



WWI Chemical Weapons

1918 Influenza Pandemic



WWI Chemical Warfare



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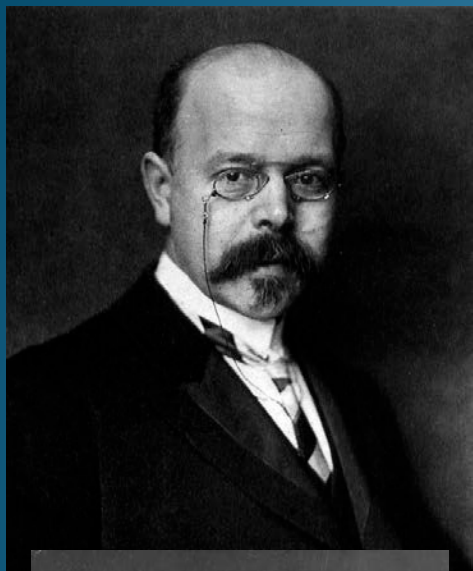
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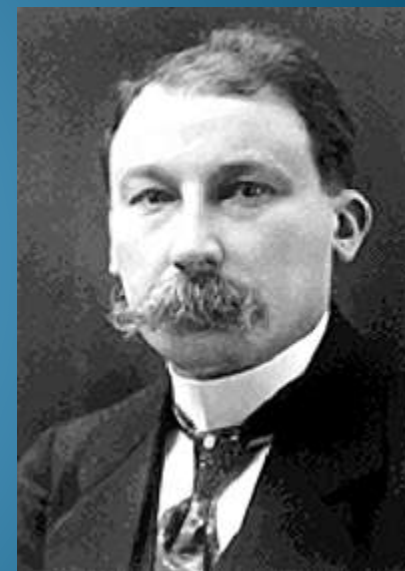
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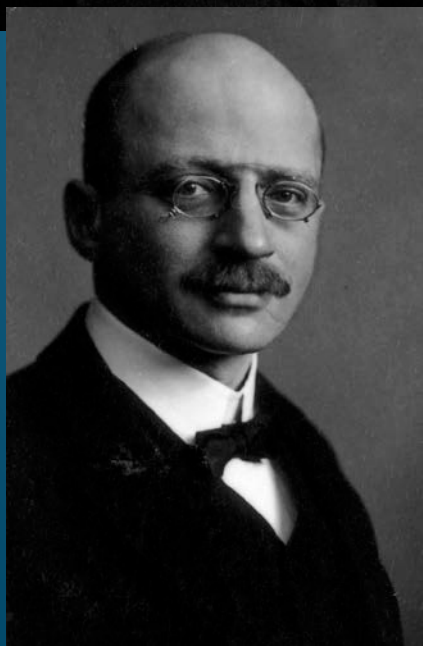
The War of the Nobel Chemists



