Recommending enhanced seasonal influenza vaccines in adults age 65 and older could have wide-ranging impacts on influenza burden

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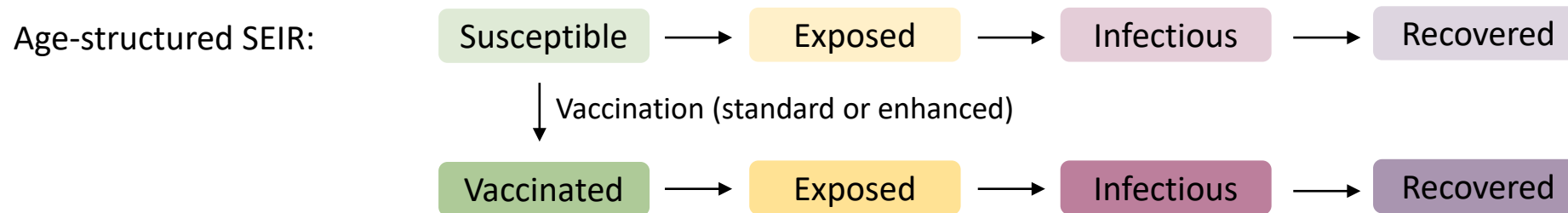ACIP meeting, 23 February 2022

Overview

Question

How might a preferential recommendation for enhanced vaccines (e.g. high-dose, adjuvanted, recombinant)
over standard vaccines in adults 65+ impact influenza burden over the course of a season?

Approach

1. Create a **baseline model** that can capture influenza dynamics under current guidelines (2 exs: **high** and **low** severity seasons)

Age-structured SEIR:

| Susceptible | ⟶ | Exposed | ⟶ | Infectious | ⟶ | Recovered |

↓ Vaccination (standard or enhanced)

| Vaccinated | ⟶ | Exposed | ⟶ | Infectious | ⟶ | Recovered |

   -- Calibrate using published parameter estimates and reported burden from previous high/low severity seasons
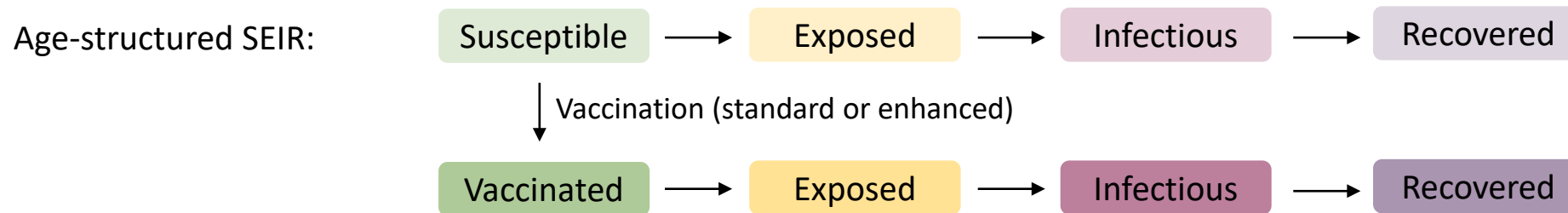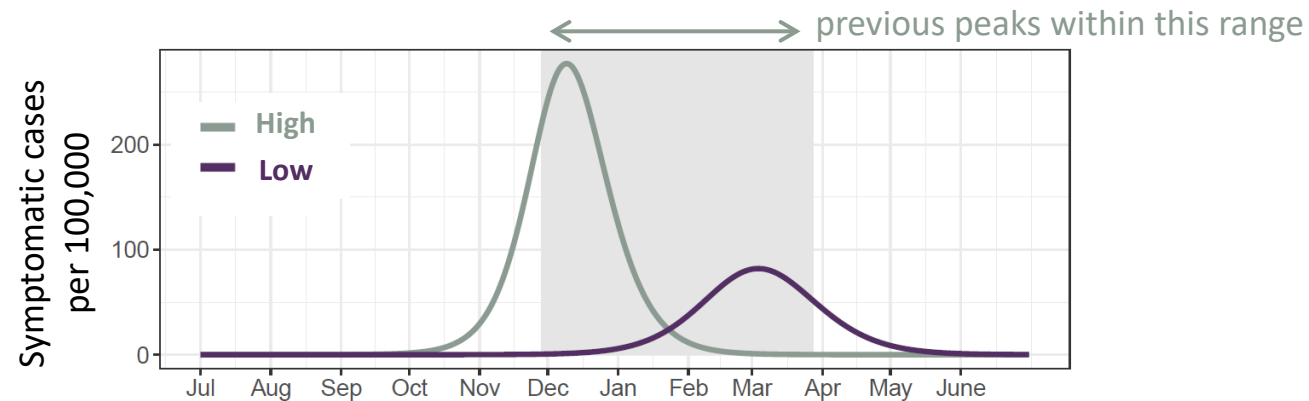
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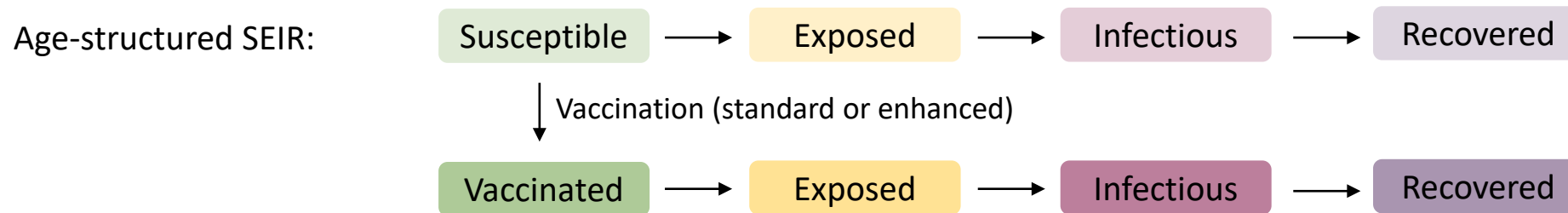
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2. Model what might happen **following a preferential recommendation** for enhanced vaccines (EVs),

