It Starts With Us:
Why Healthcare Worker Immunization Matters

Paul J. Carson, MD, FACP

Professor Emeritus

Sanford Health, Infectious Disease

NDSU Dept. of Public Health

UND School of Medicine and Health Sciences

Faculty Disclosure

- Paul Carson has no relevant financial relationships with ineligible companies to disclose.

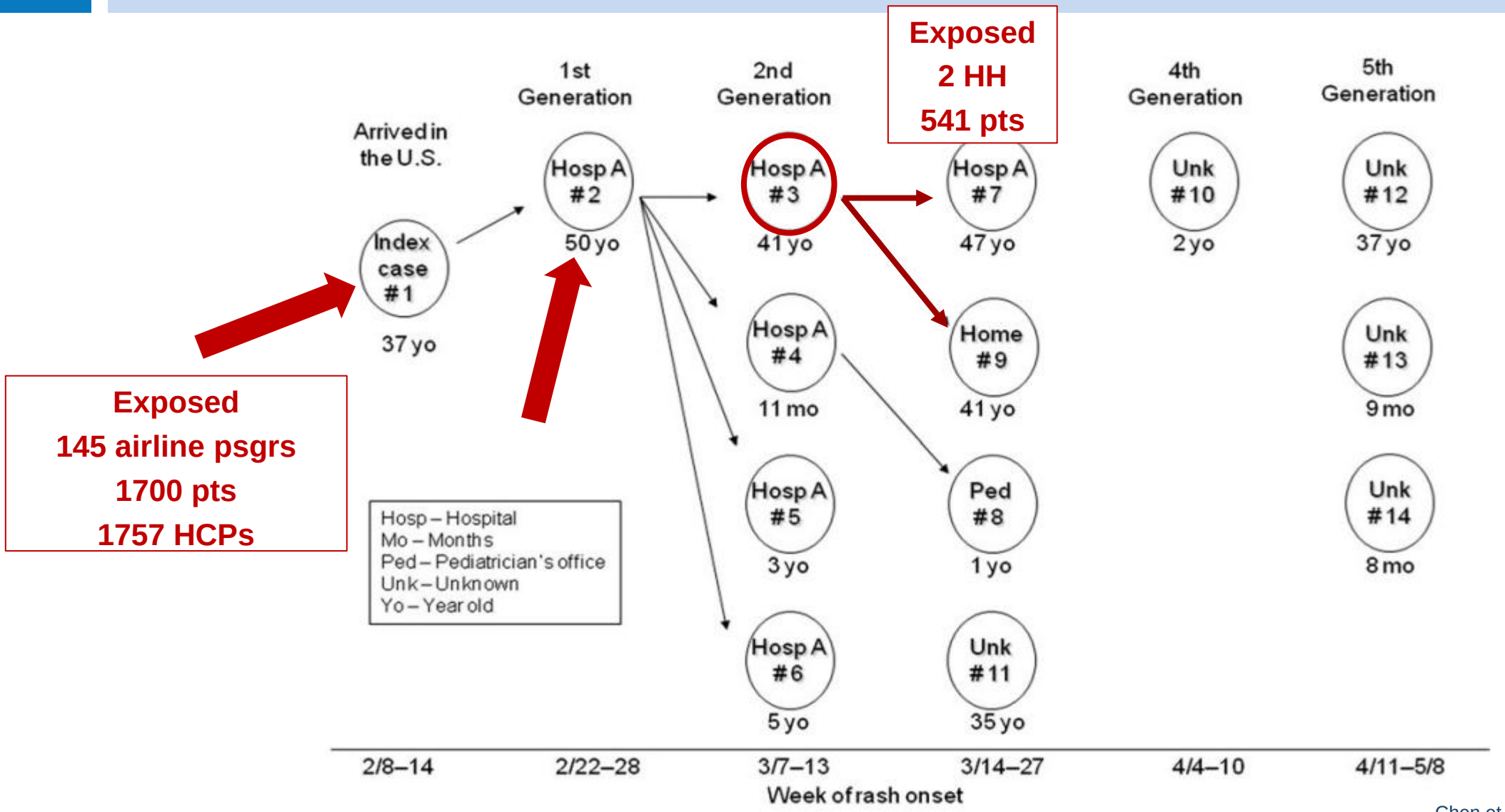
Chen et al. J Infect Dis. 2011 Jun 1;203(11).

Learning Objectives

- 1. List the current CDC-recommended immunizations for healthcare workers.
- 2. Explain the importance of healthcare worker vaccination in reducing disease transmission, protecting vulnerable patients, and maintaining workforce.
- 3. Identify the potential benefits and challenges of implementing vaccine mandates for healthcare workers.

Chen et al. J Infect Dis. 2011 Jun 1;203(11).

A Cautionary Tale: Measles Outbreak in a Tucson Hospital - 2008



Chen et al. J Infect Dis. 2011 Jun 1;203(11).

Tucson Hospital Measles Outbreak: All Told

- Index case and most next generation cases were not suspected. Total of 14 cases, most acquired in HC facilities
- 8,231 contact investigations conducted for the 14 patients (58% were HCF exposures)
- Required rapid review of **14,844** HCP at 7 hospitals, and emergency vaccination of ~ **4,500 (30%)** HCP lacking documentation of adequate immunity
- The two main hospitals involved spent **~$800,000 ($1.2 million today)** responding to and containing the measles cases in their facilities

Chen et al. J Infect Dis. 2011 Jun 1;203(11).