Walther Nernst



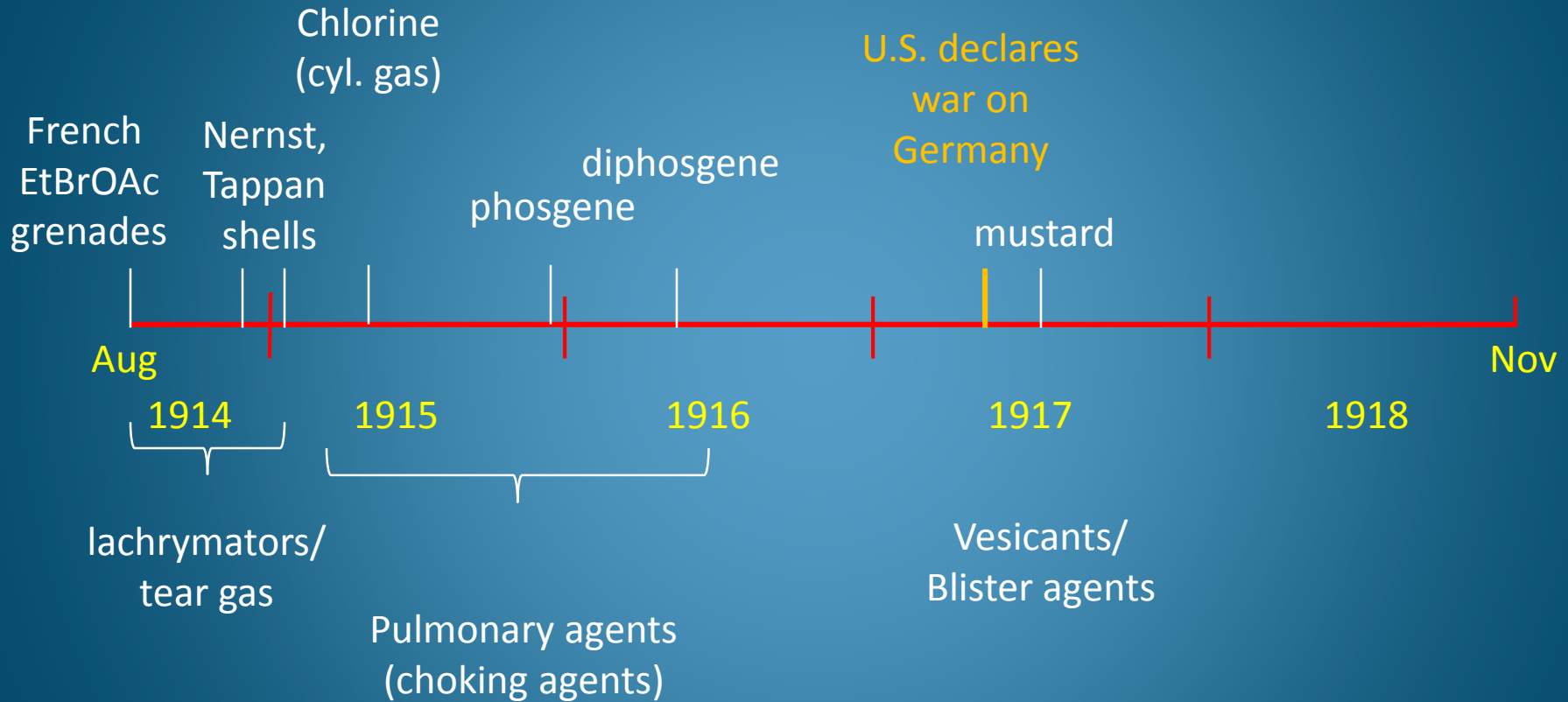
Victor Grignard



Fritz Haber

WWI Chemical Warfare

Timeline:



Early Delivery Methods: Gas Cylinders

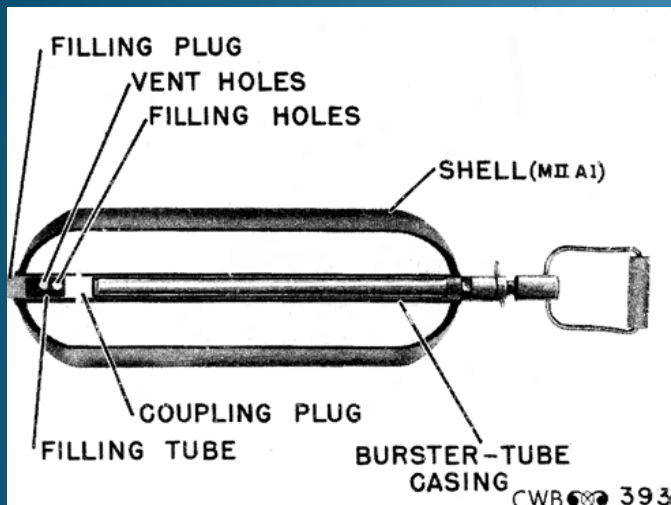


A French cylinder attack on German trenches in Flanders.

Photograph: Chemical and Biological Defense Command Historical Research and Response Team, Aberdeen Proving Ground, Md.

