

 spncrfx@gmail.com

 @foxandtheflu

The seasonality of pandemic influenza emergence

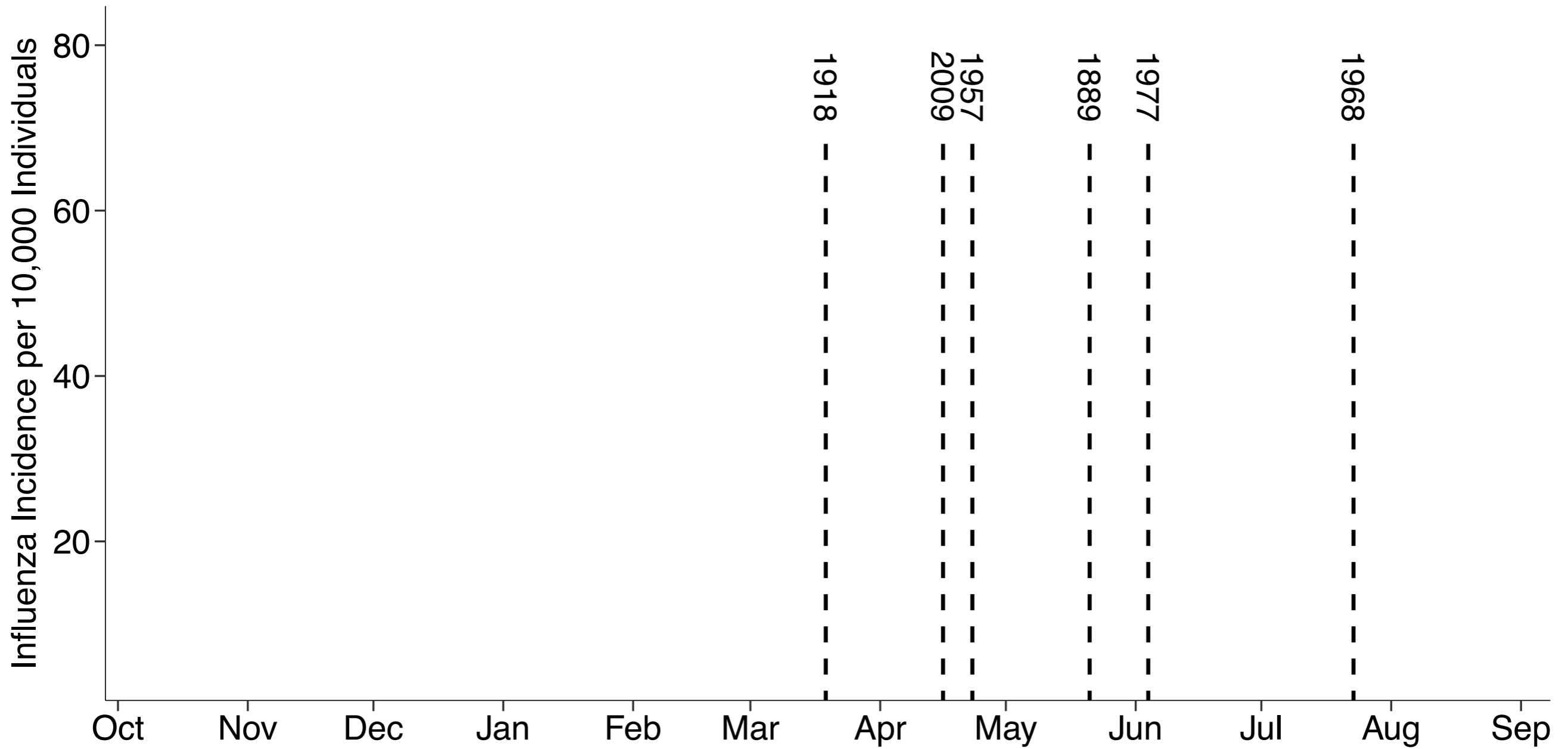
Spencer Fox

PhD Student

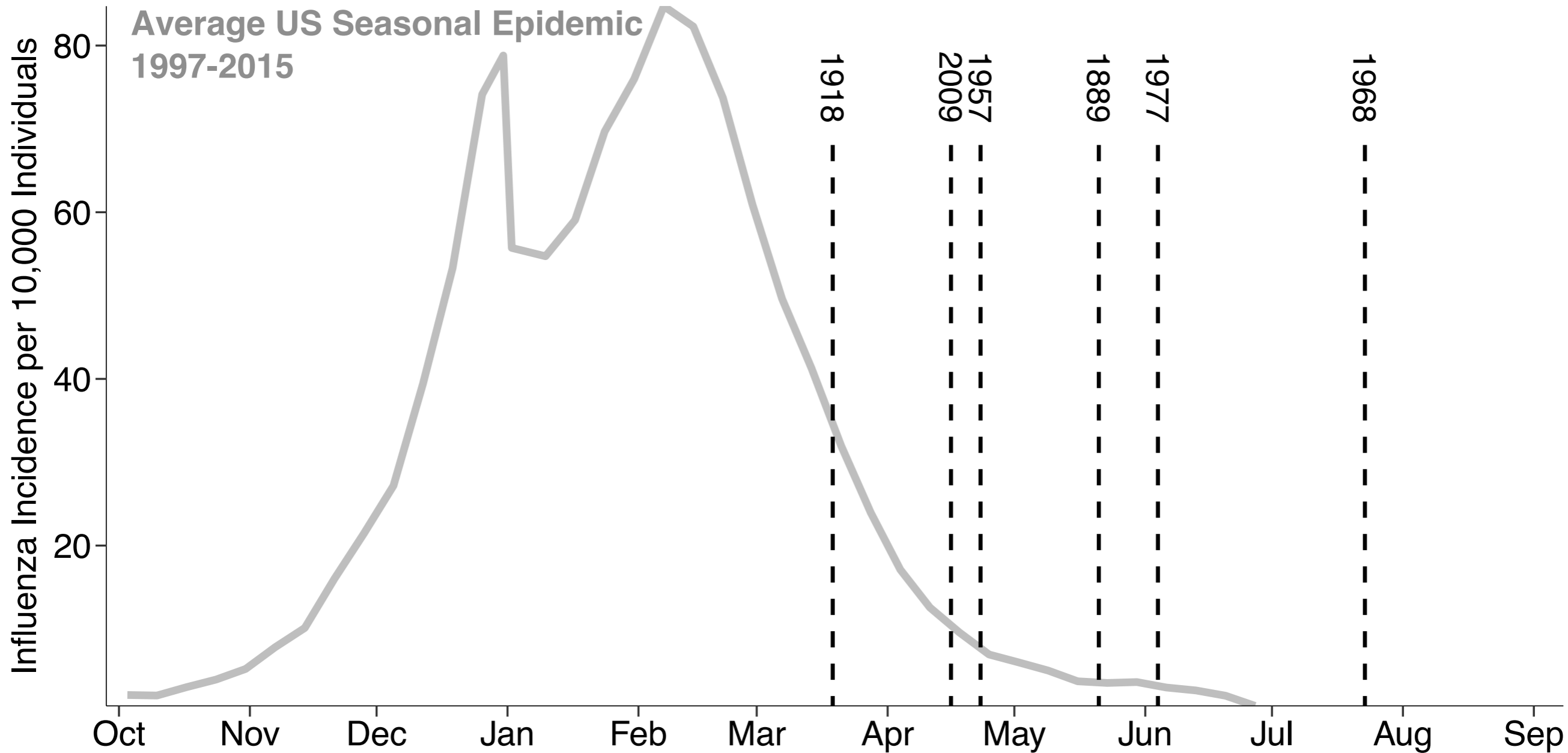
Lauren Meyers Lab

The University of Texas at Austin

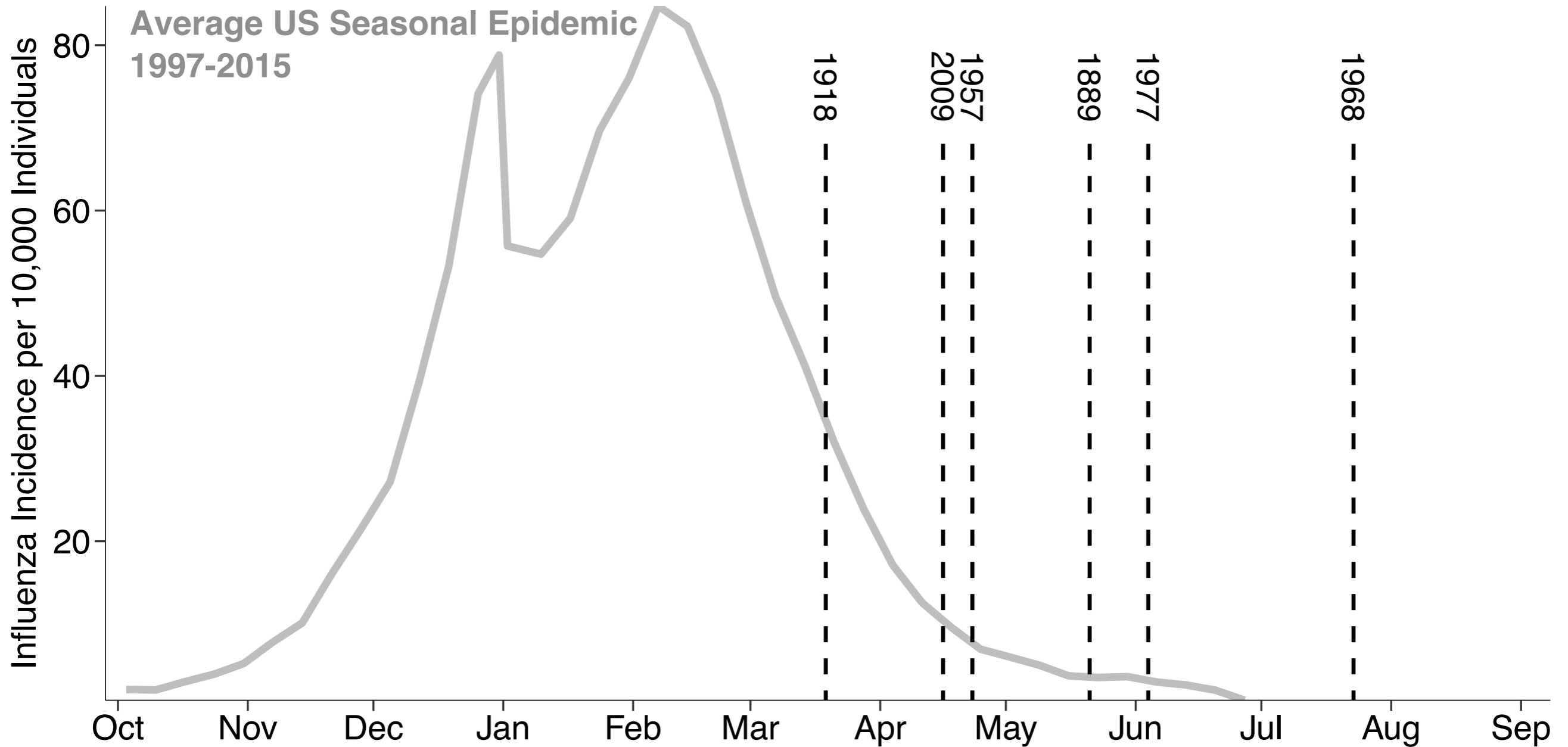
Pandemics emerge outside the typical influenza season



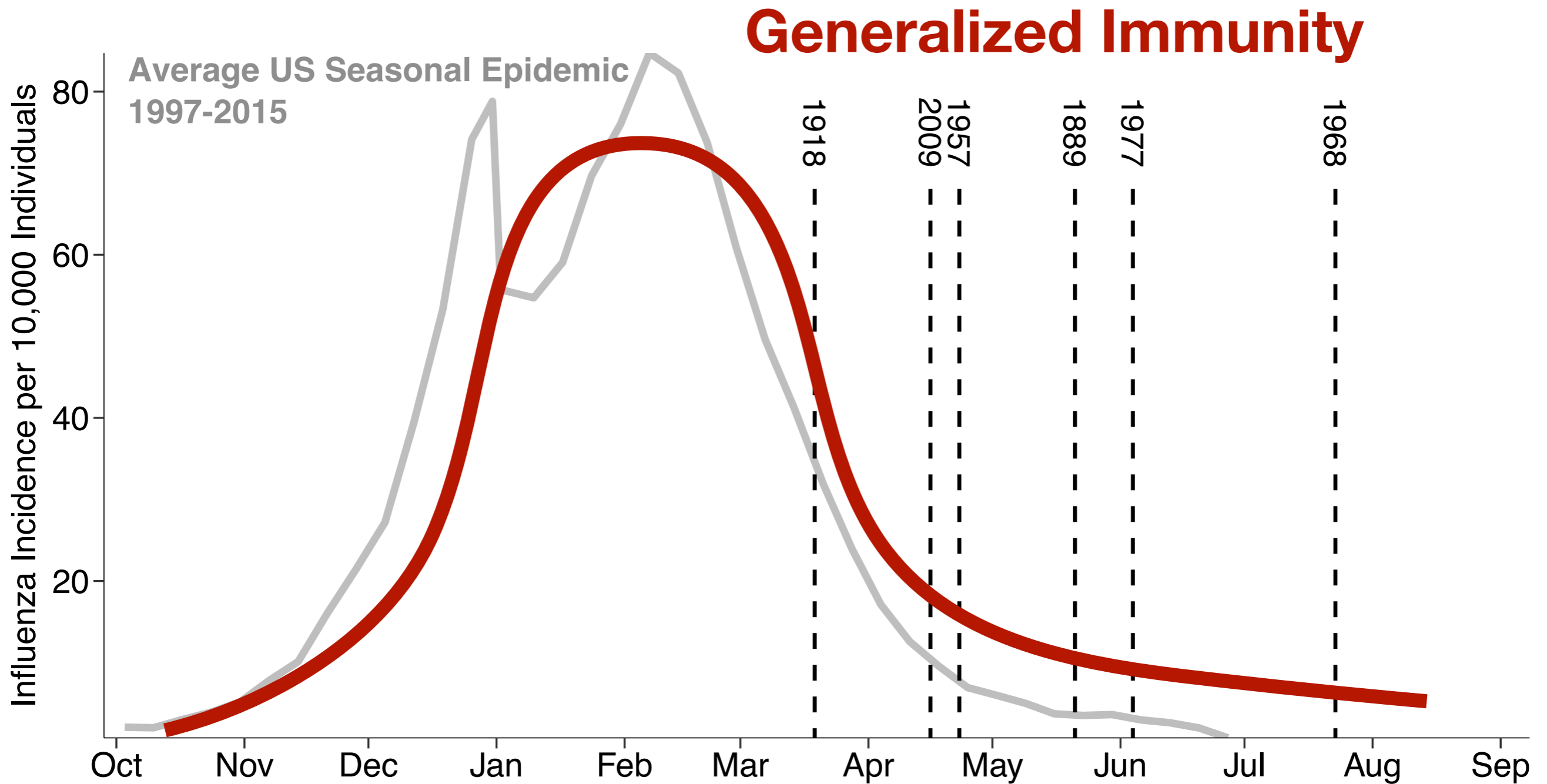
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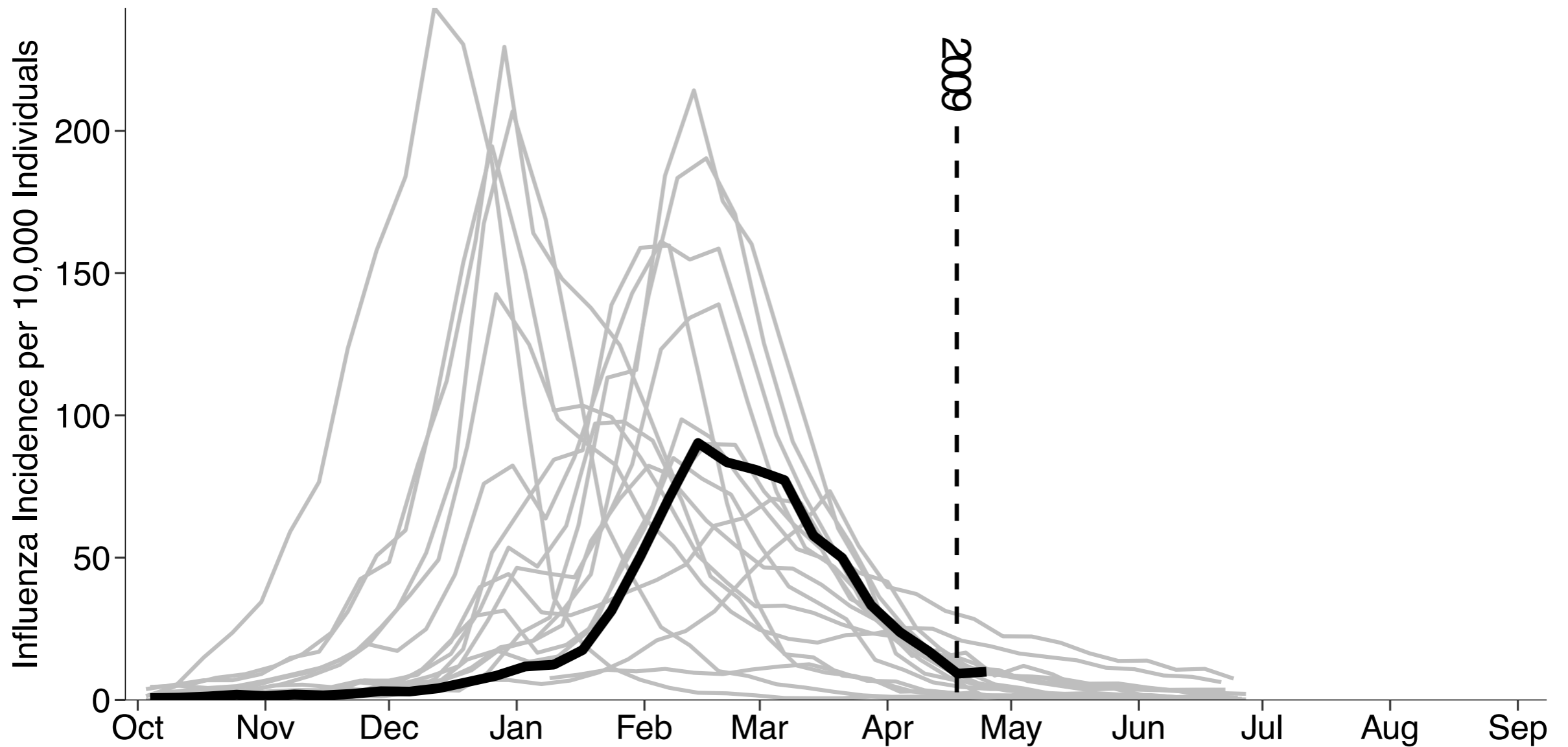
Short-term, generalized immunity could prevent emergence during seasonal epidemics