“When meditating over a disease, I never think of finding a remedy for it, but instead, a means of preventing it”

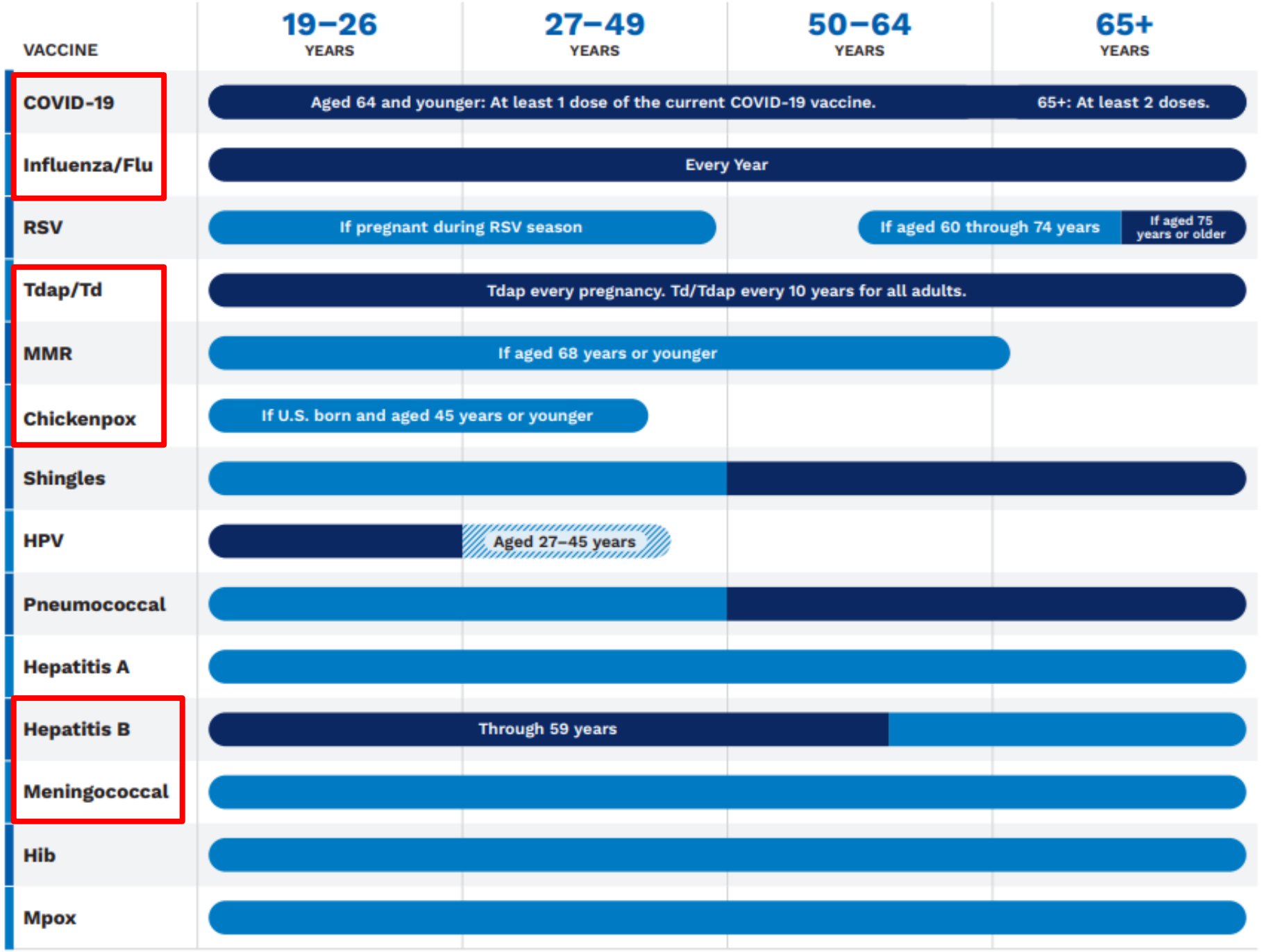
Louis Pasteur
(1822-1895)

Staying **up to date** on your vaccines is one of the best things you can do to protect your health.

If you are pregnant or have a medical condition that puts you at higher risk for infections, talk to your health care provider about which vaccines are right for you.

KEY

- ALL adults in age group should get the vaccine.
- SOME adults in age group should get the vaccine.
- Adults should talk to their health care provider to decide if this vaccine is right for them.



ACP American College of Physicians

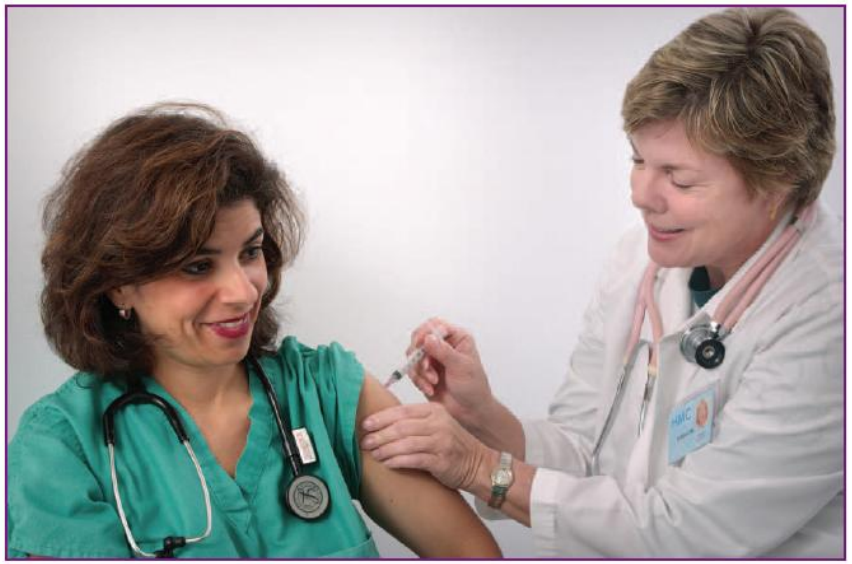
CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

ACIP immunization recommendations for HCP, 2011

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Recommendations and Reports / Vol. 60 / No. 7
November 25, 2011

Immunization of Health-Care Personnel

Recommendations of the Advisory Committee on Immunization Practices (ACIP)



Who Are “Health Care Personnel (HCP)”?

