

# Behavior and the Dynamics of Epidemics

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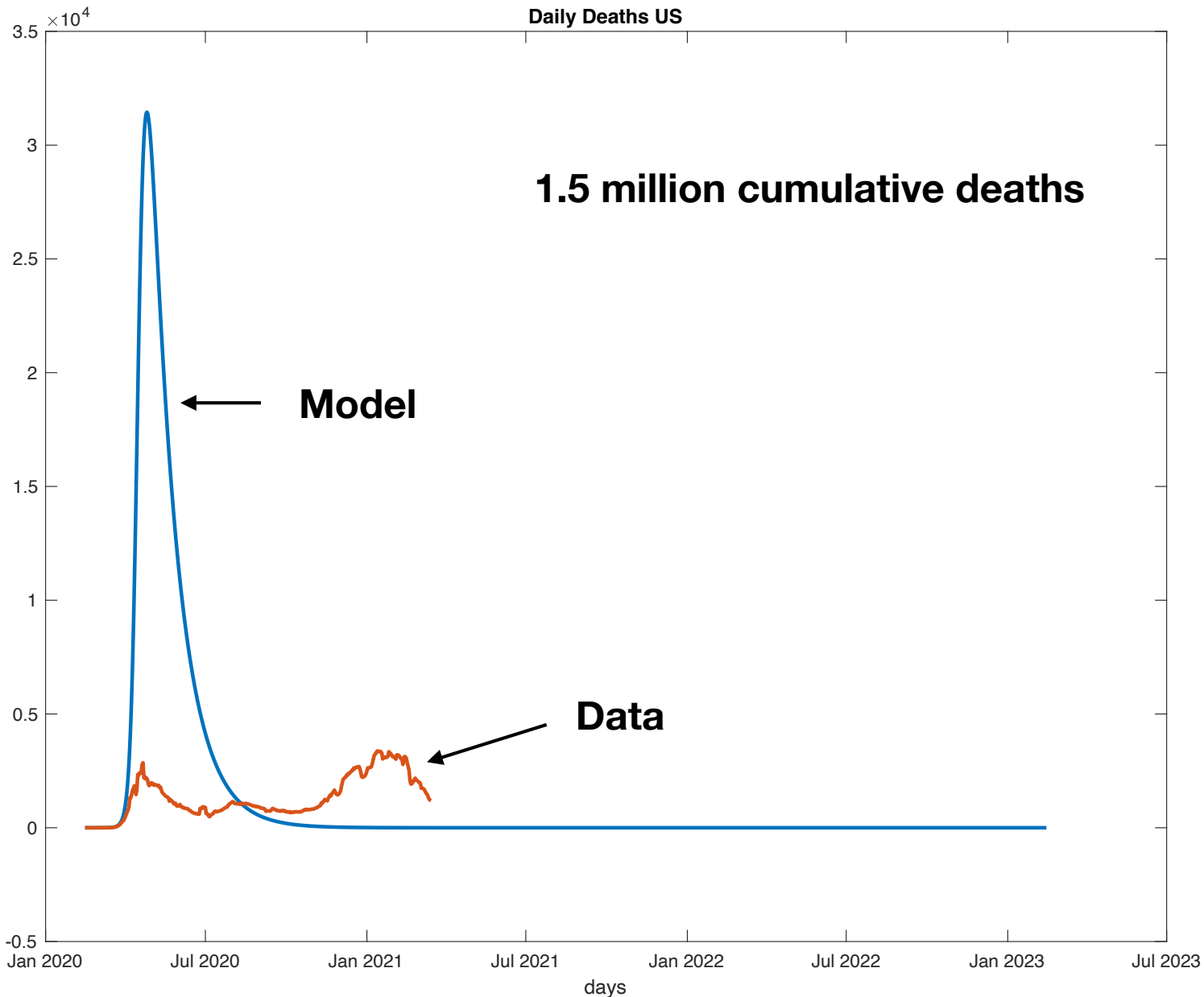
UCLA and Federal Reserve Bank of Minneapolis