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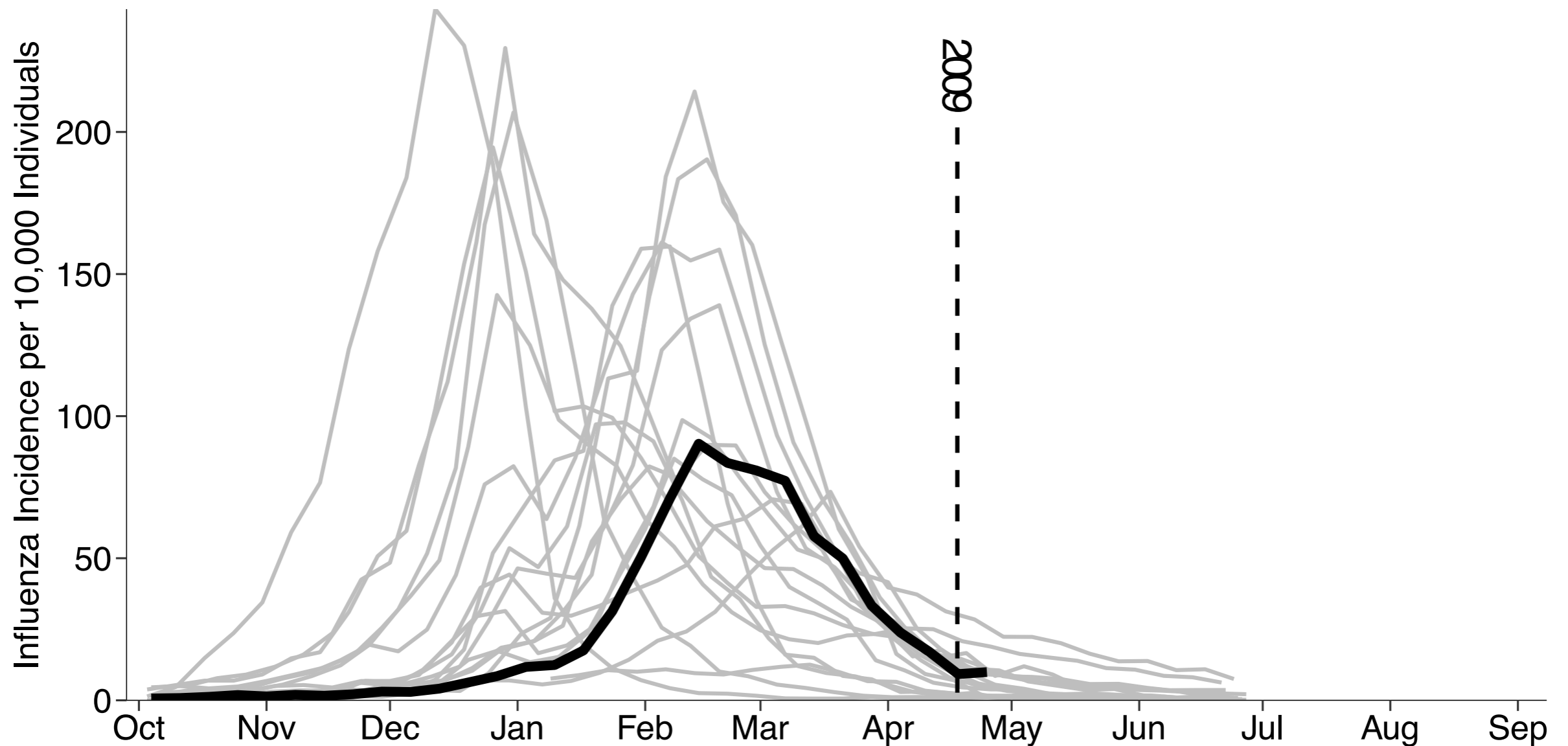


Combination of refractory period and seasonality fit the historic pandemic emergence timing



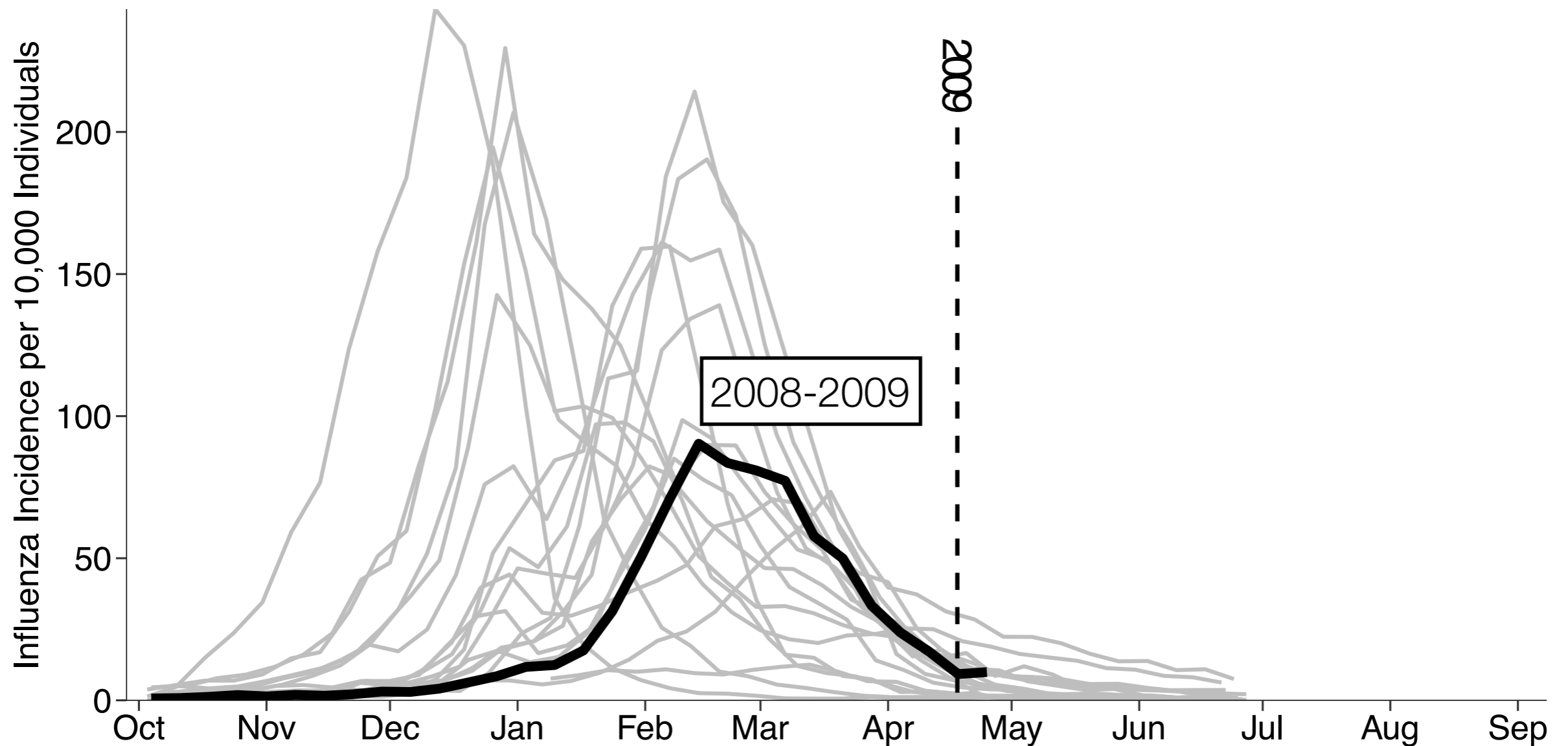
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1. Two-strain model



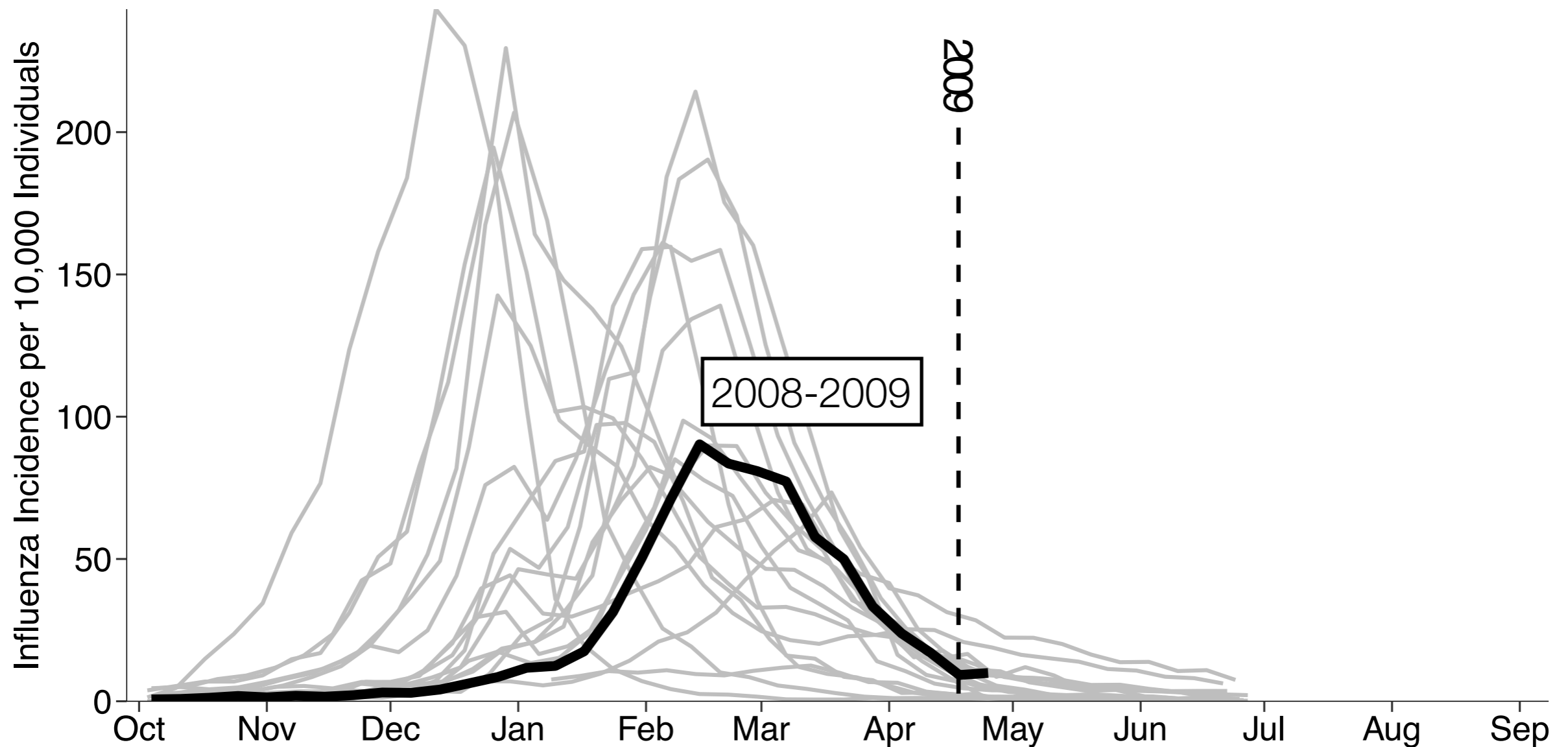
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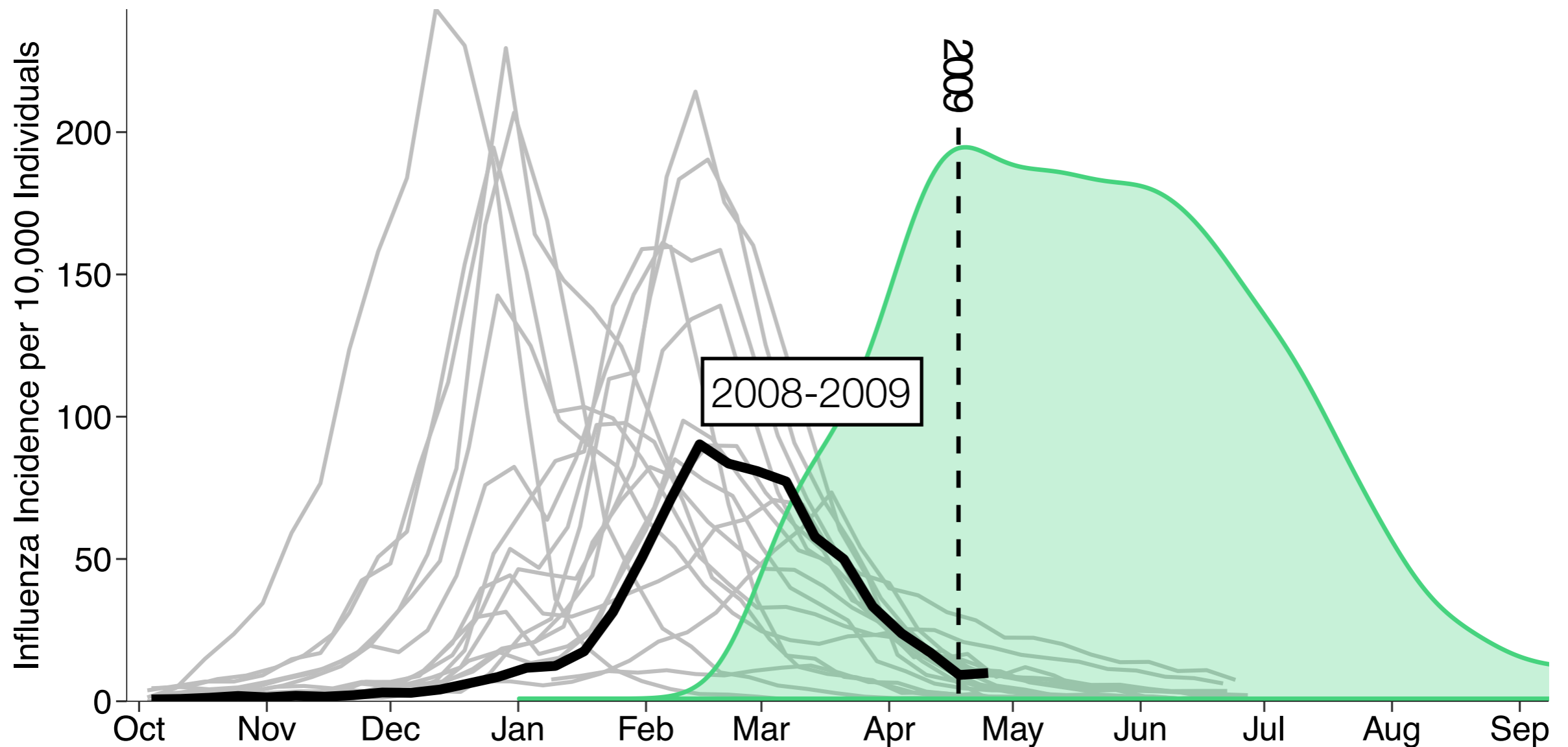
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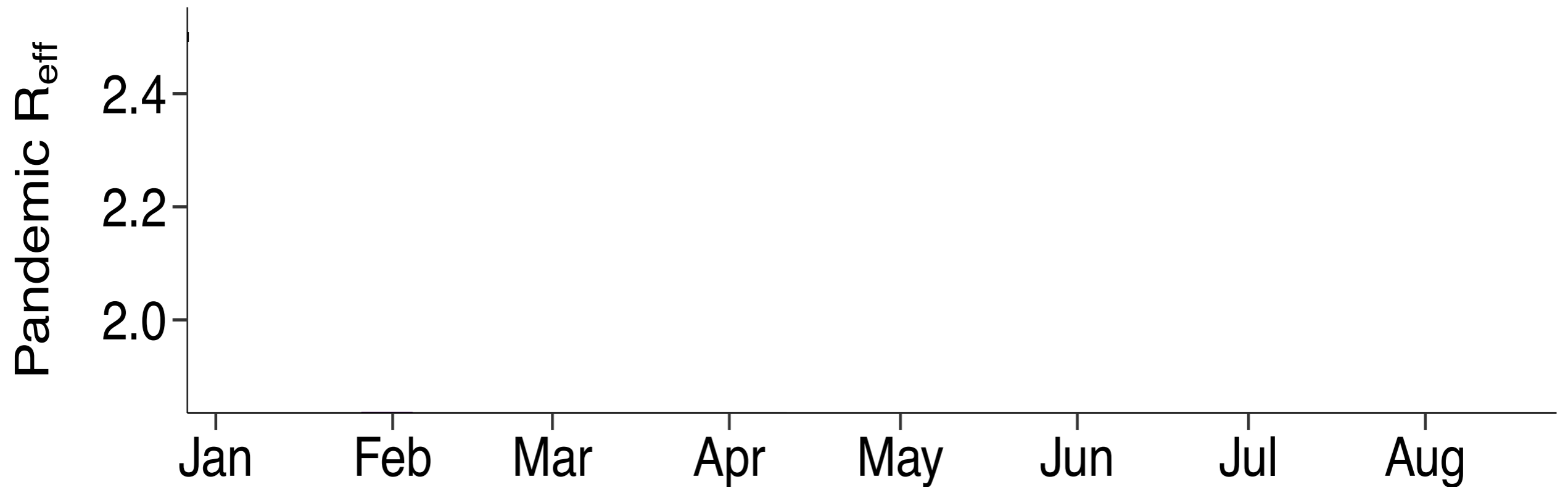


