

# 2009-2010 H1N1 Pandemic

Overview, One Health, and Implications

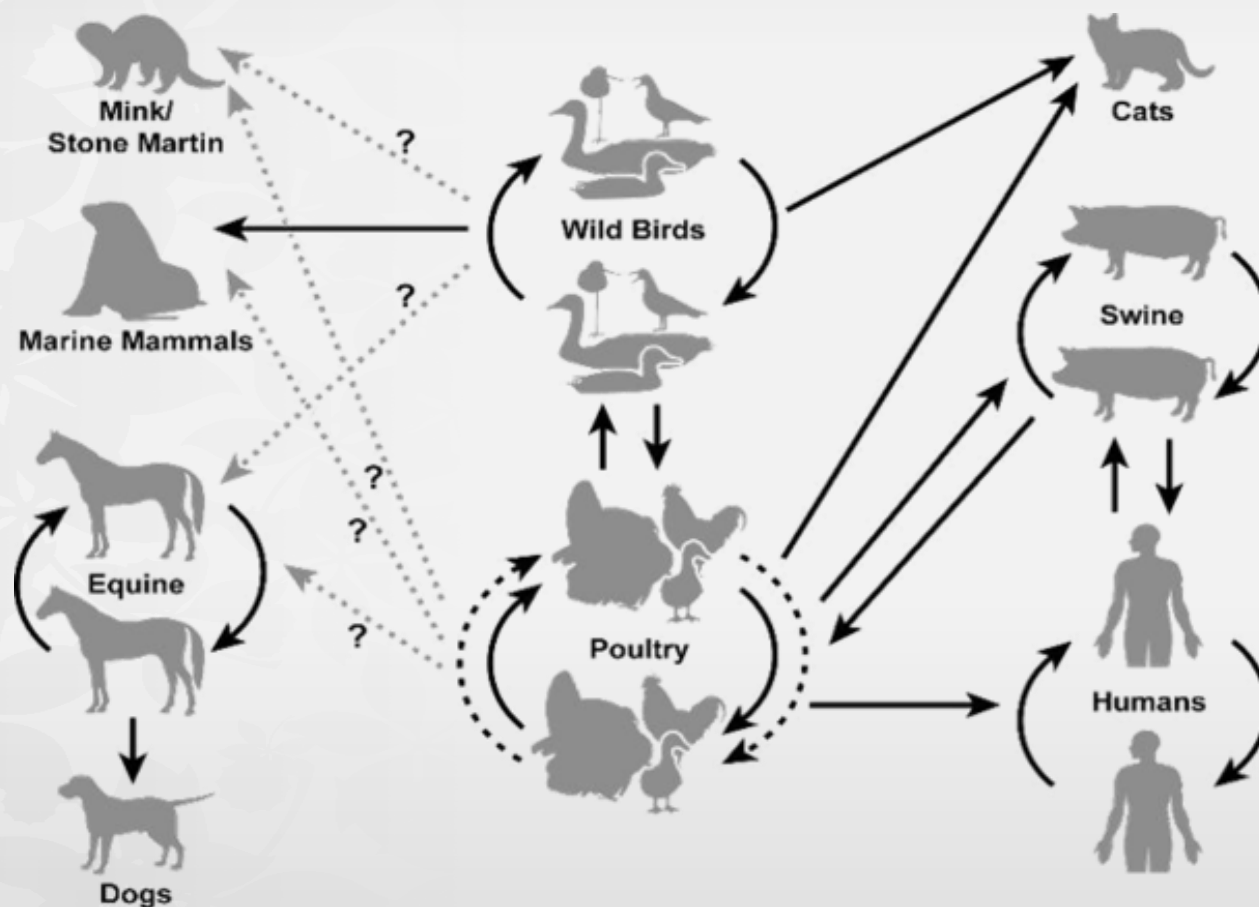
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THE OHIO STATE UNIVERSITY

