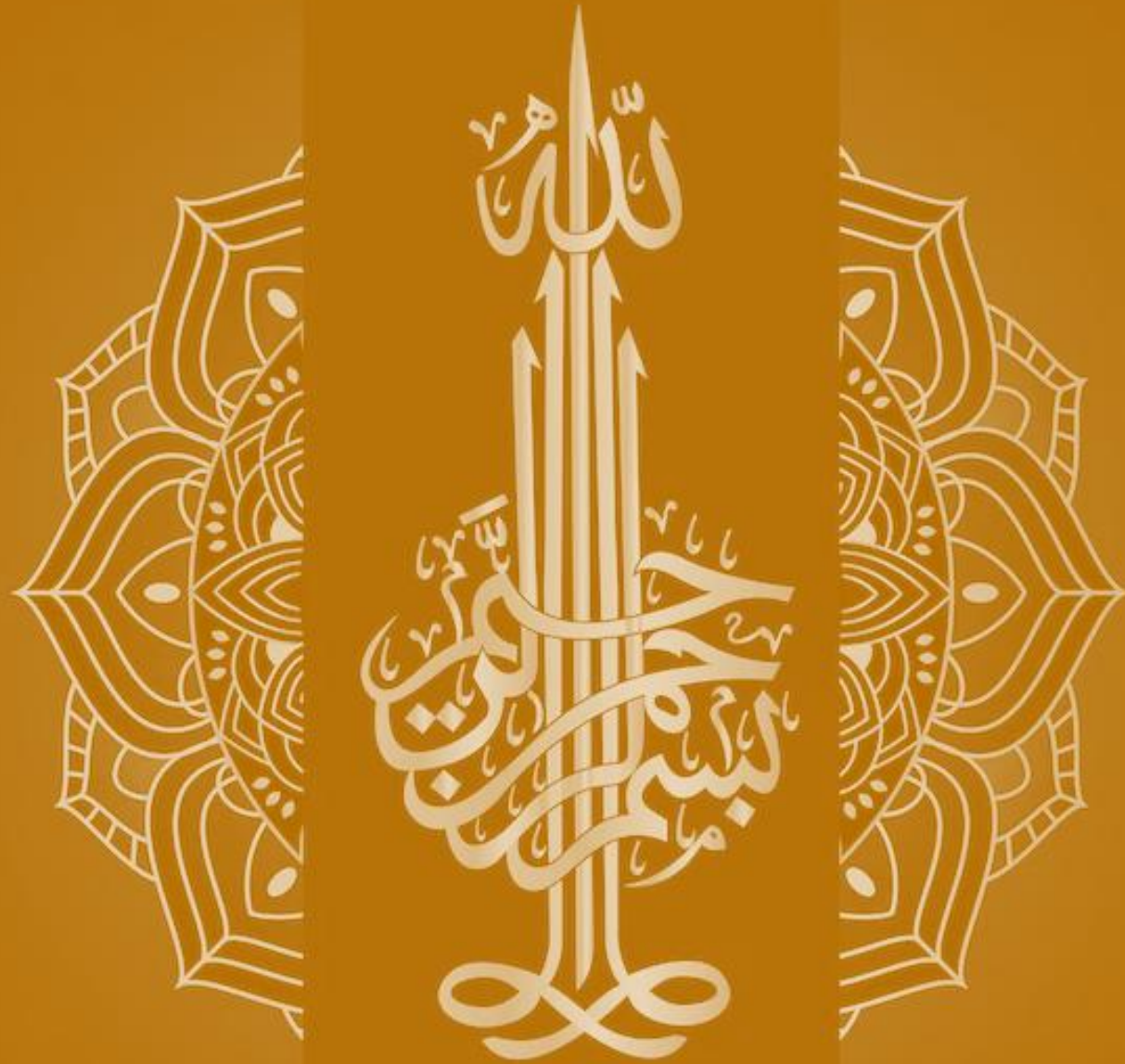
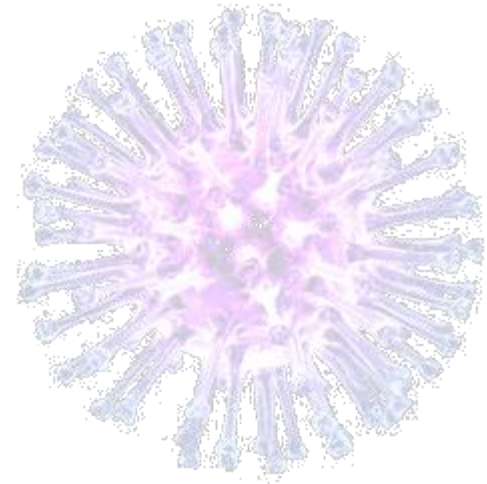


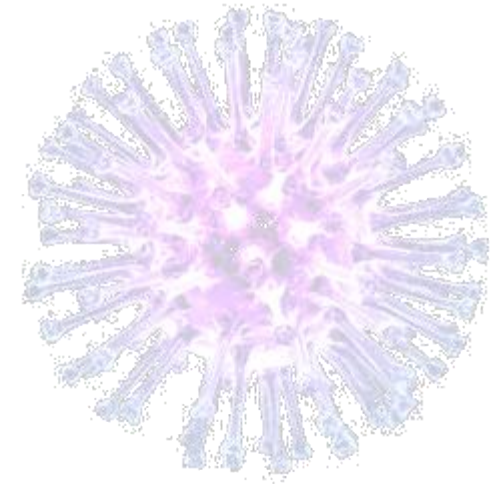


BISMILLAH





Influenza Epidemiology in IRAN and WORLD



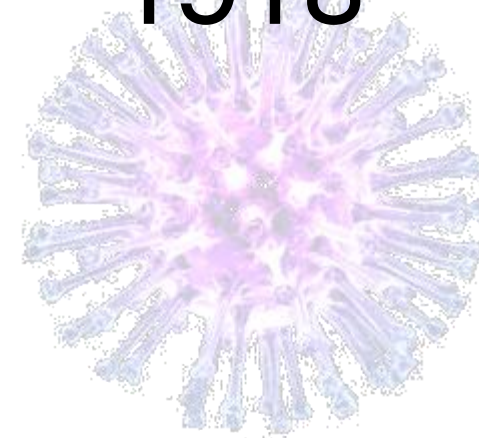
F. Shirvani MD

Professor of pediatric infectious diseases

Shahid Beheshti University of Medical Sciences

More people died due to the influenza pandemic after the war (50 million) than died as a result of the war (17 million).

