Progress against influenza and other threats to health

May 15, 2014

Thomas R. Frieden, MD, MPH
Director,
Centers for Disease Control and Prevention

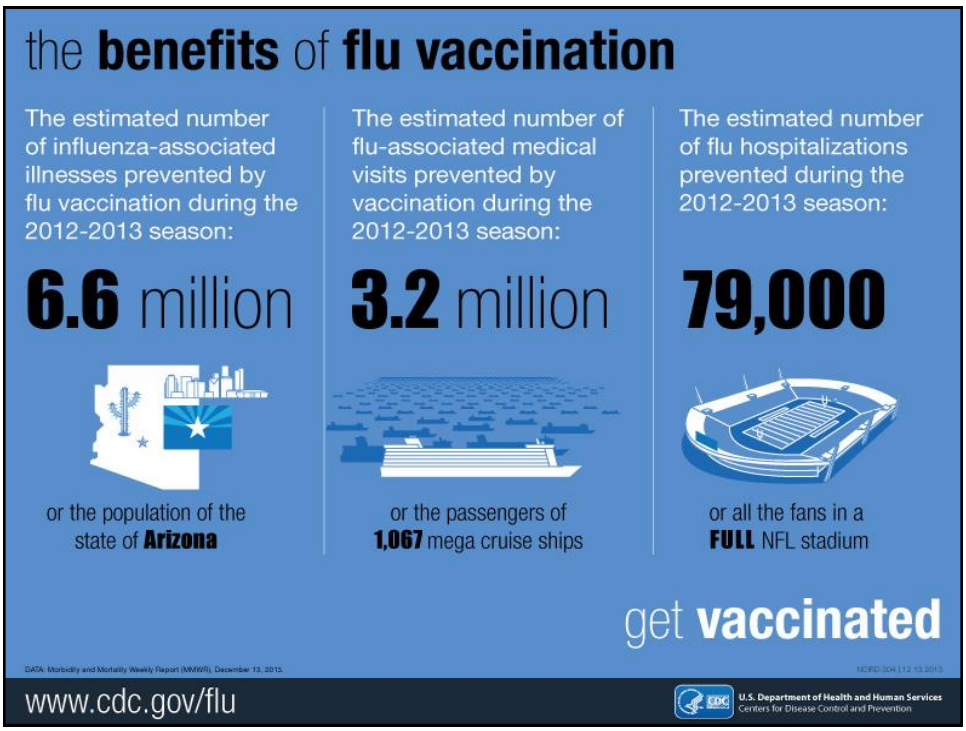
Vaccine-preventable diseases cause long-term illness, hospitalization, and even death

- Each year in the U.S.
  - 3,000–49,000 people die of influenza and its complications, mostly adults
  - HPV causes ~17,000 cancers in women, and ~9,000 in men
    - ~4,000 women die from cervical cancer
- ~32,000 cases of invasive pneumococcal disease in 2012 and 3,300 deaths
- 800,000–1.4M people suffer from chronic hepatitis B, with complications including liver cancer

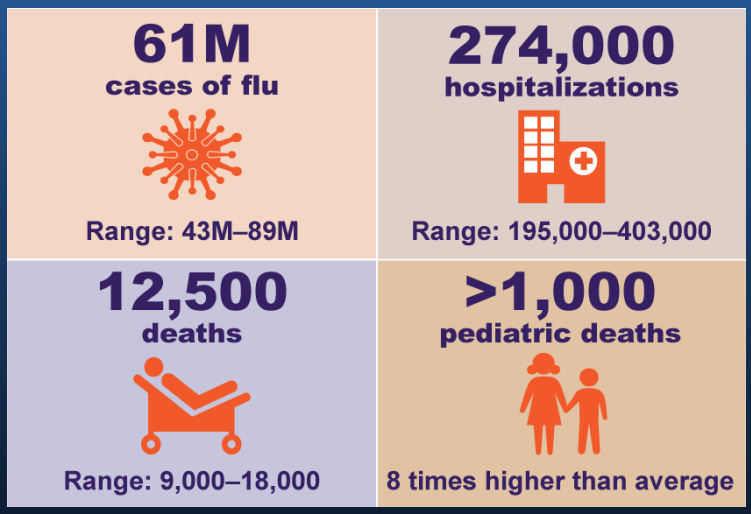
Seasonal flu is a constant, though variable, threat to public health

Influenza season	Estimated number of cases (in millions)	Estimated number of medically-attended cases (in millions)	Estimated number of hospitalizations
2005–06	10.9	4.6	84,500
2006–07	6.8	2.8	47,300
2007–08	13.0	5.5	118,700
2008–09	10.2	4.3	61,700
2009–10	52.0	24.2	290,200
2010–11	22.0	9.3	169,900
Season average	19.2	8.5	128,700

Kostova D, Reed C, Finelli L, et al. Influenza Illness and Hospitalizations Averted by Influenza Vaccination in the United States, 2005-2011. PLoS One. 2013; 8(6): e66312.