Advanced Delivery Systems

Livens projector

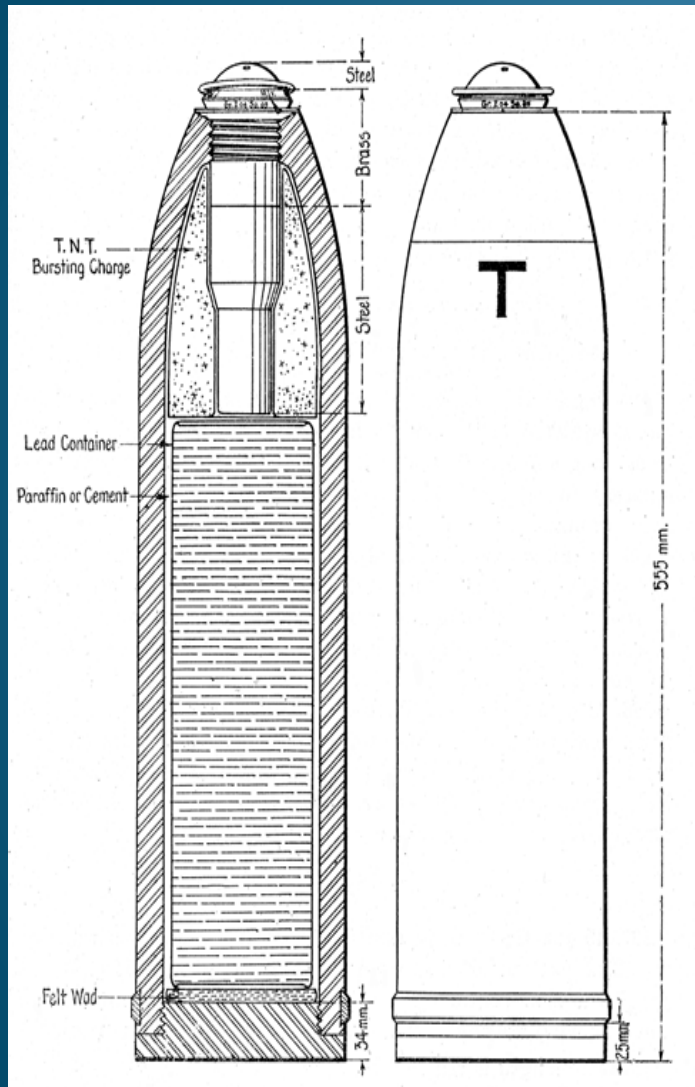


Stokes mortar



Photographs: Chemical and Biological Defense Command
Historical Research and Response Team, Aberdeen Proving
Ground, Md.

Advanced Delivery Systems



<http://self-preservation-society.blogspot.com/2013/11/war-stories-john-thomas-bloor-and.html>

U.S. Chemical Warfare Involvement



US soldiers receiving instructions from French officers in early 1918.

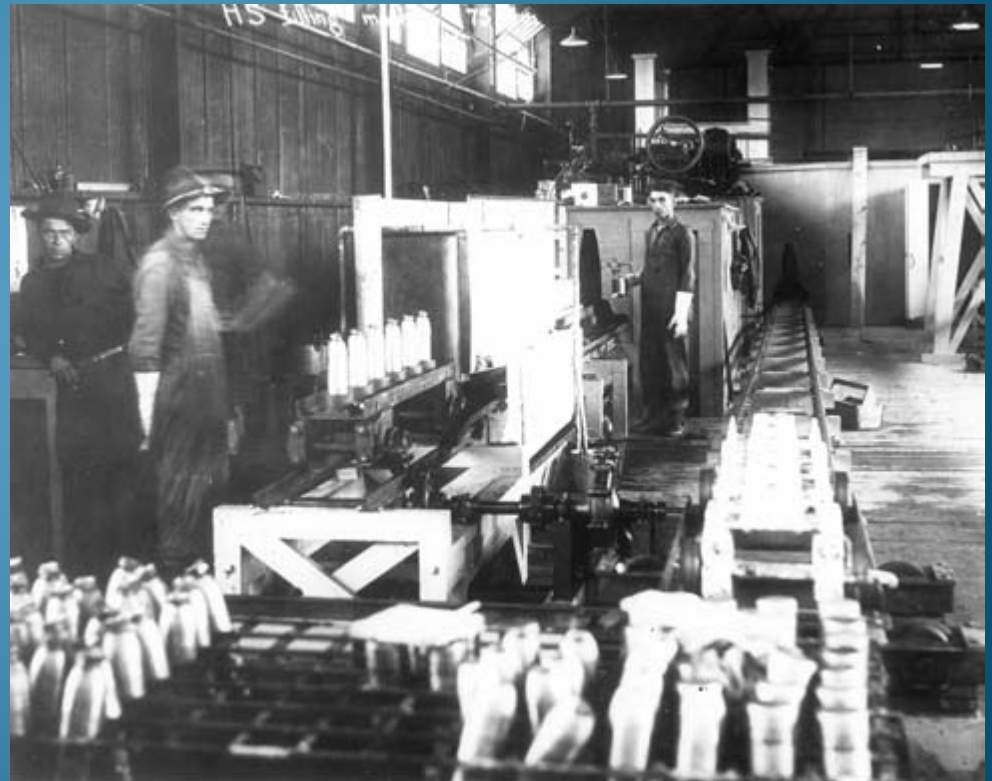


US Signal Corps photographs

U.S. Chemical Warfare Involvement



Blinded by mustard. Photograph: US Army Military History Institute, Carlisle, Pa.



Filling 75mm shells with mustard, Edgewood arsenal. Photograph: Chemical and Biological Defense Command Historical Research and Response Team, Aberdeen Proving Ground, Maryland.