1918



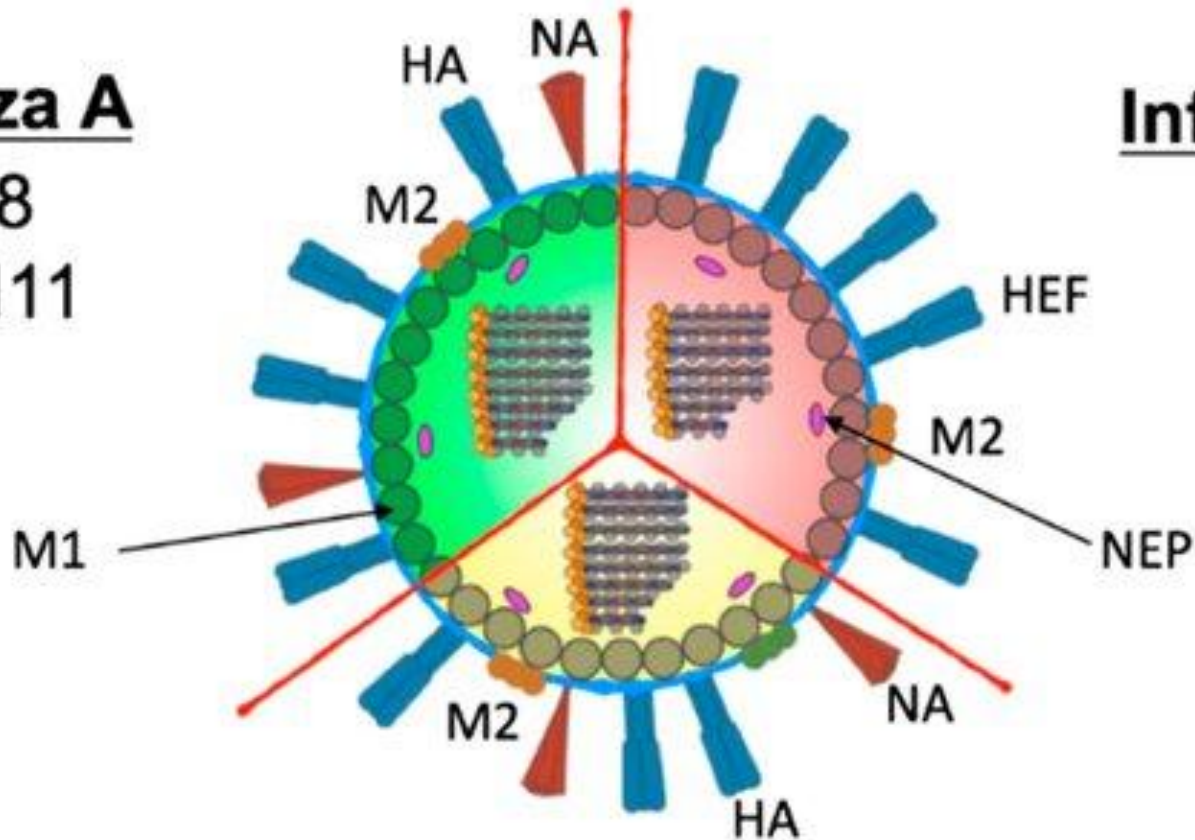
Influenza Virus Types

Influenza A

1-18
1-N11

Influenza C

HEF



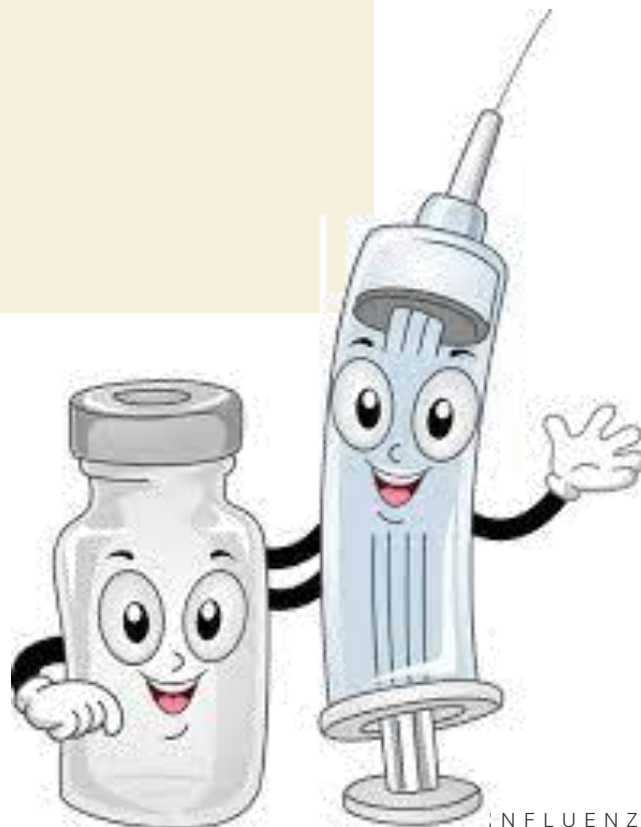
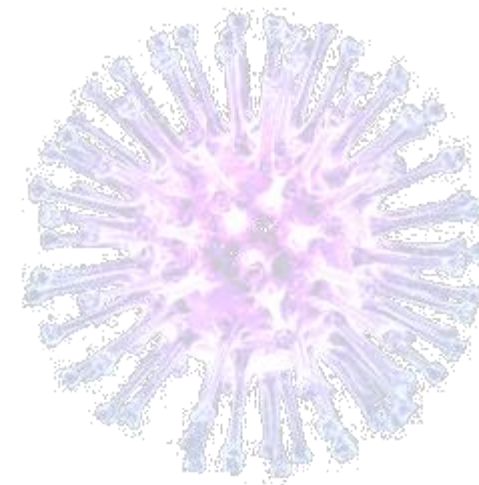
Influenza B

Yamagata & Victoria



hemagglutinin-esterase-fusion glycoprotein HEF that possesses receptor binding, receptor destroying and membrane fusion activities, thus combining the functions of Hemagglutinin (HA) and Neuraminidase (NA) of influenza A and B viruses.

WHY VACCINATION



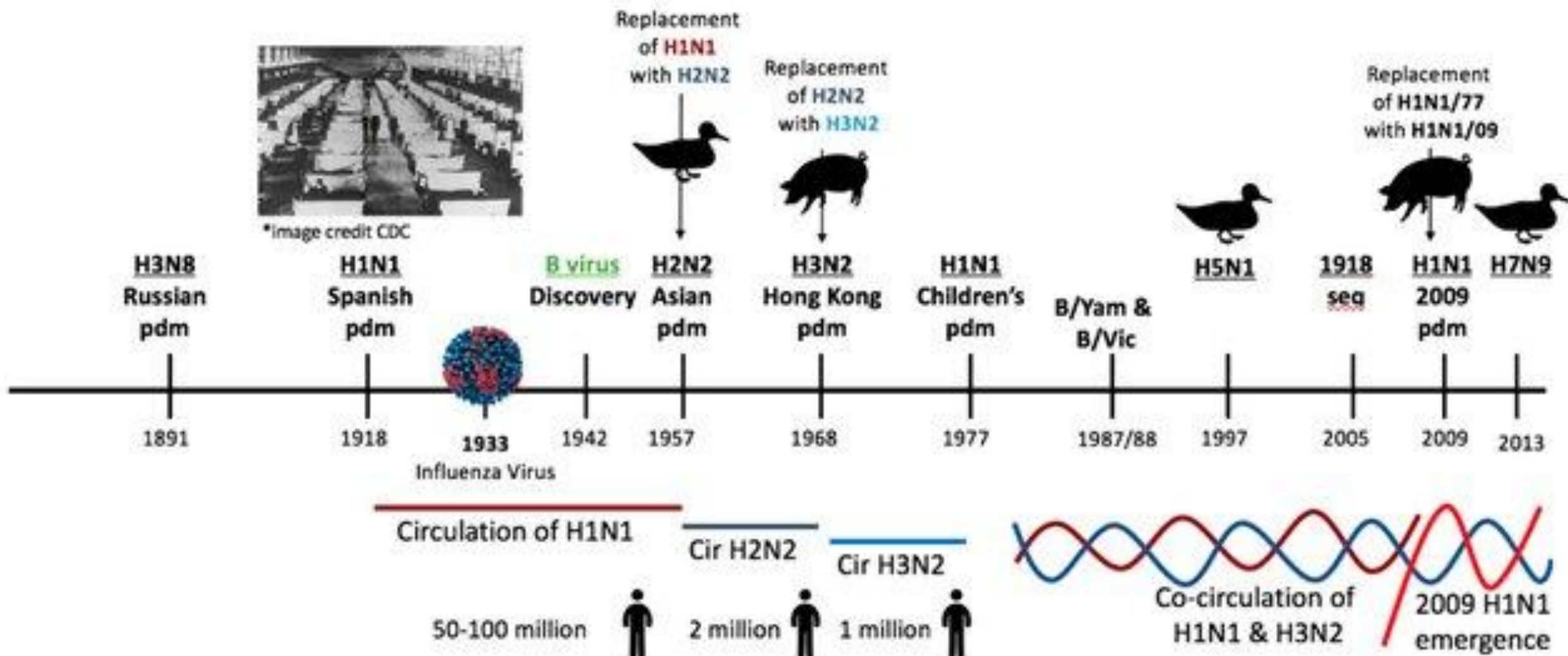
Influenza. A Zoonotic Disease



History of Influenza A and B viruses



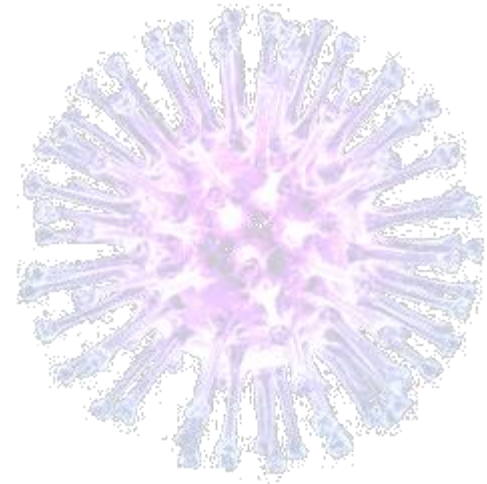
*Image credit CDC

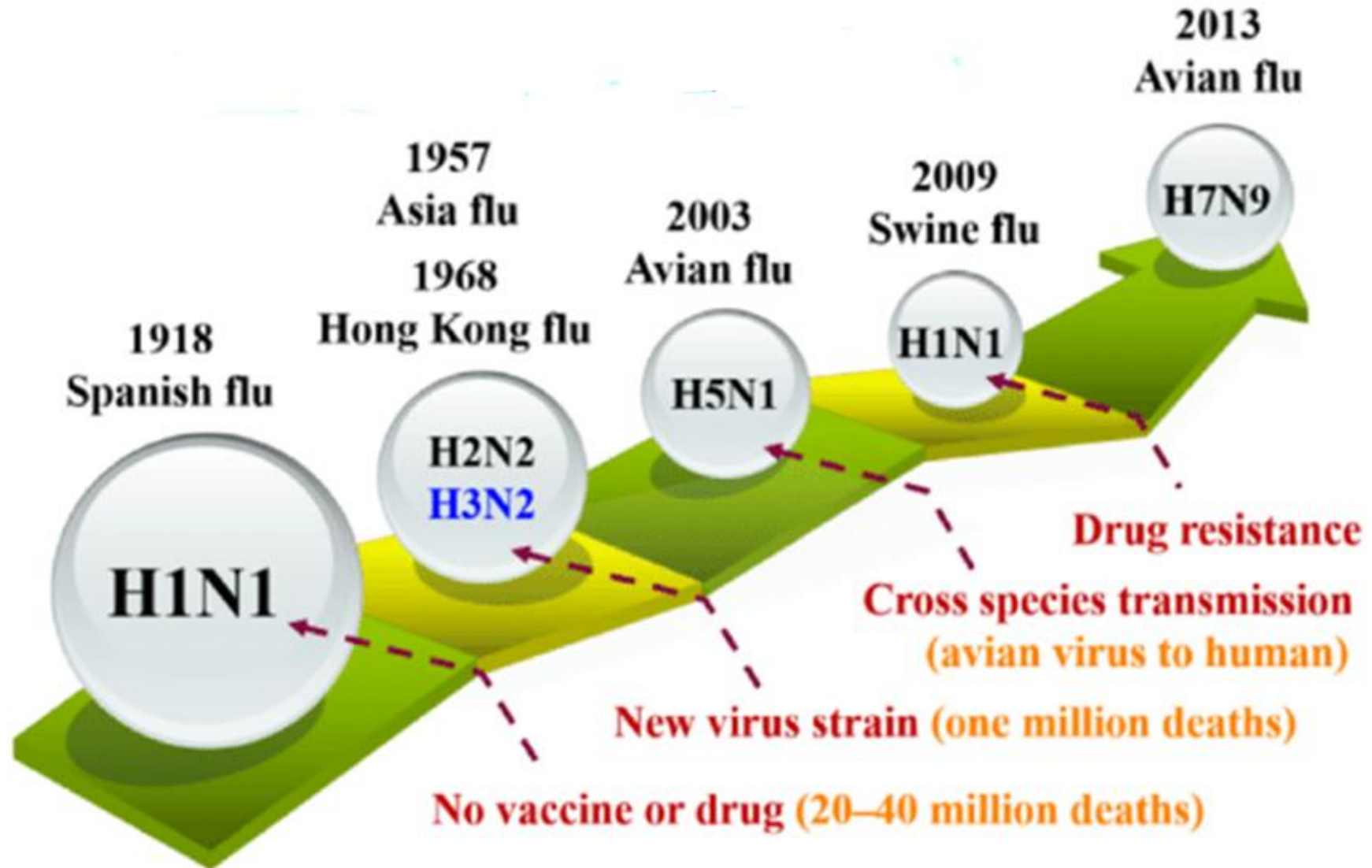


Co-circulation of influenza B lineages B/Yamagata and B/Victoria



With support from the US Army, the first inactivated flu vaccine was developed by Thomas Francis and Jonas Salk at the University of Michigan. The vaccine was tested for safety and efficacy on the US military, before being licensed for wider use in 1945

