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* Pandemics are thought to spread particularly through lower social status groups
* The hypothesis is that this is true for the later stages of pandemics
* This was analyzed over two studies: first analyzing region-level COVID-19 infection data, and second by analyzing historic data from the 1918 Spanish Flue pandemic
* For both, disease spread more rapidly through people of higher social status first, and in later stages this reverses

‌Colizza, V., Barrat, A., Barthelemy, M., Valleron, A.-J., & Vespignani, A. (2007). Modeling the Worldwide Spread of Pandemic Influenza: Baseline Case and Containment Interventions. PLoS Medicine, 4(1), e13. <https://doi.org/10.1371/journal.pmed.0040013>

* H5N1 avian influenza virus is a potential candidate for a severe pandemic
* Studied spread using metapopulation stochastic epidemic model on a global scale
* Model considers air travel flow among urban areas
* Temporal and spatial evolution with sensitivity analysis
* Compared different containment strategies against a base case (e.g., travel restrictions and antiviral drugs)
* Considering air travel is vital when modeling these epidemics
* Large-scale application of antivirals seems possible and would effectively mitigate some of the spread

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* Hypervirulent subtypes of flu are emerging
* Efficient spread through humans would be problematic
* Control would be limited by availability of vaccines
* Key measure would be to delay spread
* Higher international travel could lead to faster global spread than previous pandemics
* Analysis involves stochastic models of the internation spread of influenza based on extensions of coupled epidemic transmission models
* Restrictions on air travel demonstrate little values on delaying the spread of virus
* Only ceasing all travel has a significant impact on preventing the epidemic
* Local transmission control measures are better methods for controlling the spread of disease

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* Combined data from CDC ranging from 1997 to 2009
* The magnitude of the pandemic is measured by cumulative incidence proxy (CIP)
* There is a negative association between the CIP and pandemic season (i.e., CIP gets smaller as season progresses? Building immunity?)
* Method for estimating CIP involves looking at the incidence of each strain (or its complement) and see how long it takes for the CIP to reach some threshold
* Early circulation of one strain is associated with a reduced total incidence of the other strains

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* SEIRS and SVEIRS epidemic modes are considered here to capture the main characteristic of transmission of influenzas epidemic
* Least squares (i.e., minimizing the sum of squared differences between the measurements and the model predictions) is used to estimate the unknown parameters
* These tuned models capture the dynamic nature of the data
* Vaccine efficacy and vaccination prevalence are important things to consider in the model

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* There have been four influenza pandemics in the past one hundred years
* Modern globalization and society have impacted the way that these things develop/spread
* Influenza/pandemics are a product of human development, and we should consider the context for which they spread
* Progress in controlling pandemics can be attributed to pharmaceutical intervention and surveillance
* Persistent challenges include pandemics happen in unpredictable waves and virus jump unpredictable from animals to humans
* Historically, pandemics spread through dominant trade routes, but this is less clear with globalization since there are so many more routes for transmission
* The uncertainty means that we must have flexible policies for handling them when they do occur

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* Mitigation strategies (e.g., closing schools, limiting air travel, etc.) are some of the only was to address pandemics at the moment
* This is because stockpiles of resources (e.g., antiviral medication) are not likely to be had, nor will vaccines be very prevalent
* Large-scale agent-based model to analyze isolation scenarios (e.g., school closures and fear-based home isolation)
* Certain changes in behavior can be effective at curtailing the spread of disease (e.g., school closures throughout the pandemic can decrease clinical attack rates by 50%)
* Also, stopping intervention/mitigation strategies too soon can lead to a second wave of infection

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