   i.e. if the % of adults 65+ getting an EV instead of a standard vaccine (SV) **increases**

   BUT   -- there could be a **delay** in receiving those EVs

   -- there could be a **reduction** in overall coverage if individuals offered SVs do not take them

Potential societal impacts of a new recommendation

Benefits

Assume **0 - 20% increase** in vaccinees 65+ who receive an enhanced vaccine (EV)

Opportunity costs

Value range	⏱ Delay in extra EVs	⤸ Reduction in overall coverage
Best	0 weeks	0%
Intermediate	3 weeks	10%
Worst	6 weeks	20%

Effectiveness and uptake of EVs

Parameter	Value	Select reference(s)
Effectiveness of EV	5 – 50% > standard vaccines (26 – 60% in absolute terms)	DiazGranados et al. (2014) NEJM
Uptake within vaccinated adults 65+ **at baseline**	60 – 80% receive EV (remaining receive standard vaccine)	Izurieta et al. (2019, 2020, 2020) JID, CID

Note: these **changes only apply to adults 65+**

Hospitalizations averted (adults 65+) with a new recommendation

Increasing reduction
in overall coverage

Increasing
delay

| 0wk delay 0% decrease | 0wk delay 10% decrease | 0wk delay 20% decrease |

Parameters varied (1000 times)