- “….all paid and unpaid persons working in health-care settings who have the **potential** for exposure to patients and/or to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air

ACIP recommendations for HCP

- Employer must consider:

  - Nature of employment of HCP
  - Likelihood of exposure to VPDs and the potential consequences of not vaccinating susceptible HCP
  - Characteristics of the patient/resident population the facility serves - how likely they are to have VPDs
  - Risks and consequences of infected HCP transmitting VPDs to patients

Vaccines recommended for susceptible HCP

Vaccine	Schedule
Hepatitis B	Three doses
Influenza	One dose annually
Measles	Two doses
Mumps	Two doses
Rubella	One dose
Tetanus, diphtheria, and acellular pertussis (Tdap)	One dose
Varicella-zoster (VZV)	Two doses
COVID0-19	At least 1 dose, seasonal updates for HCW's

*Meningococcal vaccines are recommended for microbiologists who work with *N. meningitidis* isolates

Are there any federal or state requirements for immunization of HCP?

- There are no federal requirements that HCP be immune to (or receive immunization for) any VPD; there may be state or local requirements (none in ND)

- Some healthcare facilities require immunity/immunization for specific VPDs as a condition of employment (most often measles, mumps, rubella, varicella, and some for influenza and COVID-19)

OSHA Vaccine Requirement

- The only vaccine addressed by federal OSHA is hepatitis B vaccine in the Bloodborne Pathogen standard

- Per OSHA, employers are required to offer hepatitis B vaccine to susceptible employees who may be exposed to blood or other potentially infectious materials as part of their job duties (the vaccine is not required)

- If the vaccine is declined, a declination form must be signed

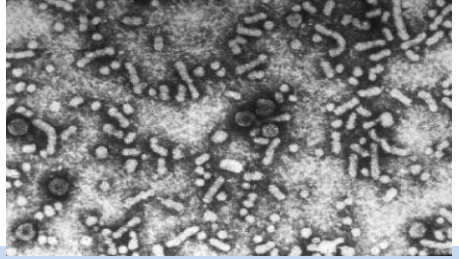
Knowledge Check

Which of the following vaccines is currently recommended by the CDC for all healthcare workers?

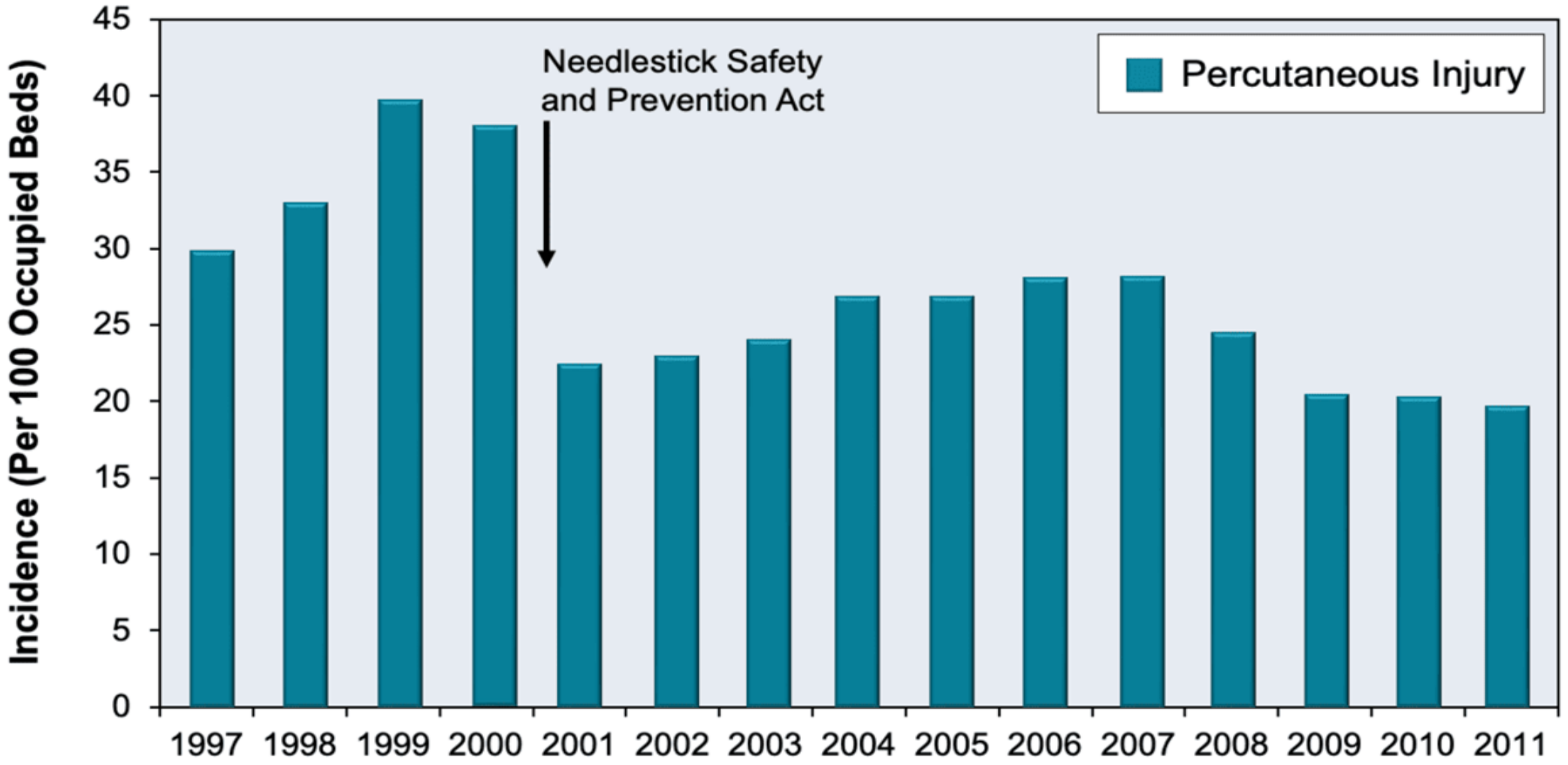
A. Hepatitis B
B. MMR (measles, mumps, & rubella)
C. Varicella (chickenpox)
D. All of the above