COLLEGE OF VETERINARY MEDICINE

# Who's giving what to whom?



# Origins of the 2009 H1N1 pandemic

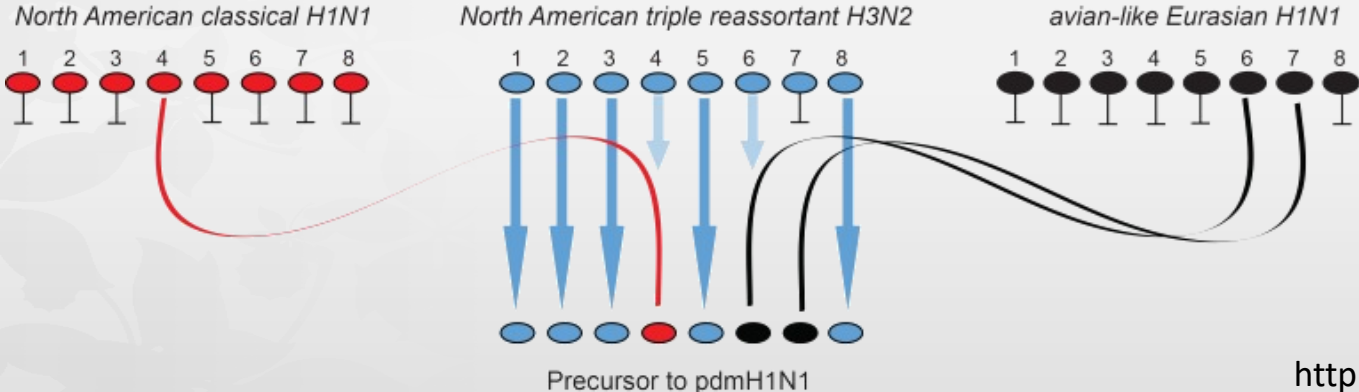
Introduction of North American classical and triple reassortant swine viruses into central-west Mexico (c. 1990s - 2000s)



Introduction of Eurasian swine viruses into central-west Mexico (c. 1990s)