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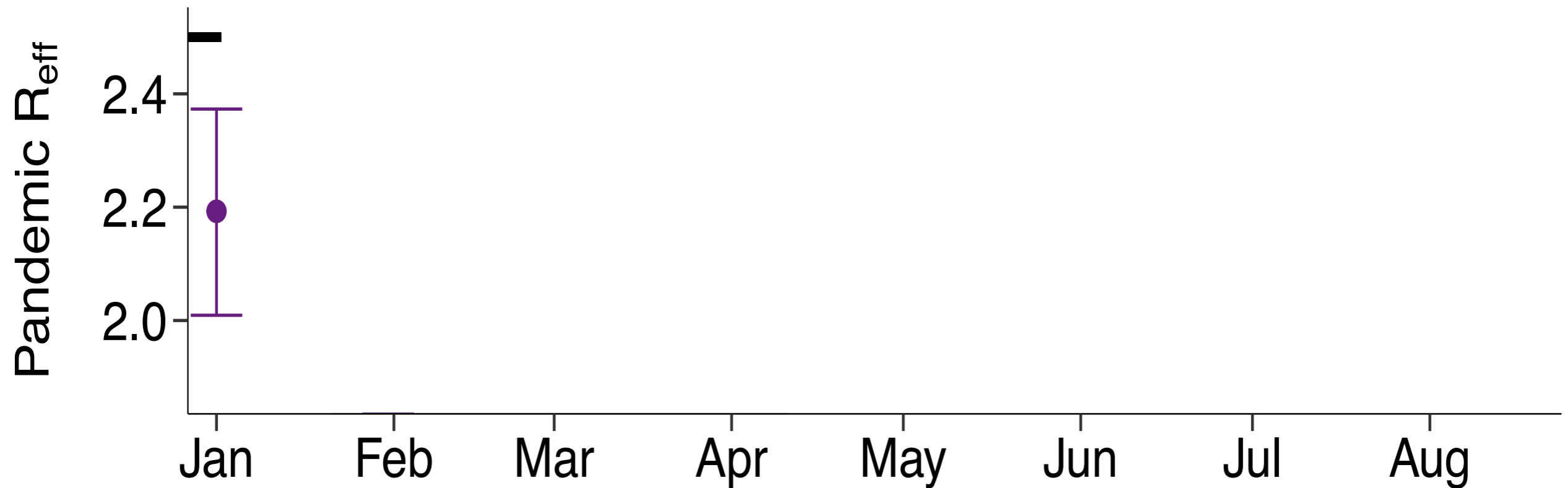
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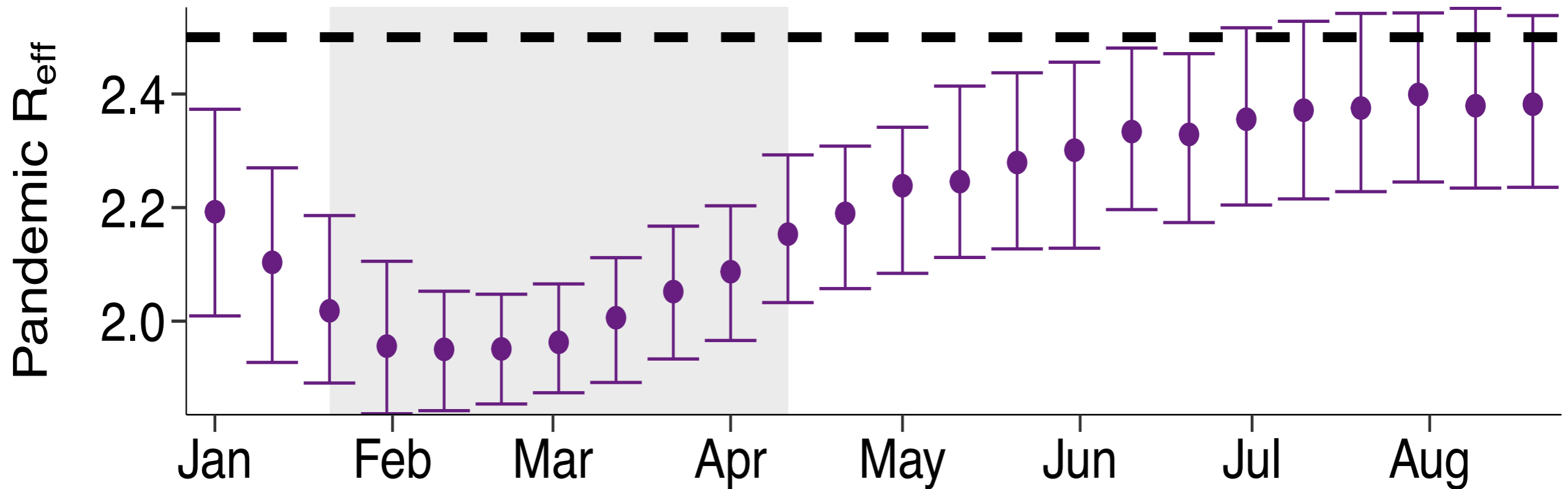
Pandemics that are successful emerge “slower” within the refractory period



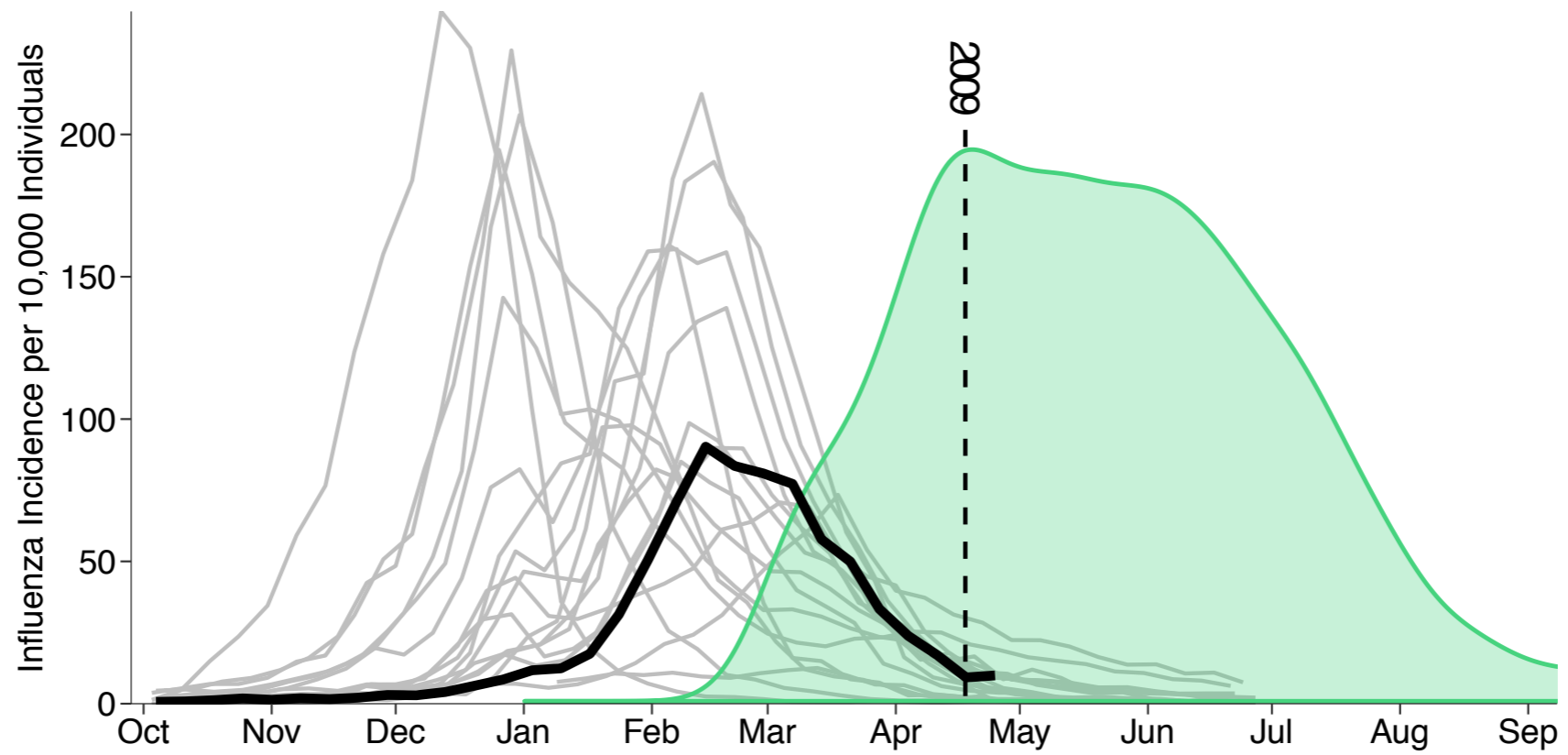
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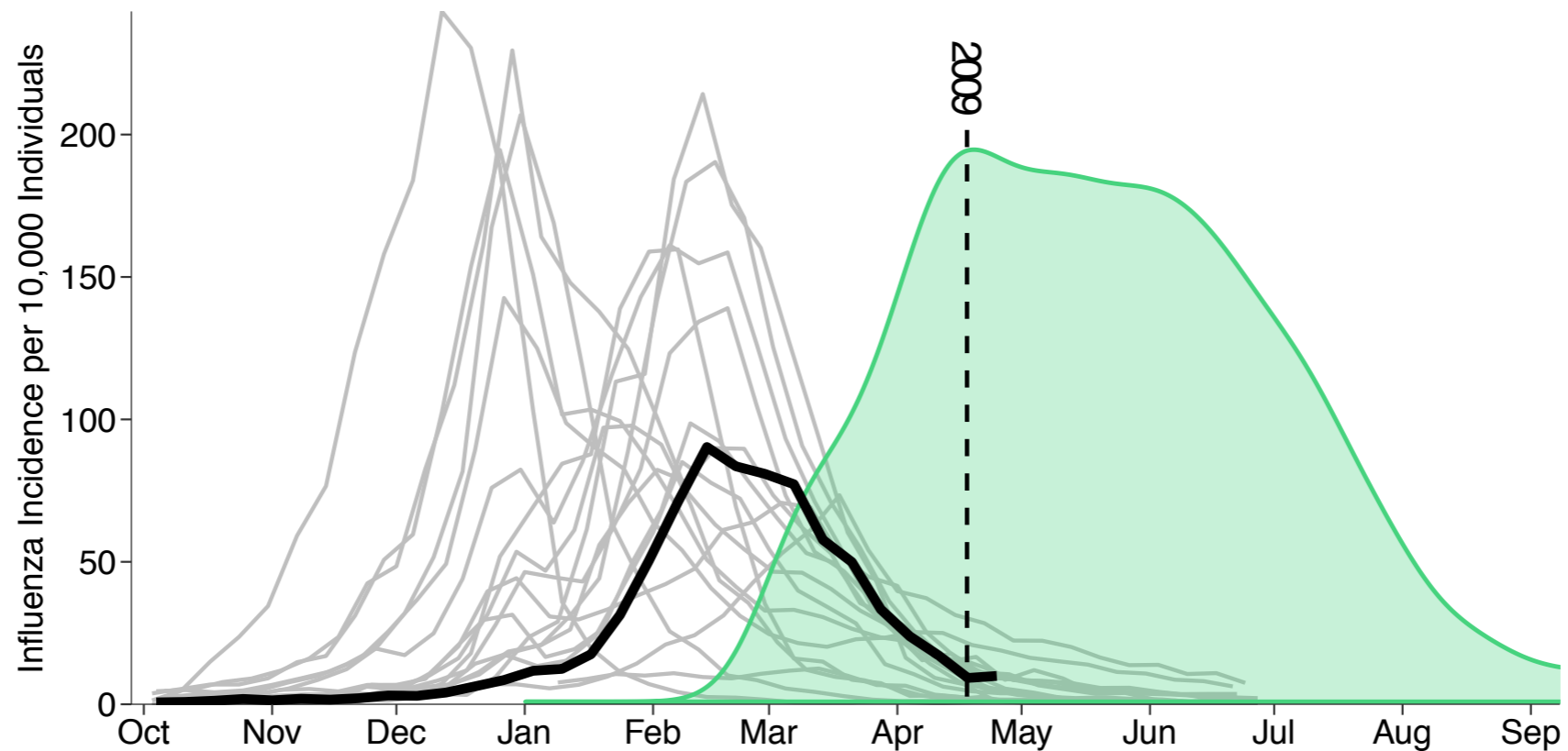


Conclusions



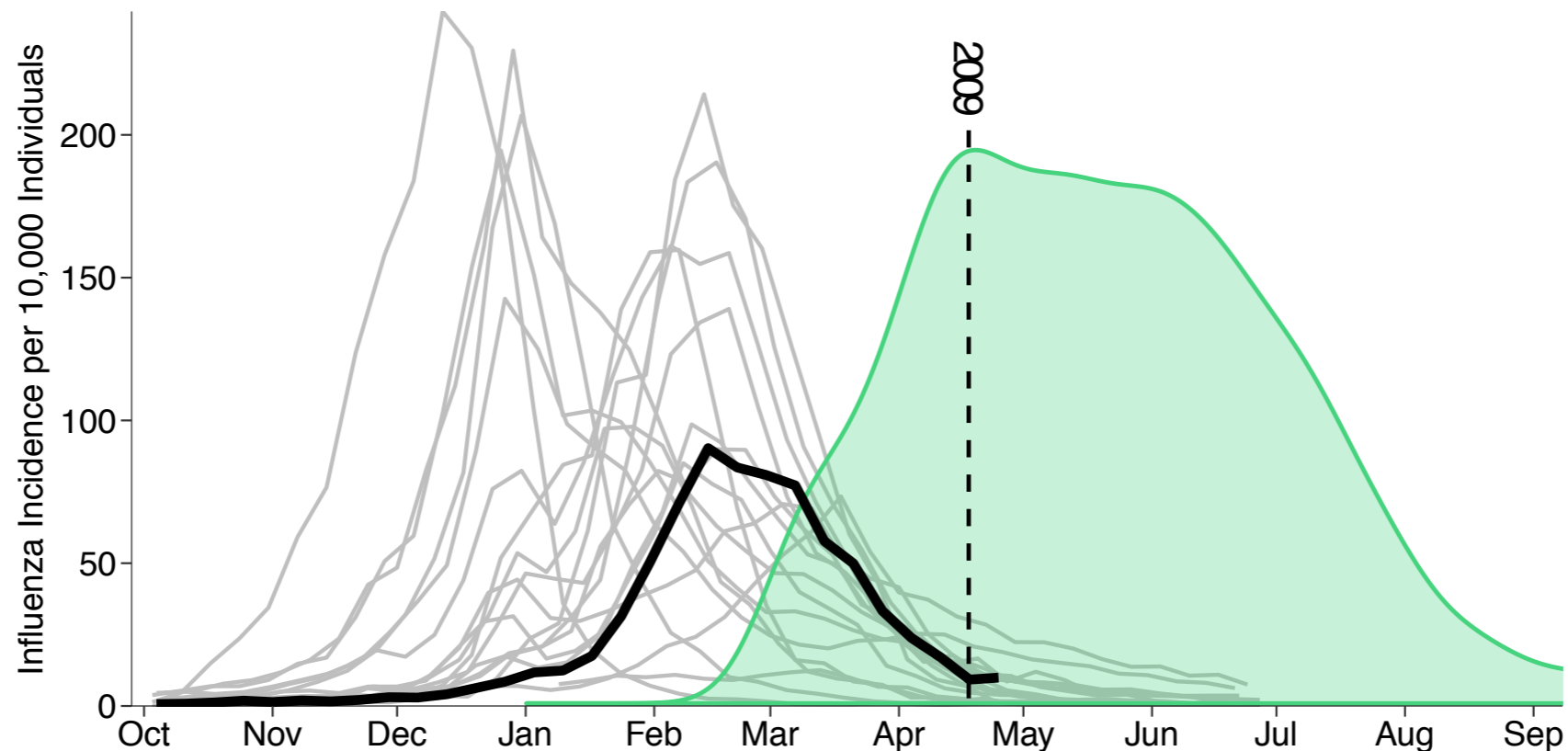
Conclusions

- Reasonable
 - Still need better understanding of short-term immunity, but it could explain pandemic emergence seasonality



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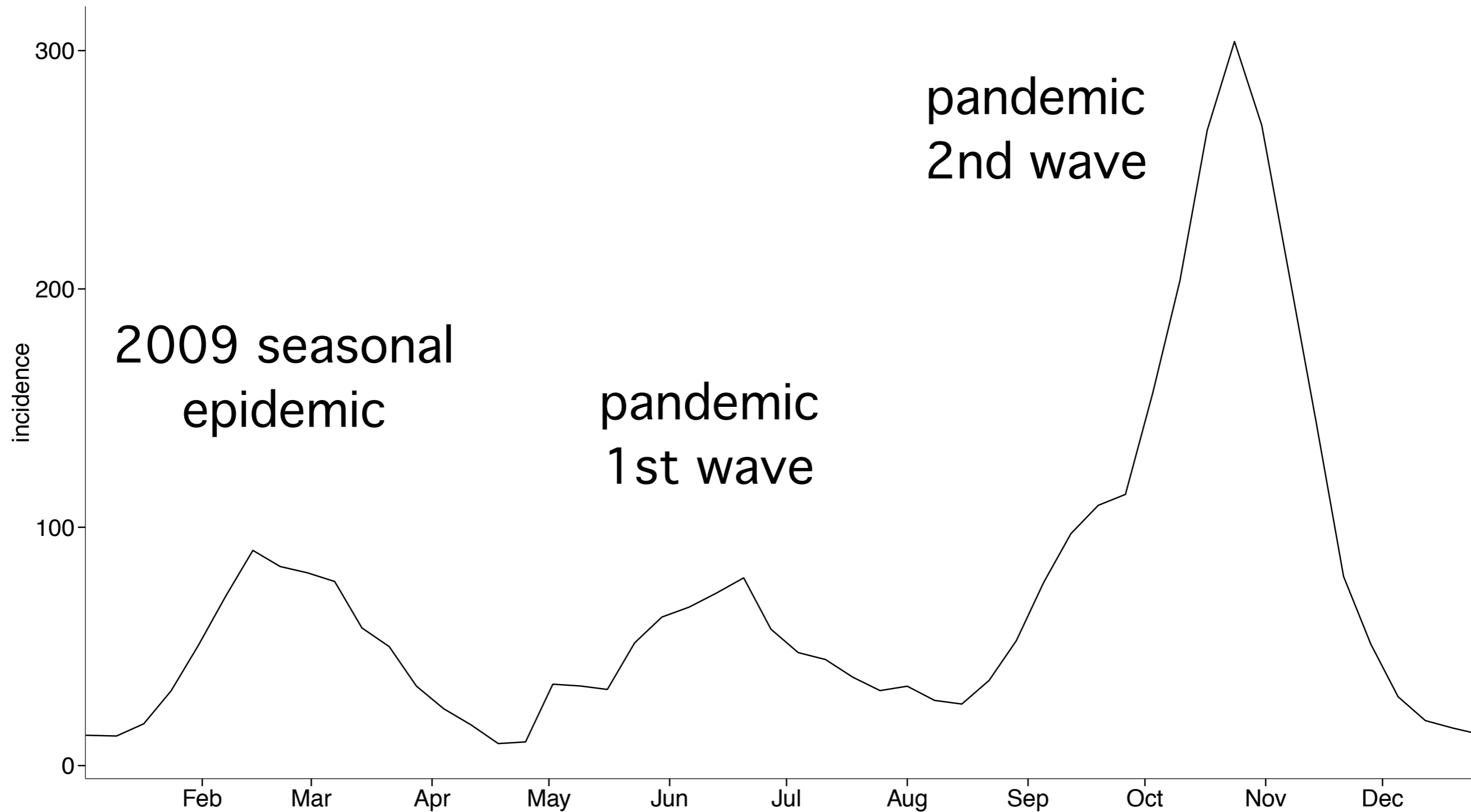
- Reasonable
 - Still need better understanding of short-term immunity, but it could explain pandemic emergence seasonality
- Handwavy, but (maybe) cool implications
 - Optimizing pandemic surveillance systems and response
 - Seasonal flu vaccination



