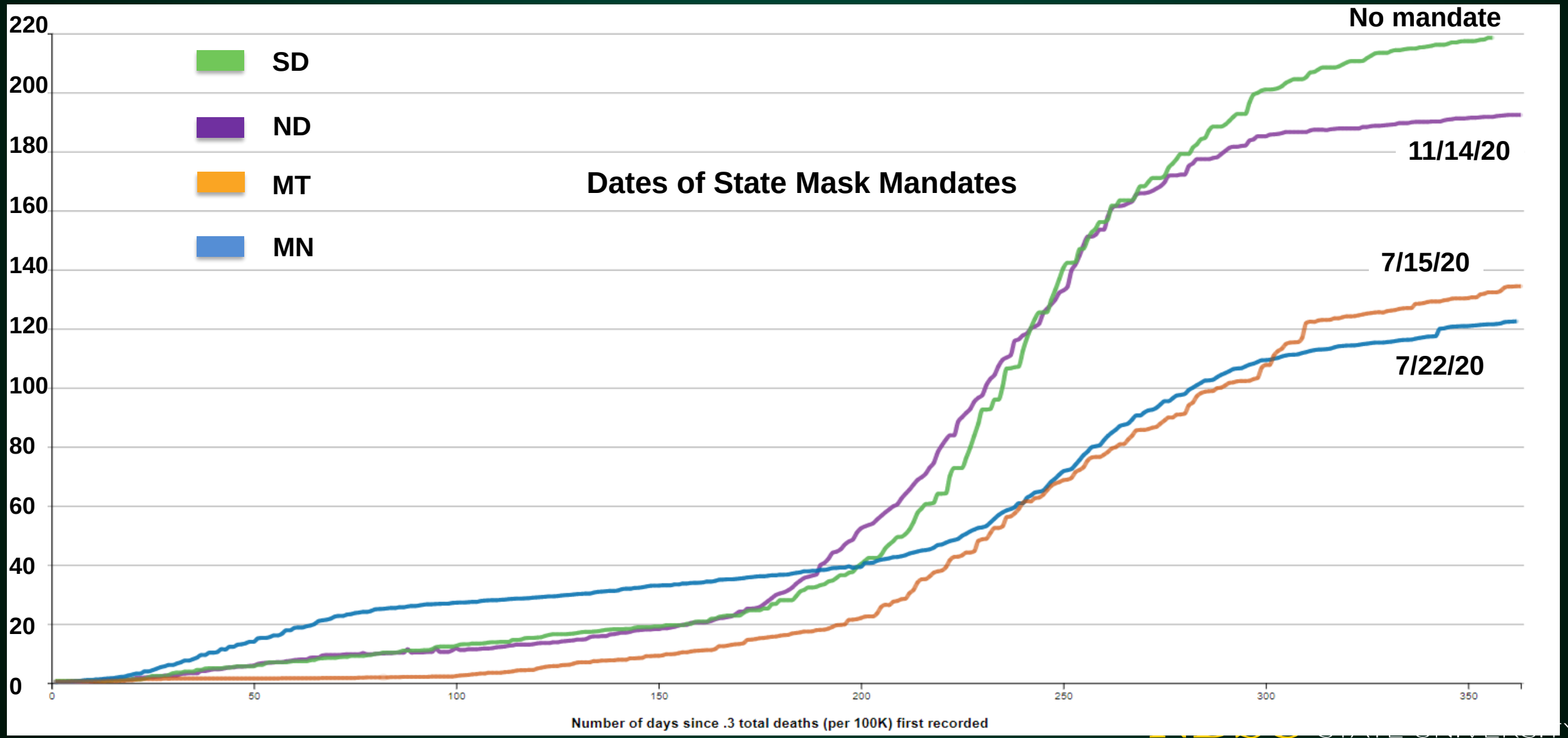
States With Early Mask Adoption Associated with Lower Case Rates