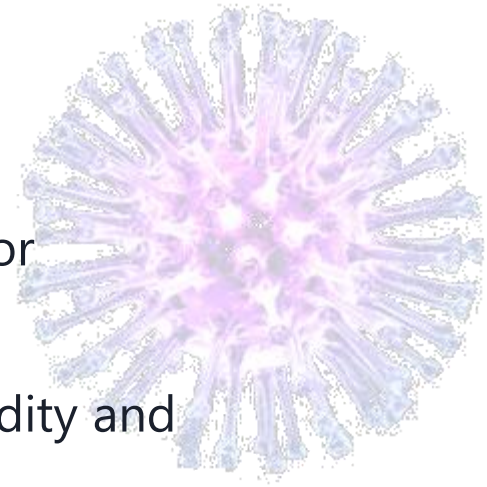






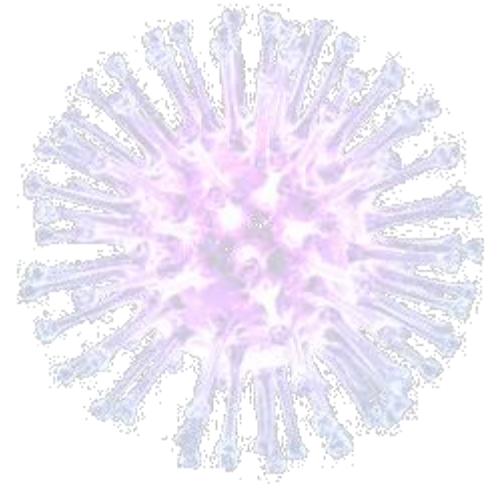
Learning Objectives

- **Define** key epidemiological terms: incidence, prevalence, and burden of disease for influenza.
- **Describe** the global epidemiology of influenza, including estimated annual morbidity and mortality.
- **Identify** the temporal patterns (seasonality) of influenza across different global regions.
- **Review** the available data on the incidence and prevalence of influenza in Iran.
- **Discuss** the specific burden and clinical impact of influenza on pediatric populations globally and in Iran.
- **Recognize** the importance of surveillance and vaccination in mitigating disease burden.





: The Influenza Virus: A Moving Target



- **Types A & B:** Cause seasonal epidemics. Type A is associated with pandemics.
- **Antigenic Drift:** Minor, cumulative changes in surface proteins (HA/NA). Reason for annual epidemics and need for updated seasonal vaccines.
- **Antigenic Shift:** Major, abrupt change in influenza A. Can lead to pandemics due to lack of population immunity.
- **Circulating Subtypes:** Currently, A(H1N1)pdm09, A(H3N2), and B lineages (Victoria/Yamagata) drive seasonal illness



Key Epidemiological Concepts

Incidence: The number of **new cases of influenza occurring in a specific population during a given time period (e.g., per flu season)**. Reflects the risk of infection.

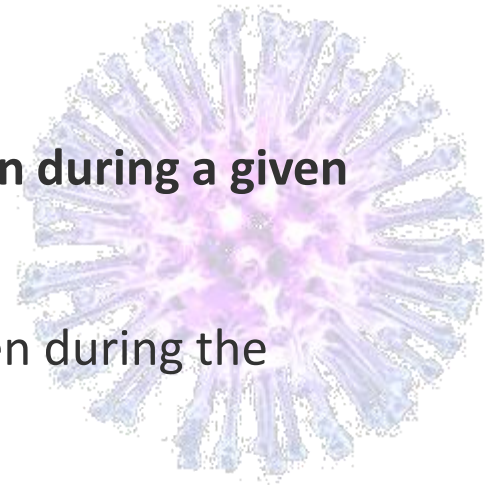
Example: "The incidence of influenza in children under 5 was 150 per 1,000 children during the winter season."

Prevalence: The proportion of a **population currently affected by influenza at a specific point in time**. Less useful for acute infections like flu.

Note: For acute respiratory infections, incidence is a far more relevant measure than point prevalence.

Burden of Disease: The overall impact of influenza, quantified by:

- **Morbidity:** Hospitalizations, clinic visits, complications (e.g., pneumonia, otitis media).
- **Mortality:** Deaths attributed to influenza.
- **Economic Cost:** Healthcare costs, lost productivity.





Global Epidemiology: A Significant Annual Burden

- **(Source: WHO estimates)**
- **Annual Attack Rate:** ~5-10% in adults, **20-30% in children.**
- **Symptomatic Cases:** ~**1 billion** cases annually worldwide.
- **Severe Cases:** **3-5 million** cases of severe illness.
- **Respiratory Deaths:** **290,000 – 650,000** annual respiratory deaths associated with influenza.
 - *80% of deaths occur in those >65 years.*
 - However, significant morbidity occurs in young children.

The attack rate is calculated as the number of people who became ill divided by the number of people at risk for the illness.





Key facts

- Ninety-nine percent of deaths in children under 5 years of age with influenza-related lower respiratory tract infections are in developing countries.
- Symptoms begin 1–4 days after infection and usually last around a week.



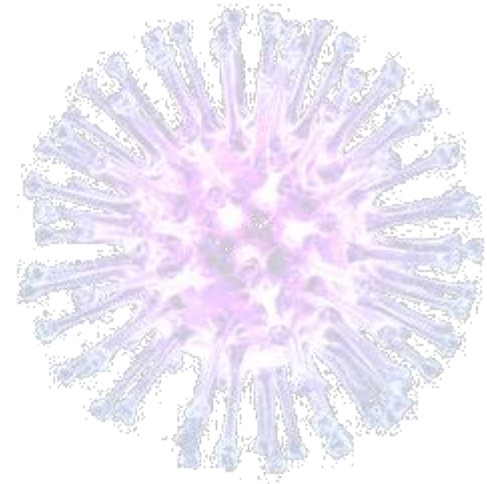


2024-2025 Season (Preliminary data)

Overall hospitalizations: 127 per 100,000 population.

ICU admissions: About 17% of hospitalized patients were admitted to an intensive care unit, and 6% received invasive mechanical ventilation.

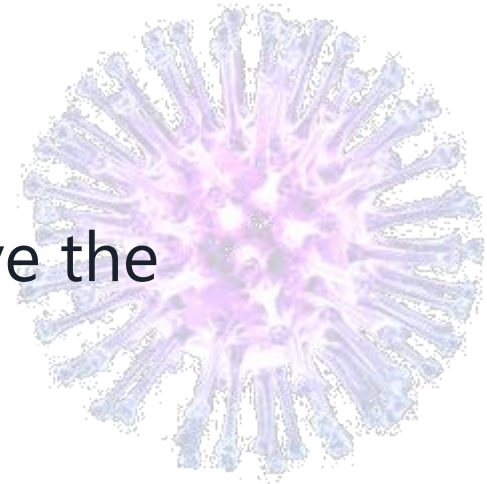
Pediatric data: One study estimated that 4% to 24% of hospitalized children with influenza required PICU admission.