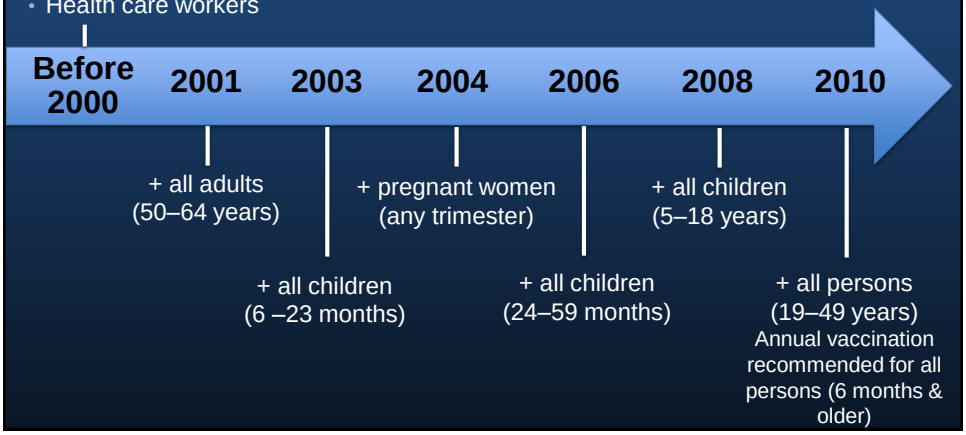
2009 H1N1 virus took a significant toll on the U.S. population



Shrestha SS, et al. Estimating the Burden of 2009 Pandemic Influenza A (H1N1) in the United States (April 2009–April 2010). Clinical Infectious Diseases. 2011; 52(suppl 1): S75-S82.

Major changes for ACIP influenza vaccination recommendations

- Persons 65 years and older
- Persons of any age with chronic medical conditions conferring higher risk for flu-related complications
- Pregnant women in 2nd or 3rd trimester
- Contacts (household and out-of-home caregivers) of the above groups
- Health care workers



Influenza vaccines approved for use in the U.S., 2013–14

	Trade name	Age indications	Route
Inactivated influenza vaccine, trivalent (IIV3), standard dose	Afluria	≥9 yrs.	IM
	Fluarix	≥3yrs	IM
	Flucelvax	≥18 yrs.	IM
	FluLaval	≥3 yrs.	IM
	Fluvirin	≥4 yrs.	IM
	Fluzone	6 mos-64 yrs.	IM
	Fluzone Intradermal	18–64 yrs.	Intradermal
Inactivated influenza vaccine, trivalent (IIV3), high dose	Fluzone High-Dose	≥65 yrs.	IM
Inactivated influenza vaccine, quadrivalent (IIV4), standard dose	Fluarix Quadrivalent	≥3 yrs.	IM
	Flulaval Quadrivalent	≥3 yrs.	IM
	Fluzone Quadrivalent	6-36 mos	IM
Recombinant influenza vaccine, trivalent (RIV3)	FluBlok	18–49 yrs.	IM
Live attenuated influenza vaccine, quadrivalent (LAIV4)	FluMist Quadrivalent	2–49 yrs.	Intranasal

www.cdc.gov/mmwr/preview/mmwrhtml/rr6207a1.htm?s_cid=rr6207a1_w#Tab1

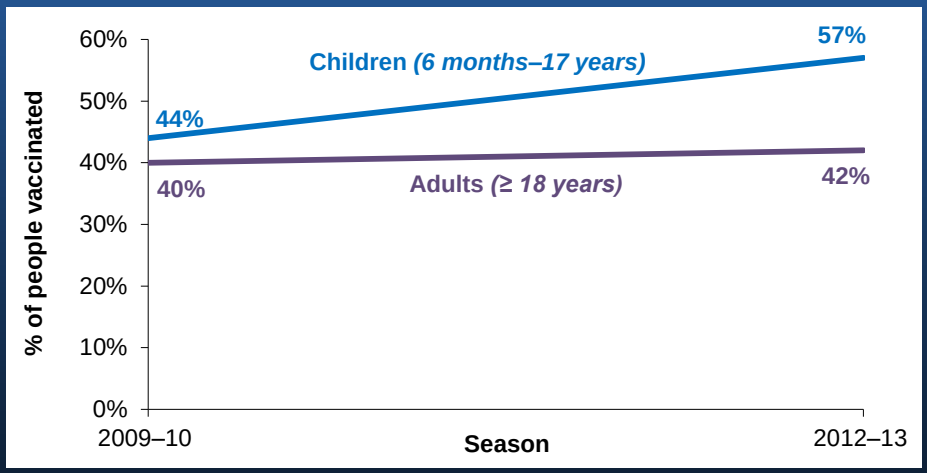
Influenza vaccination has prevented millions of illnesses and medical visits, and thousands of hospitalizations