Correct answer: D

Hepatitis B



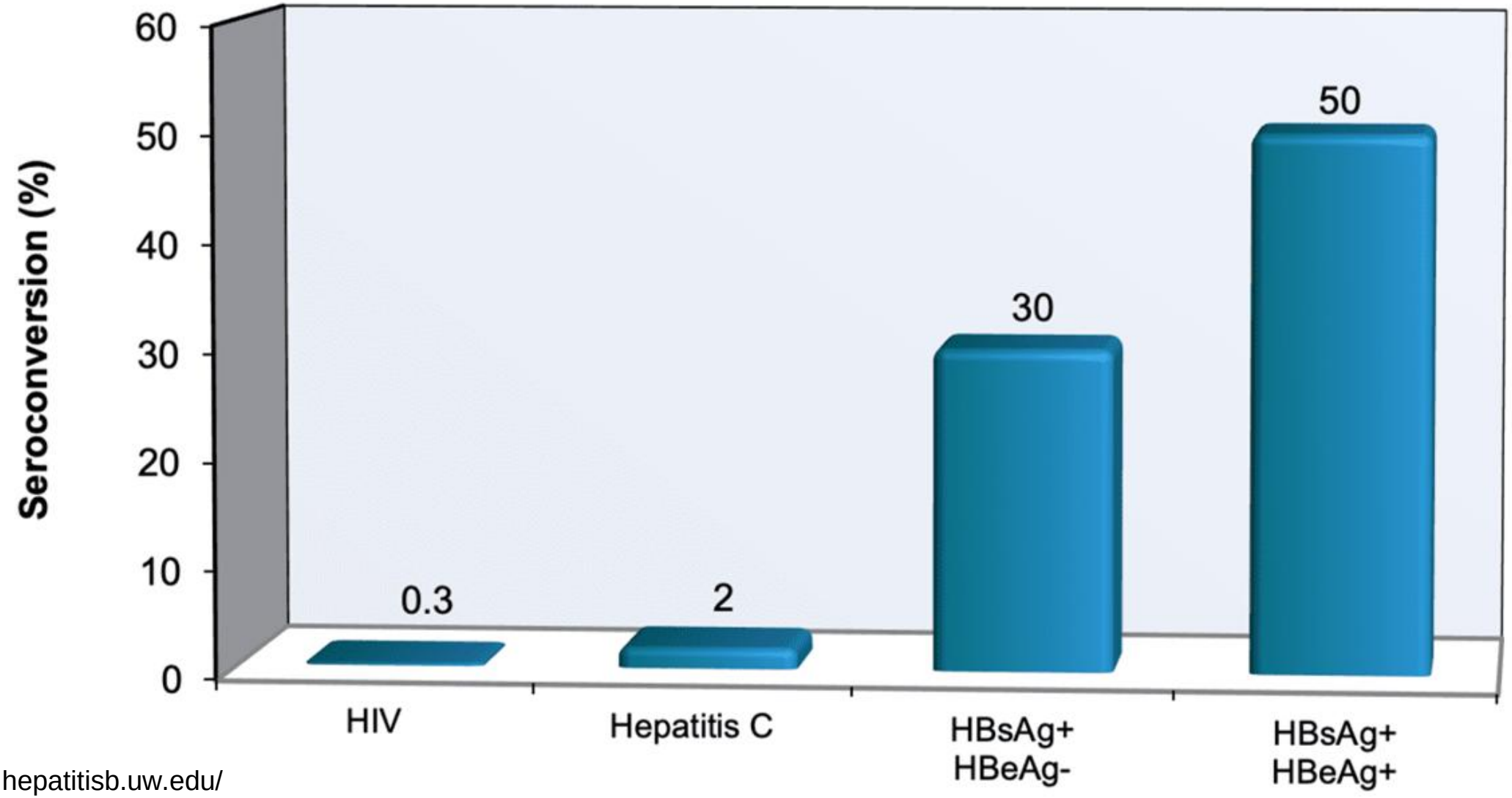
Incidence of Percutaneous Injury and Mucosal Exposure in HCWs