BPEA, March 25, 2021

# Lessons after one year of COVID

- Behavior, both public and private, has had a powerful impact on the shape of the COVID pandemic worldwide relative to model predictions without behavior
- *Prevalence-elastic* demand for costly measures to control disease
  - Mitigation efforts rise and fall as current levels of infections and deaths rise and fall
- Impact on equilibrium dynamics of pandemic
  - Short term vs. long term
- Implications for the impact of public health interventions
  - Short term vs. long term
  - Without and with a vaccine or cure
- Why policy has to prepare now for a the possibility of a long haul even with vaccines

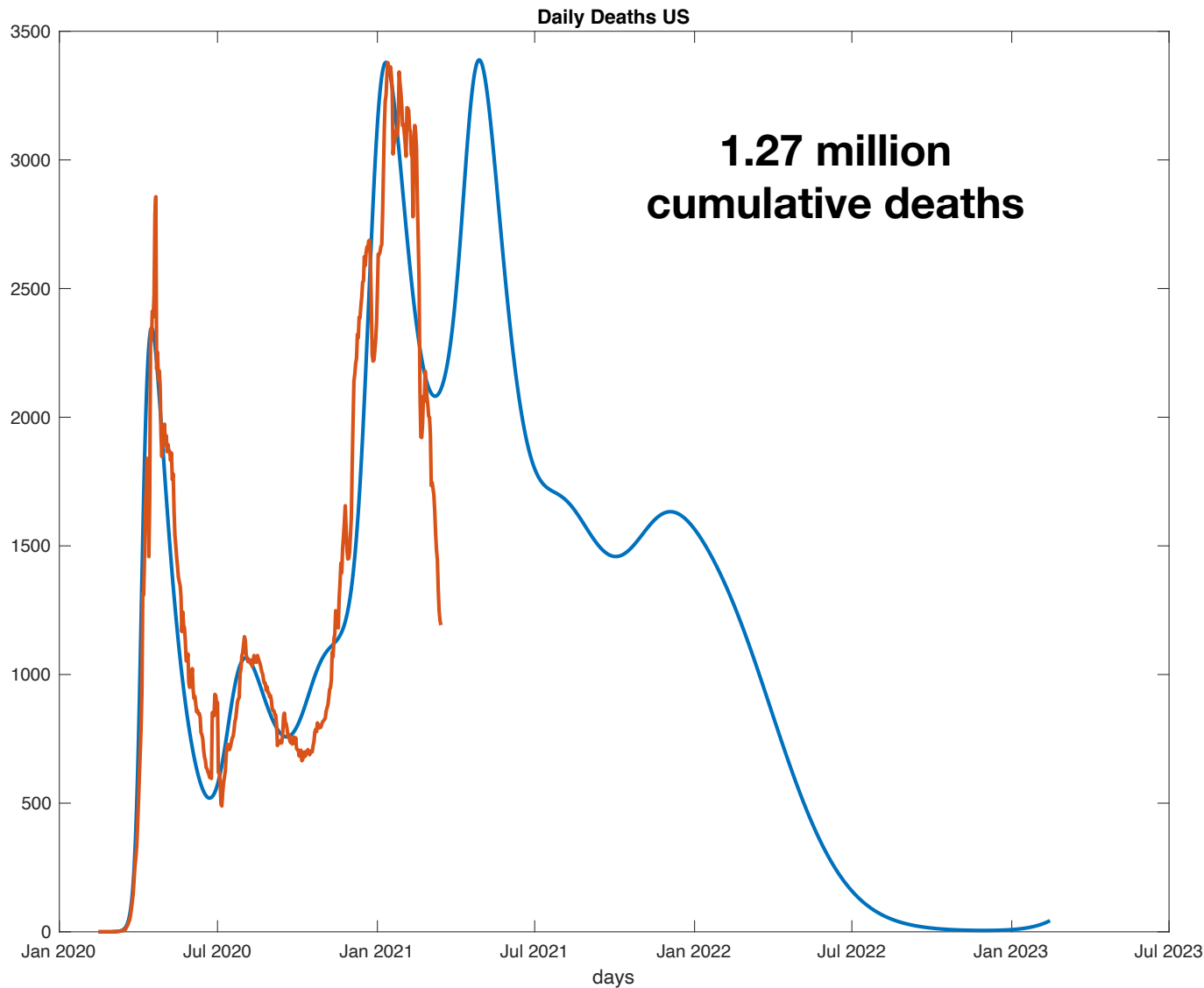
# Model with no Behavioral Response



Similar to  
Imperial College  
Angela Merkel  
March 2020

Basic reproduction  
number  $R_0$   
determines peak  
and  