Rebeiro PF. CID Feb 2021

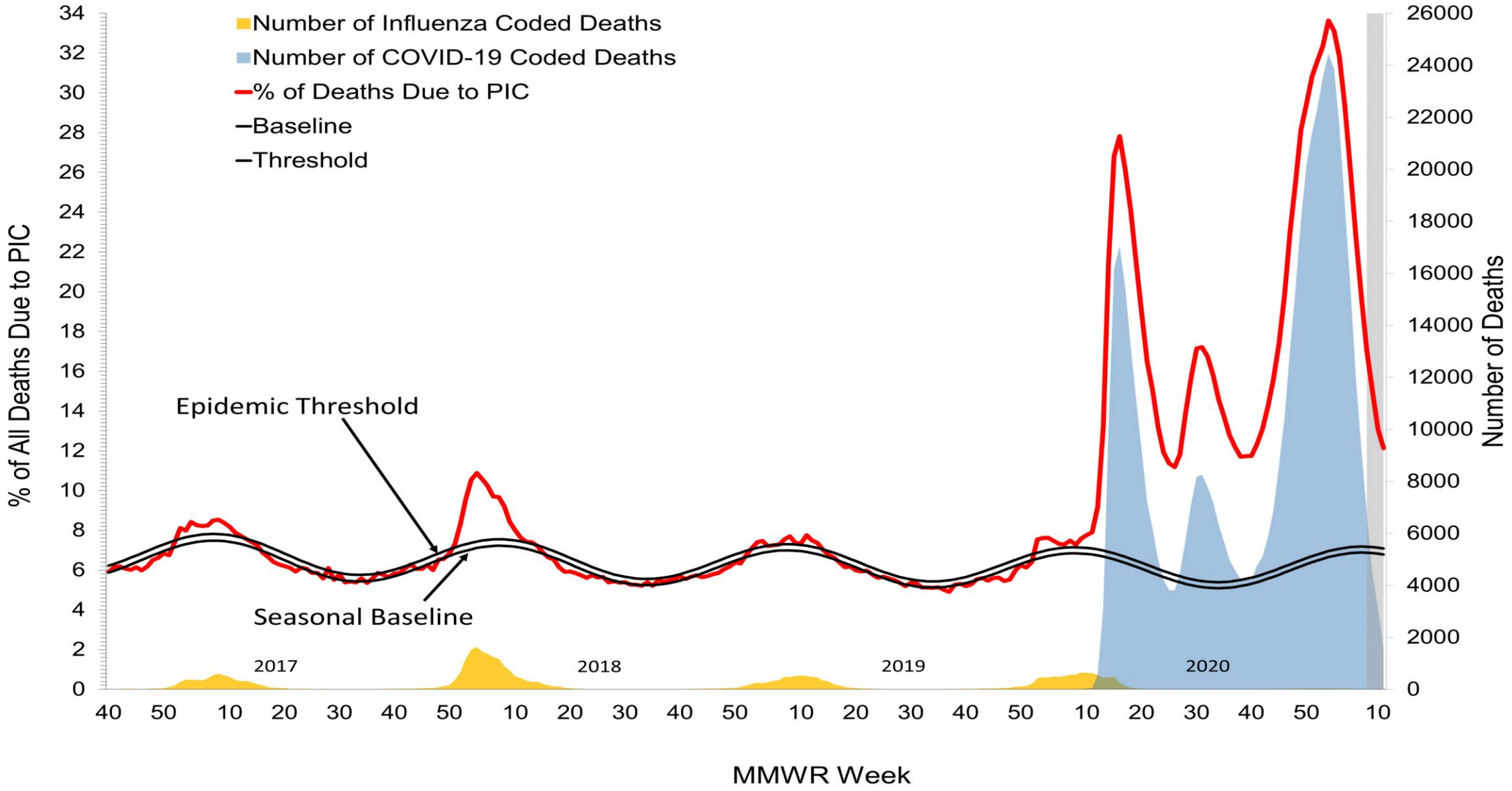
NDSU NORTH DAKOTA STATE UNIVERSITY

Cumulative Death Rates/100k in ND, SD, MT, MN

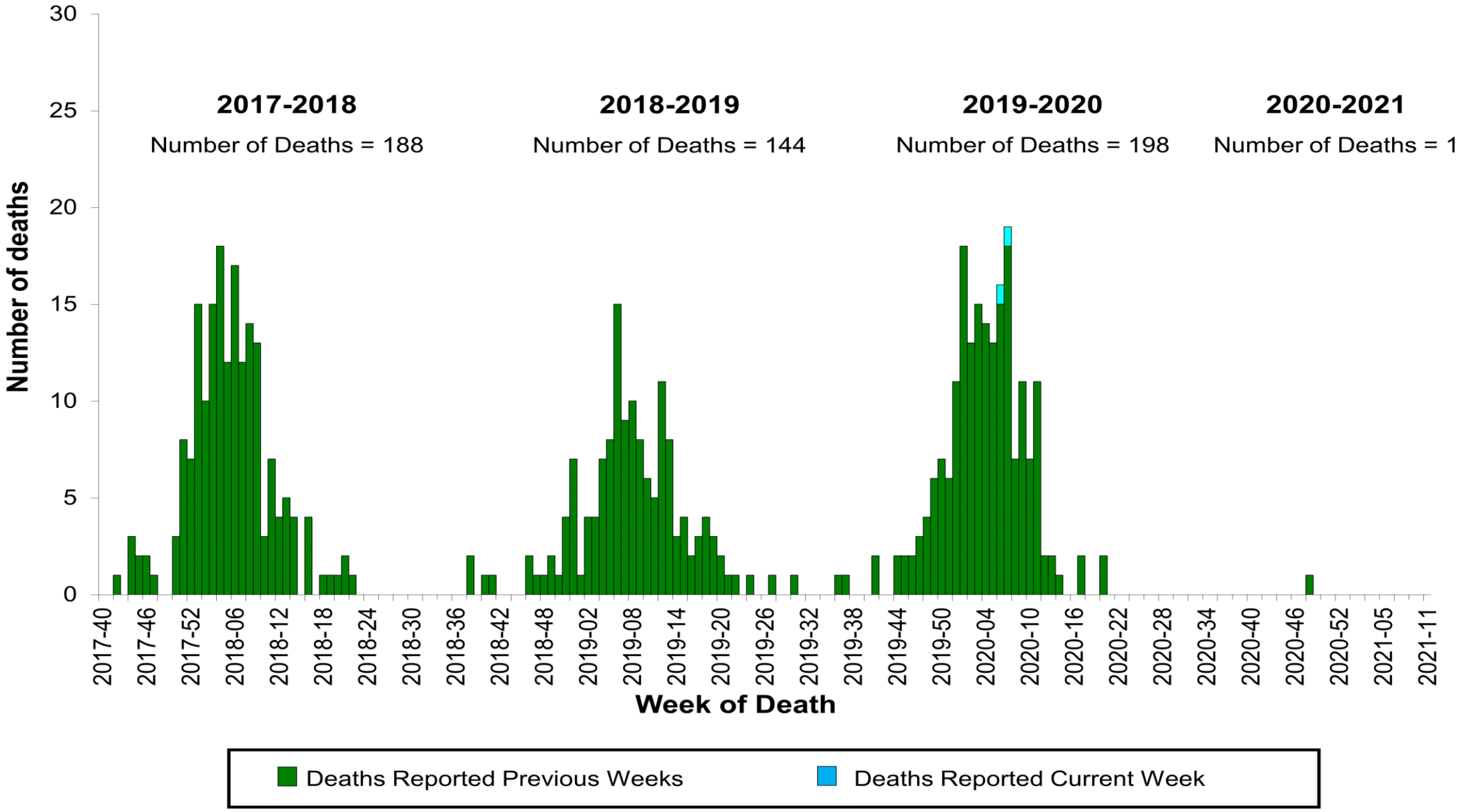


Pneumonia, Influenza, and COVID-19 Mortality from the National Center for Health Statistics Mortality Surveillance System

Data through the week ending March 20, 2021, as of March 25, 2021



Influenza-Associated Pediatric Deaths by Week of Death, 2017-2018 season to 2020-2021 season



Is Wearing a Mask an Excessive Burden or Potentially Bad for You?

A doctor runs 22 miles in a face mask to prove that they are safe

By **Amanda Jackson**, CNN

Updated 1:32 PM ET, Sun August 9, 2020

CNN World

Dr. Tom Lawton wore a three-layered cloth mask during two runs, totaling 22 miles.

Masking Effects on CO_2 or O_2 Levels

- 15 healthy residents and 15 veterans with severe COPD
- Oxygen and Carbon dioxide levels at baseline, 5 min after mask, 30 min after a mask, and 6 min after walk test
- No significant change in either group

Sammanan R. Annals of the American Thoracic Society March 2021

Inability to Ever Issue a Mask Mandate?

Pathogen	Case-Fatality Rate
COVID-19	0.7 – 2.3%
SARS	12%
MERS	35%
Ebola	57%
Avian Influenza (H5N1)	60%