* per 100 occupied beds

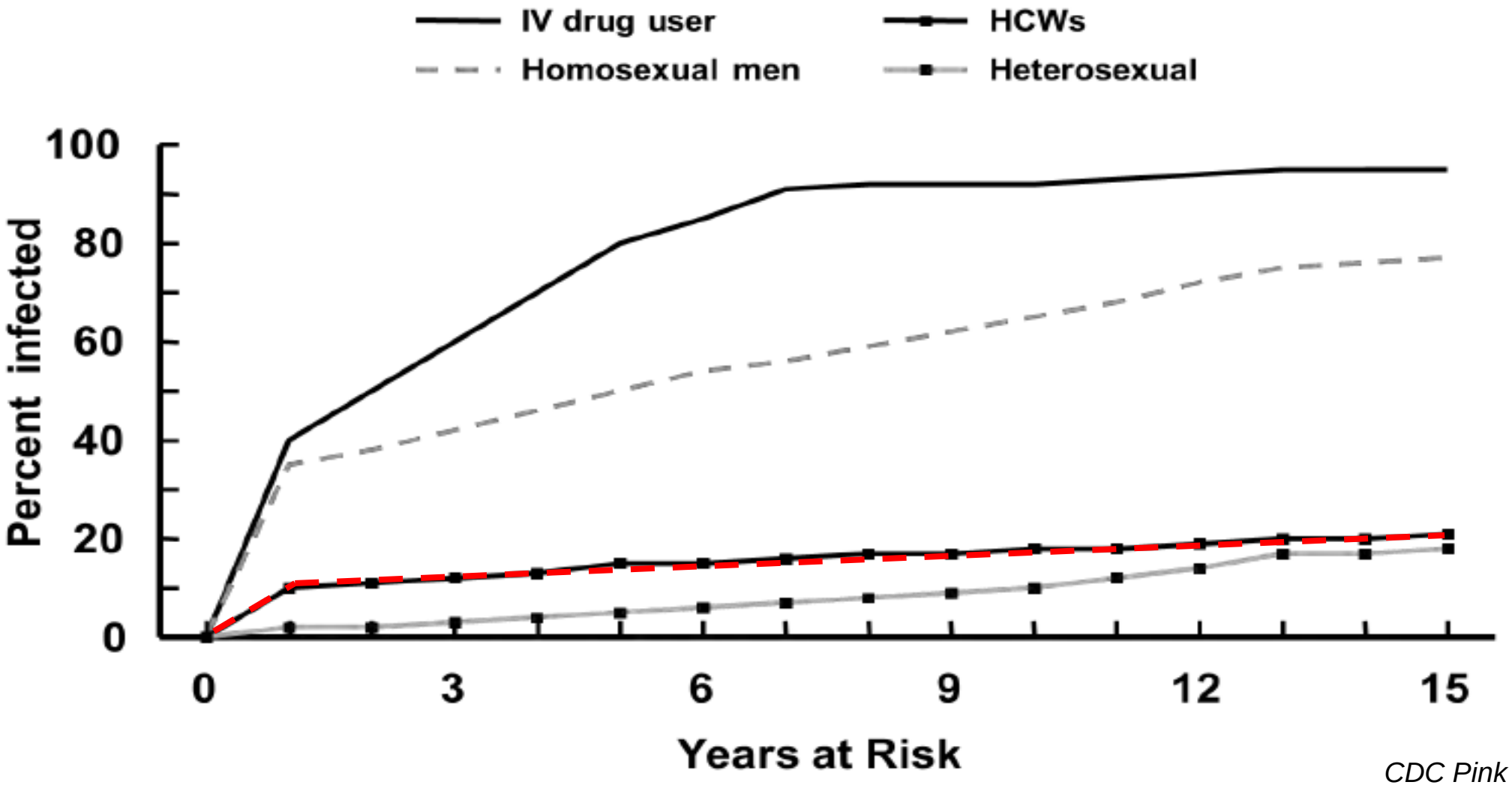
https://www.hepatitisb.uw.edu/

Risk of Seroconversion with Percutaneous Injury fr BB Pathogen



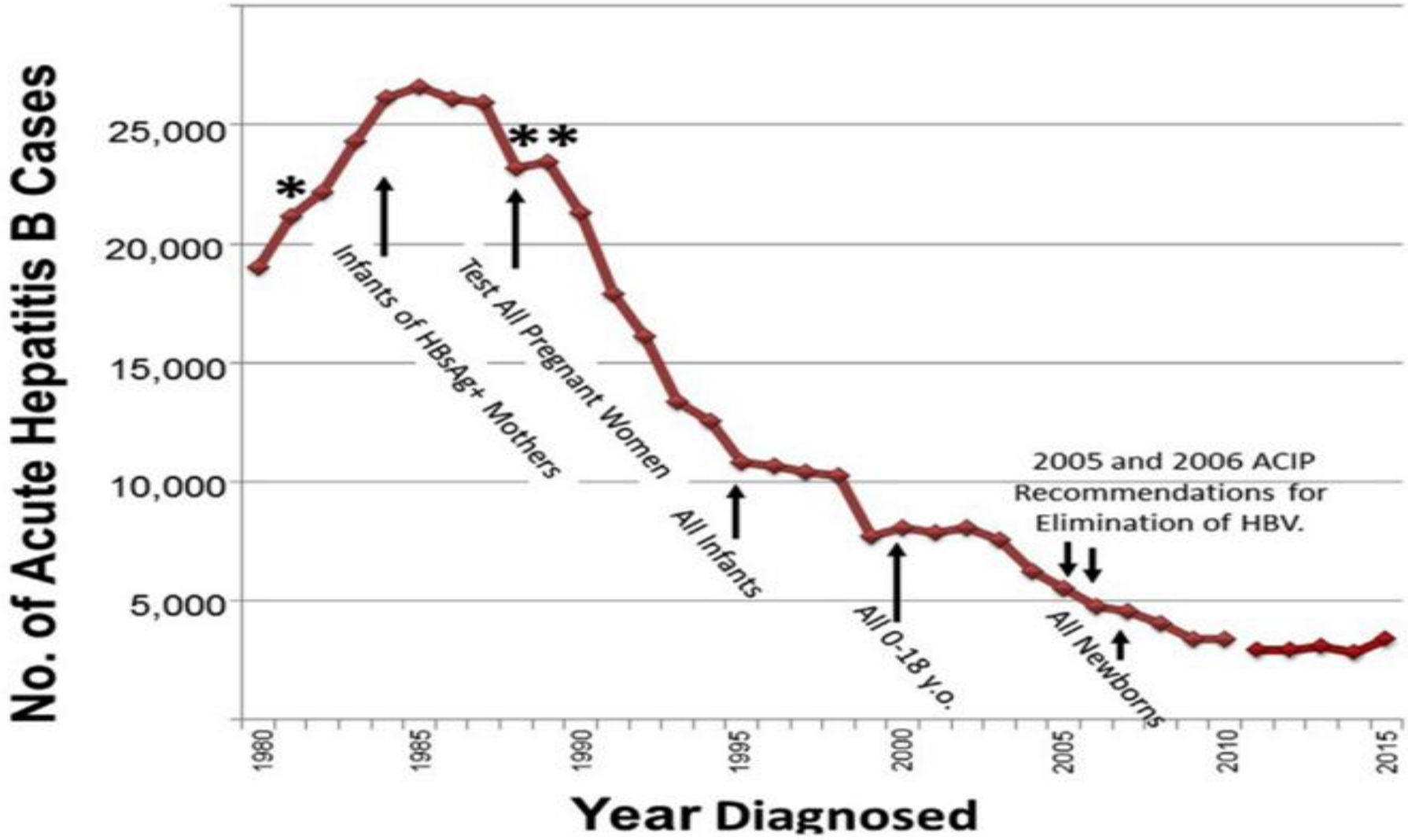
https://www.hepatitisb.uw.edu/

Hepatitis B Virus Infection by Duration of High Risk Behavior



CDC Pink Book

Declining Incidence of Hep B in U.S.



Stevens CE. *Biologicals*. 2017

HBV Vaccine

➢ Recommended for any HCW with potential exposure to blood or body fluids

▪ Composition	Recombinant HBsAg +/- CpG 1018 adjuvant
▪ Efficacy	92% HCWs < 40 yo, 84% in HCWs > 40 yo