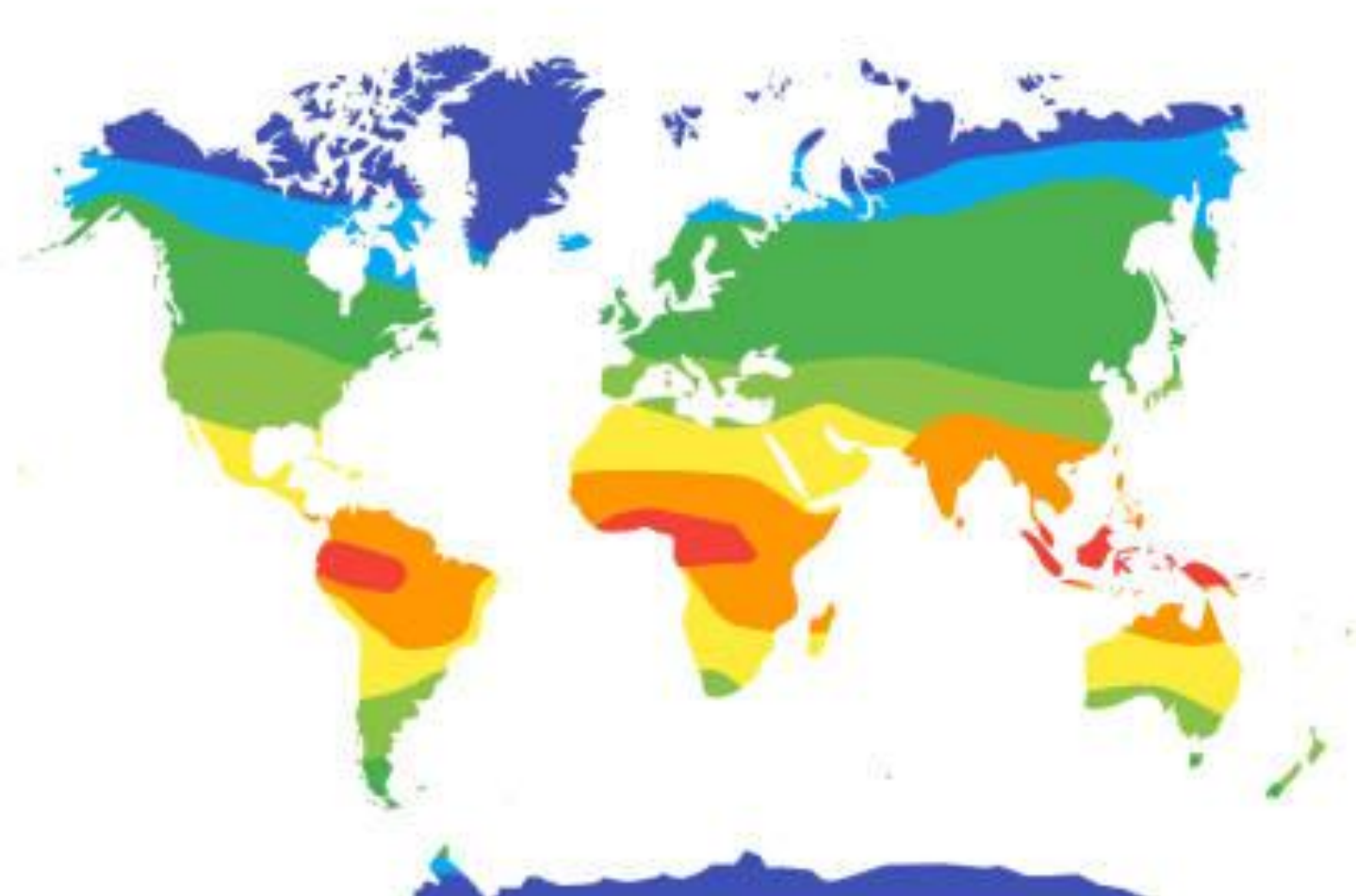




Pediatric Burden: A Vulnerable Population

- **Highest Incidence:** Children, especially those <5 years, have the highest attack rates.
- **Hospitalizations:** Young children (<2 yrs) have rates of **hospitalization** comparable to the elderly.
- **Complications:** Higher risk of **otitis media, pneumonia, febrile seizures, and severe (dehydration).**
- **Role in Transmission:** Children are key drivers of community spread due to longer viral shedding and close contact in schools/daycares





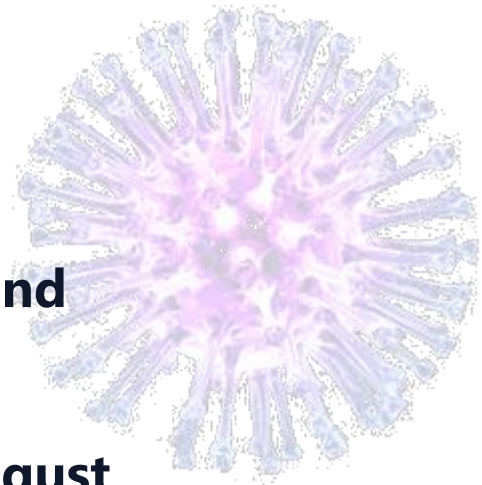
- Equatorial zone
- Subequatorial zone
- Tropical zone
- Subtropical zone
- Temperate zone
- Subpolar zone
- Polar zone





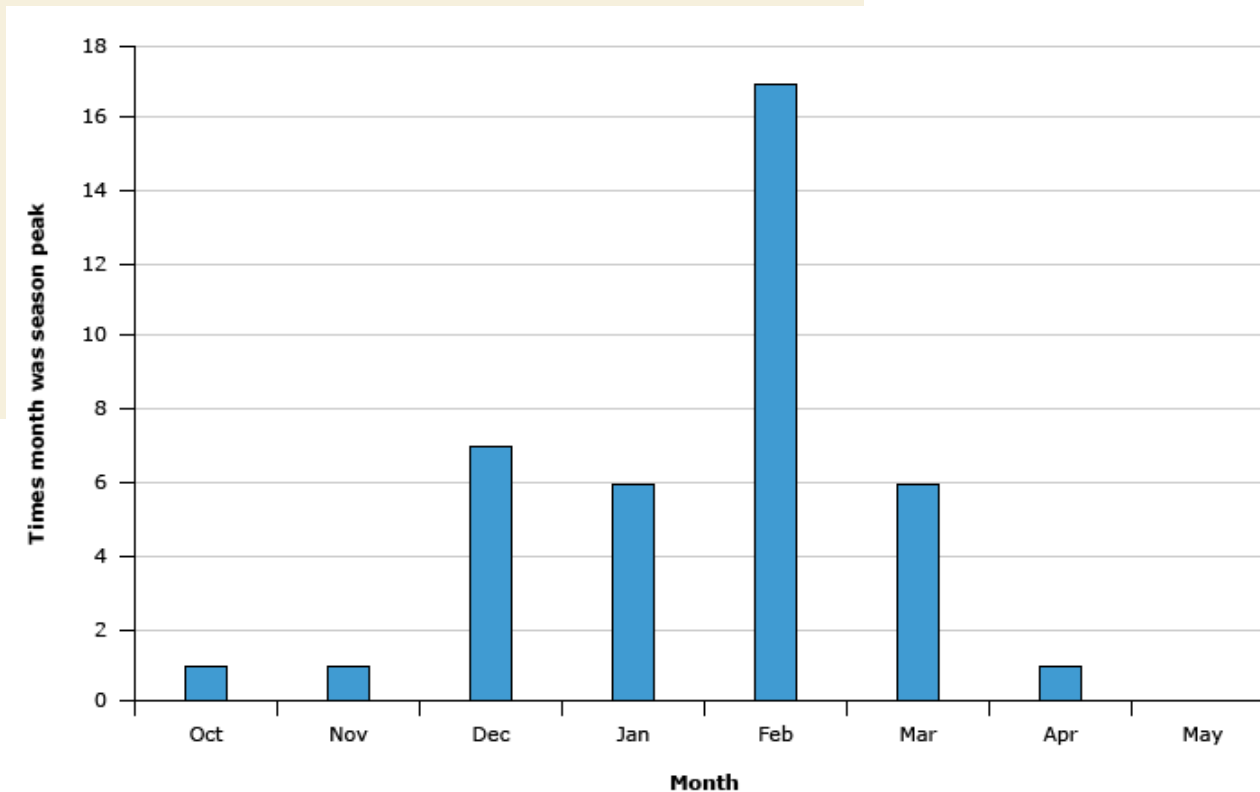
Global Seasonality Patterns

- **Temperate Zones (N. Hemisphere):** Epidemics peak between **December and February**.
- **Temperate Zones (S. Hemisphere):** Epidemics peak between **June and August**.
- **Tropical Zones:** Influenza can circulate **year-round**, with less predictable peaks, often during rainy seasons.
- **Implication:** Global surveillance is continuous; when one hemisphere's season ends, the other begins.





Influenza seasonal pattern



ژانویه: ۱۱ دی تا ۱۱ بهمن
فوریه: ۱۲ بهمن تا ۹ اسفند
مارس: ۱۰ اسفند تا ۱۱ فروردین
آوریل: ۱۲ فروردین تا ۱۰ اردیبهشت
می: ۱۱ اردیبهشت تا ۱۰ خرداد
ژوئن: ۱۱ خرداد تا ۹ تیر
جولای: ۱۰ تیر تا ۹ مرداد
آگوست: ۱۰ مرداد تا ۹ شهریور
سپتامبر: ۱۰ شهریور تا ۸ مهر
اکتبر: ۹ مهر تا ۹ آبان
نوامبر: ۱۰ آبان تا ۹ آذر
دسامبر: ۱۰ آذر تا ۱۰ دی



9/29/2020 10/27/2024

Country, Area or Territory

Iran (Islamic Republic of)

Display time period for

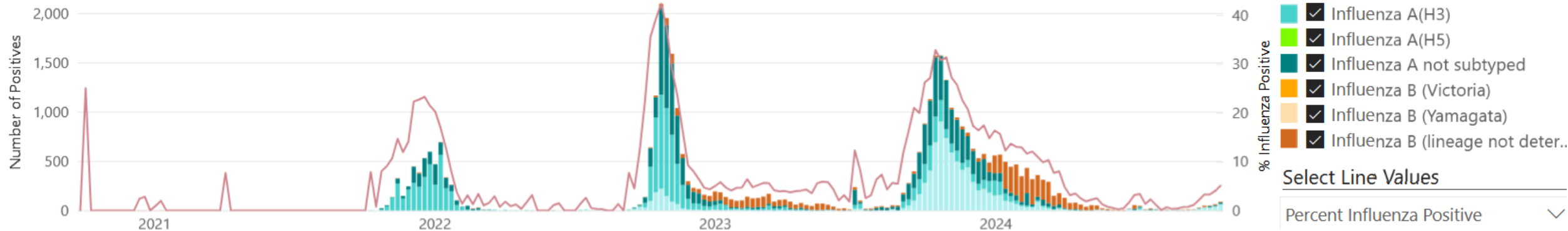
All

Surveillance site type

(FluNet chart only)