Benefits: increase enhanced vaccine (EV)
            uptake by **0–20%**

EV effectiveness: **5–50%** greater than SV

EV uptake at baseline: **60–80%** of vaccinees 65+

| 3wk delay 0% decrease | 3wk delay 10% decrease | 3wk delay 20% decrease |

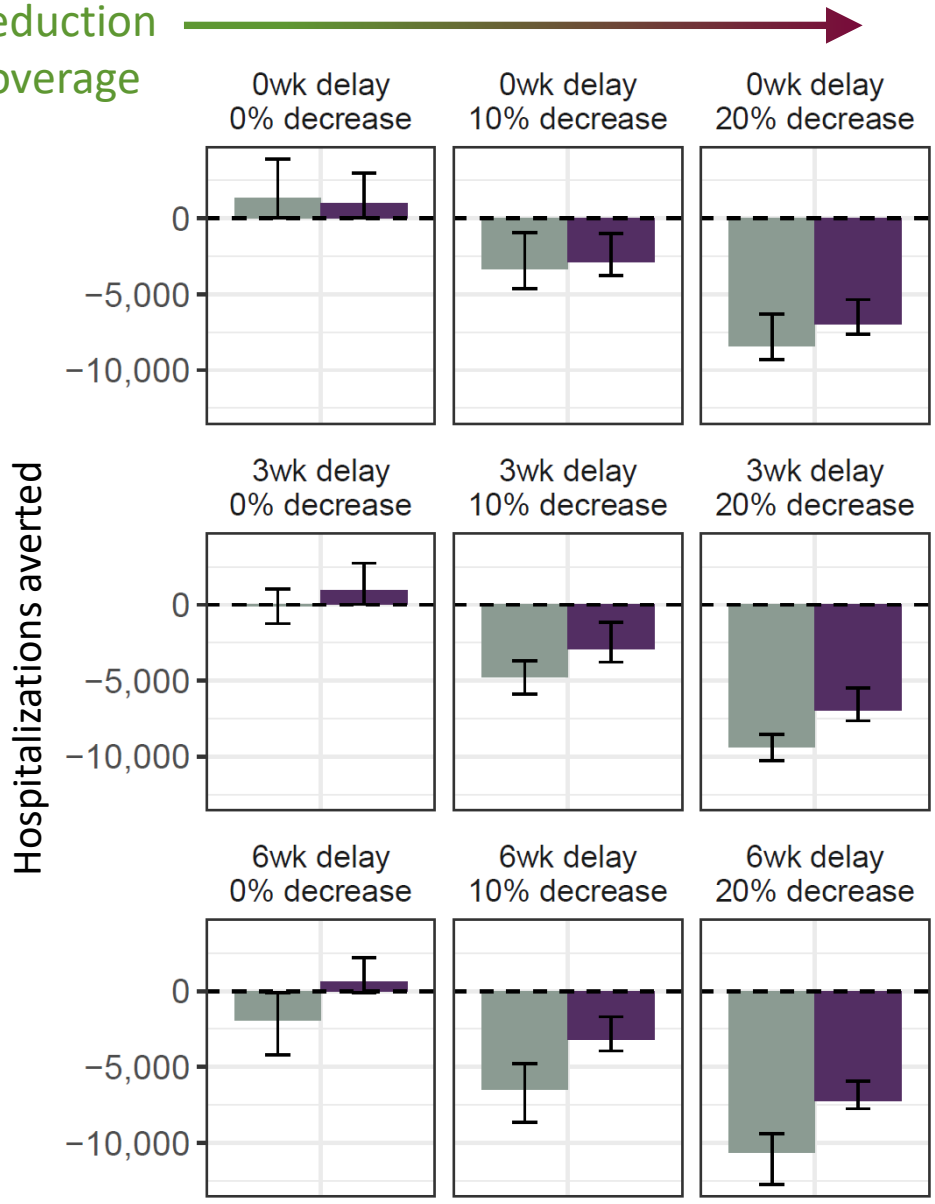| 6wk delay 0% decrease | 6wk delay 10% decrease | 6wk delay 20% decrease |

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Shown: mean & 95th percentiles