Cumulative influenza illnesses and hospitalizations averted by influenza vaccination, 2005–2013, U.S.

Influenza seasons	Estimated number of cases averted	Estimated number of medically-attended cases averted	Estimated number of hospitalizations
2005–11*	13.6 M	5.8 M	112,900
2011–12†	1.5 M	720,000	18,900
2012–13‡	6.6 M	3.2 M	79,300
Total	21.7 M	9.8 M	211,100

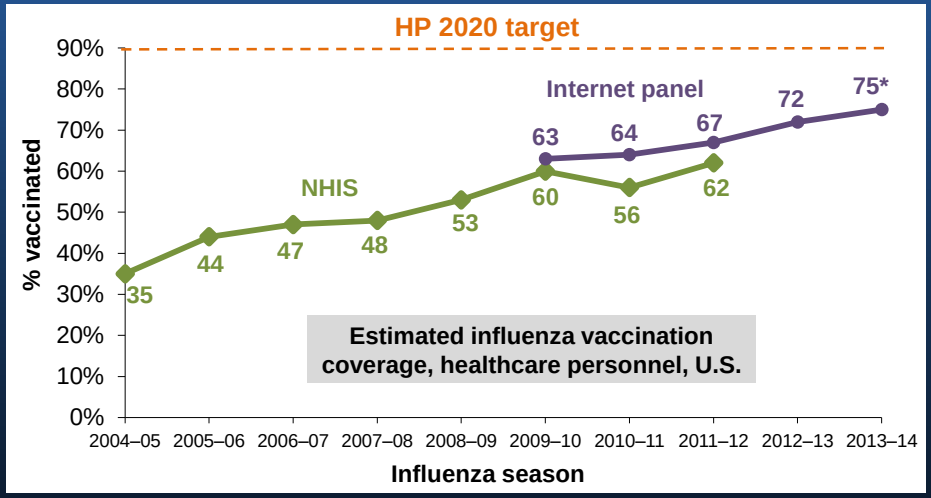
**Kostova D, et al. Influenza Illness and Hospitalizations Averted by Influenza Vaccination in the U.S., 2005-2011. PLoS One. 2013; 8(6): e66312. †Unpublished CDC data. ‡Estimated influenza illnesses and hospitalizations averted by influenza vaccination - US, 2012-13 influenza season. MMWR 2013; 62(49): 997-1000.*

Seasonal influenza vaccine coverage increased among children and adults



** 2009-10 estimates data are from Behavioral Risk Factor Surveillance System (BRFSS) (≥18 years) and the National 2009 H1N1 Flu Survey (≥ 6 months), www.cdc.gov/flu/fluvaxview/coverage_0910estimates.htm. 2012-13 estimates are from BRFSS (≥18 years) and National Immunization Survey (6 months-17 years), www.cdc.gov/flu/fluvaxview/coverage-1213estimates.htm*

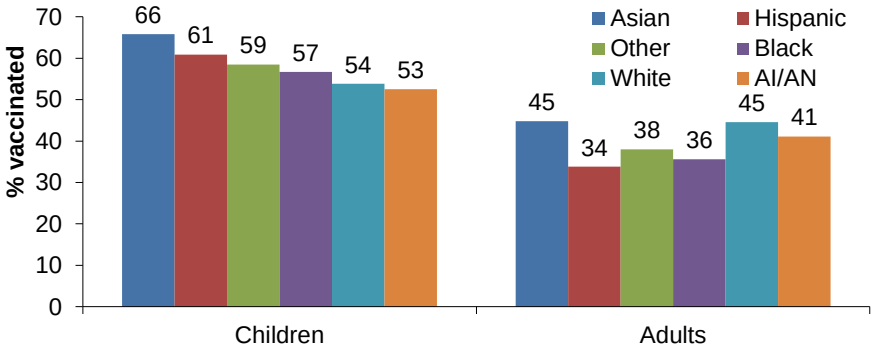
Vaccination coverage among health care personnel increased by 20%