▪ Duration of immunity	~ 75% HCWs have Abs 10-31 yrs after immunization
▪ Schedule	3 doses, given at 0, 1, and 6 mos (minimum interval – 4 wks between dose 1 and 2, 8 wks between 2 and 3, and 16 weeks between 1 and 3)

Protective Ab Levels and Anamnestic Response

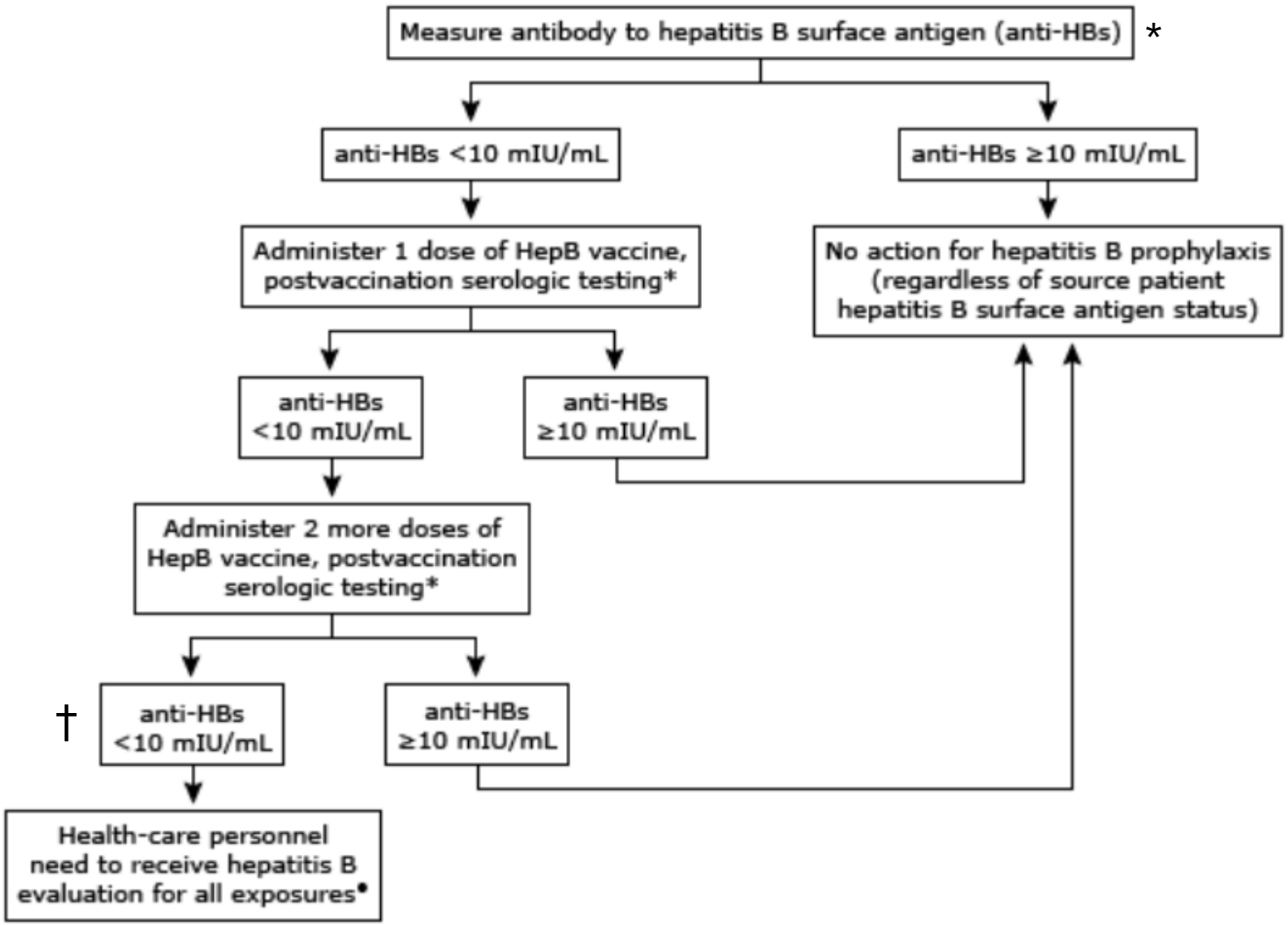
- Level of Anti-HBs considered protective is > 10 mIU/mL
- Levels of antibodies decline over time - more rapid if vaccinated as infant
- If initial responder - essentially all will have an anamnestic response with re-exposure
- Problem: we don’t test routinely after vaccination, so don’t know who is a “responder”