Influenza 1918

PBS America Influenza 1918
Video

1918 Influenza

- 25-50 million deaths worldwide
- 675,000 Americans died
~43,000 mobilized American servicemen
- Estimates: 50% of population infected, 30% became ill
- 2.5% mortality
(seasonal influenza = 0.1%)



Spread of Influenza 1918



★ March 11 Camp Funston, KS

Spread of Influenza 1918



March 4 Camp Funston, KS

★ April: France (Allies and German soldiers)

May: Spain, Italy

Spread of Influenza 1918



March 4 Camp Funston, KS

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Spread of Influenza 1918



March 4 Camp Funston, KS

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Spread of Influenza 1918



March 4 Camp Funston, KS
April: France (Allies and German soldiers)
May: Spain, Italy

June: Bombay, Calcutta
July: China, New Zealand, Philippines
★ August: 2nd wave begins

Fort Devens, MA 1918

- Aug. 20: Maj. Gen Henry McCain-
12th Infantry division to be ready in 14 weeks
-camp built for 35,000 has 45,000 (5,000 under canvas)
- Sep. 7: 1st soldier with flu symptoms
- Sep. 10: 142 hospital admissions (31 on Sep. 2)
- Sep. 18: 1,176 hospital admissions (6,674 cumulative)
- Sep. 23: 12,604 total diagnoses, 63 die on that day,
-90 would die on worst days
- Sep. 30: 1,902 cases of pneumonia under care
-hospital designed for 2,000 now has 8,000 patients
-300 nurses; at one point 90 are sick