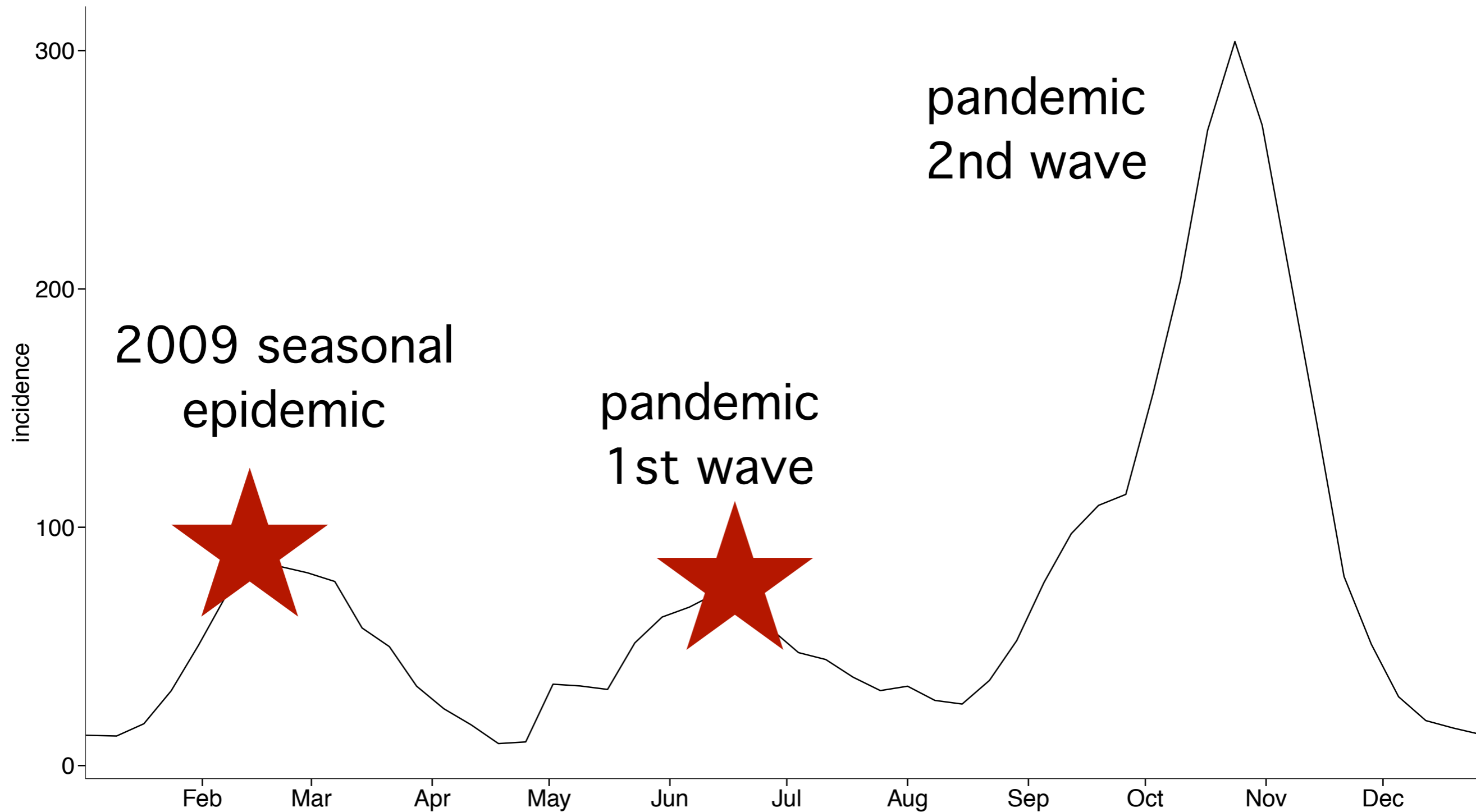
Pandemic wave dynamics



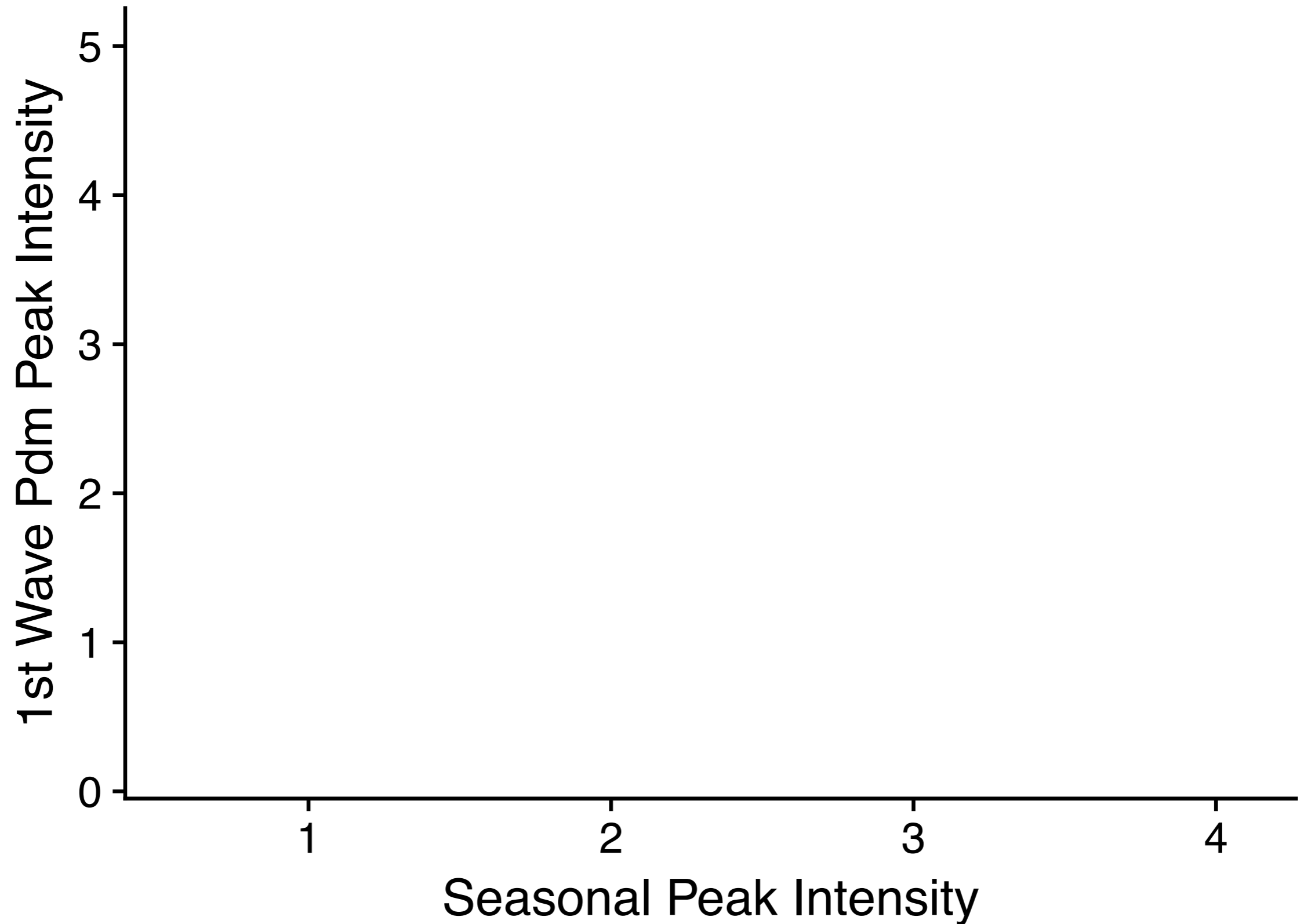
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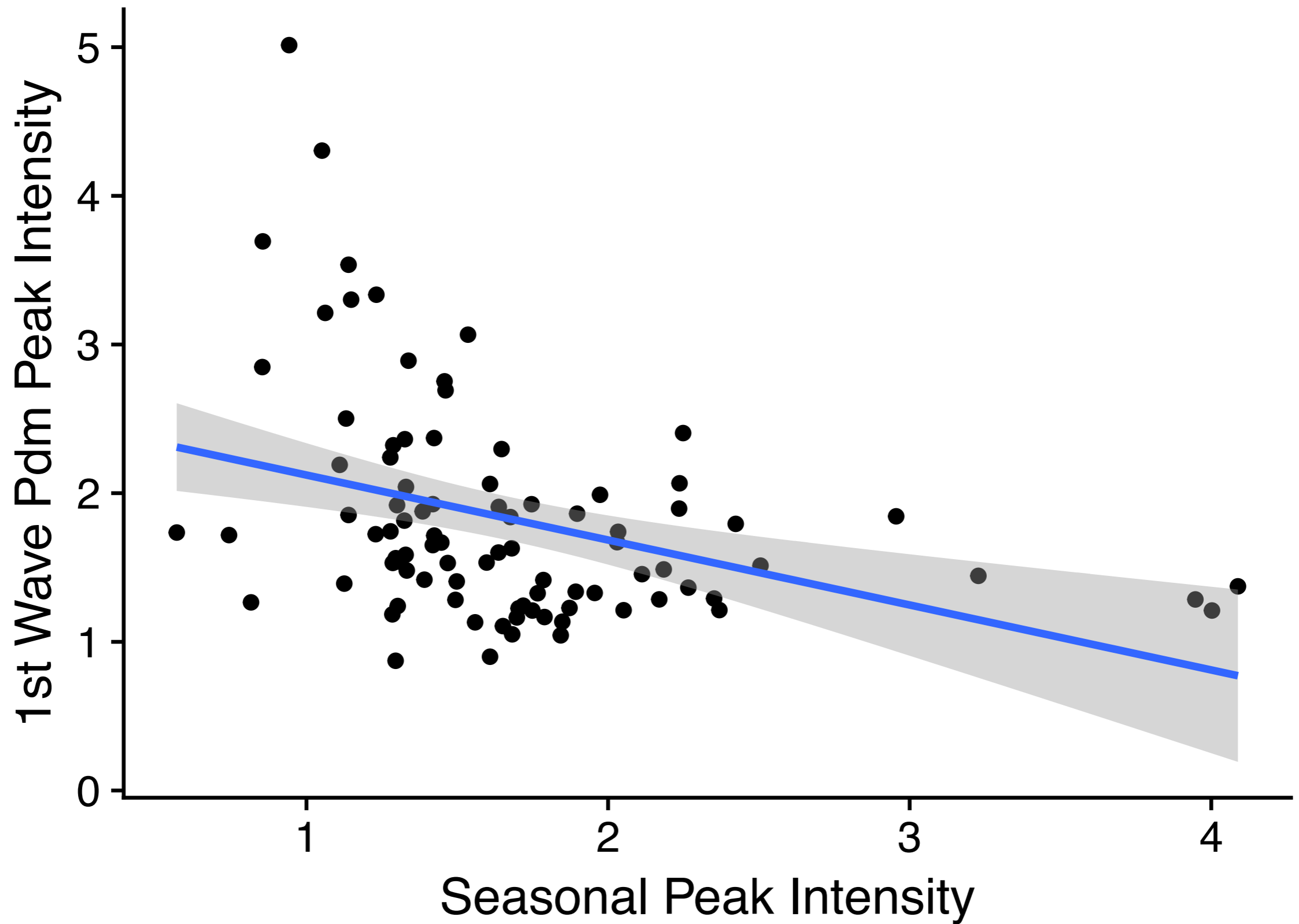
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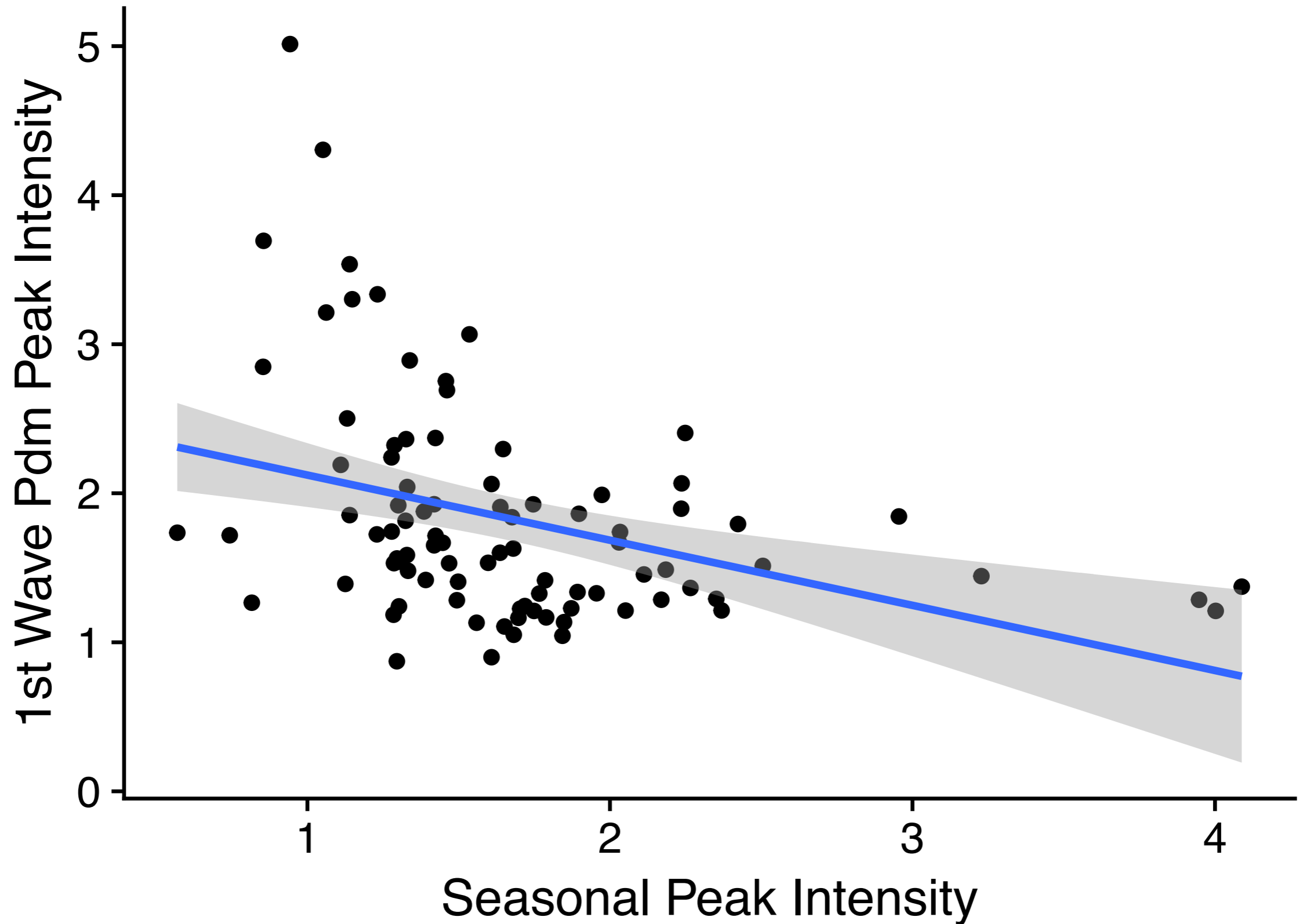
Cities with larger seasonal flu epidemics had smaller initial pandemic waves



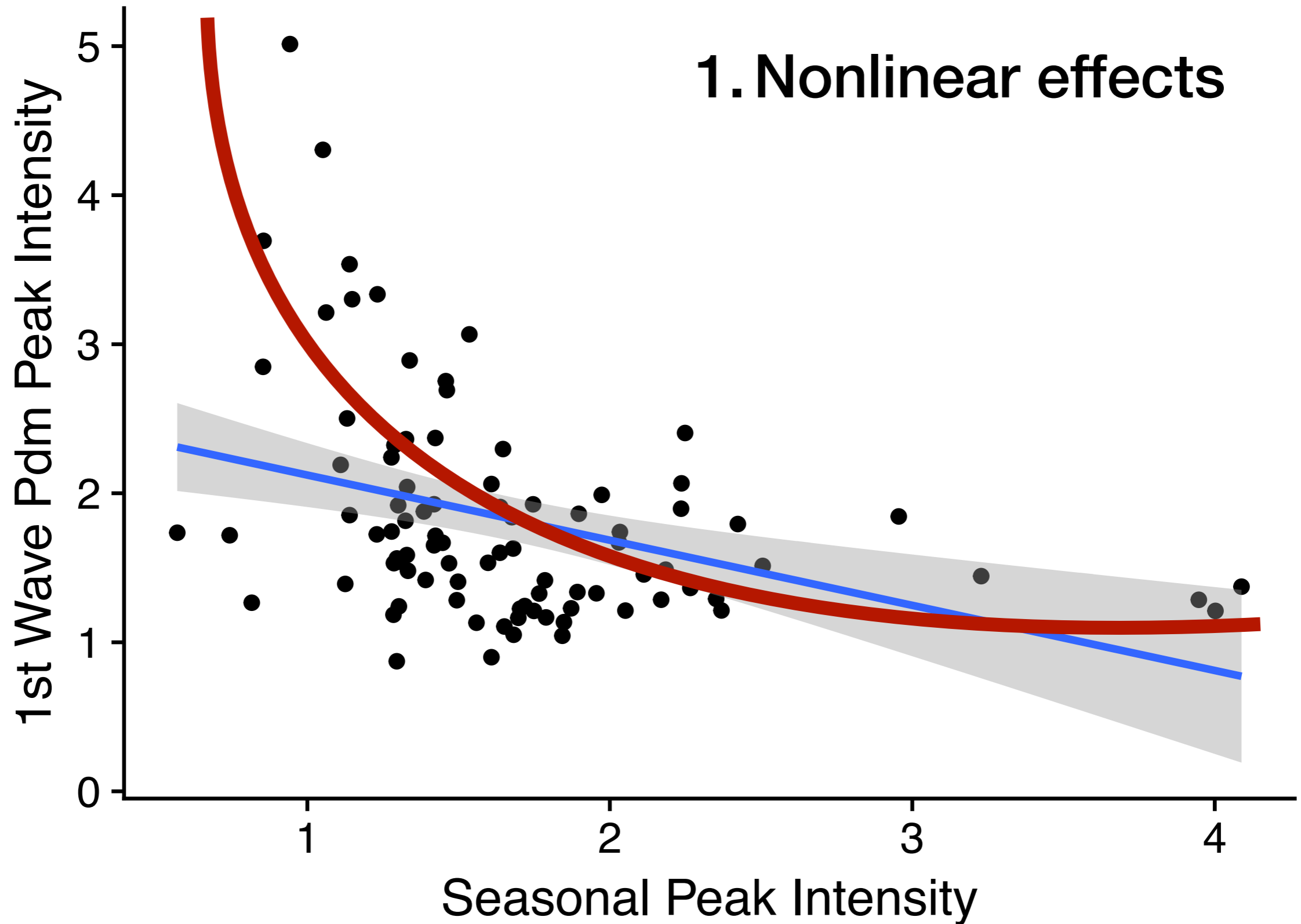
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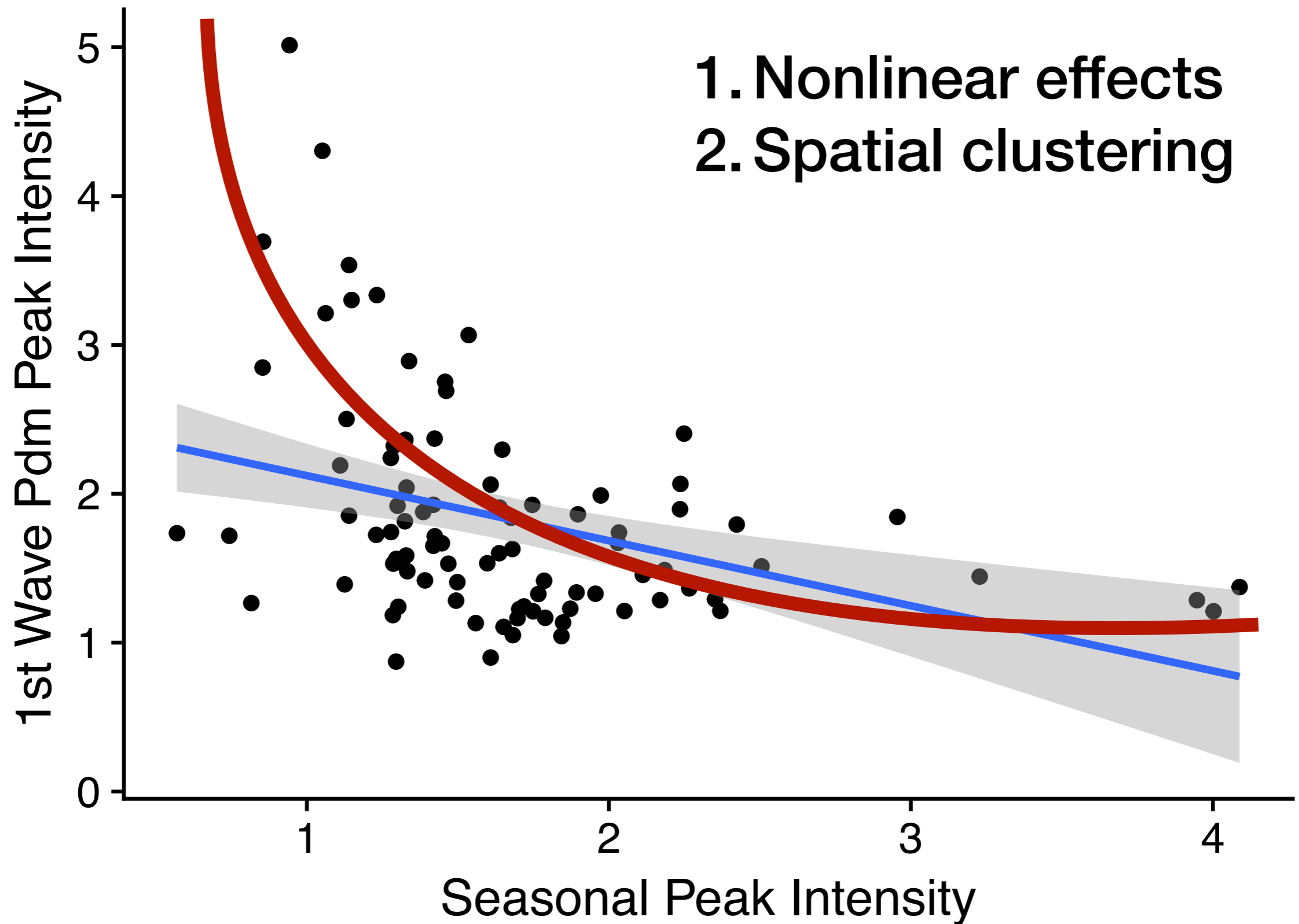
Many other factors to investigate, and needs some more intricate modeling