Reassortment between all 3 lineages in central-west Mexico



<http://dx.doi.org/10.7554/eLife.16777.024>

# Global spread of 2009 H1N1 pandemic



doi: 10.1371/journal.pone.0016591

# Morbidity and Mortality

**April 12, 2009 to April 10, 2010**

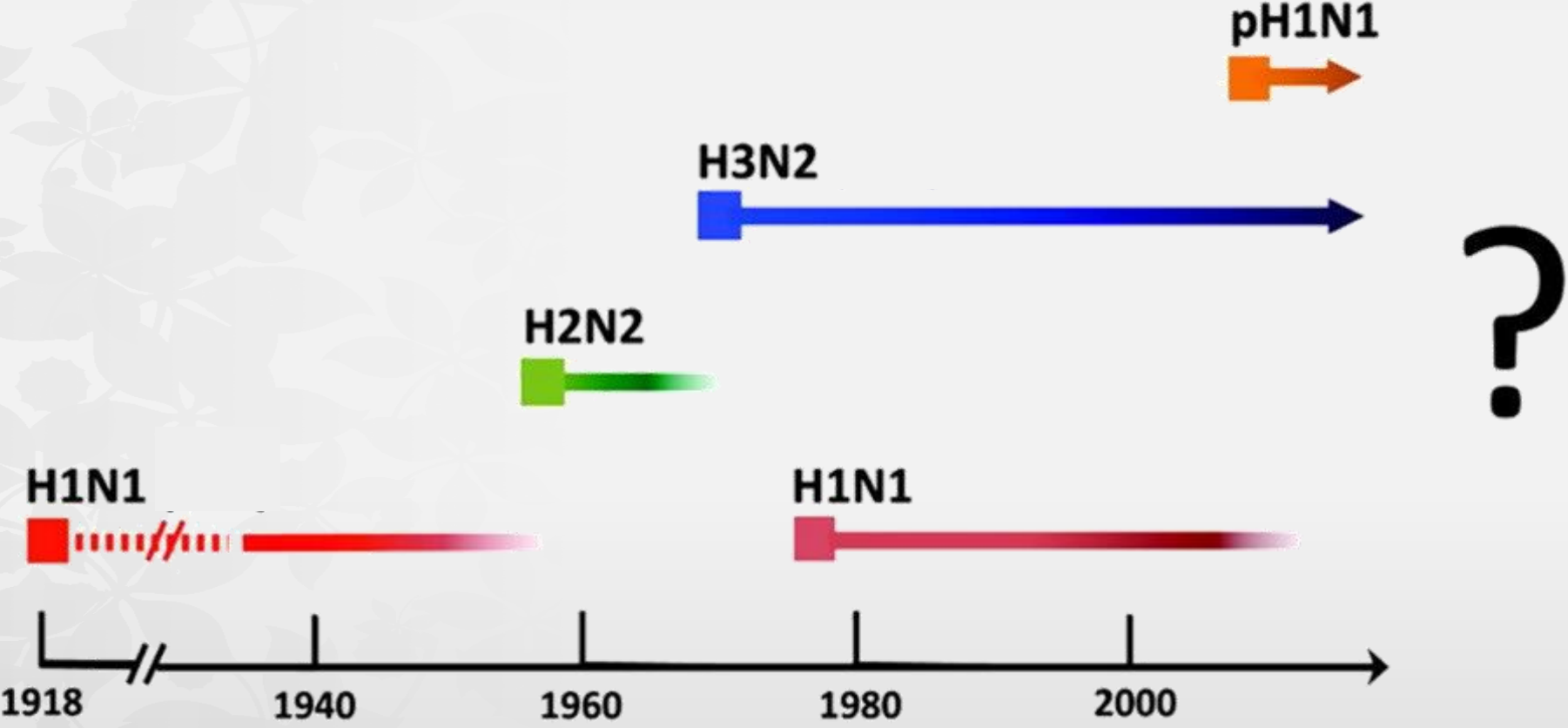
## United States

- 60.8 million cases (range: 43.3-89.3 million),
- 274,304 hospitalizations (range: 195,086-402,719)
- 12,469 deaths (range: 8,868-18,306)