1918 Influenza

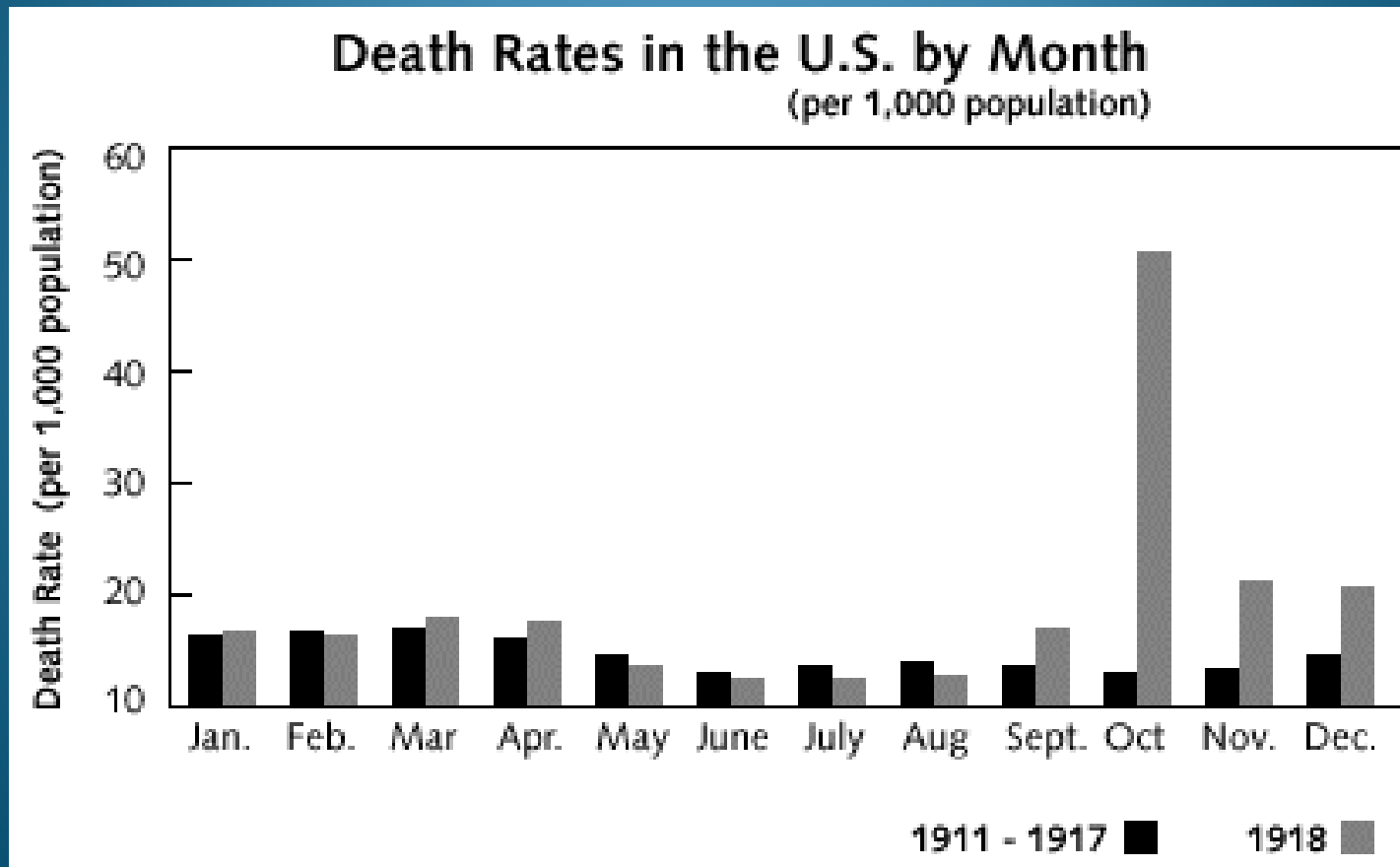
Societal Impacts



Seattle, WA

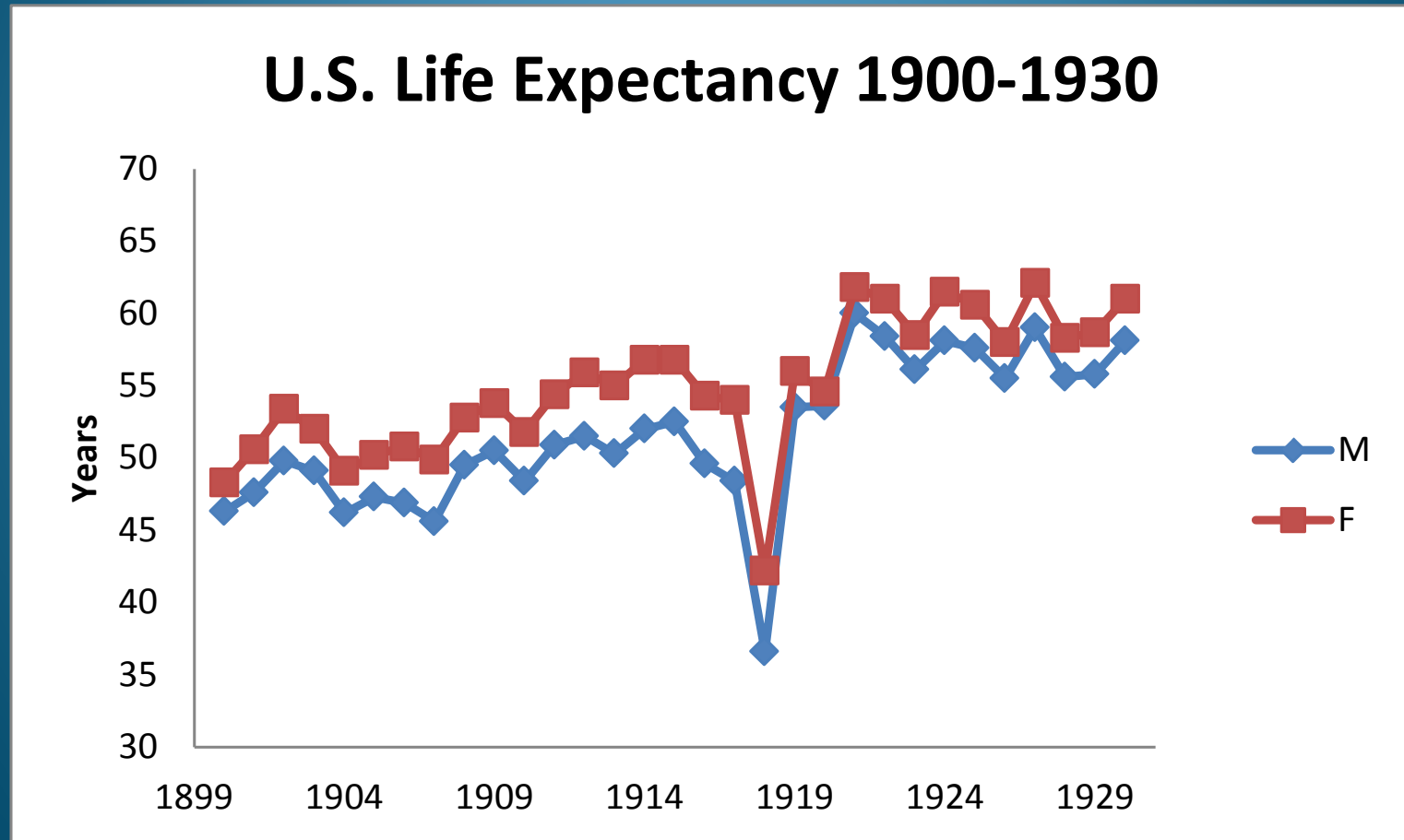


Influenza Mortality: 1918 versus Preceding 7 years



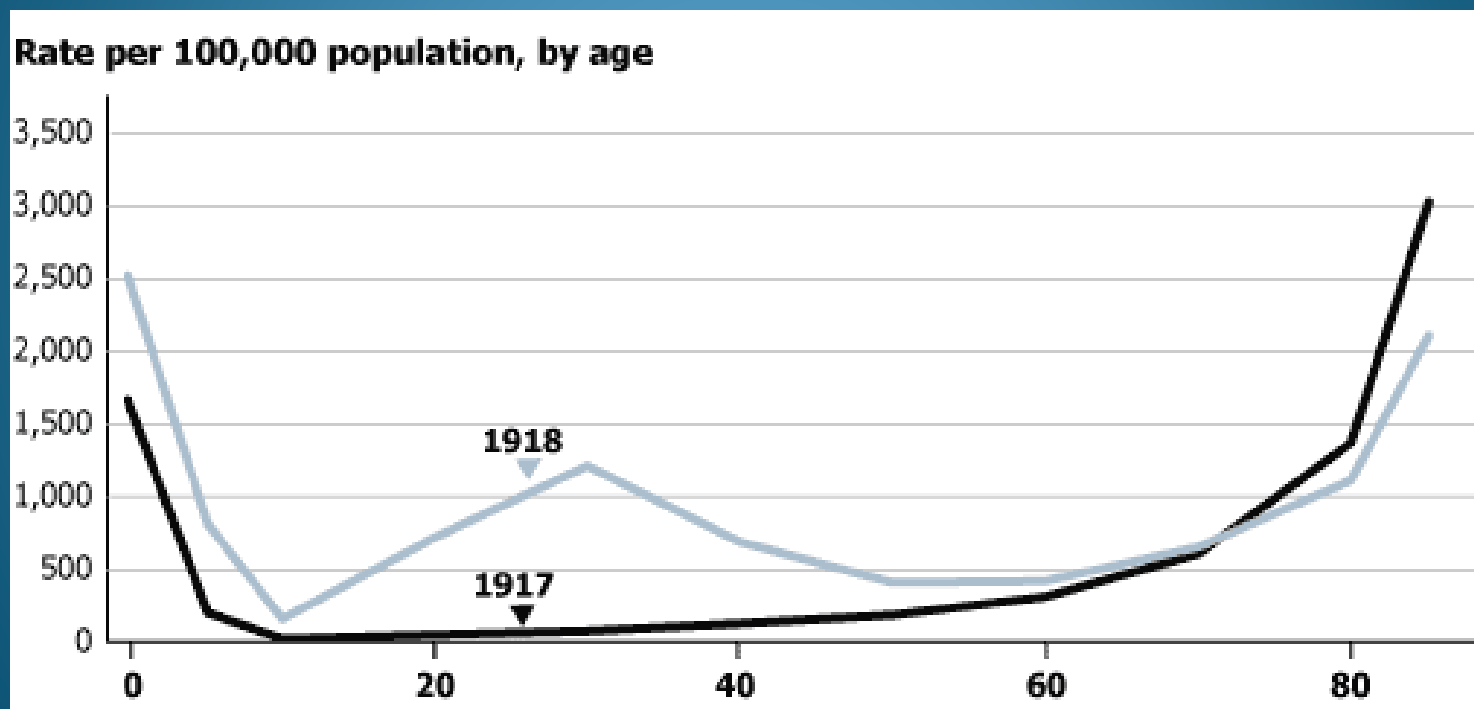
U.S. Centers for Disease Control data

Influenza Mortality: Effect on Average life expectancy in the US



U.S. Centers for Disease Control data

Influenza Mortality by Age