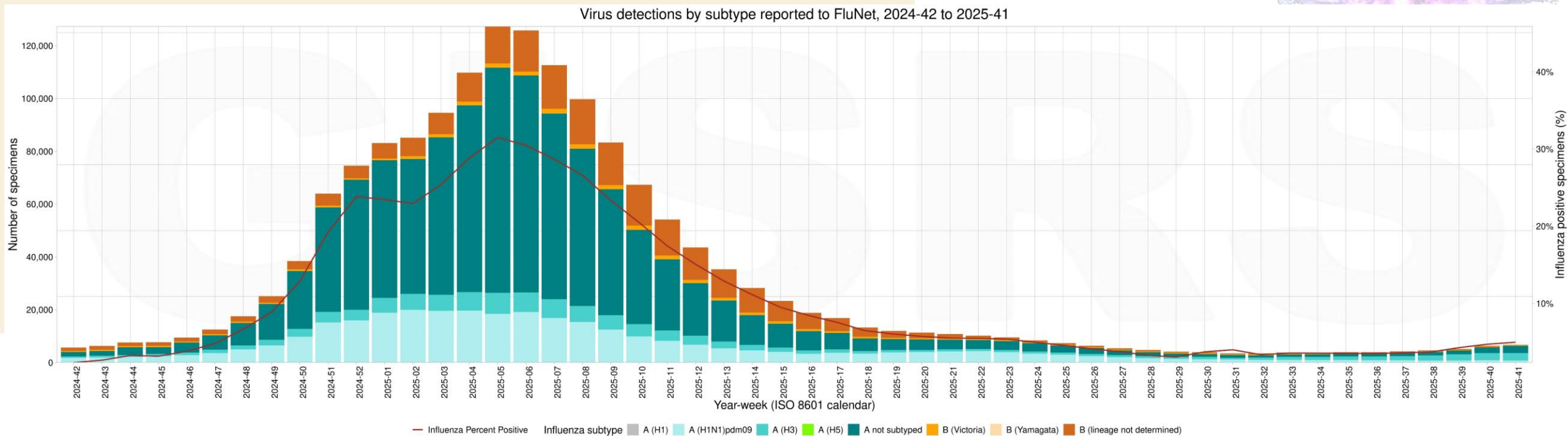
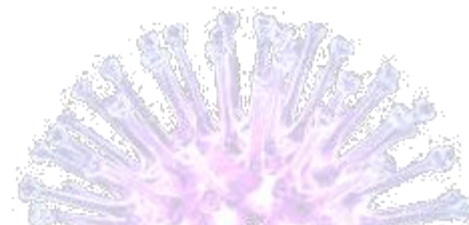
All

Number of specimens positive for influenza by subtype and % Positive



No data on ILI/ARI cases

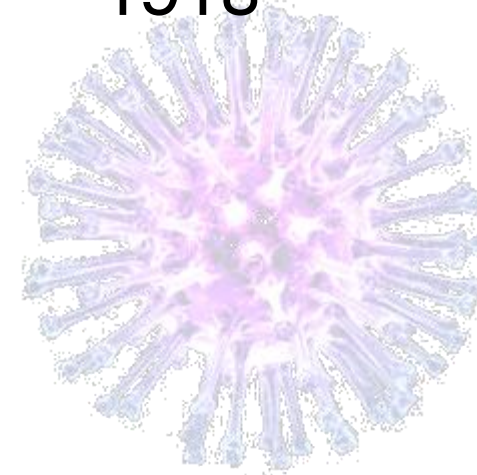
% Influenza Positive
Data source: FluNet, GISRS



The chart above is displayed for Global in all sites for year-weeks (ISO 8601) 2024-42 to 2025-41



1918



انفلوآنزا در ایران

انفلوآنزا در ایران



بستن کافور به گردن





استفاده از ماسک

10/30/2025



ORLD



Current healthcare expenditure, expressed as a percentage of GDP, encompasses goods and services for medical care consumed annually. This indicator excludes capital expenditures in healthcare, such as buildings, machinery, information technology, and emergency or outbreak vaccine stockpiles.



Iran (Islamic Republic of)

Health data overview for the Islamic Republic of Iran

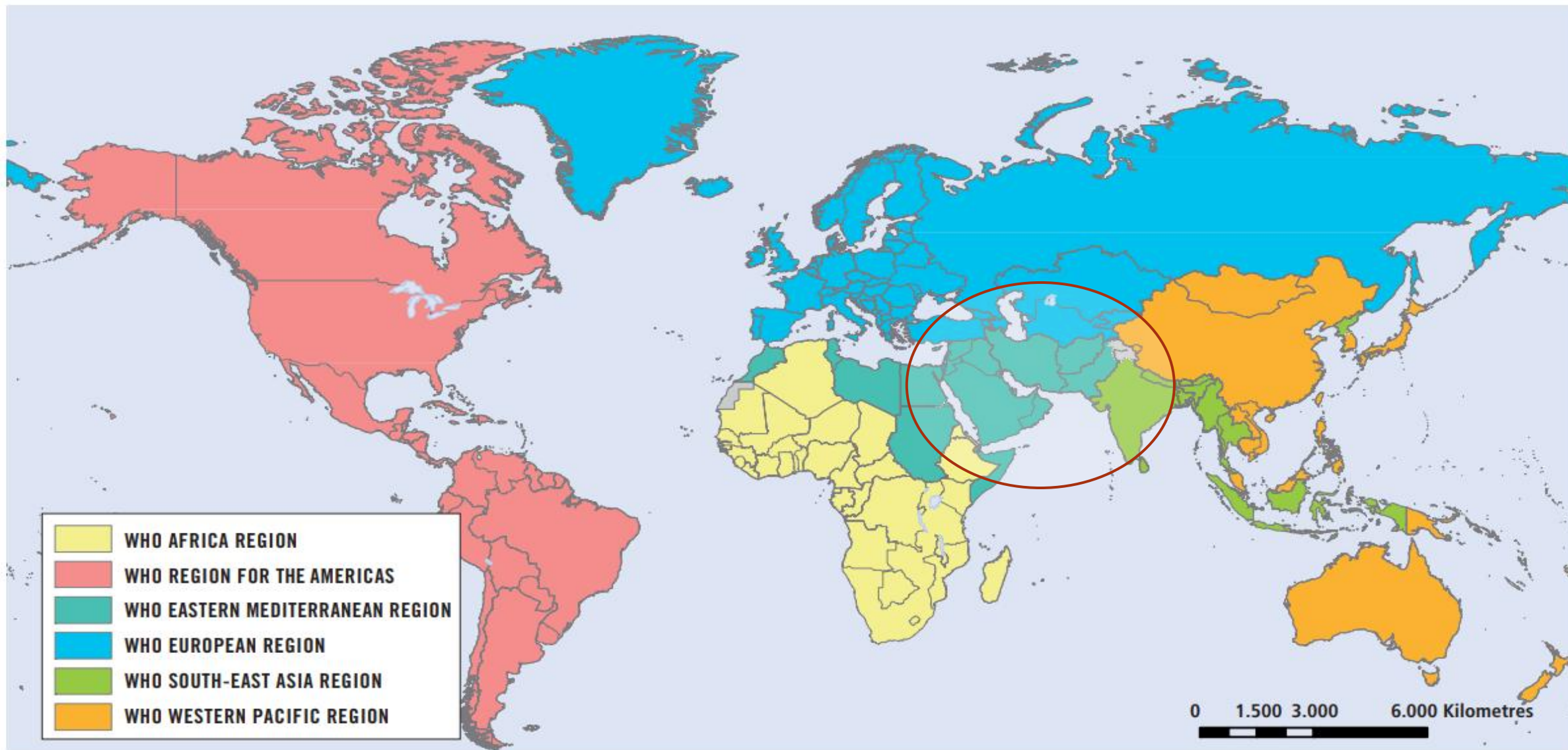
Population	90 608 707 (2023)
Current health expenditure (% of GDP)	5.77 (2021)
WHO region	Eastern Mediterranean
World Bank income level	Upper-middle income (UMC)



Population, Iran (Islamic Republic of)

 Iran (Islamic Republic of)





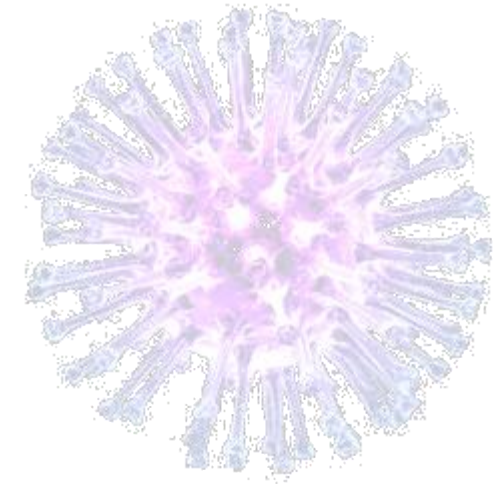
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate lines for which there may not be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization.



World Health
Organization

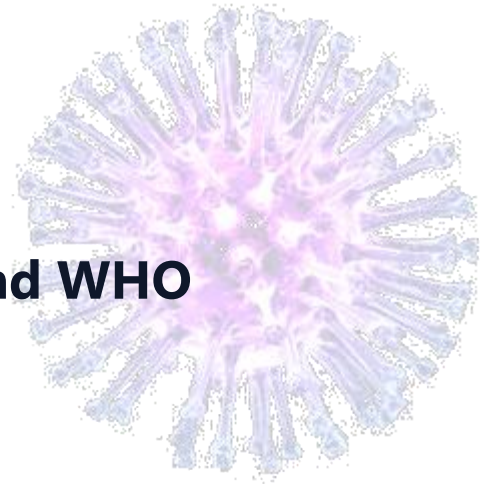
© WHO 2008. All rights reserved



- In Iran (Islamic Republic of), **the current population is 90,608,707** as of 2023 with a **projected increase of 12%** to **101,861,993** by 2050.