long run outcome

# With behavior but without vaccines



**Seasonality**

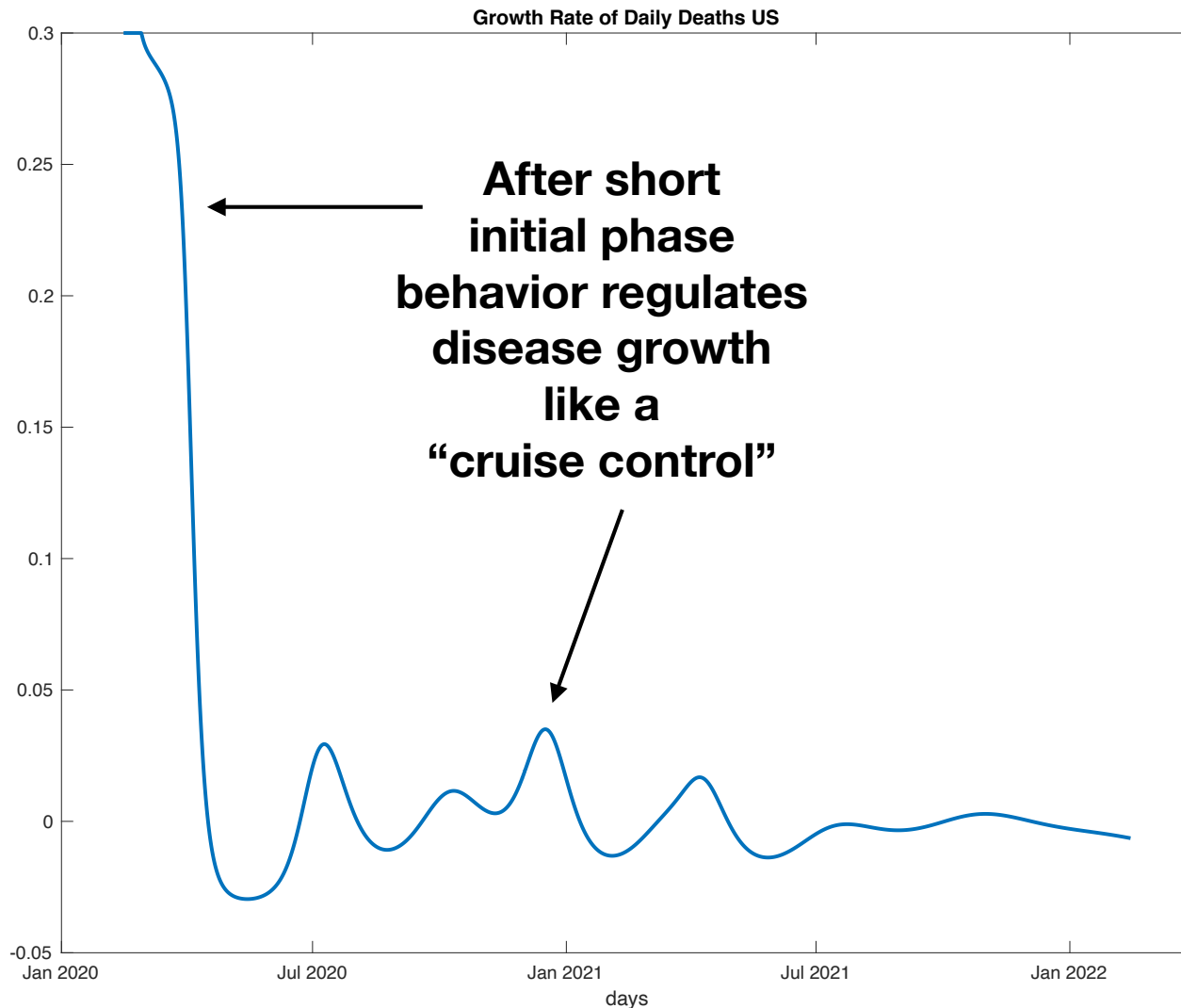
**Pandemic fatigue  
In late fall**

**UK variant in  
December**

**Behavior cuts off  
peak but leads  
to similar long run  
outcome**

**Behavior limits  
“overshooting” of  
herd immunity  
threshold**

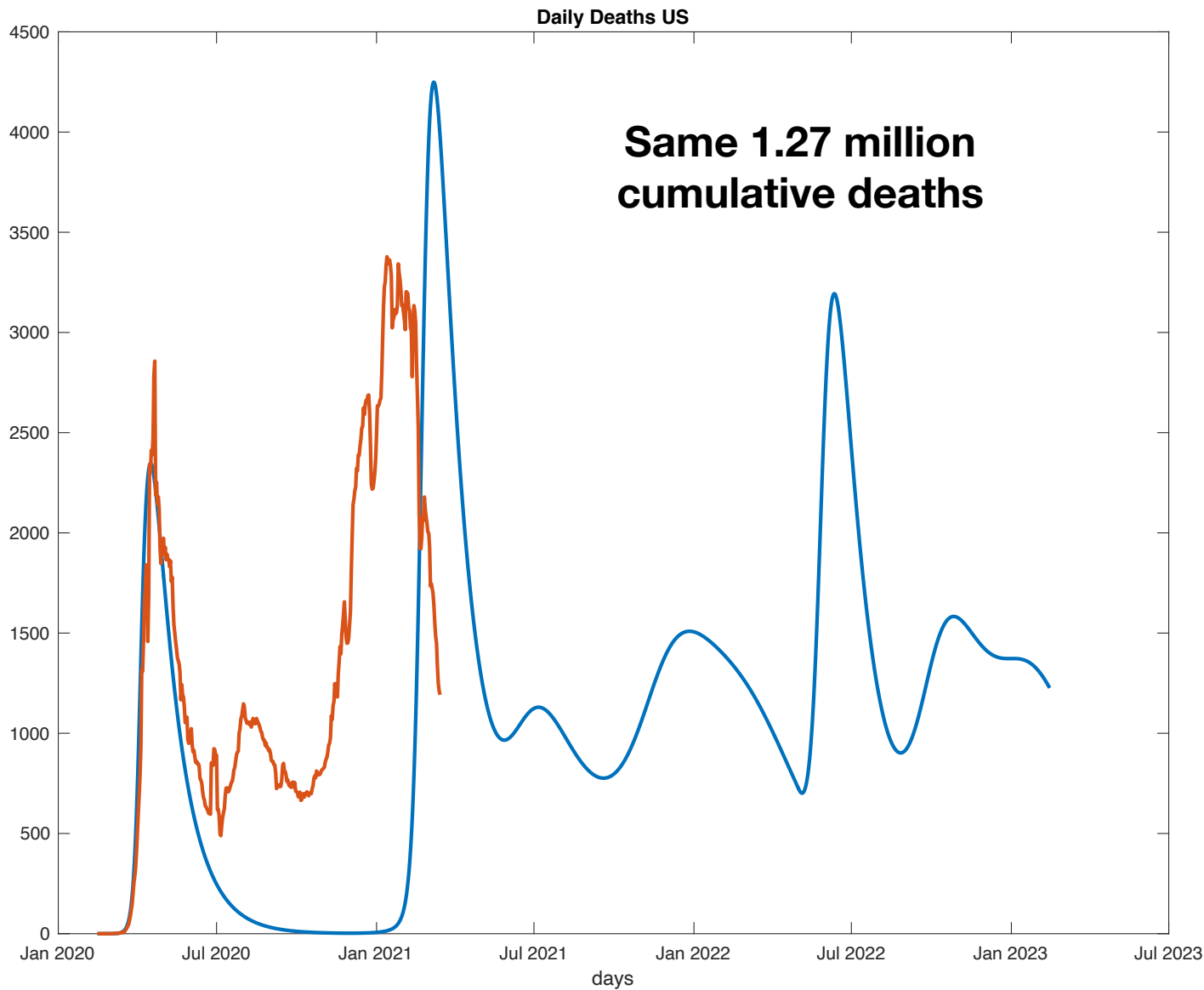
# Implications of prevalence-elastic demand for costly disease control