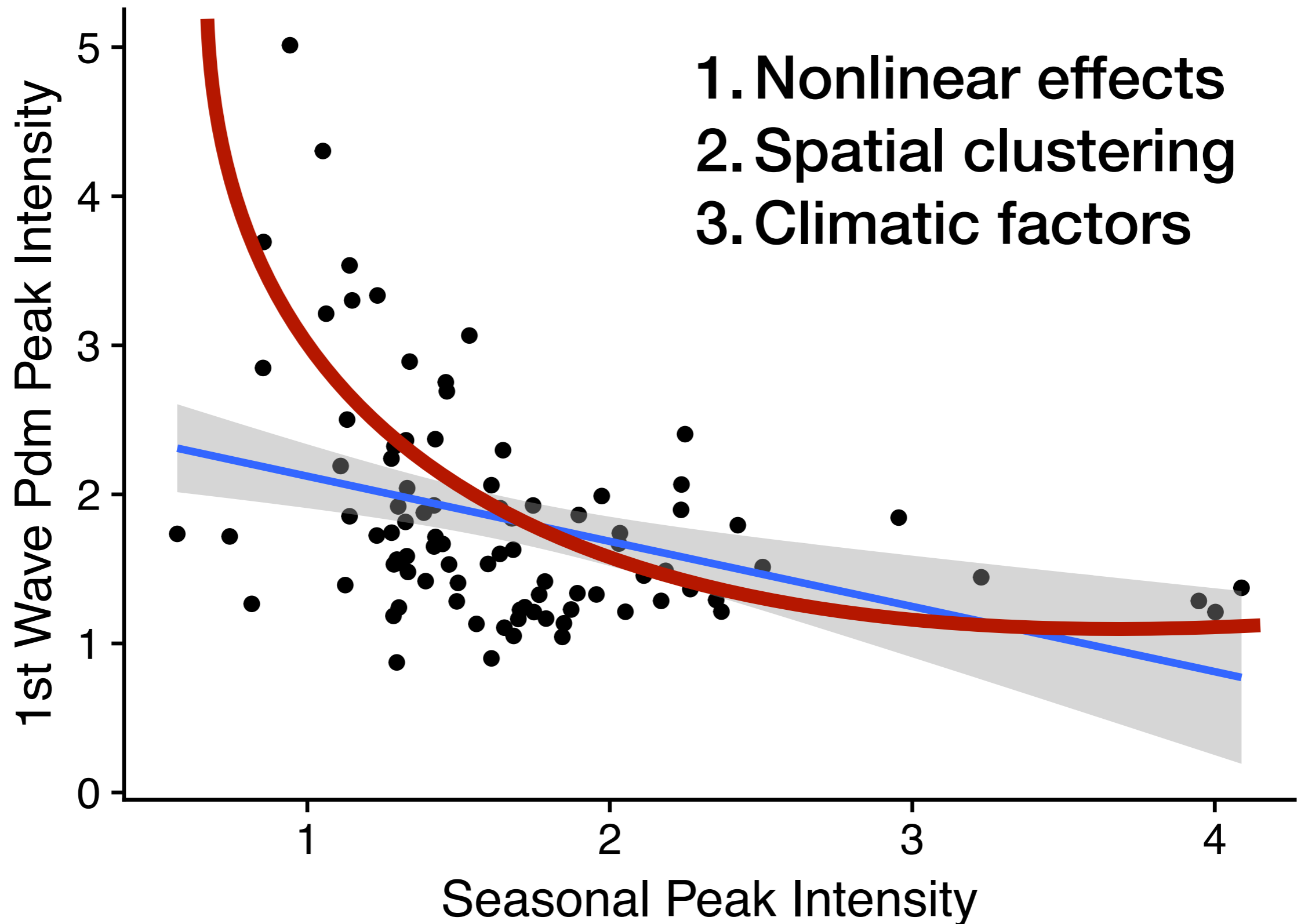
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Acknowledgements

- Lauren Ancel Meyers
- Joel C. Miller
- Cécile Viboud
- Funding
 - NIH MIDAS program
 - DTRA
 - National Geographic Young Explorer Program

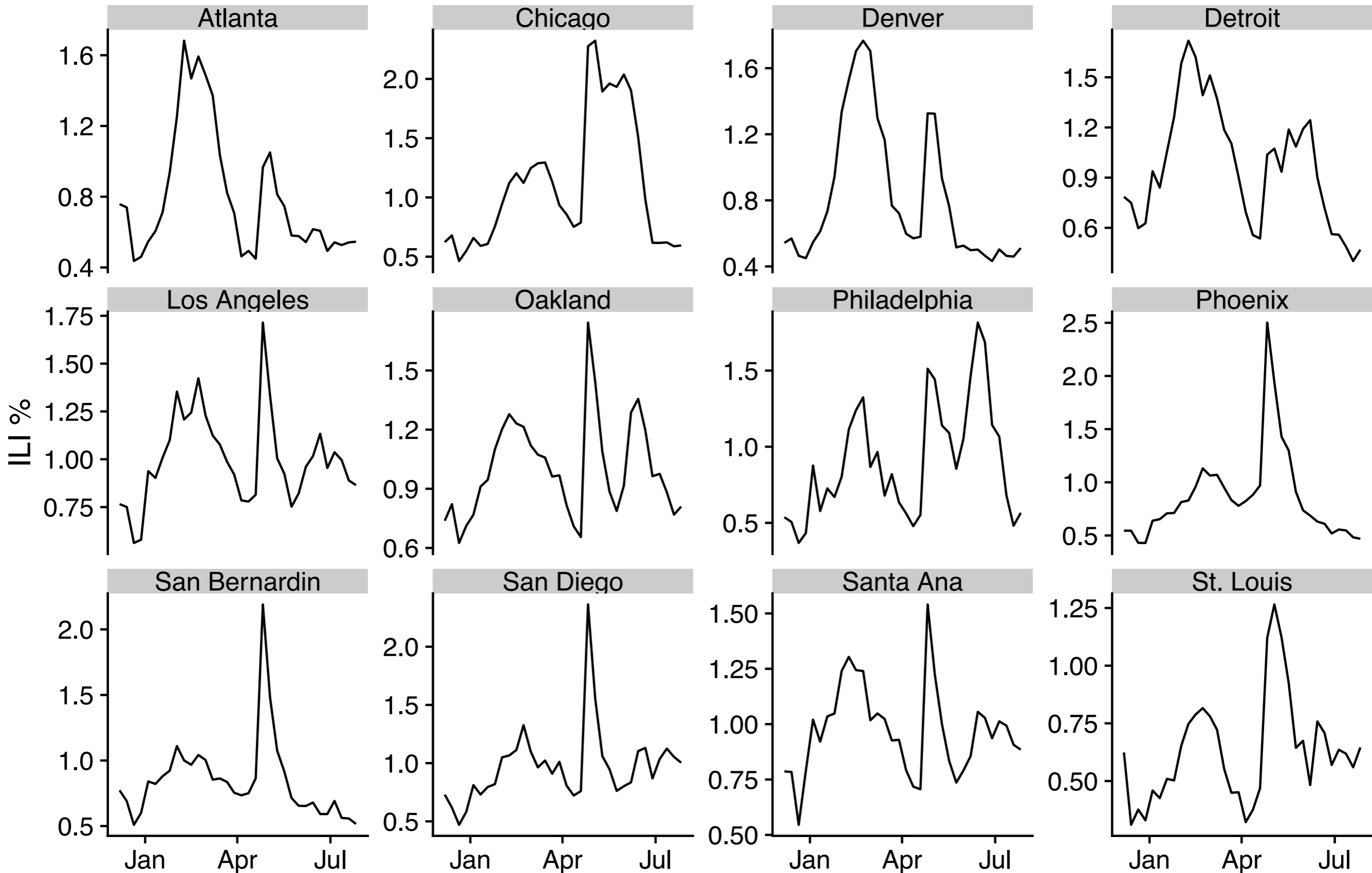


Spencer's contact info:

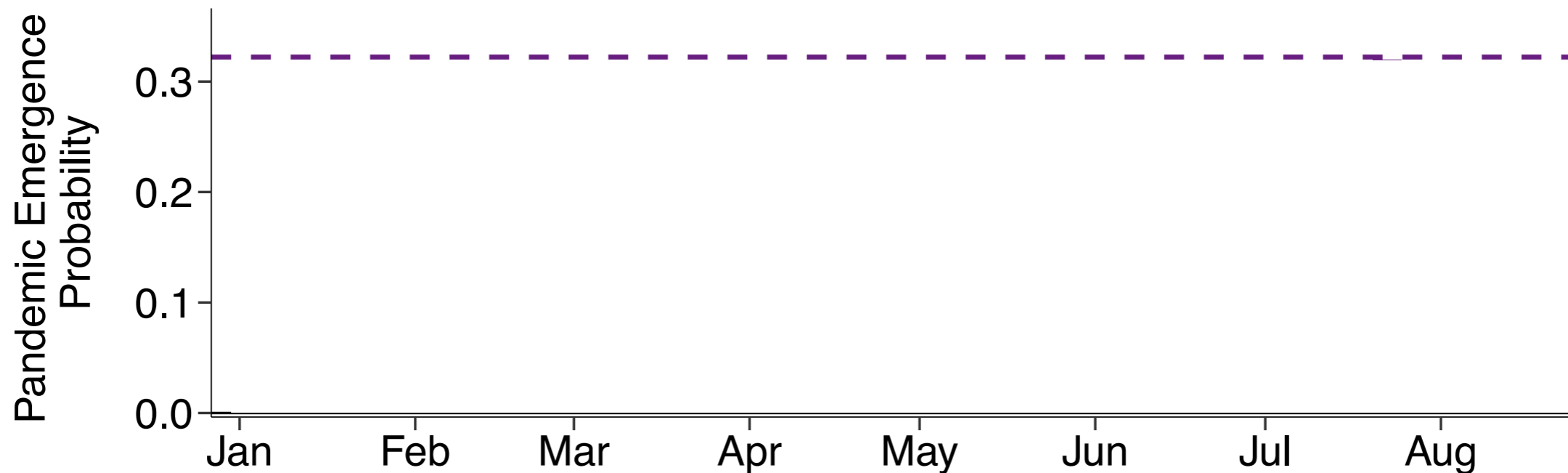
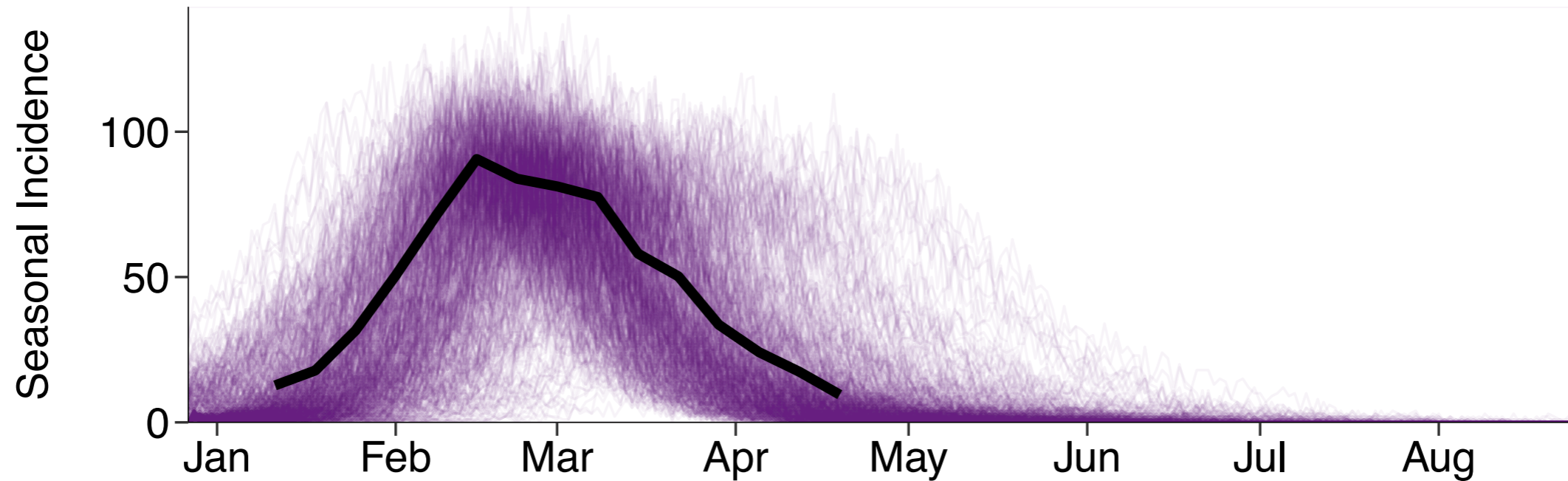
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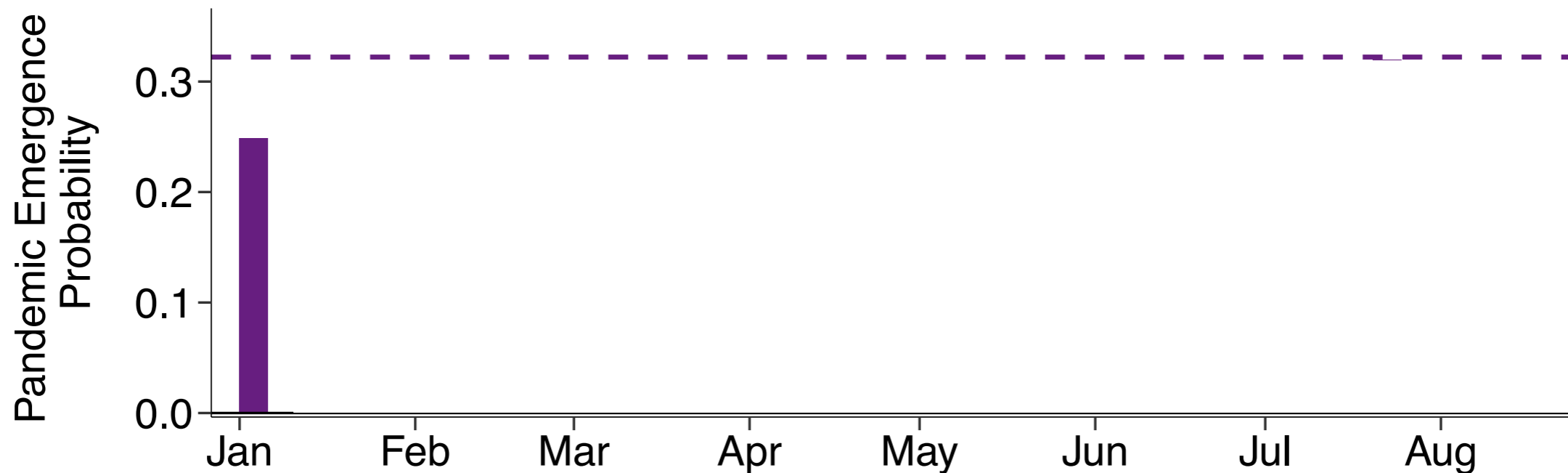
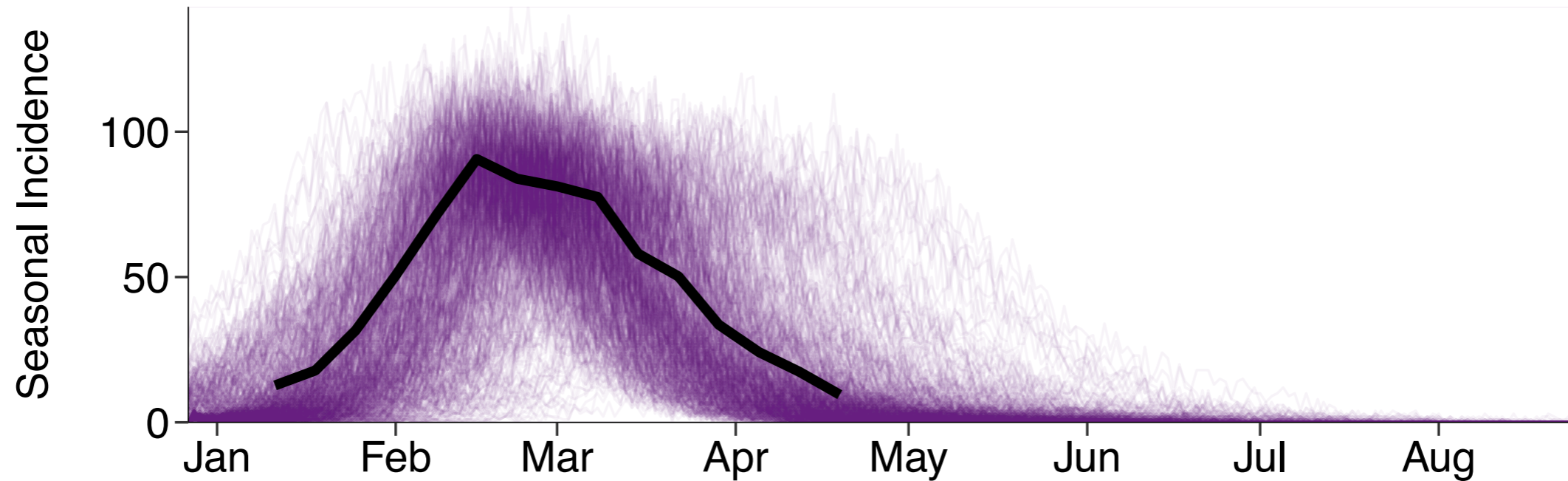
City flu data may hold clues