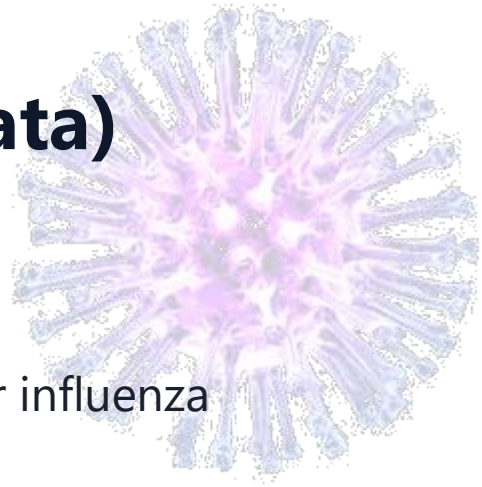
Focus: Influenza Epidemiology in Iran



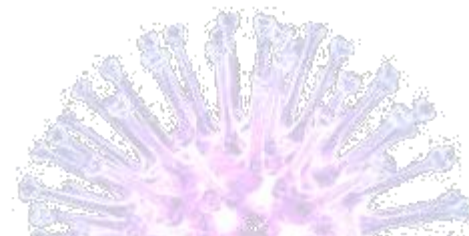
- (Source: Data from Iran's National Influenza Center, Ministry of Health, and WHO reports)
- **Seasonality:** Iran experiences typical **Northern Hemisphere seasonality**.
 - Activity begins to increase in **October-November**.
 - Peak activity usually occurs between **December and January**.
 - Season typically declines by **March-April**.
- **Surveillance:** Iran has a well-established sentinel surveillance system for Influenza-Like Illness (ILI) and Severe Acute Respiratory Infection (SARI), reporting data to the WHO's FluNet.



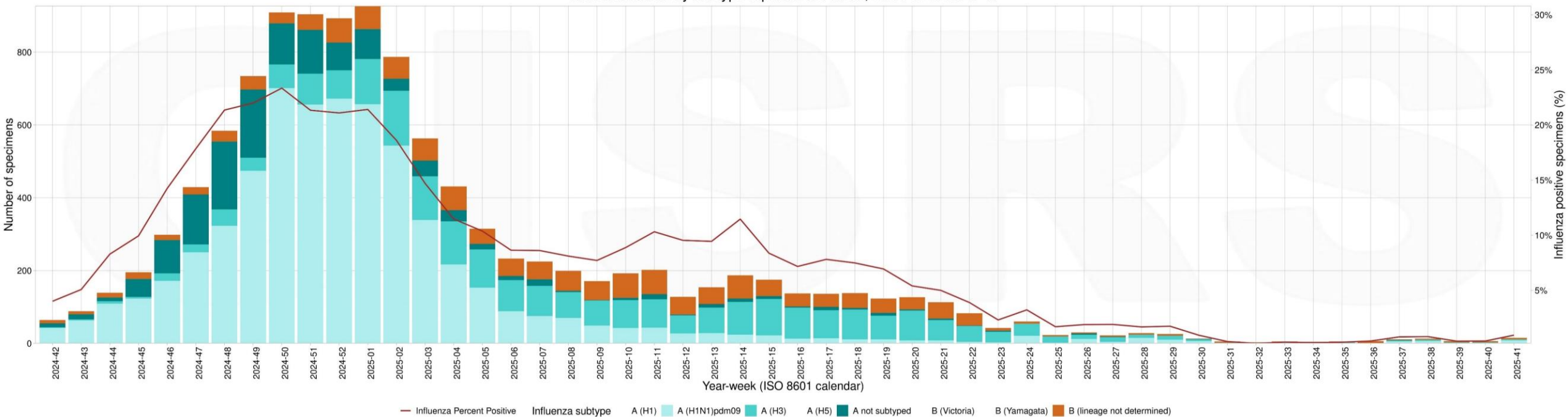
Incidence and Circulating Strains in Iran (Recent Data)



- **Sample Data (Hypothetical based on trends):**
- **Annual Positivity Rate:** Sentinel samples typically show a **15-30% positivity rate** for influenza during the peak season.
- **Strain Distribution (Recent Season):**
 - Influenza A: 65% (A(H3N2): 40%; A(H1N1)pdm09: 25%)
 - Influenza B: 35% (Mostly B/Victoria lineage)
- **Note:** Strain dominance can vary significantly year-to-year, influencing disease severity and vaccine effectiveness.



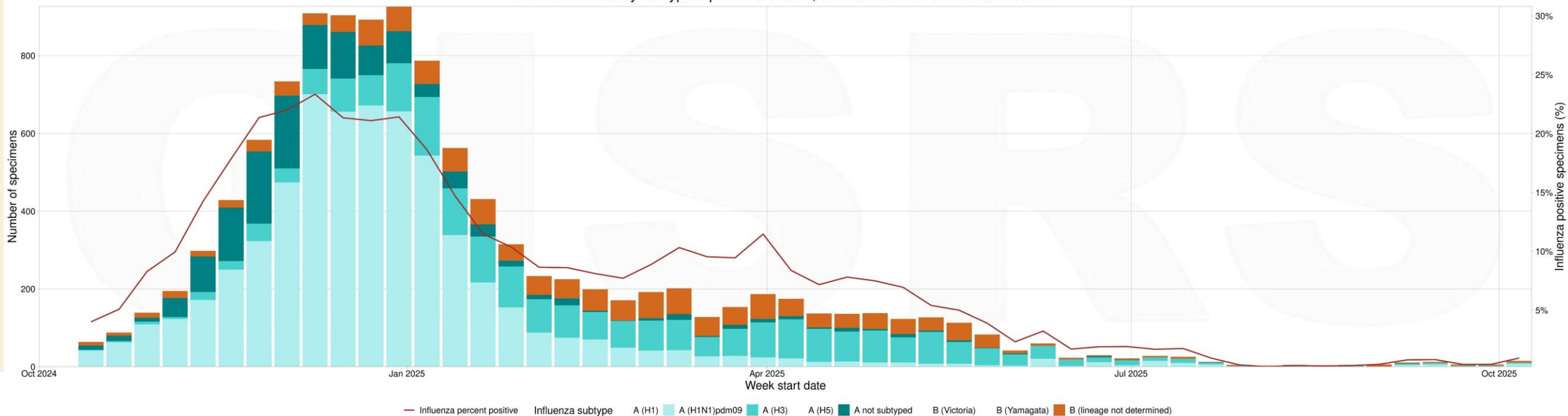
Virus detections by subtype reported to FluNet, 2024-42 to 2025-41



The chart above is displayed for Iran (Islamic Republic of) in all sites for year-weeks (ISO 8601) 2024-42 to 2025-41



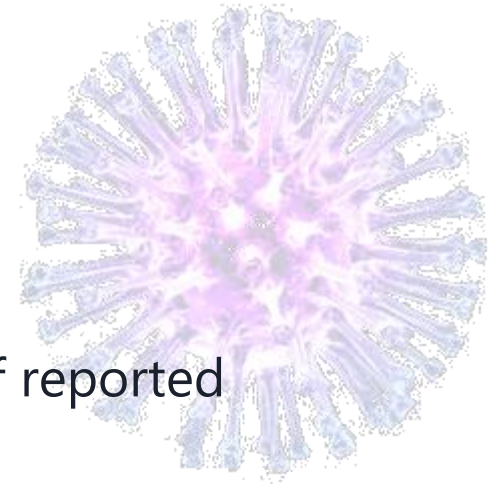
Virus detections by subtype reported to FluNet, 14 October 2024 to 06 October 2025



The chart above is displayed for Iran (Islamic Republic of) in all sites for week start dates 14 October 2024 to 06 October 2025



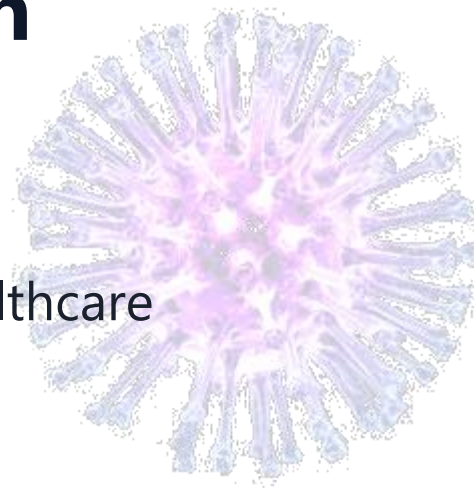
Pediatric Impact in Iran



- **Incidence:** Children and adolescents represent a **significant proportion** of reported ILI/SARI cases.
- **Severe Outcomes:** Pediatric hospitalizations and ICU admissions due to influenza complications (e.g., pneumonia, encephalopathy) are reported each season.
- **Risk Factors:** Similar to global patterns; highest risk in infants <6 months and children with comorbidities (asthma, cardiac disease, immunosuppression).



Challenges and Public Health Response in Iran



- **Challenges:**

- Low vaccination uptake in high-risk groups, including children and healthcare workers.
- Misconceptions about vaccine **safety and efficacy**.
- **Co-circulation with other respiratory viruses (RSV, SARS-CoV-2)** complicating diagnosis.