**But epidemic does not end until Herd Immunity allows a return to pre-pandemic behavior**

**“Self-limiting” demand for mitigation limits policy options**

# Extra mitigation without vaccines

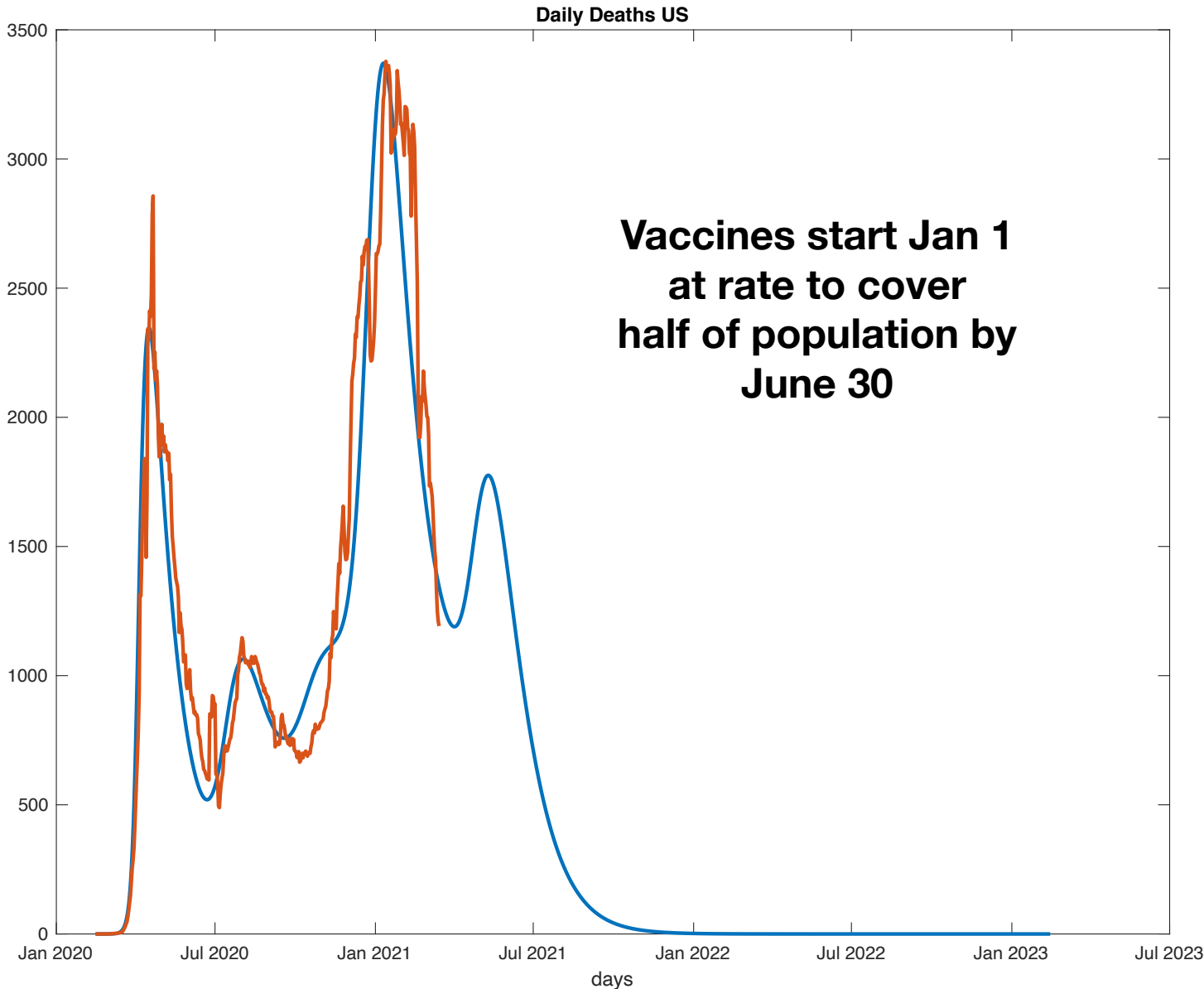


**Extra mitigation  
From May 2020  
To May 2022**

**NPI's like masks,  
testing  
tracing, and  
isolation, etc.**

**Deaths delayed  
but not prevented**

# Behavior with vaccines

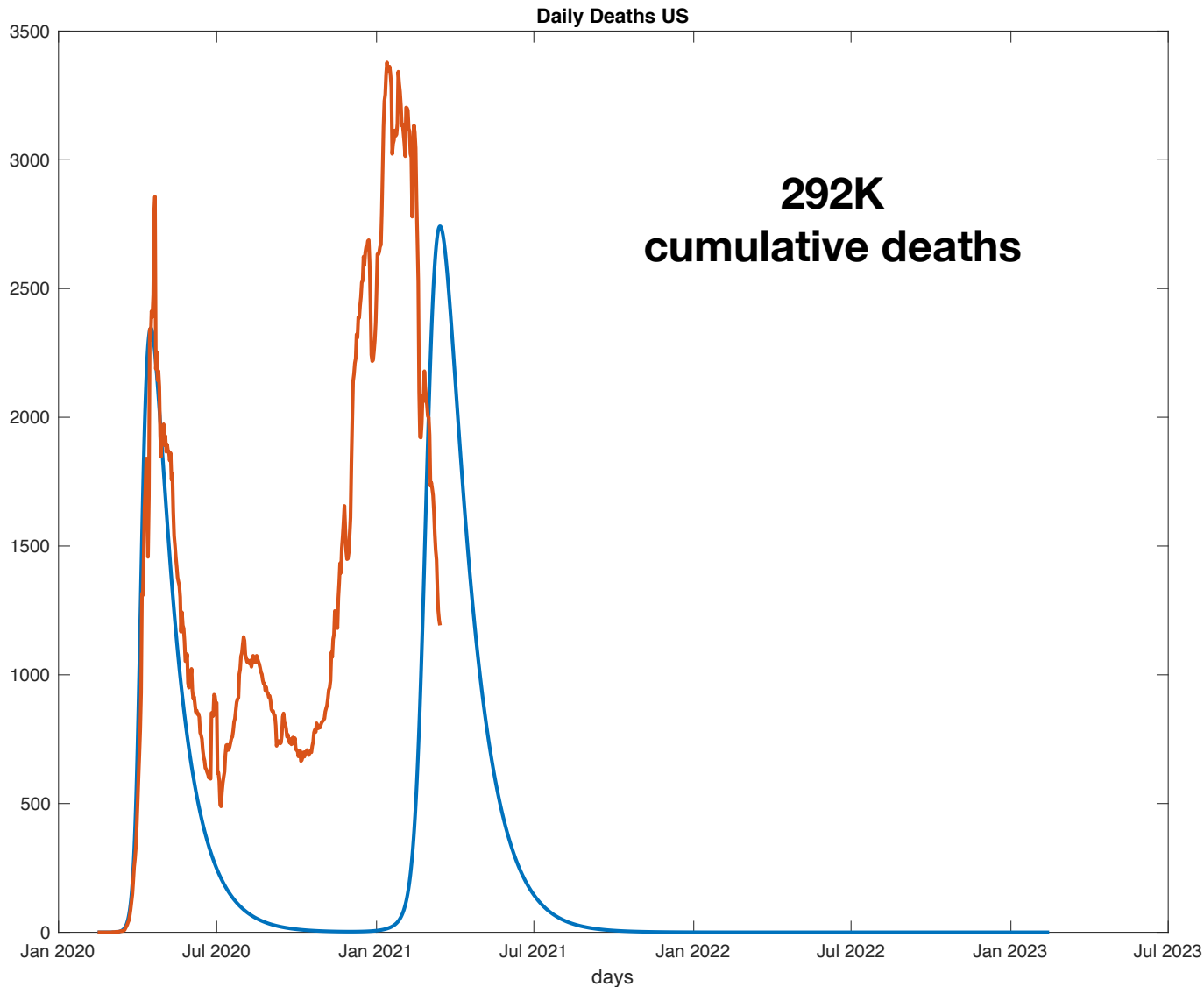