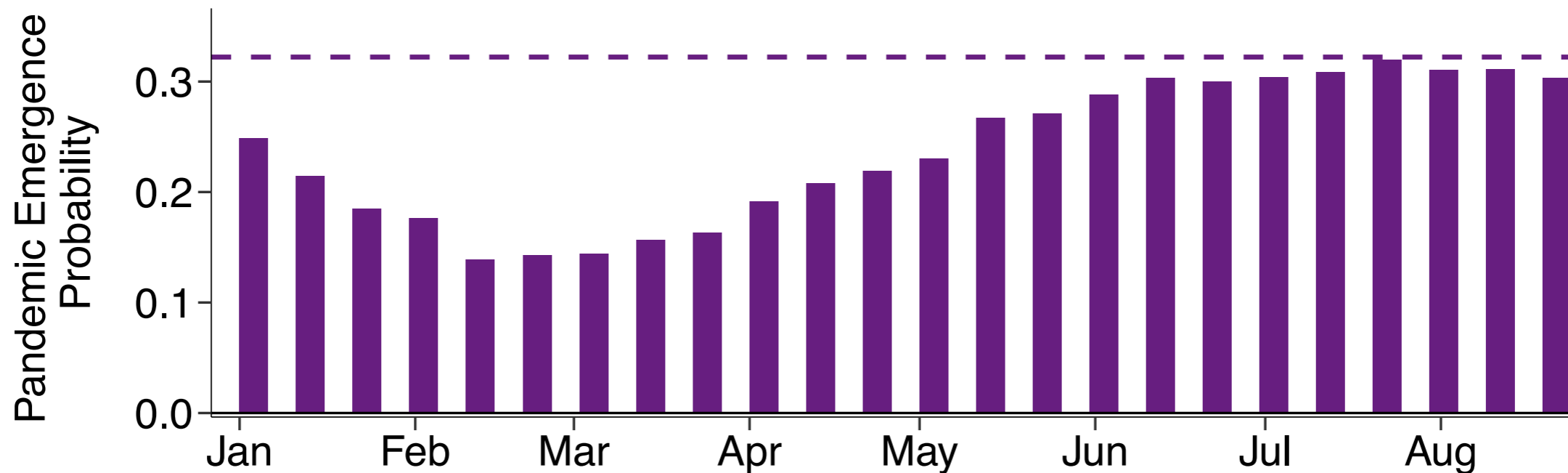
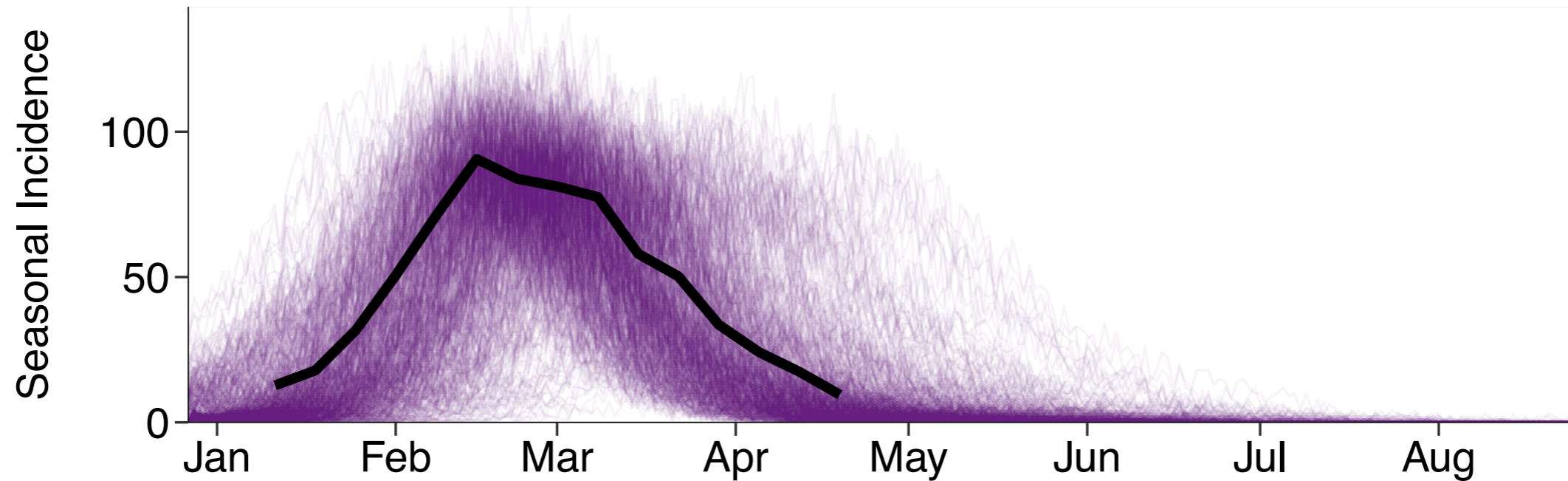
Seasonal epidemics and short-term immunity create pandemic “refractory period”



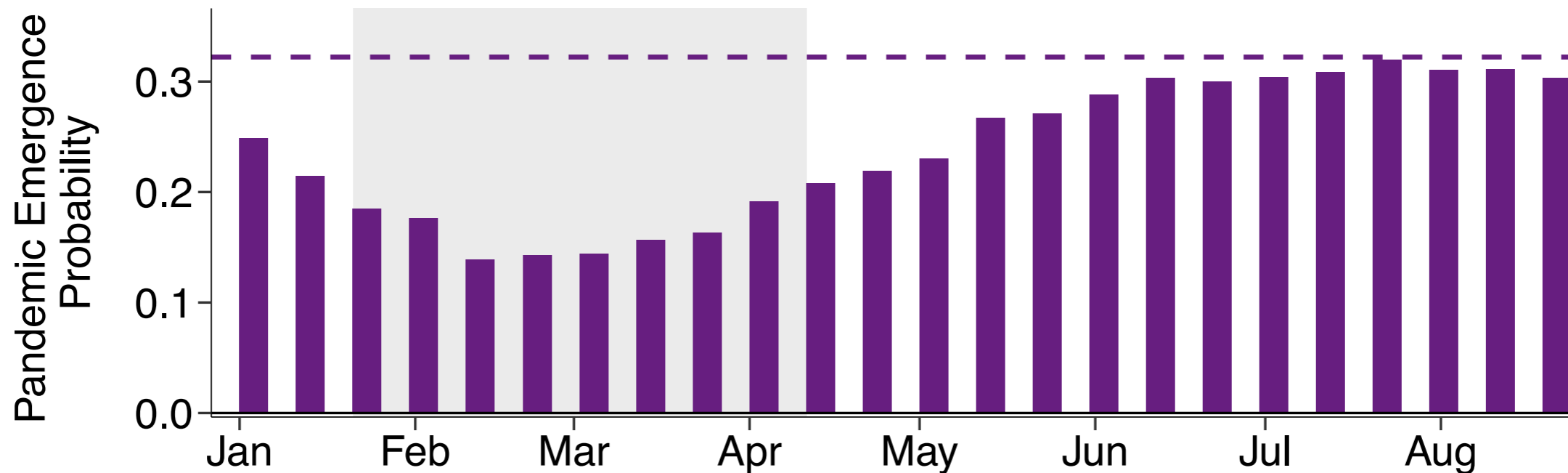
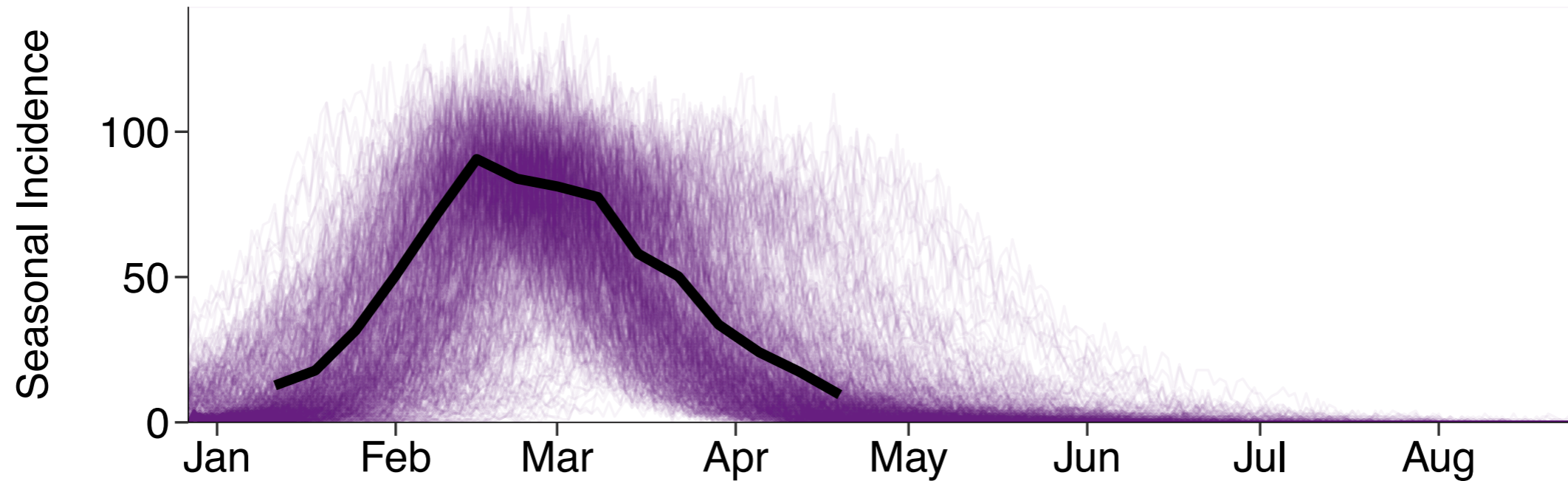
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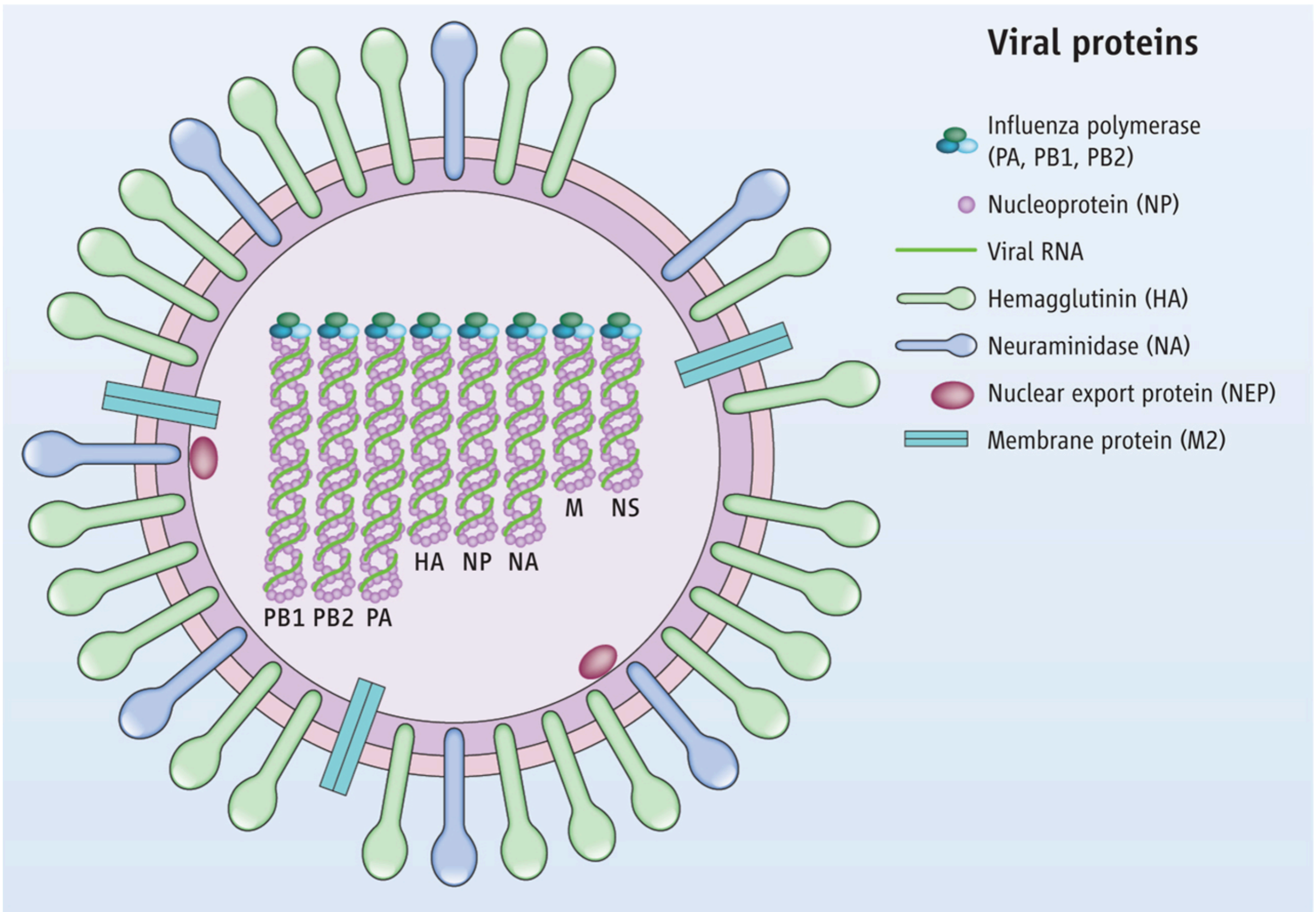
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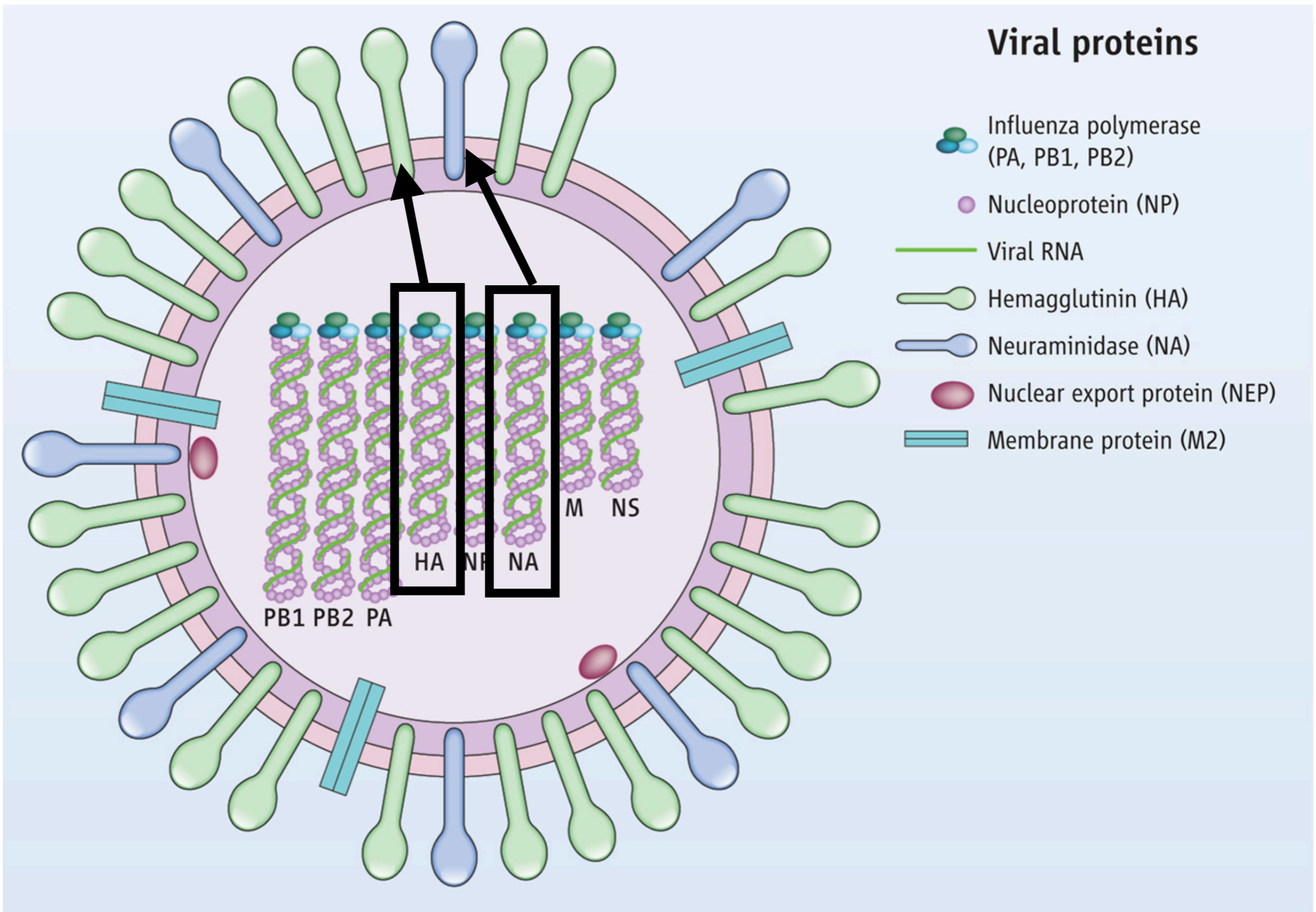
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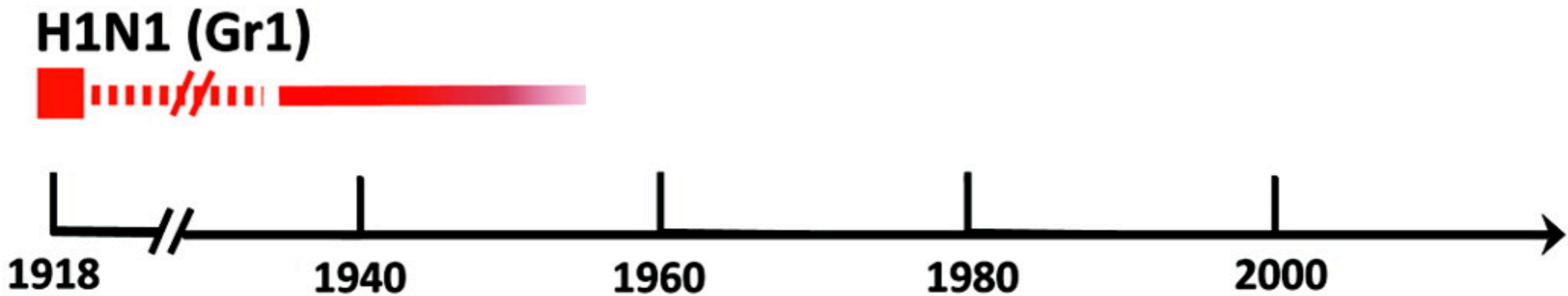
Influenza pandemics are defined by the two main antigens