- **Public Health Response:**

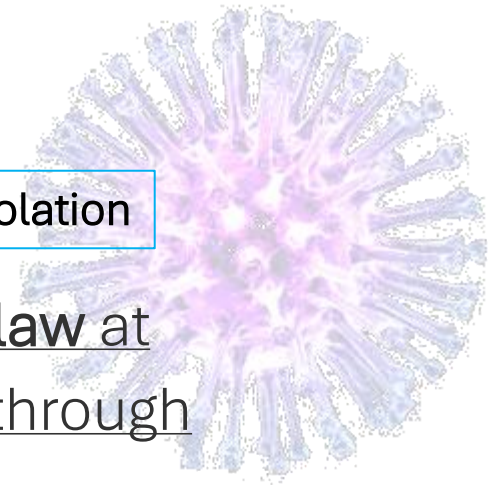
- **Strengthening Surveillance:** Continuous monitoring of strains and severity.
- **Vaccination Programs:** Promoting annual vaccination, especially for target groups (pediatrics, elderly, pregnant women, comorbidities).
- **Antiviral Stockpiling:** Ensuring availability of oseltamivir for treatment and prophylaxis.



Progress toward a vaccine

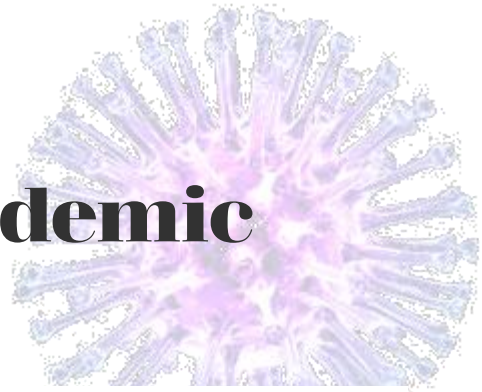
Virus isolation

- In **1933**, British researchers **Wilson Smith, C.H. Andrewes and P.P. Laidlaw** at London's National Institute for Medical Research (NIMR) made a breakthrough when they isolated and identified the influenza virus.
-
- With support from the US Army, **the first inactivated flu vaccine was developed by Thomas Francis and Jonas Salk at the University of Michigan.** The vaccine was tested for safety and efficacy on the US military, **before being licensed for wider use in 1945.**





2024 and beyond: Preparing for the next pandemic



To investigate the viruses in circulation, the World Health Organization (WHO) established the Worldwide Influenza Centre in 1948 and the Global Influenza Surveillance and Response System (GISRS) in 1952.





Denver Post employees get flu shots in November 1957





© CDC

This historic image depicts a line of people each awaiting a New Jersey Influenza vaccination. Also known as the Swine Flu, this image was captured during a **1976** immunization campaign.

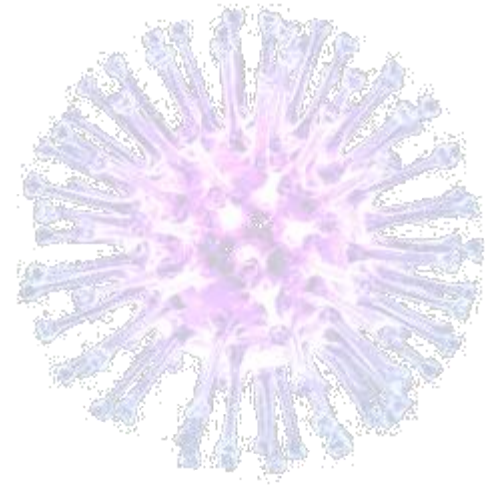


Scores of patients crowd the waiting hall of a clinic on Hong Kong Island during the influenza epidemic in July 1968





VACCINATION

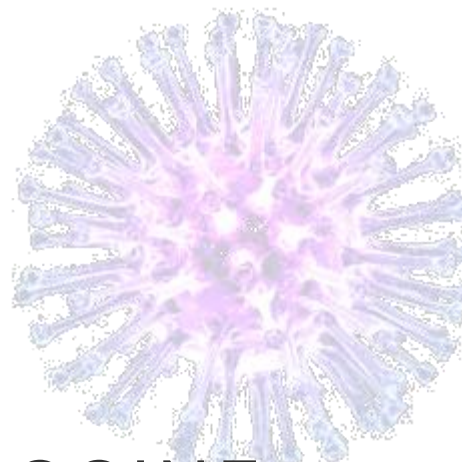




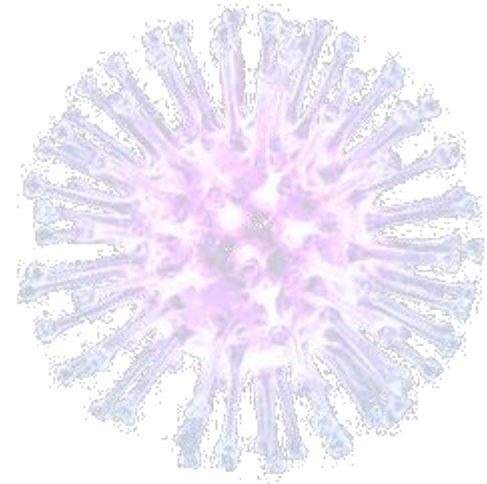
Continued efforts

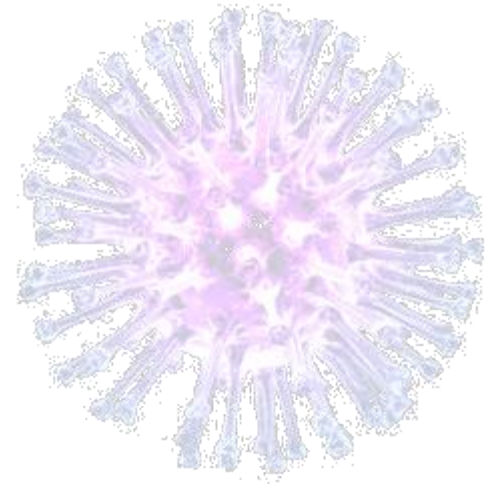
🦠 A **live attenuated vaccine** delivered in the form of a nasal spray was first licensed in 2003

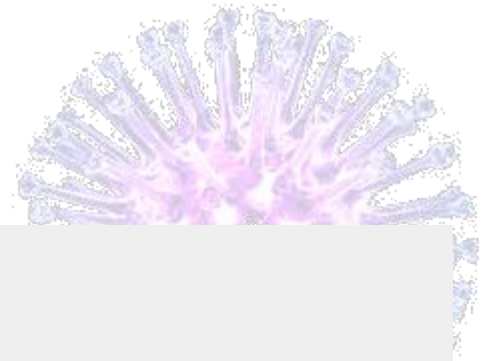
🦠 a vaccine using **recombinant DNA technology** was approved in 2013, and additional influenza vaccines based on newer technologies are being tested in clinical trials.



LIVE ATTENUATED VACCINE
RECOMBINANT DNA
TECHNOLOGY







واکسن آنفلوانزای فلوگارد

- **واکسن فلوگارد:** یک واکسن ۴ ظرفیتی نو ترکیب است که برای مقابله با ویروس‌های آنفلوانزای فصلی طراحی شده است.
- **ویروس‌های هدف:** این واکسن در برابر بیماری‌های ناشی از ابتلا به زیرگروه‌های A (H3N2 و H1N1) و B (Yamagata و Victoria) ویروس آنفلوانزا به صورت فعال ایمنی‌زایی می‌کند.
- **مناسب برای افراد 18 سال و بیشتر:** تزریق این واکسن برای افراد با سنین 18 سال و بیشتر جهت پیشگیری از ابتلا به ویروس آنفلوانزا مناسب است.
- **خلوص بالا:** واکسن فلوگارد فاقد پروتئین تخم‌مرغ و مواد نگهدارنده است.
- **بدون ایجاد بیماری:** این واکسن باعث ابتلا به ویروس آنفلوانزا و ایجاد بیماری در افراد نمی‌شود.



سویه‌ها

چرا فلوگارد

سویه ویروس: H1N1
ویسکانسین 2022

سویه ویروس: H3N2
دیستریکت آو کلمبیا 2023

سویه ویروس: B/Victoria
اتریش 2021

سویه ویروس: B/Yamagata
پوکت 2013



چهار ظرفیتی و تنها واکسن نو ترکیب
علیه ویروس آنفلوانزا در ایران

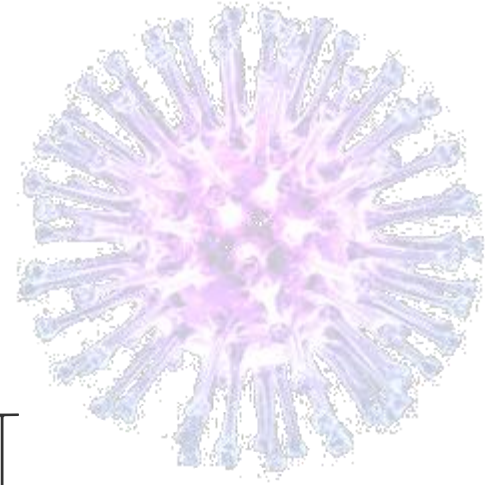
احتمال بروز واکنش آلرژیک کمتر
ناشی از تخم مرغ

