History of Influenza A and B viruses

*image credit CDC

Replacement of H1N1 with H2N2

Replacement of H2N2 with H3N2

Replacement of H1N1/77 with H1N1/09

H3N8 Russian pdm — 1891

H1N1 Spanish pdm — 1918

1933 Influenza Virus

B virus Discovery — 1942

H2N2 Asian pdm — 1957

H3N2 Hong Kong pdm — 1968

H1N1 Children's pdm — 1977

B/Yam & B/Vic — 1987/88

H5N1 — 1997

1918 seq — 2005

H1N1 2009 pdm — 2009

H7N9 — 2013

Circulation of H1N1 — 50-100 million

Cir H2N2 — 2 million

Cir H3N2 — 1 million

Co-circulation of H1N1 & H3N2

2009 H1N1 emergence

FLU-WATCH SURVEILLANCE

Multicomponent surveillance system help achieve comprehensive information Weekly on :

- **circulating influenza strains**
- Extent to which they **match the strains** in the influenza **vaccines** and
- Proportion of tested strains that are **resistant to antivirals**

FLU HISTORY: SURVEILLANCE

20th century:

- **1918: The deadliest pandemic of the 20th century**

  new strain of the influenza A virus that started in birds (H1N1). **Spanish flu:** Europe, Asia and the United States, it rapidly spread around the world.

  30-35% of the world's population

  20 million to 50 million killed

- **1952 "WHO creates first system for surveillance":**

  WHO launched the first system for the surveillance of circulating influenza virus strains. This helped researchers to determine the composition of seasonal influenza vaccines.

Early detection of (health) issues helps determine necessary corrective actions.

1918 influenza epidemic poster issued by the Board of Health in Alberta, Canada.

https://avatiflu.com/Articles/2022/The-History-of-Influenza

FLU HISTORY: 20TH CENTURY:

This is the first picture of the new mask adopted and being

1918 influenza epidemic poster issued by the Board of Health in Alberta, Canada.

https://www.flu.com/Articles/2022/The-History-of-Influenza

FLU HISTORY

- **21st century: Swine Flu pandemic**

- **2009:** Swine flu affected children and young adults.
  - **Later in 2009, an H1N1 flu vaccine becomes available**.

Due to the rapid response of the CDC and WHO, a **vaccine** was quickly developed. The first doses were administered on October 5 of the same year.

https://www.flu.com/Articles/2022/The-History-of-Influenza

BURDEN OF INFLUENZA IN THE ELDERLY

Disparities & absence of stratified data:

- Access to healthcare resources,
- Quality of surveillance systems,
- Influenza vaccination rates,
- Healthcare-seeking behavior,
- Prevalence of risk factors for severe outcomes,
- **Elderly distribution** in the population with underlying medical conditions,
- New influenza virus strains,
- Varying effectiveness of seasonal influenza vaccines, and
- Shifts in population immunity over time
- **DATA GAP: Since 2018 less studies ……**

https://www.researchgate.net/publication/385547291_Systematic_Review_on_Influenza_Burden_in_Emerging_Markets_in_2018-2023-An_Evidence_Update_to_Guide_Influenza_Vaccination_Recommendations- 2024

FLU PREVALENCE

World Health Organization (WHO) estimated each year:

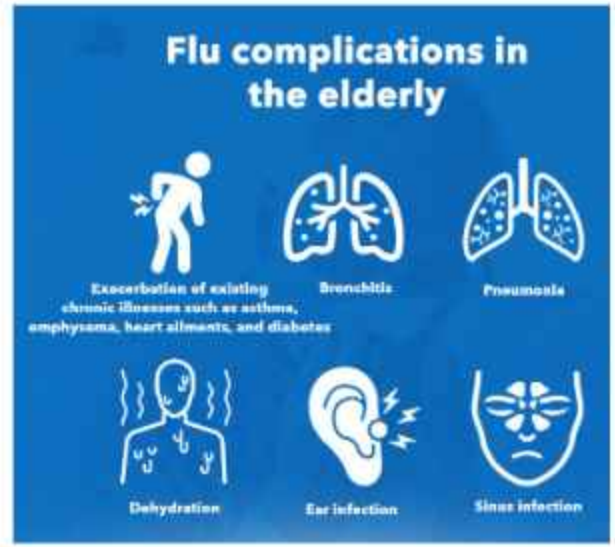
- 1 billion cases each year globally- (2-10%)
- Majority recover within a week without seeking medical attention,
- 3–5,000,000 severe infections, -(0.1% 1 out of 1000 cases)
- 290,000–650,000 deaths worldwide
- Exacerbation of overall epidemiologic burden:
- underlying comorbid conditions,
  - cardiovascular disease,
  - chronic respiratory diseases,
  - diabetes, obesity,
  - neurologic conditions, and
  - bacterial co-infections

WHY ARE ELDERLY AT RISK OF GETTING FLU?