*National Health Interview Survey (**NHIS**) - Lu et al. AJE. NHIS is data source for HP2020 objective Internet Panel Surveys - MMWR 2013;62(38); *Preliminary results*

Coverage among Hispanic, black, and Asian children was higher compared to non-Hispanic whites

Influenza vaccination coverage by race/ethnicity, 2012-13 season



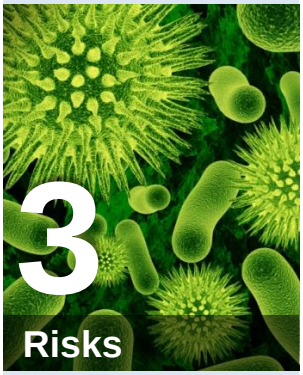
Other racial/ethnic groups exclude Hispanics
Sources: National Immunization Survey (NIS) (6 months-17 years) and Behavioral Risk Factor Surveillance System (BRFSS) (≥18 years)

Progress in influenza diagnostics: CDC's molecular detection kits

- Produce fast, accurate information from flu samples
- Lead to rapid public health response in the case of emerging novel virus infections
- Distributed to all states and National Influenza Centers globally
- Can determine type and subtype of a flu virus in hours, not days
- Lead to cost-savings at the state level

H7N9 virus detection kits

Global Health Security

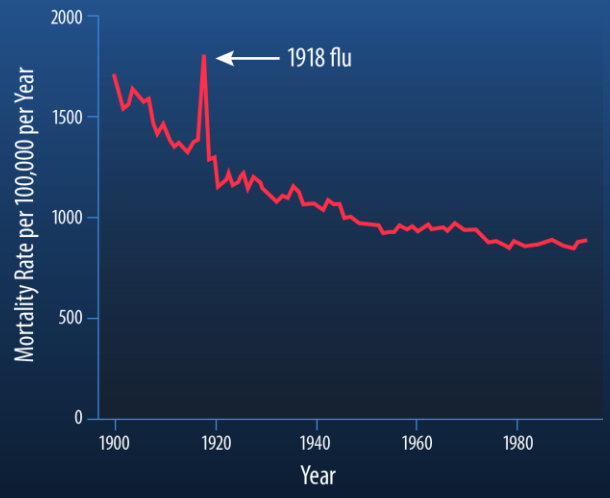


- Emerging organisms
- Drug resistance
- Intentional creation

- Societal commitment
- New technologies
- Success leads to success

- Prevent wherever possible
- Detect rapidly
- Respond effectively

More Americans died from the 1918–1919 influenza pandemic than died in World War I

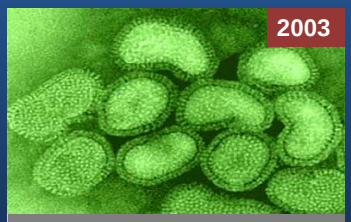



Flu quarantine, 1918, Iowa

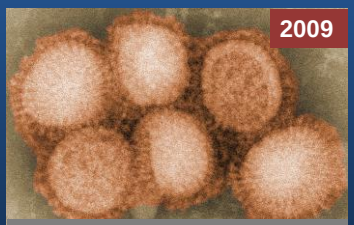

Live bird market, Asia, 2014

Armstrong GL, Conn LA, Pinner RW. Trends in infectious disease mortality in the United States during the 20th Century. JAMA 1999;281(1):61-66.

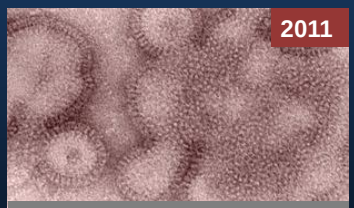
New influenza viruses have the potential to emerge as pandemic



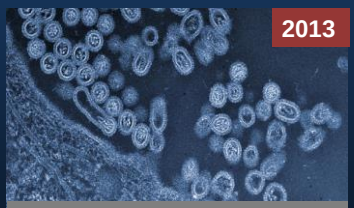
Avian Influenza A (H5N1)



Influenza A (H1N1)



Influenza A (H3N2) variant



Avian Influenza A (H7N9)