## Globally

- 80% of H1N1 pdm09 deaths occurred in people <65 years of age

# Fate of a pandemic virus

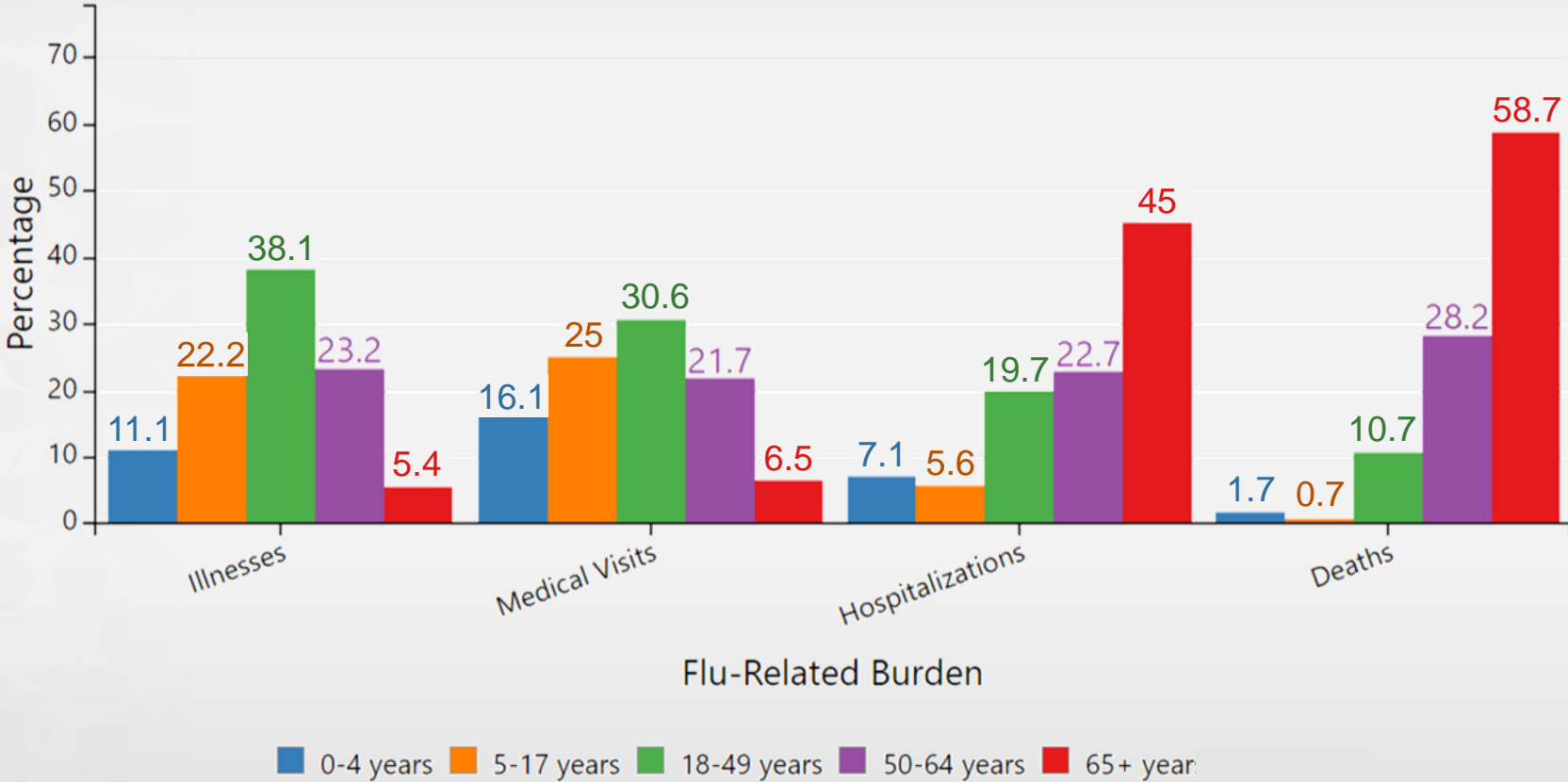


doi:10.1128/mBio.00150-11

# Seasonal Influenza

## 2019-2020 flu-related burden

~35 million illnesses  
~16 million medical visits  
~380,000 hospitalizations  
~20,000 deaths



<https://www.cdc.gov/flu/about/burden/2019-2020.html>

# Bacterial co/secondary infections

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- 11 - 35% influenza patients have bacterial co/secondary infection  
doi: 10.1111/irv.12398
- 75% of influenza-related pneumonia have bacterial co-infection  
doi: 10.1002/rmv.319
- 29–55% of the 2009 pandemic mortalities had secondary bacterial pneumonia  
doi: 10.1043/1543-2165-134.2.235



# Antimicrobial use in Patients with Influenza

12,806 patients with influenza January 2011–January 2019

- No treatment (n=4,228)
- Antibiotic only (n=671)
- Antiviral only (n=6,492)
- Antibiotic plus antiviral (n=1,415)

Those prescribed an antiviral, antibiotic, or both had a lower risk of hospitalization within 30 days compared to those without therapy.