**Long-run  
cumulative  
deaths  
672K**

**Vaccine or cure  
can limit  
long run impact**

**Short run  
NPI's  
now save  
lives in the  
long run**

# Extra mitigation with vaccines



**Extra mitigation  
From May 2020  
To May 2022**

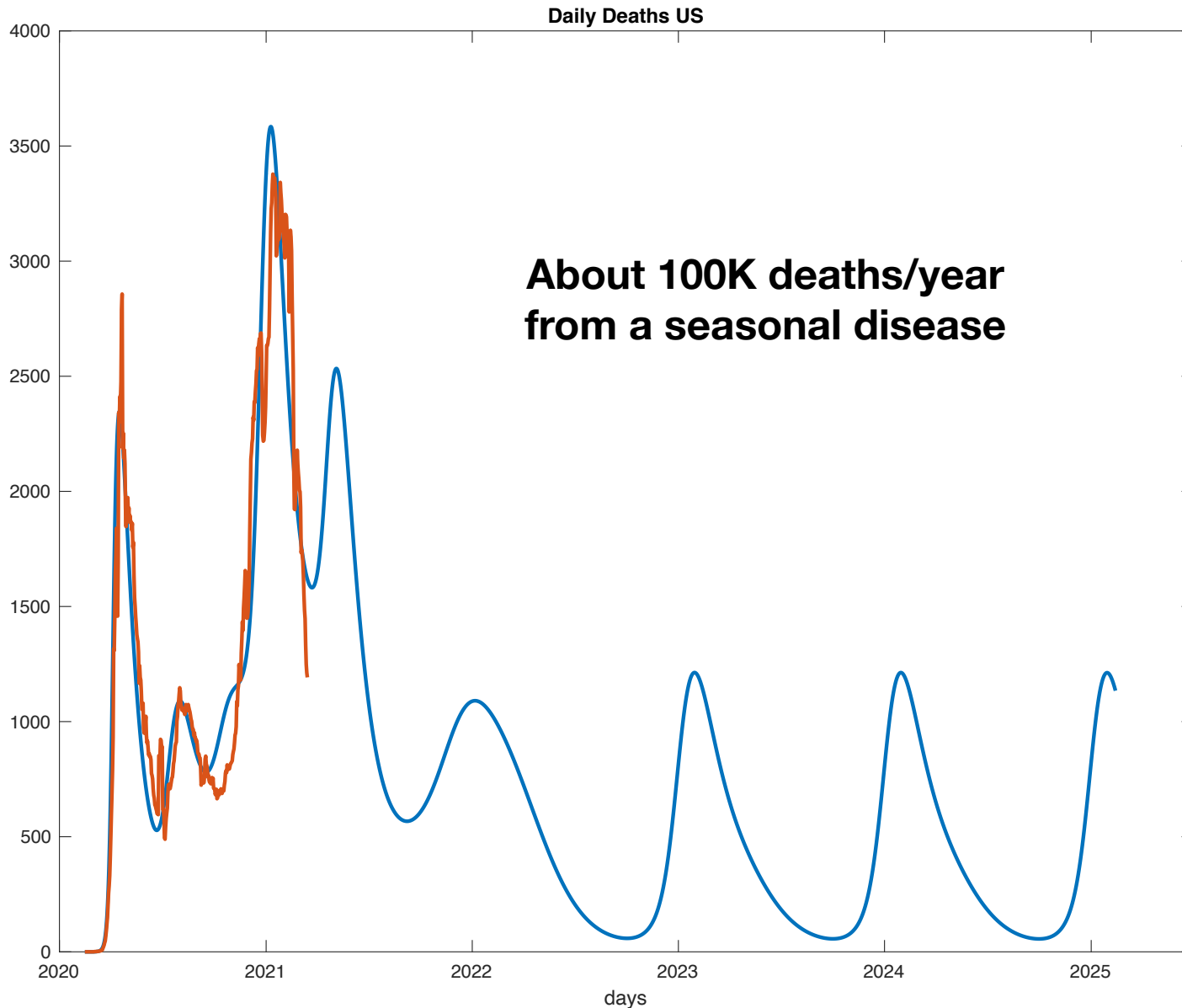
**Delaying deaths  
with extra  
mitigation  
pays off  
while waiting  
for vaccine  
even with  
private offsetting  
response**



# Success stories with mitigation

- Taiwan, South Korea, Japan, Vietnam, Thailand
- Australia and New Zealand
- Finland and Norway
- Uruguay and Mongolia
- University of Illinois Champaign Urbana, Georgia Tech, Clemson

# Preparing for an endemic scenario



**Model:  
immunity lasts  
on average  
18 months**

**continuous  
vaccination  
at current rate**

**What are our options  
for continuous  
disease control?**