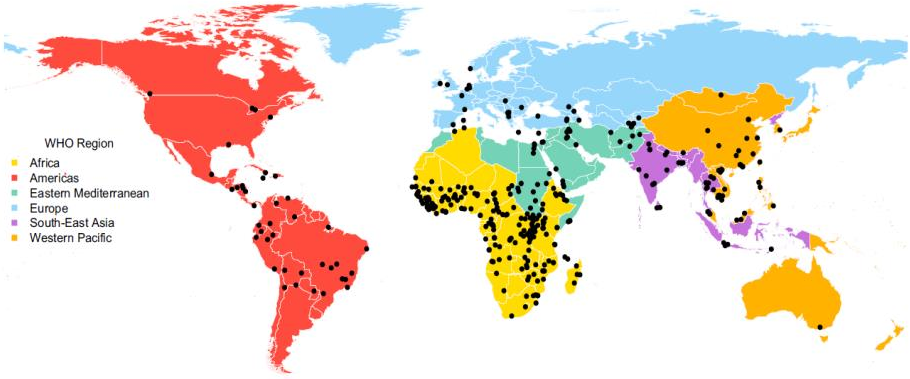
A health threat anywhere is a health threat everywhere

Global aviation network

Source: The Lancet 380:9857, 1-7 Dec 2012, pp. 1946-55.
www.sciencedirect.com/science/article/pii/S0140673612611519
Note: Air traffic to most places in Africa, regions of South America, and parts of central Asia is low. If travel increases in these regions, additional introductions of vector-borne pathogens are probable

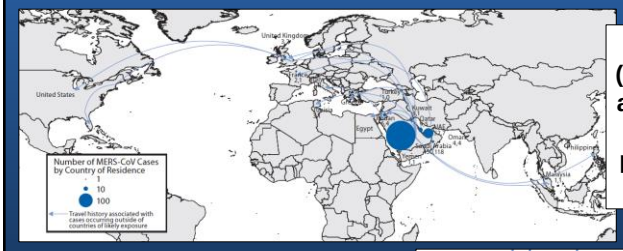
Outbreaks can start anywhere

Outbreaks reported by WHO, 1996-2009



Source: Chan EH, et al. Global capacity for emerging infectious disease detection, December 14, 2010, 107:50, pp. 21701-21706; www.pnas.org/cgi/doi/10.1073/pnas.1006219107
Note: Points mark reported origin of outbreak or, if unknown, where highest reported morbidity/mortality rates were recorded.

Diseases are just an airplane ride away



Confirmed cases of MERS (N = 536) as of May 9, 2014,* and history of travel from in or near the Arabian peninsula within 14 days of illness onset

Points of entry and volume of travelers on flights to the U.S. from Saudi Arabia and the United Arab Emirates, May-June 2014

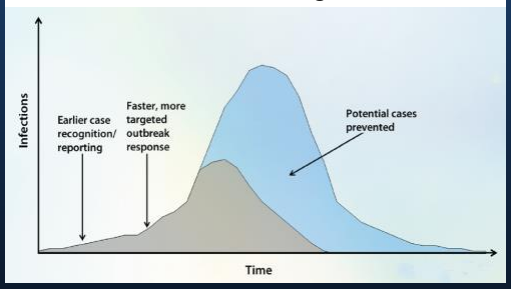
**Reported by WHO*
Source: MMWR Early Release, Vol. 63, May 14, 2014

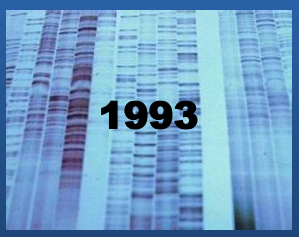
Advanced Molecular Detection saves lives, time, and money

- AMD includes new lab technologies that revolutionize how CDC investigates and controls outbreaks
- Enables CDC to detect outbreaks sooner and respond more effectively, saving lives, time, and money

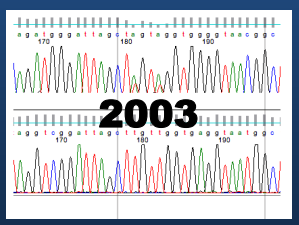
Detects pathogens in just ***hours*** or ***days***

Improving public health through AMD technologies





500 base pairs/day

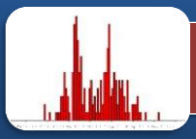


50,000 base pairs/day

50,000,000,000 base pairs/day

Human genome: 3,000,000,000bp

Advanced Molecular Detection combines cutting-edge approaches



Traditional epidemiology

+

Genomic sequencing

+

Bioinformatics

=

Advanced Molecular Detection

Key directions

- Improve vaccine coverage
- Improve influenza vaccines
- Enhance bioinformatics infrastructure
- Improve influenza surveillance in animal populations

CDC works 24/7 to save lives & protect people from health threats

Centers for Disease Control and Prevention
1600 Clifton Road NE, Atlanta, GA 30333
Phone: 1 800-CDC-INFO (232-4636)/TTY: 1 888-232-6348
Email: cdcinfo@cdc.gov Web: www.cdc.gov

CDC 24/7
Saving Lives.
Protecting People.™