Season severity: High, Low

0wk delay 0% decrease · 0wk delay 10% decrease · 0wk delay 20% decrease
3wk delay 0% decrease · 3wk delay 10% decrease · 3wk delay 20% decrease
6wk delay 0% decrease · 6wk delay 10% decrease · 6wk delay 20% decrease
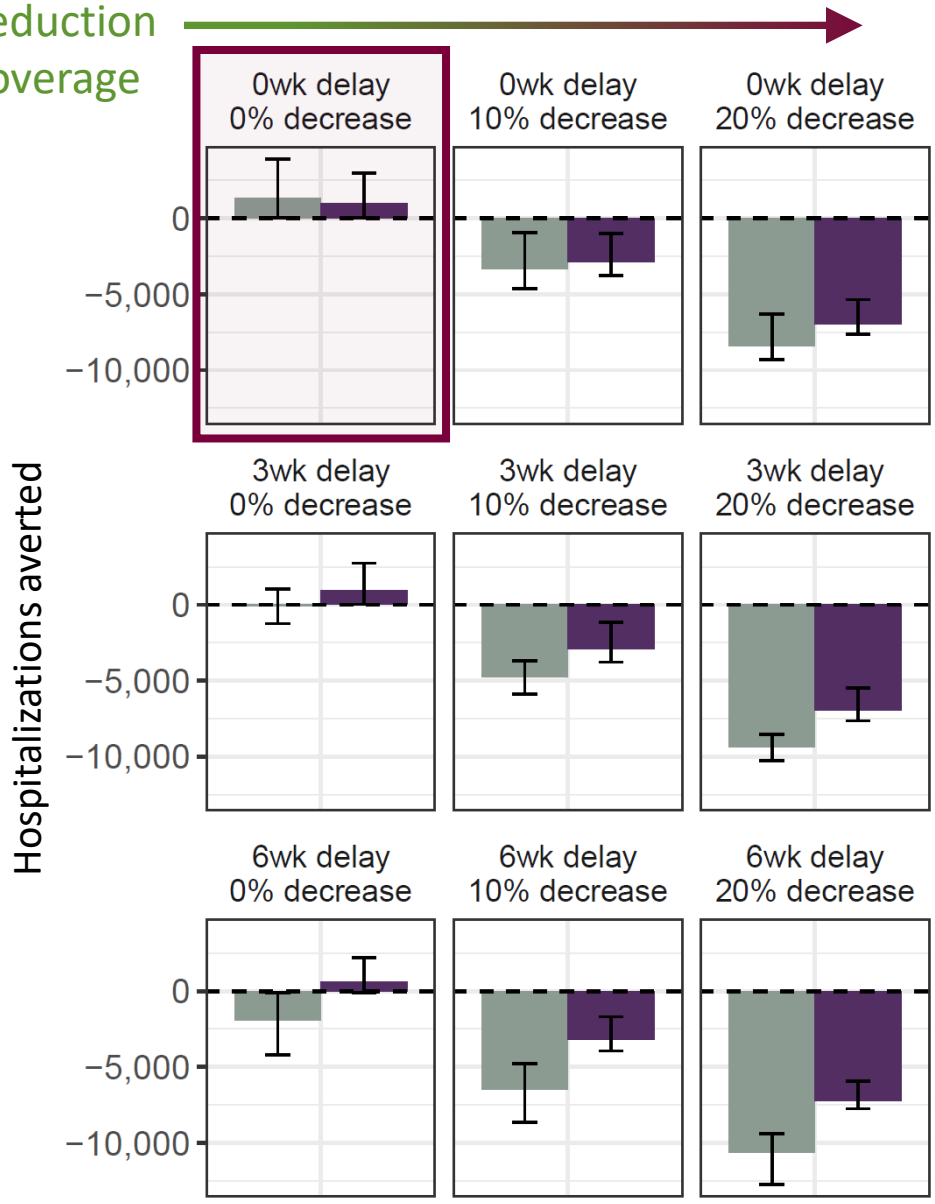
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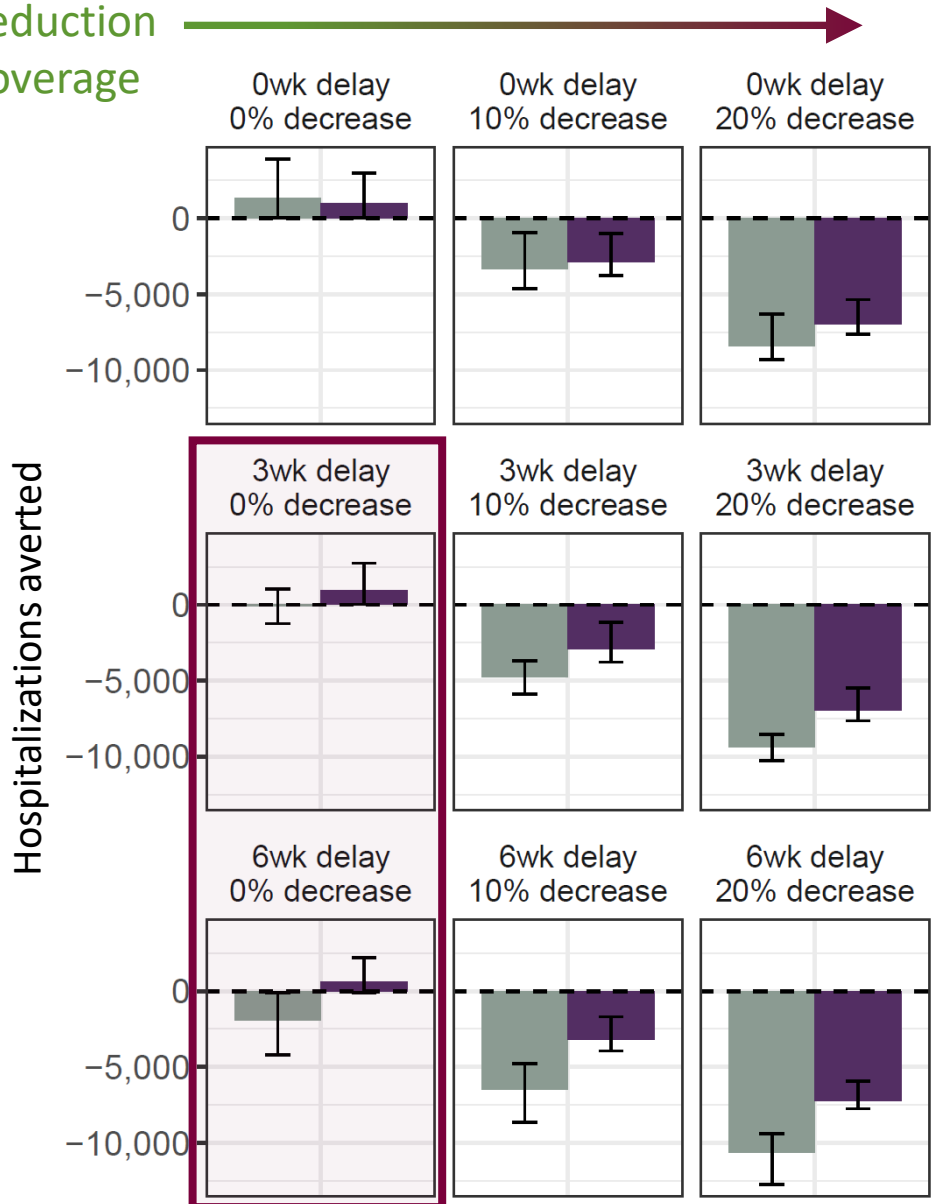Season severity
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Low