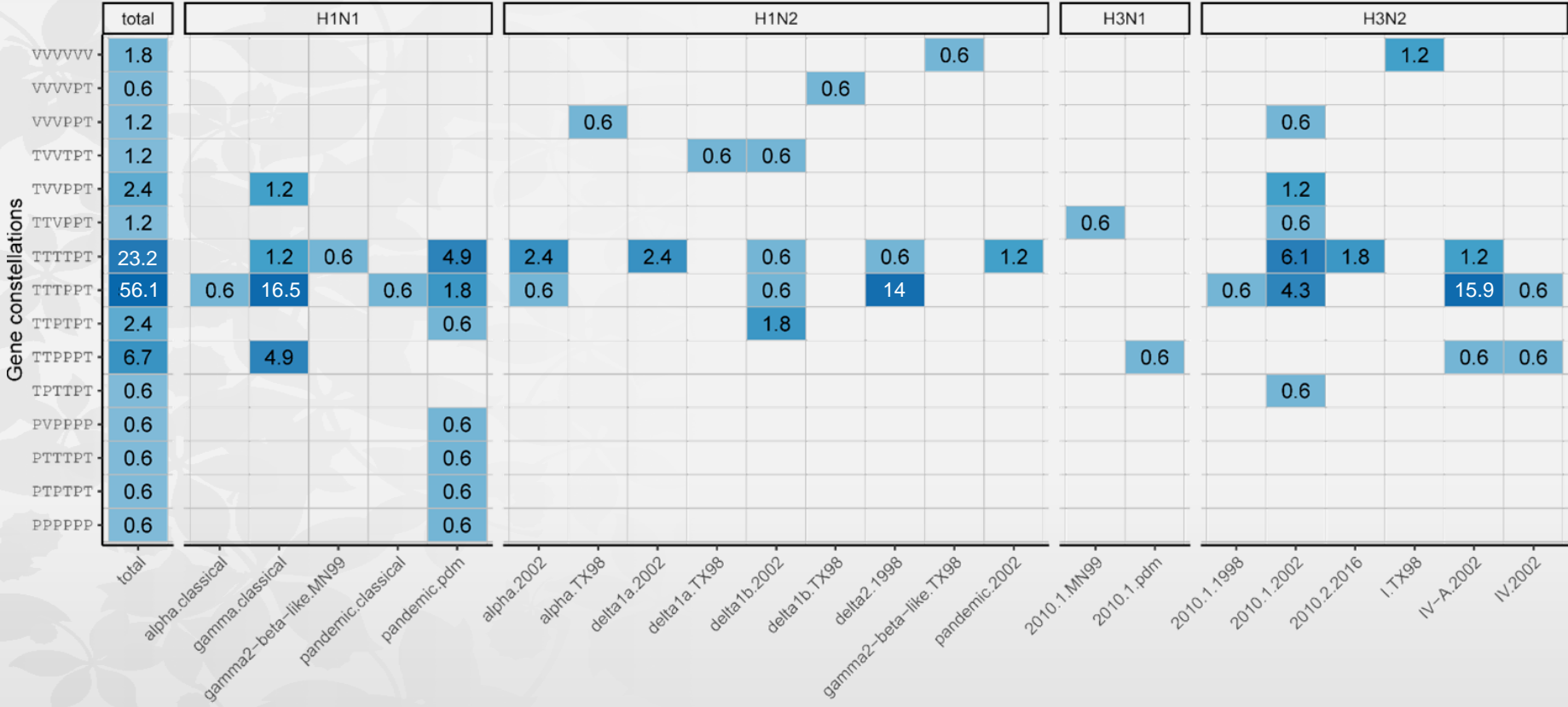
# Human-to-swine transmission of pH1N1



doi: 10.1016/j.tim.2014.12.002

# Diversity of Influenza in Swine

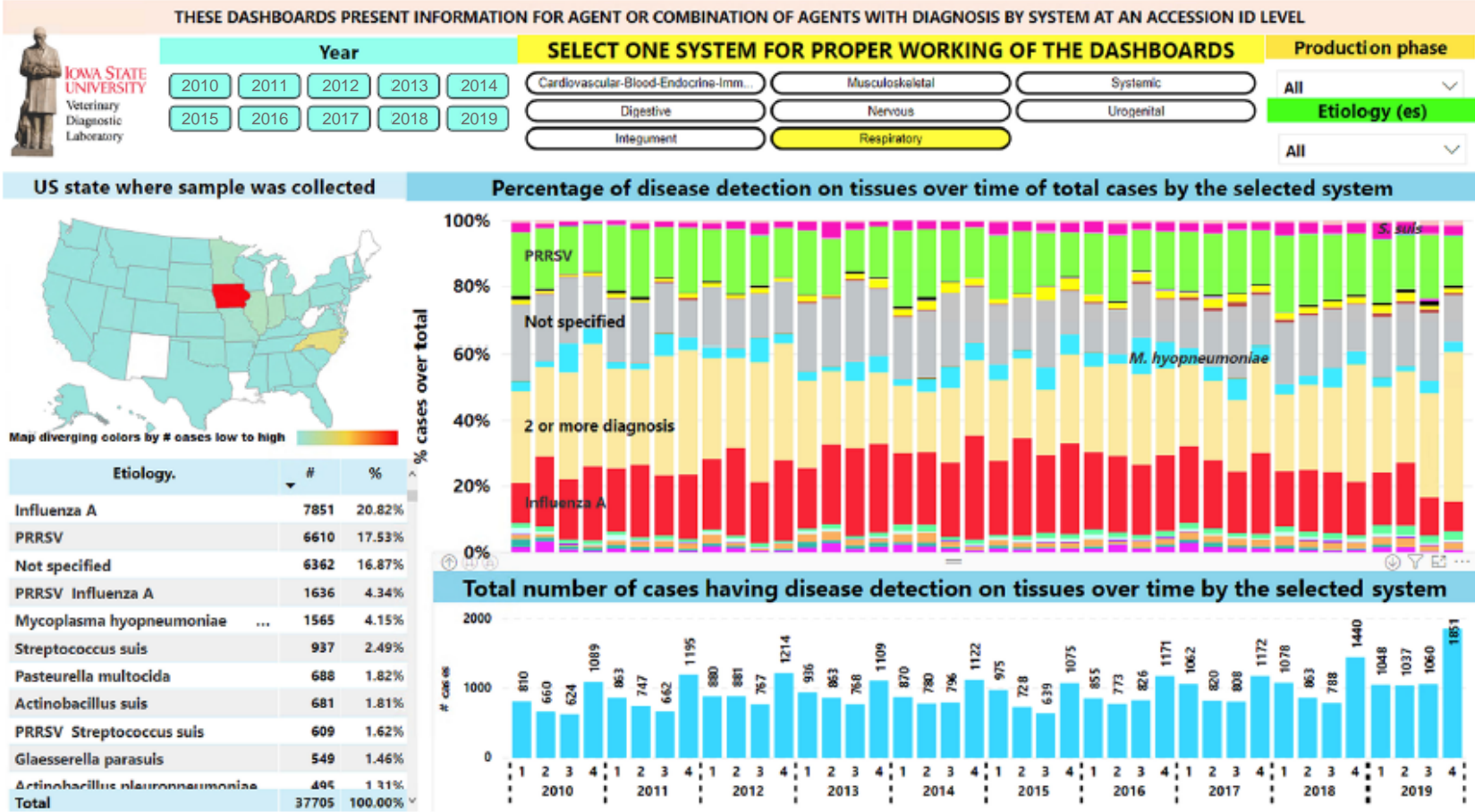
Gene Constellations (n=164)



HA and NA Phylogenetic Clade Pairs

<https://flu-crew.org/octoflushow/>

# Porcine Respiratory Disease Complex



doi:10.1177/1040638721995782

# Conclusions

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- Bi-directional interspecies transmission of influenza results in significant population-health challenges.
  - Secondary bacterial infections
- Interspecies transmission will continue to occur.



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