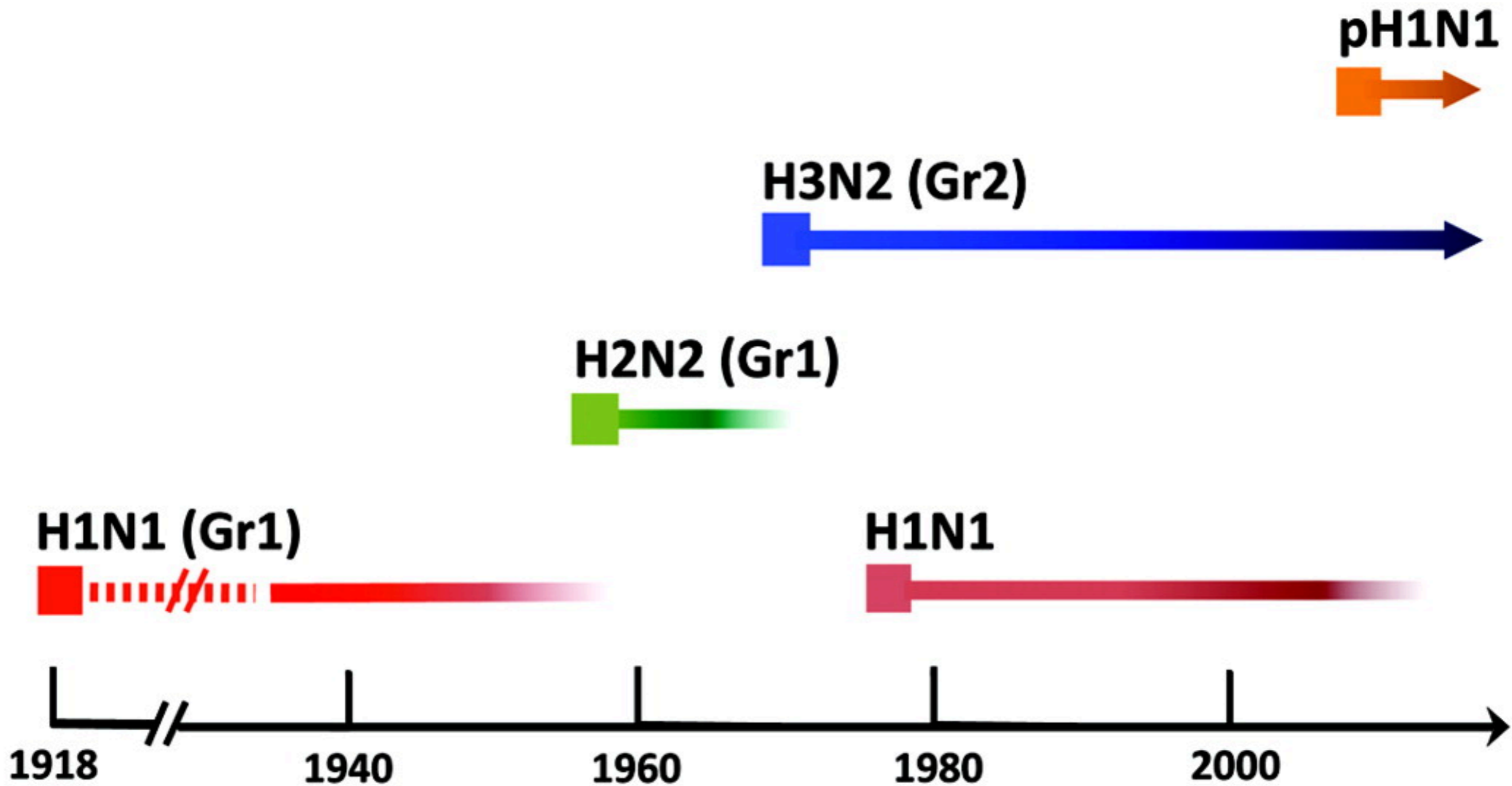
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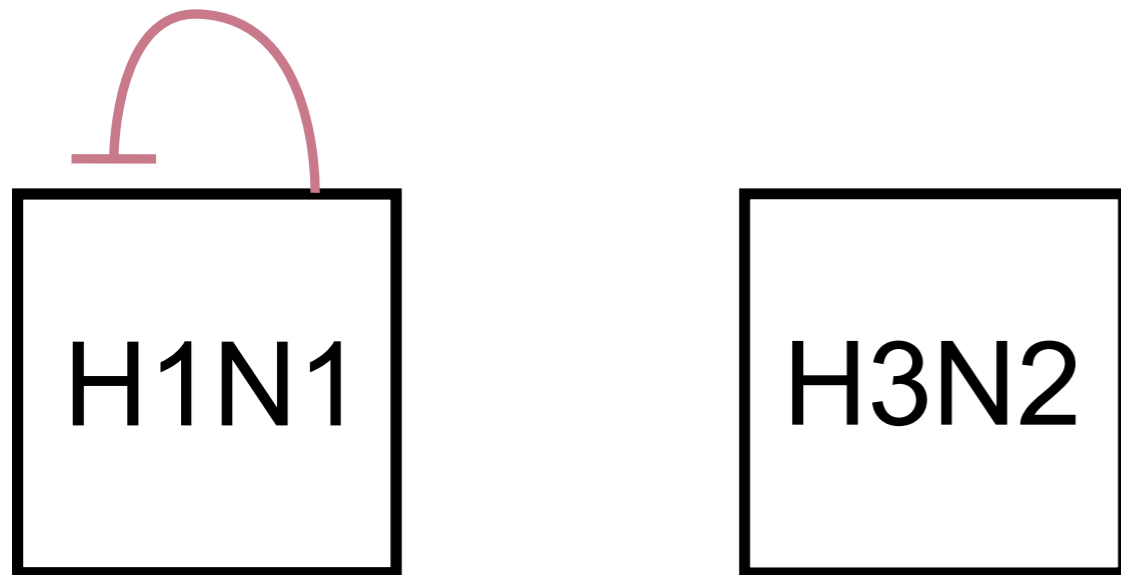
How can there be strain replacement following pandemics



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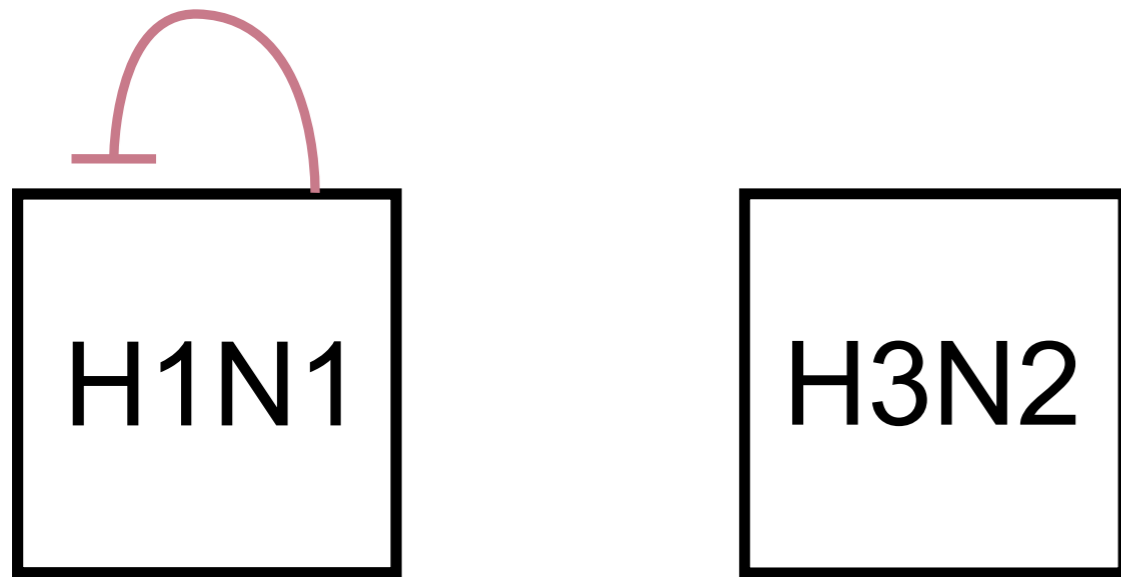
Immunological dynamics underlying flu spread



→ Increased Susceptibility

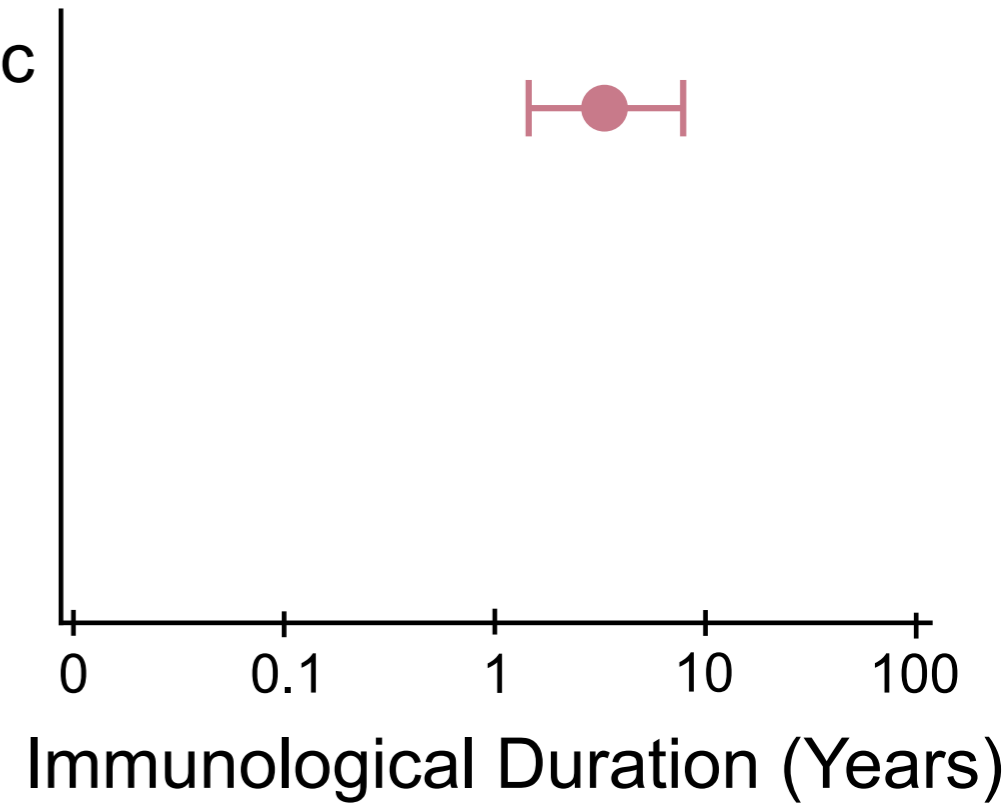
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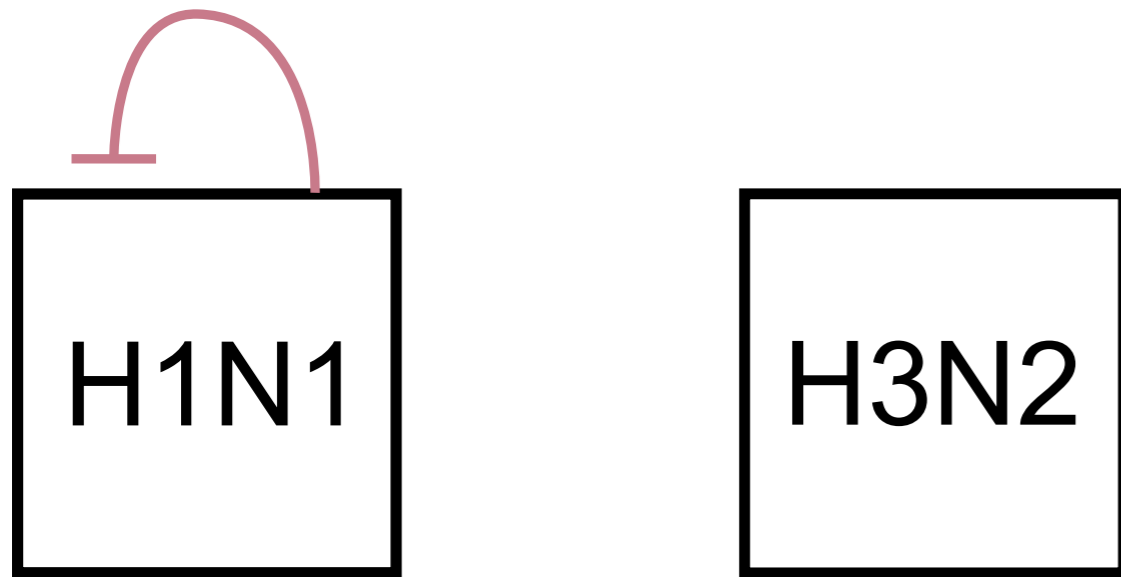


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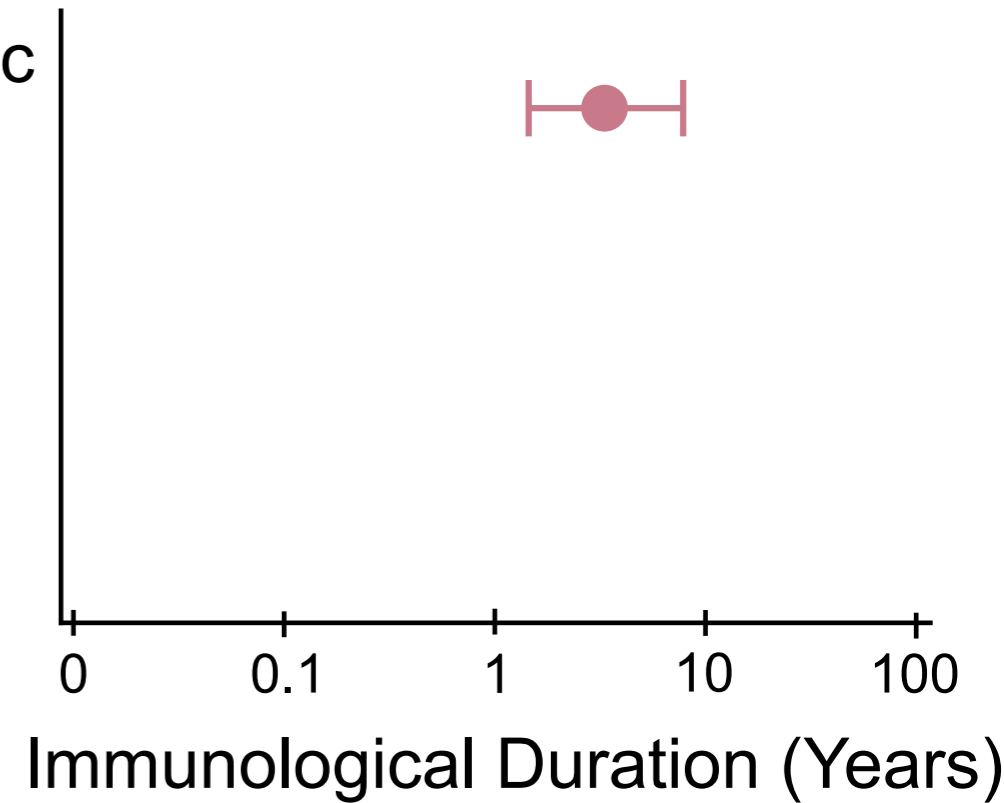
Homosubtypic
Immunity



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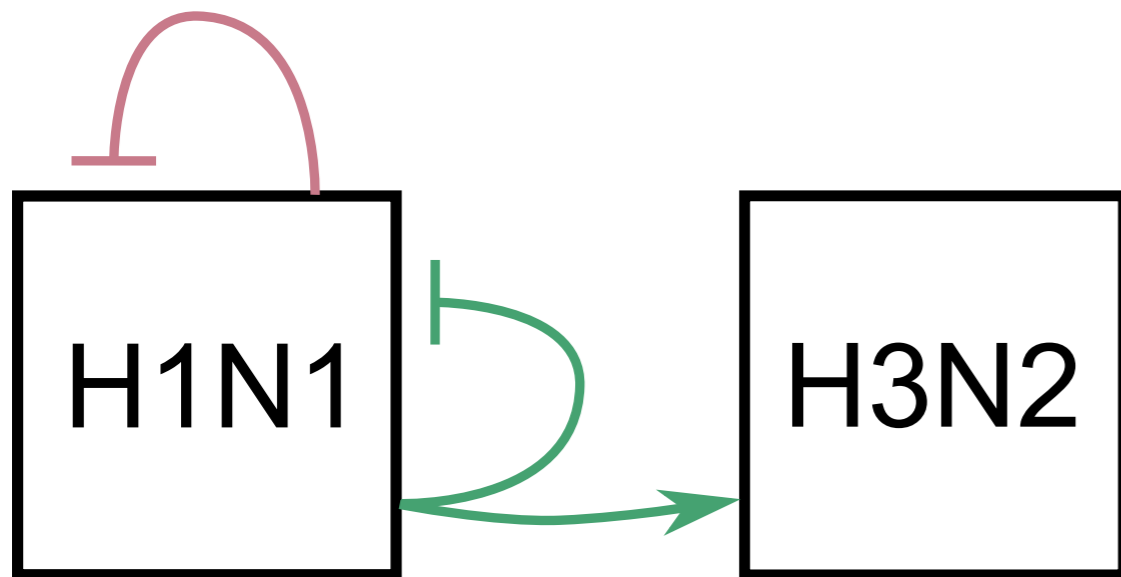
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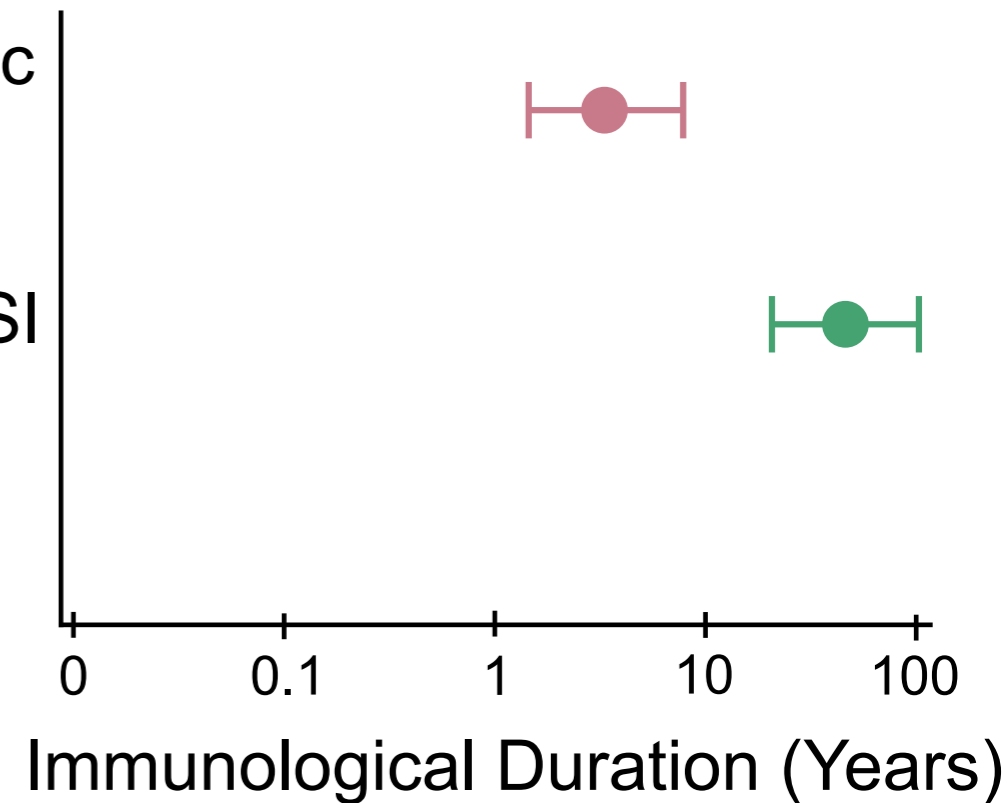
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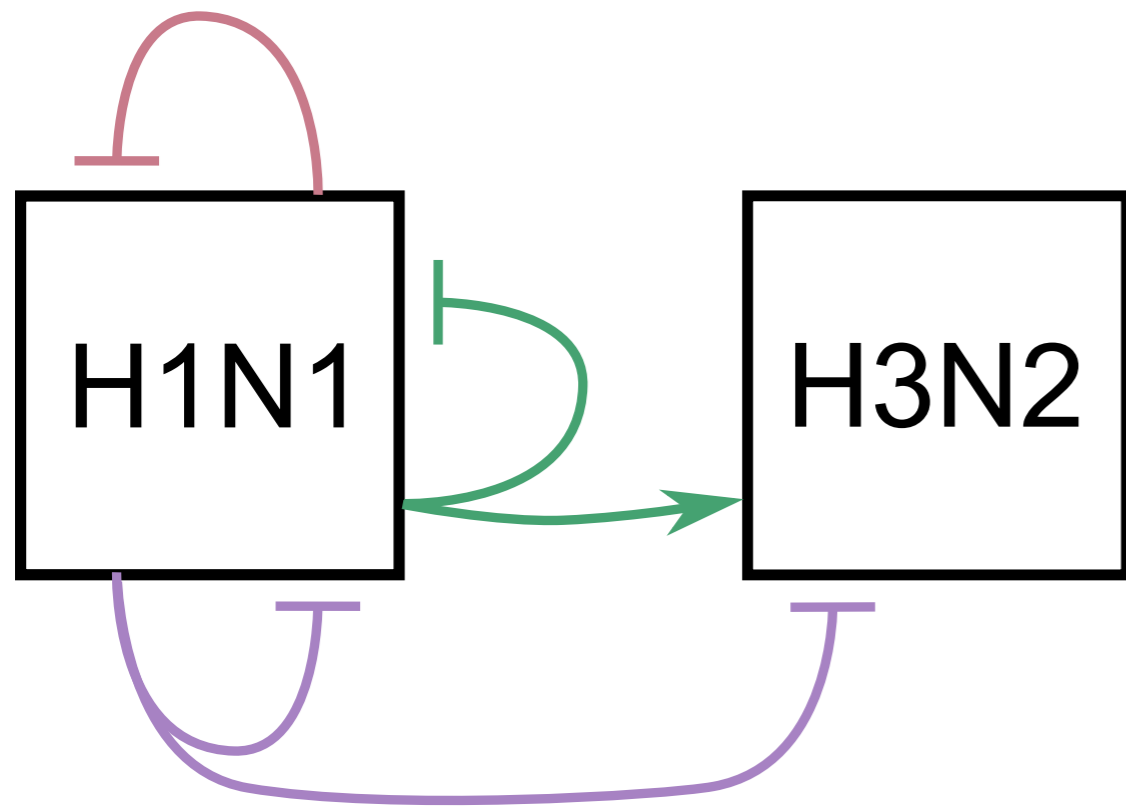