U.S. Centers for Disease Control data

1918 Influenza Impacts

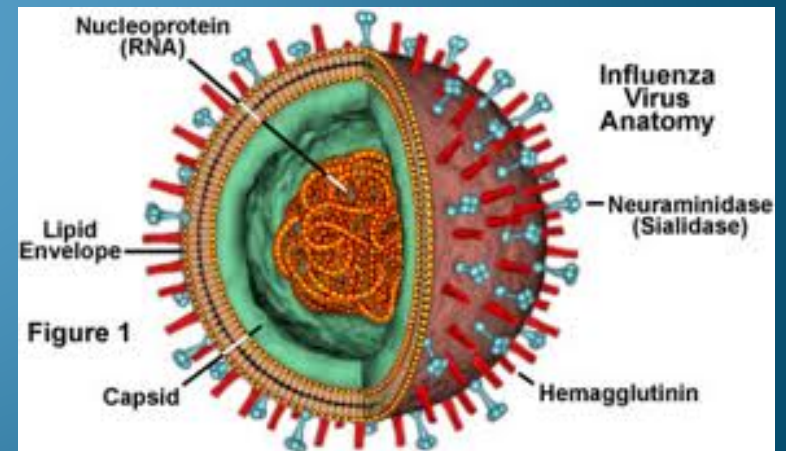
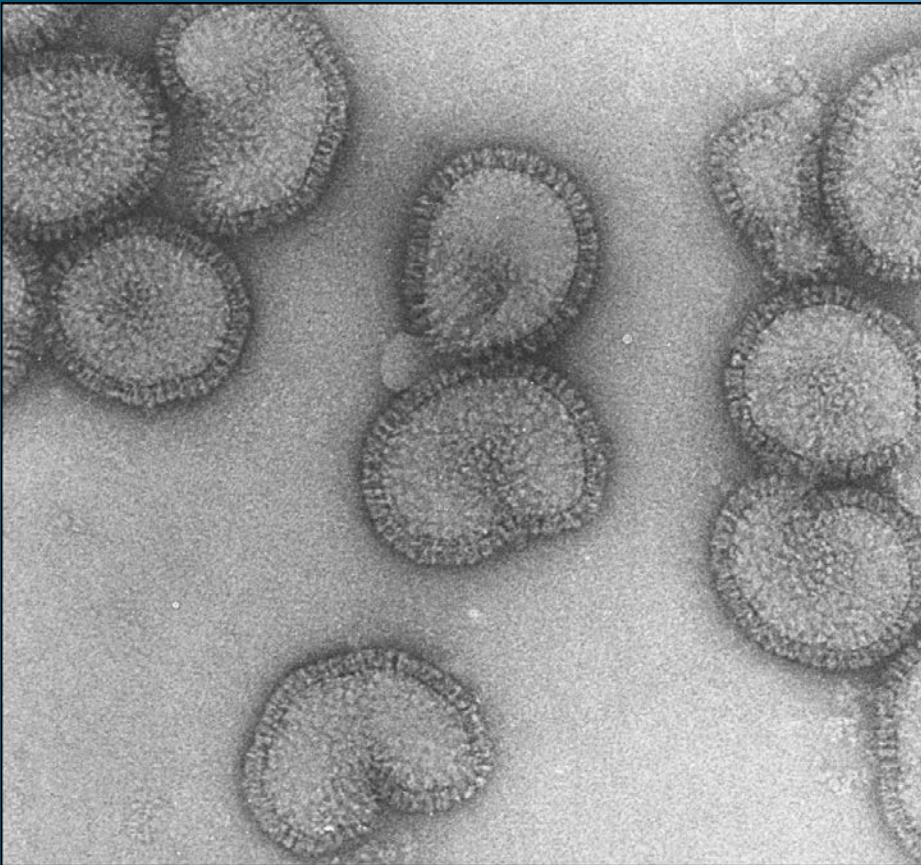


Flu orphans, Nushagak, Alaska. (Alaska State Library photo)

Influenza Virus

1933- Smith, Laidlaw and Andrewes
transmit influenza to ferrets

1938- Salk and Francis develop first
influenza vaccine



Orthomyxovirus
negative sense ssRNA genome
8 segments

Influenza Virus:

Resurrection of the 1918 strain



U.S. Army Institute of Pathology
archived tissue sections

- **H1N1 serotype**



1997, Ann Reid & Jeffrey Taubenberger

Influenza Virus:

Resurrection of the 1918 strain



Kirsty Duncan



Johan Hultin

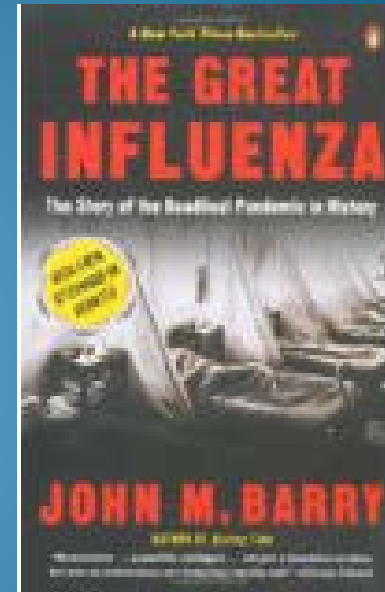
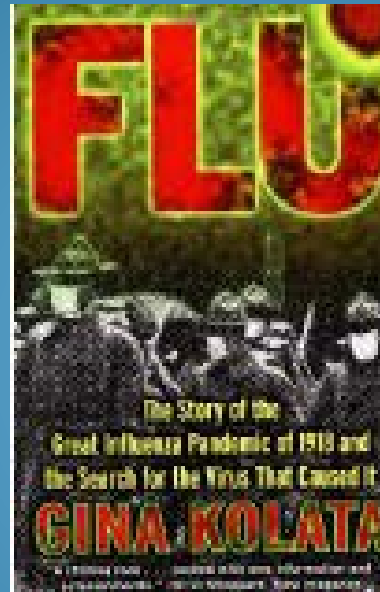
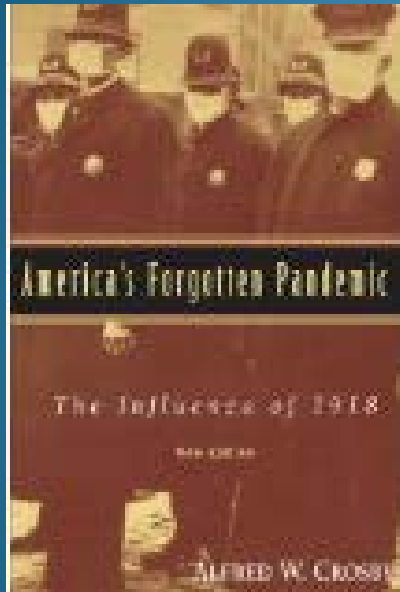
Influenza Virus: Resurrection of the 1918 strain