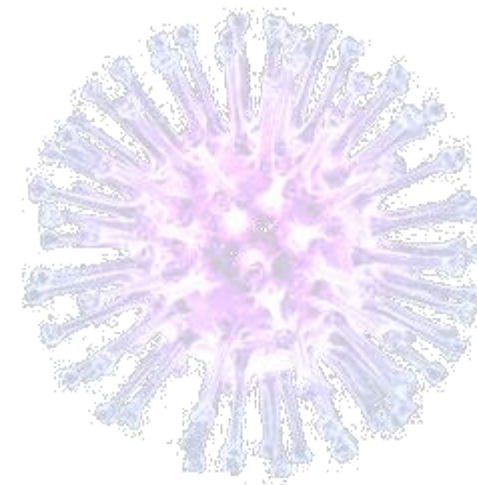
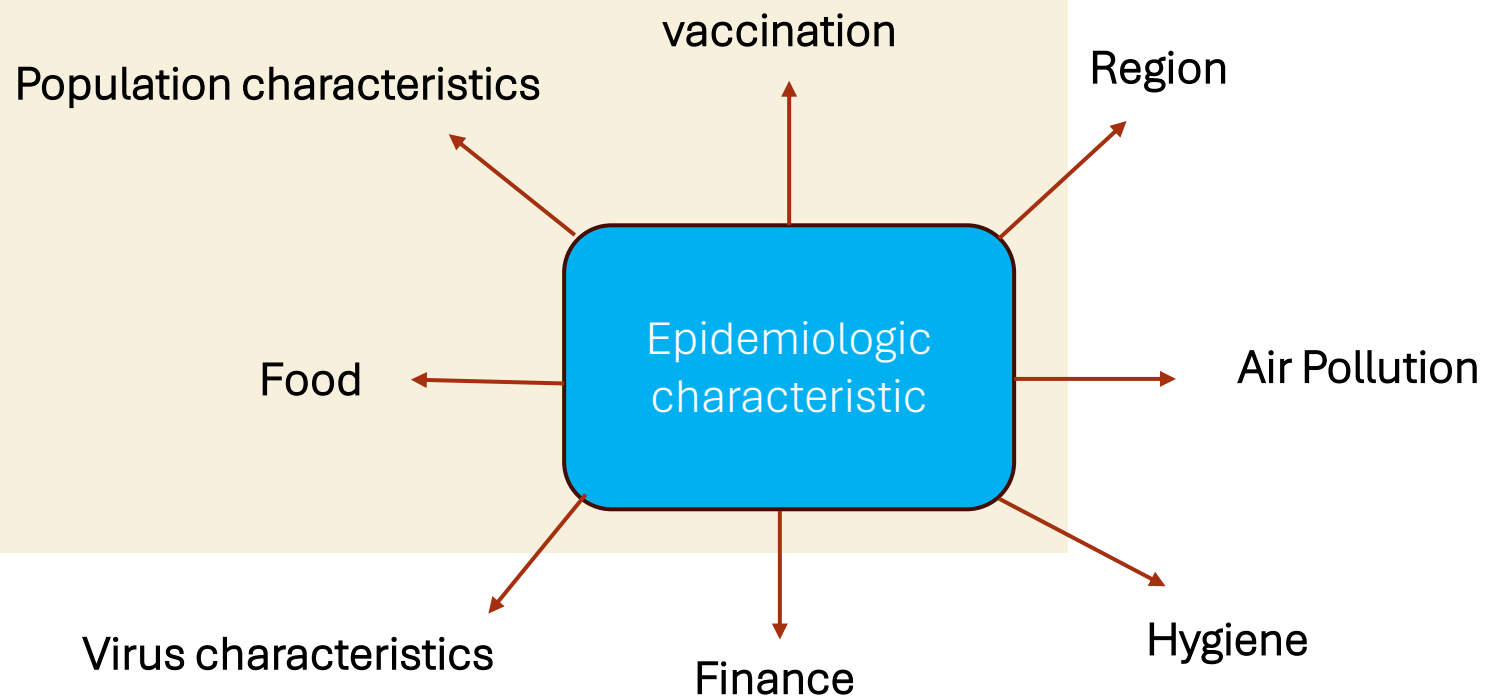
ساخته شده بر اساس توصیه های
سازمان بهداشت جهانی

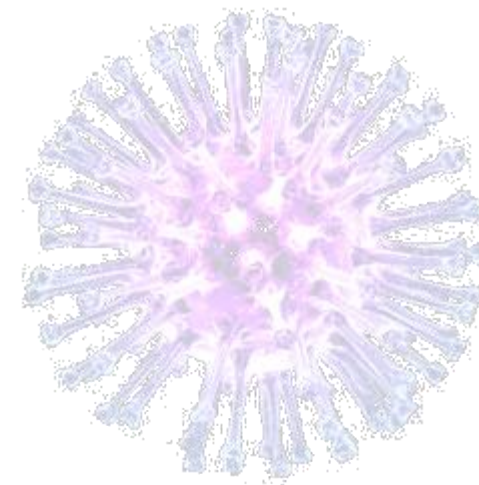
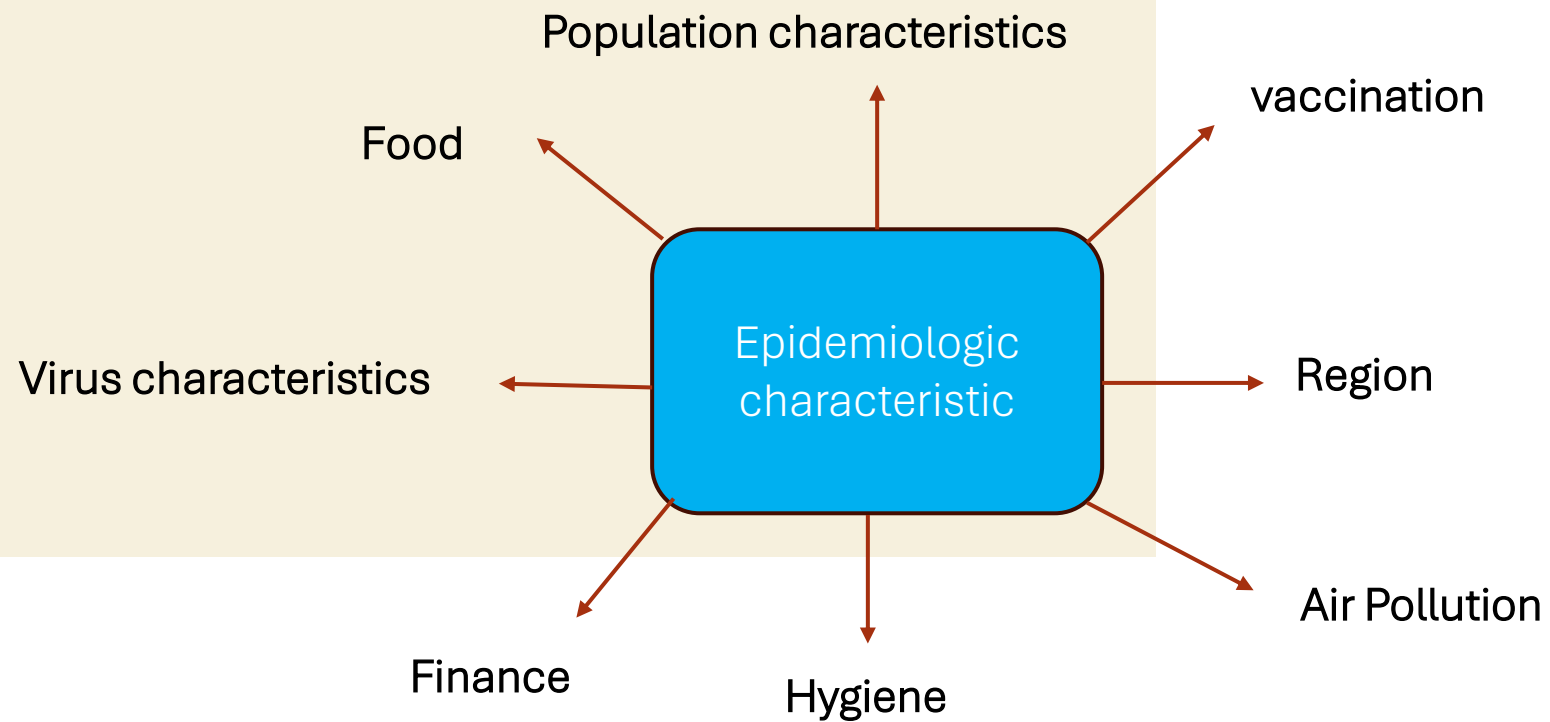
هر دوز حاوی ۱۸۰ میکروگرم هماگلوتنین



VIRUS CIRCULATION









Summary and Key Takeaways

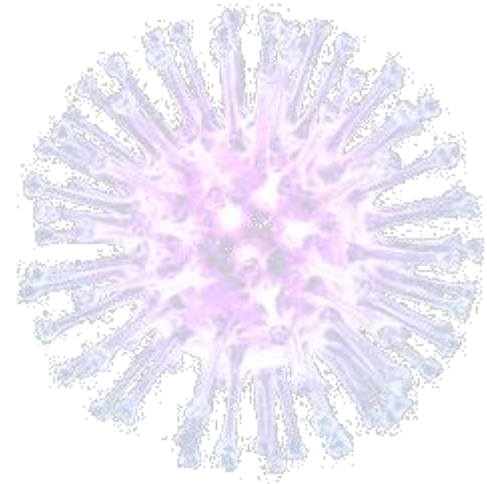
Influenza remains a major global public health threat, causing significant annual morbidity and mortality.

Children are both highly susceptible and key transmitters of the virus, suffering a disproportionate burden of cases and complications.

Iran experiences a predictable winter season, with circulating strains mirroring global trends.

Robust surveillance is critical for tracking strains, incidence, and severity to guide public health action.

Annual vaccination is the cornerstone of prevention, and improving coverage, particularly in pediatric and other vulnerable populations, is essential to reduce the national and global burden.





References & Further Reading

1. World Health Organization (WHO). Influenza (Seasonal). Fact sheets.
2. WHO FluNet database for global and country-specific surveillance data.
3. Iran Ministry of Health and Medical Education. National Influenza Center Reports.
4. okars, J. I., et al. (2018). "Updated Estimates of Mortality Associated with Seasonal Influenza through the 2017-18 Season." *MMWR*.
5. [Add 2-3 key papers on pediatric influenza epidemiology].