Hepatitis B testing for immunity after vaccination

- Newly vaccinated HCP should be tested for immunity 1-2 months after the completion of the 3-dose series
  - Revaccinate if inadequate response

- Vaccinated but unknown prior response
  - Measure Ab
    - Boost if < 10 mIU/mL
    - Recheck titer after 1-2 mos. If still low, revaccinate w Heplisav
  - Alternative: test if Bb exposure. If < 10 mIU/mL……..
    - HBIG and boost if high-risk exposure

CDC recommended pre-exposure evaluation for HCP previously vaccinated with complete ≥3 dose hepatitis B vaccine series who have not had post-vaccination serologic testing*

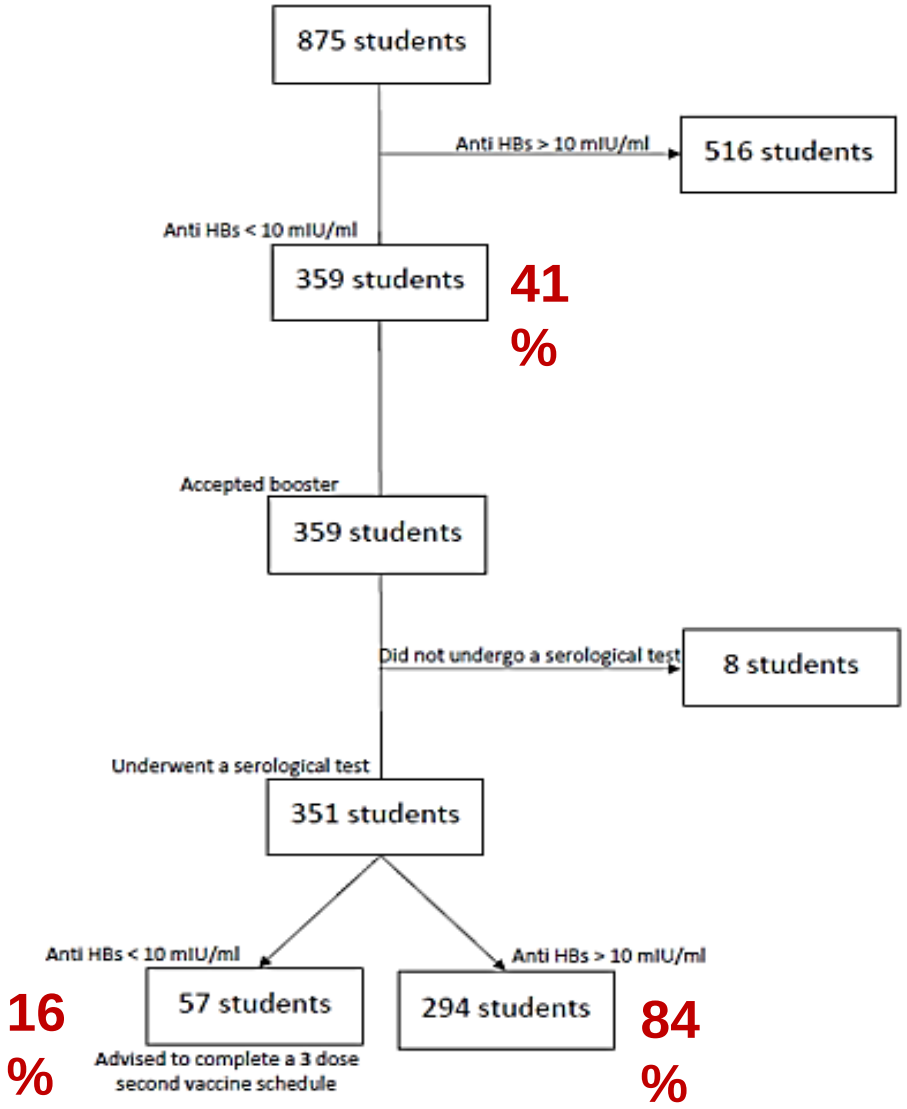


*Should be performed 1–2 months after the last dose of vaccine using a quantitative method that allows detection of the protective concentration of anti-HBs (≥10 mIU/mL), e.g., enzyme-linked immunosorbent assay (ELISA).

†A nonresponder is defined as a person with anti-HBs <10 mIU/mL after ≥6 doses of hepatitis B vaccine. Persons who do not have a protective concentration of anti-HBs after revaccination should be tested for HBsAg. If positive, the person should receive appropriate management or vaccination.

Serologic evidence of protection, by years since vaccination among persons vaccinated at age <1 year

- The recommendation for universal infant hepatitis B vaccination in the U.S. was made in 1991 and vaccine was recommended for all unvaccinated children in 1997
- Many people in this cohort are now in the workforce



