

Pandemic Flu Simulation

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Abstract

- Problem
- Previous approaches
- Novelty
- Key findings

Background

- Define the scope and significance of flu pandemics.
- Briefly introduce modeling approaches, especially the SIR model.

History

- State the purpose of the review: to explore how SIR-based models incorporate covariates such as altitude, obesity, and solar radiation.
- Overview of major flu pandemics (e.g., 1918, 2009 H1N1).
- Transmission dynamics and public health impact.
- Role of environmental and demographic factors in flu spread.

Modeling

- Description of the basic SIR framework and its assumptions.
- Extensions: SEIR, age-structured, spatially explicit models.
- Strengths and limitations in modeling flu pandemics.
- Case studies using SIR models for H1N1, SARS, or seasonal influenza.
- Integration with real-world data: mobility, vaccination, and intervention strategies.
- Use of stochastic vs. deterministic approaches.

Covariates

Altitude

- Impact of altitude on viral transmission and host susceptibility.
- Studies linking high-altitude regions to delayed or reduced flu spread.

Obesity

- Obesity as a risk factor for flu severity and transmission.
- How models account for population-level obesity rates.

Solar Radiation

- Influence of UV radiation on virus viability and immune response.
- Seasonal patterns and their incorporation into predictive models.

Method

- Data sources: WHO, CDC, climate databases, demographic surveys.
- Statistical and computational techniques for integrating covariates.
- Challenges in parameter estimation and model validation.
- Results: data visualization and tabulation, and implications.

Discussion

Future Work

- Underexplored covariates or regions.
- Need for interdisciplinary models combining epidemiology, climatology, and public health.
- Potential of machine learning to enhance traditional SIR frameworks.

Conclusions

- Summary of key findings.
- Implications for pandemic preparedness and policy.
- Call for more nuanced, data-rich modeling approaches.

References