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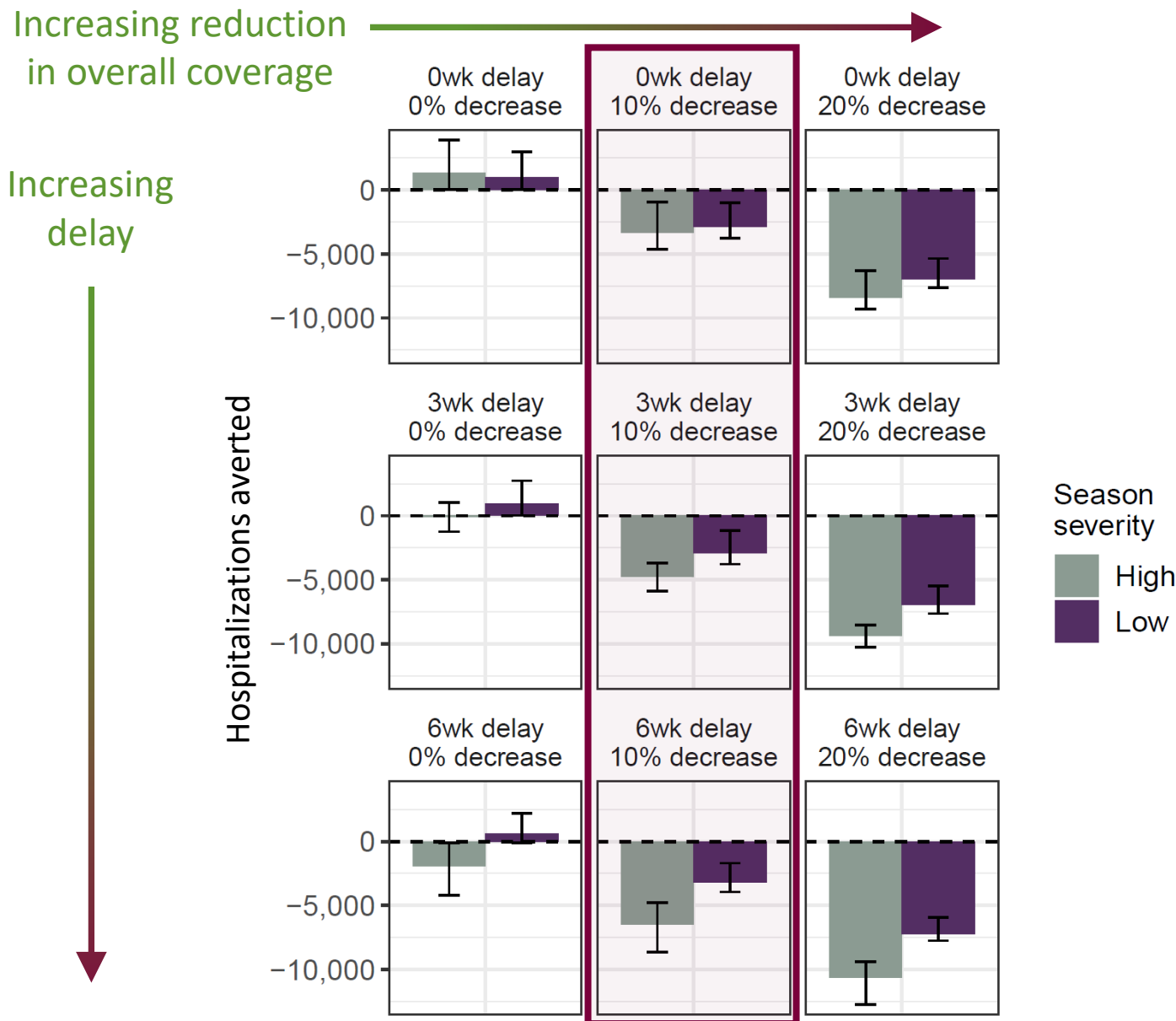
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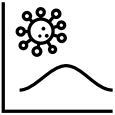
EV uptake at baseline: **60–80%** of vaccinees 65+