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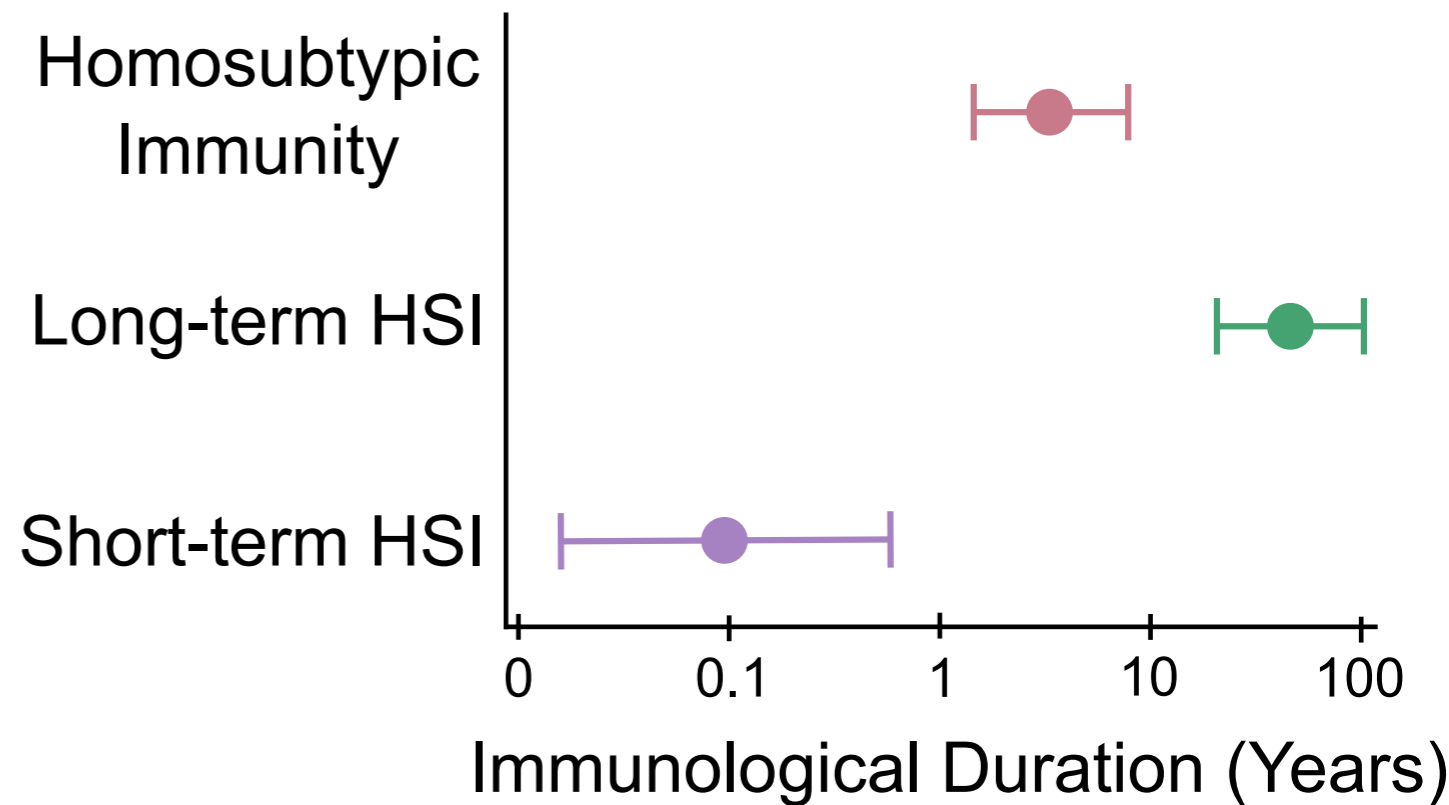
Homosubtypic Immunity
Long-term HSI



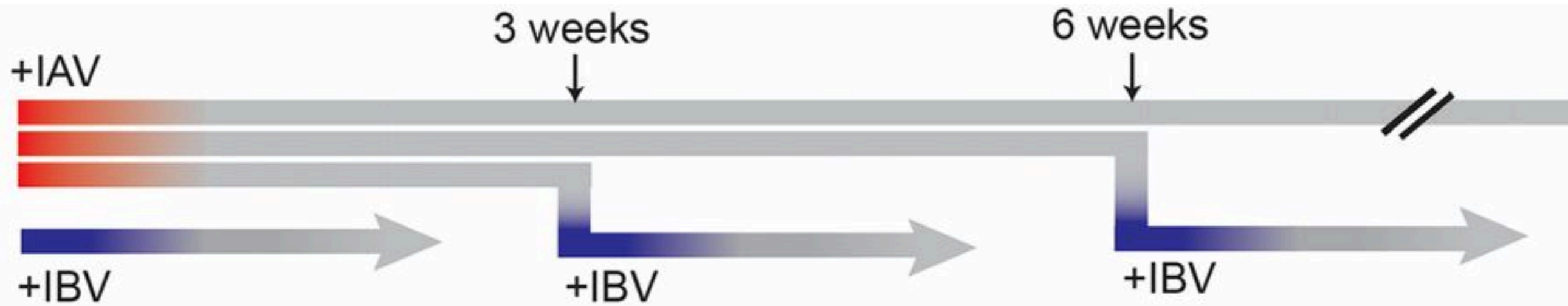
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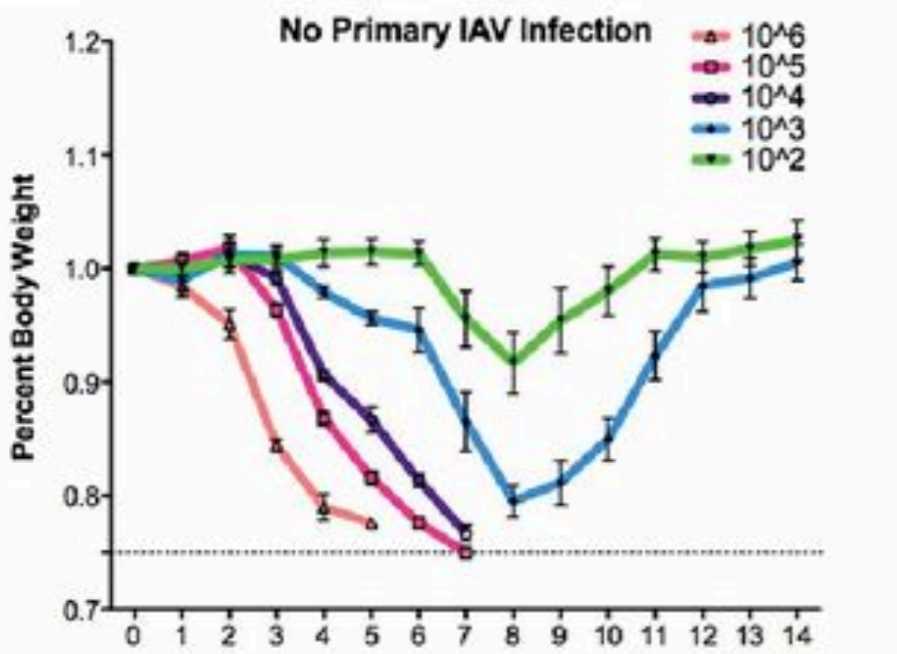
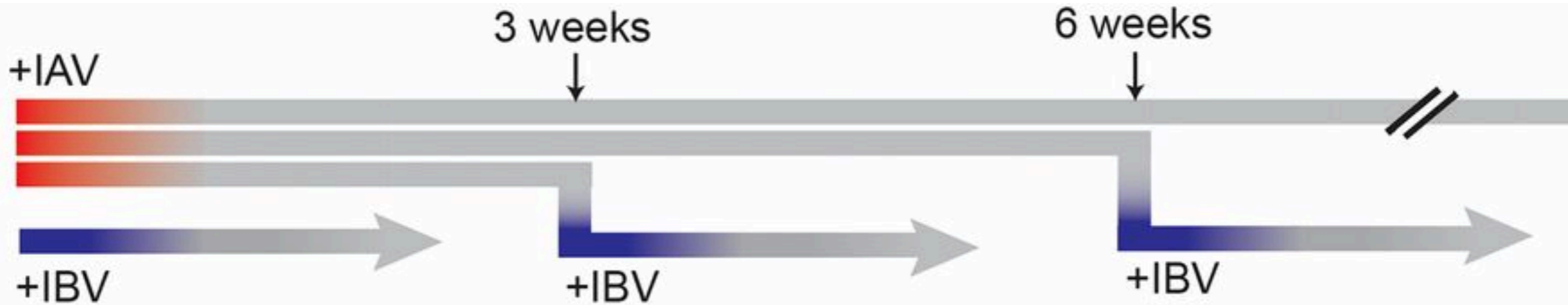
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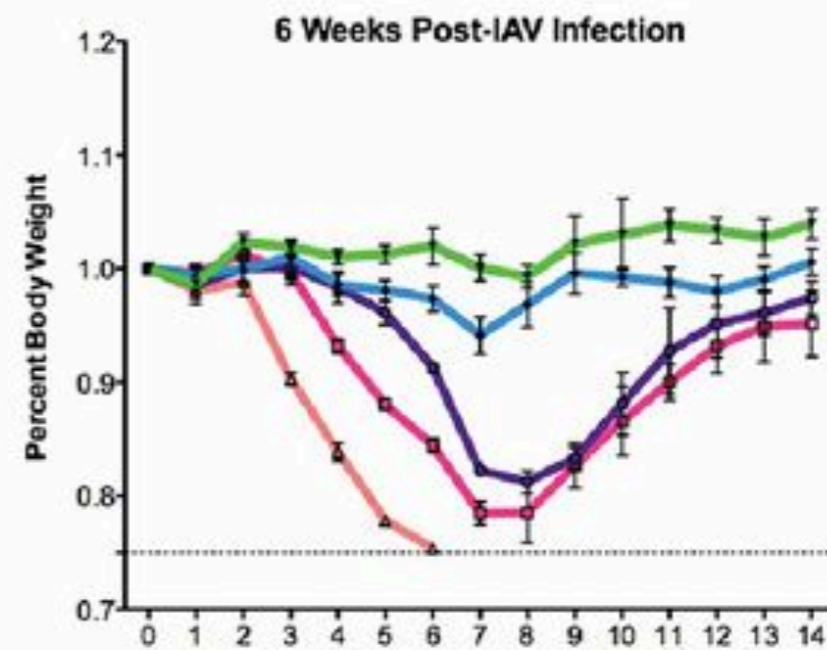
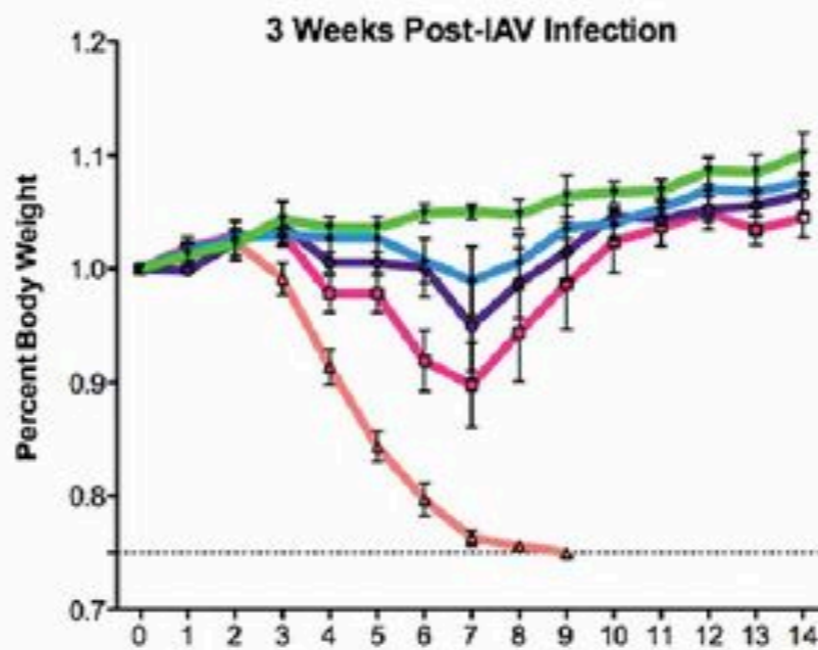
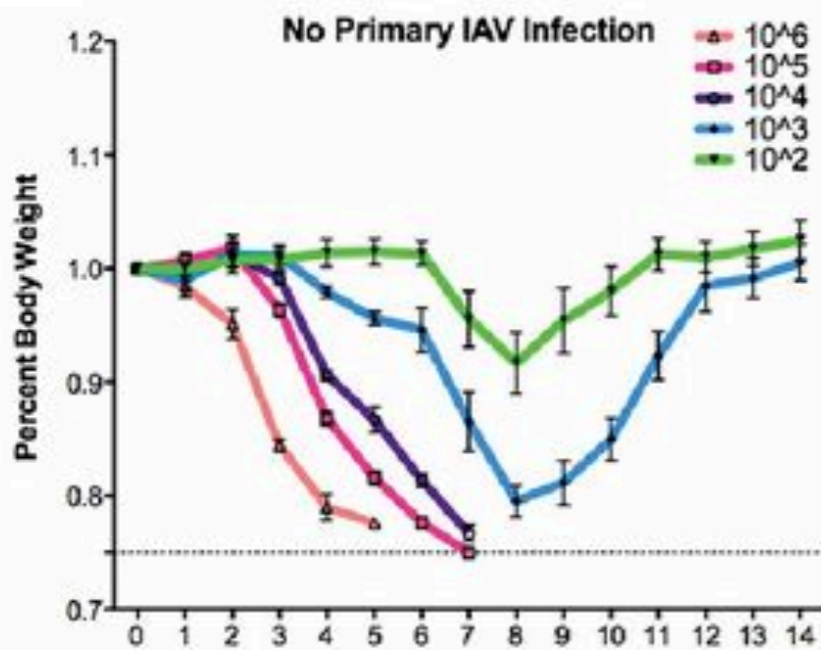
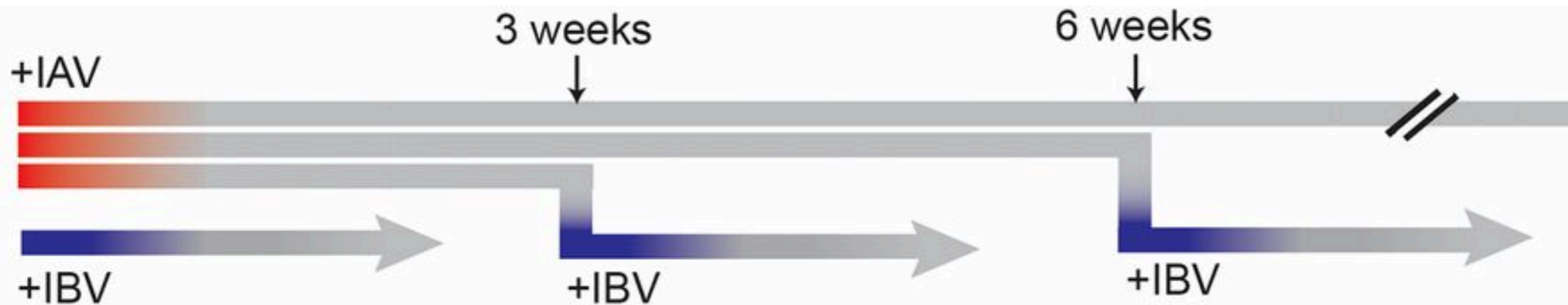
Recent experiments show example of short-term HSI



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Influenza pandemics consistently top the list of most worrisome infectious diseases