- Immune system becomes more fragile:
  - Frailty and immuno-senescence lead to altered immune responses
  - Immunogenic response to the influenza vaccine is decreased among + 65 years
  - Develop illnesses and infections quickly and
  - More difficult time recovering from the infection

predisposing the elderly to severe influenza infection, AND extra-respiratory complications

According to the CDC, older adults 65 and older are at a greater risk of developing complications from influenza.



- Flu complications in the elderly
  - Exacerbation of chronic illnesses (asthma, emphysema, heart ailments, DM)
  - Bronchitis
  - Pneumonia
  - Dehydration
  - Ear infection
  - Sinus infection

https://psshomecare.com/flu-in-the-elderly-/١٠١

Influenza Illness and Hospitalizations Averted by Influenza Vaccination in the United States, 2005–2011

Deliana Kostova, Carrie Reed, Lyn Finelli, Po-Yung Cheng, Paul M. Gargiullo, David K. Shay, James A. Singleton, Martin I. Meltzer, Peng-jun Lu, Joseph S. Bresee

Published: June 19, 2013 • https://doi.org/10.1371/journal.pone.0066312

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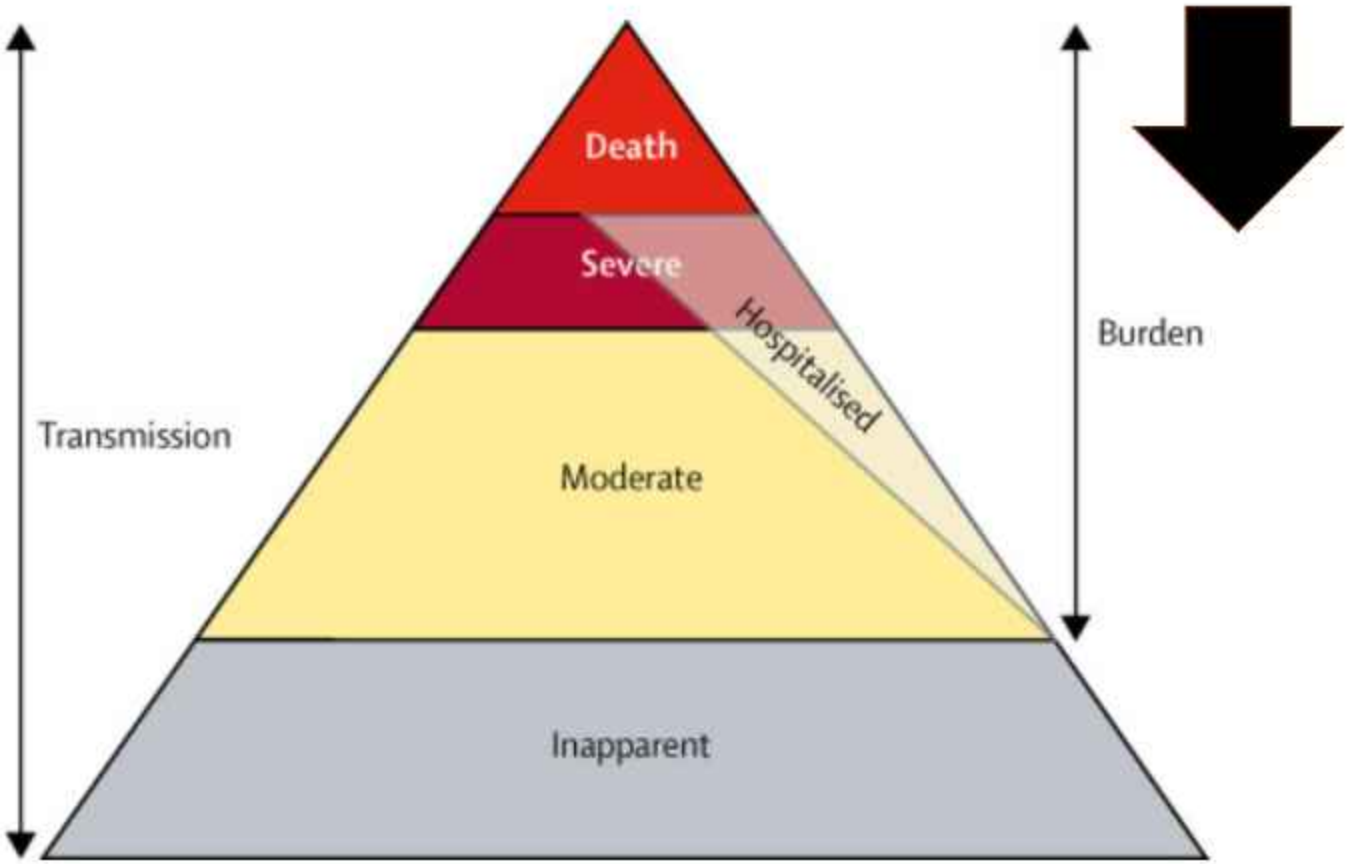
Mortality, morbidity, and hospitalisations due to influenza lower respiratory tract infections, 2017: an analysis for the Global Burden of Disease Study 2017



Transmission pyramid include asymptomatic infections, which, by definition, do not have a disease burden but might be crucial to the understanding of influenza transmission dynamics.