Shown: mean & 95th percentiles

Limitations & important points

We assume vaccines only protect against symptoms (i.e. no additional effect on infection or onward transmission)

-> Our results focus on the direct effects of vaccination, and don't consider how indirect effects may change these

We use high and low severity seasons to explore a range of possible outcomes we could expect

-> They do not represent any one particular season and are not exact predictions

We do not stratify enhanced vaccines by type (high-dose, adjuvanted, recombinant)

-> We explore a wide range of parameter values that account for variations in vaccine uptake and effectiveness between types

Our tradeoff scenarios make necessary assumptions about how individual vaccine-seeking behavior might change

-> We use these to provide examples of the range of possible outcomes, but do not assess how likely they are to occur

Summary

- With cost parameters at their best case values (0 week delay, 0% reduction in overall coverage),

  a new recommendation always has a positive impact

- With intermediate and worst case values (3 or 6 week delay, 10 or 20% reduction in overall coverage),

  negative impacts are introduced, ranging from relatively small to more substantial

- These outcomes are most sensitive to the % reduction in overall coverage

The chance of having a positive impact can be maximized by

- having timely/adequate access to enhanced vaccines (EVs)

- promoting standard vaccines when EVs are not available

Questions?

Matthew Biggerstaff, NCIRD/ID/EPB

Lisa Grohskopf, NCIRD/ID/EPB

Carrie Reed, NCIRD/ID/EPB

Jill Ferdinands, NCIRD/ID/EPB

ACIP Influenza Working Group

Referenced works

DiazGranados et al (2014) NEJM

Izurieta et al (2019) JID

Izurieta et al (2020) JID

Izurieta et al (2020) CID