Terrence Tumpey, US CDC

2005 Reconstruction of the 1918 strain using reverse genetics



References

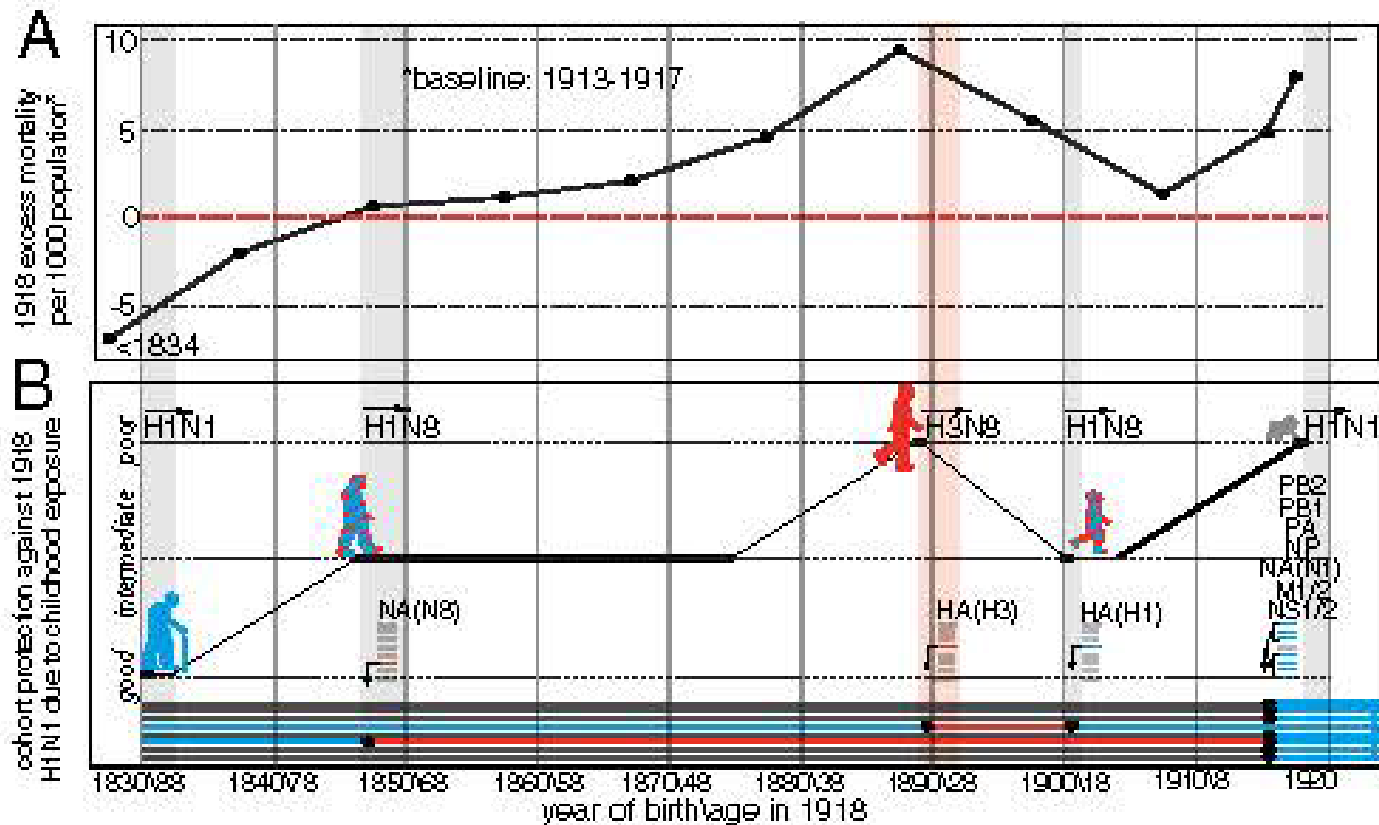


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Childhood Exposure/Cohort Immunity Model



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