Figure 1 Conceptual diagram of the influenza LRTI burden pyramid

GBD FLU-LRTI: INCIDENCE

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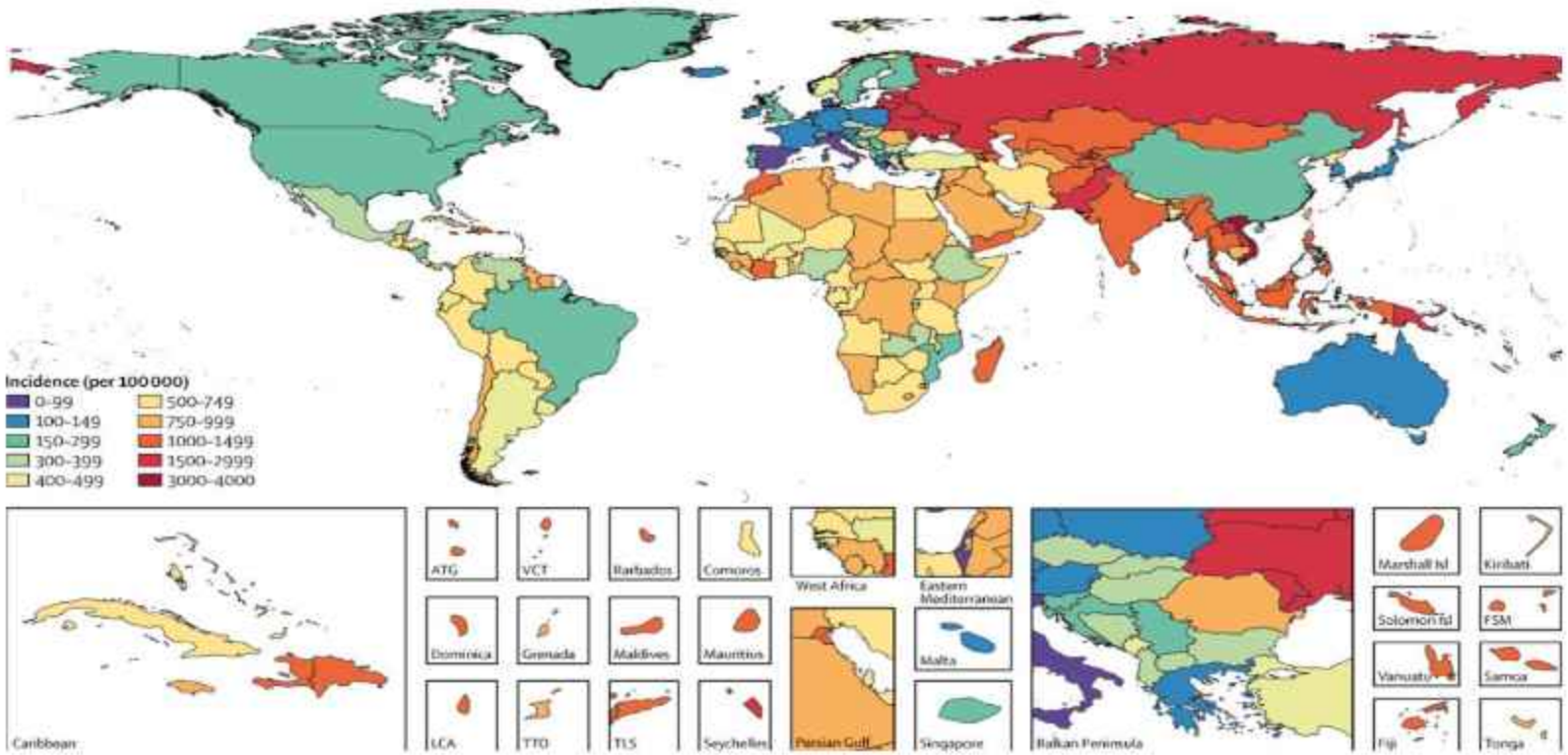

Influenza lower respiratory tract infection incidence per 100 000 for all ages, 2017

Among all ages, we estimated that 11·5% (95% UI 10·0–12·9) of LRTI episodes were attributable to influenza

The >70yrs more of LRTI episodes caused by flu (12%)