Vaccines **2023**, *11*, 1326. https://doi.org/10.3390/vaccines11081326

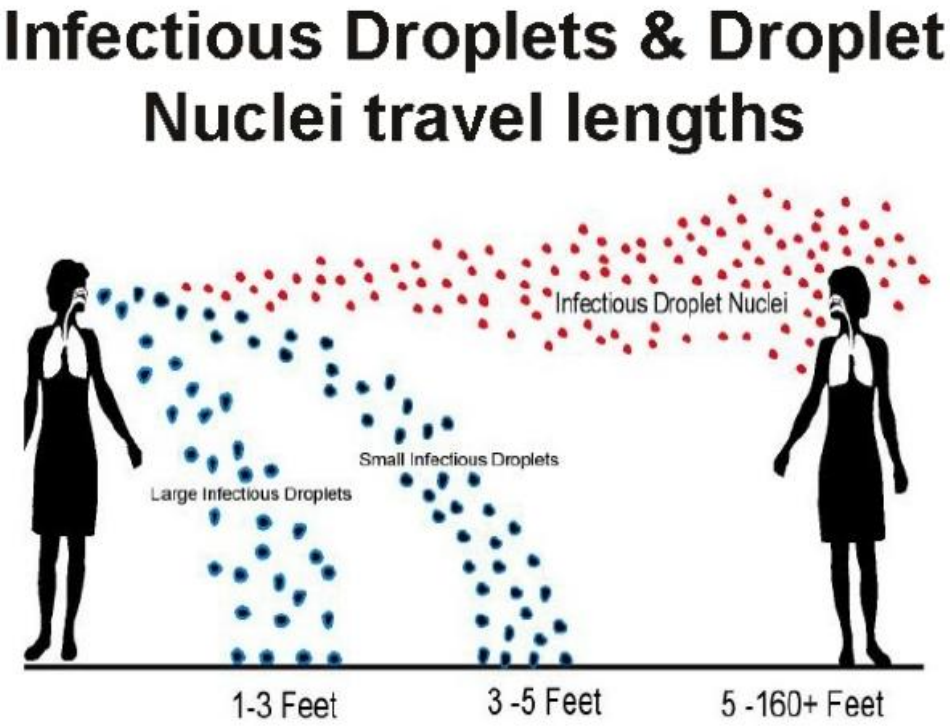
Risk Factors for Initial Poor Vaccine Response

- Age > 40
- Male gender
- Smoking
- Obesity
- Immune deficiency

If non-responder after traditional 3-dose vaccine series, should get 2nd series with Heplisav (adjuvanted Hep B)

Measles

Measles transmission



- Measles is transmitted via the airborne route and is thought to be one of the most infectious communicable diseases; R_0 =12-18
- Transmission in HC settings well documented
- HCP have been infected in recent measles outbreaks
- Still endemic in much of the world outside of North and South America.

NEWS NORTH DAKOTA

North Dakota reports first case of measles since 2011

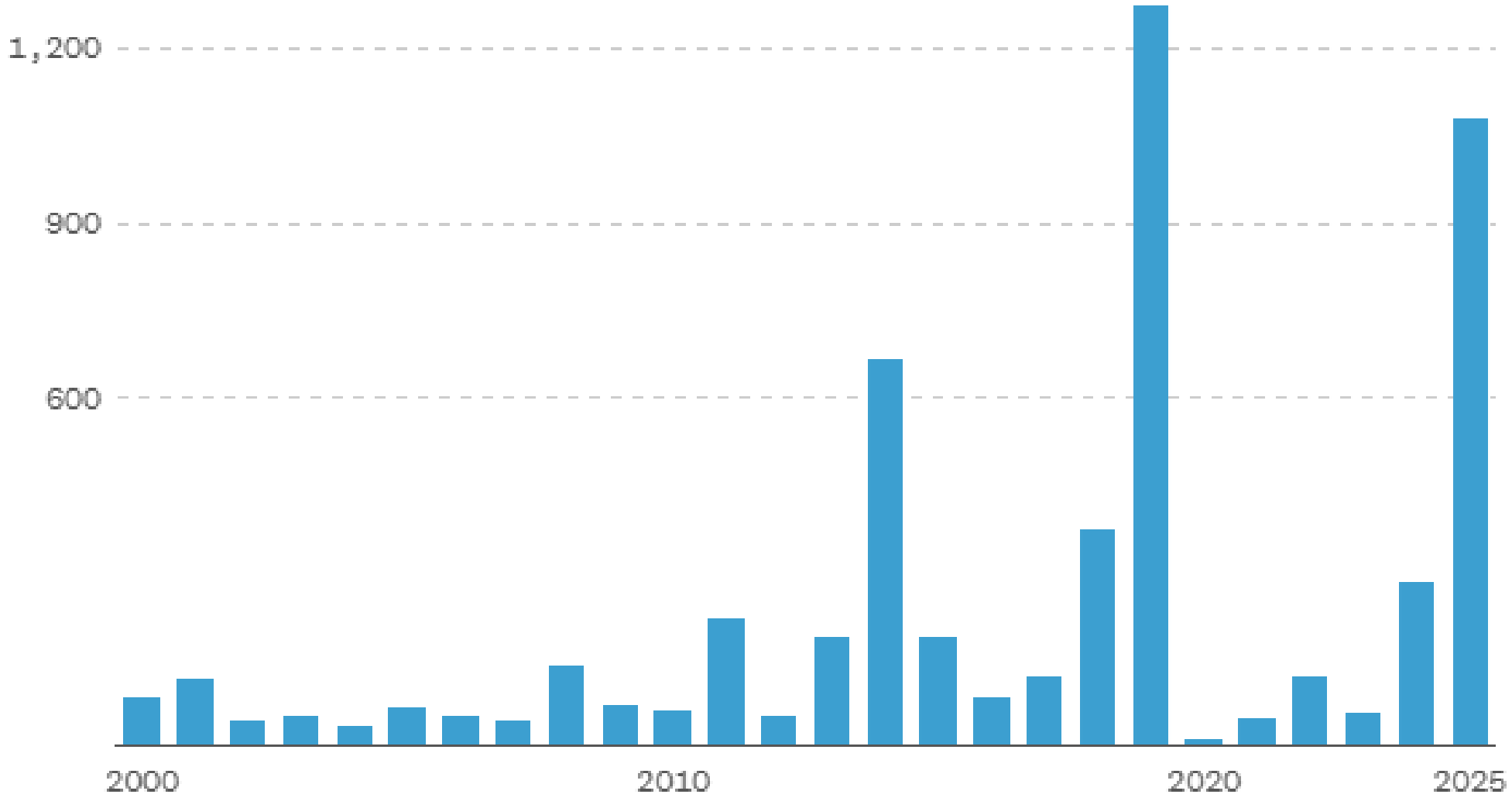
The child who contracted the virus once thought to be eliminated in the U.S. was unvaccinated, state health officials said.

A vial of the measles vaccine. Forum News Service

INFORUM
Powered by The Forum and WDAY

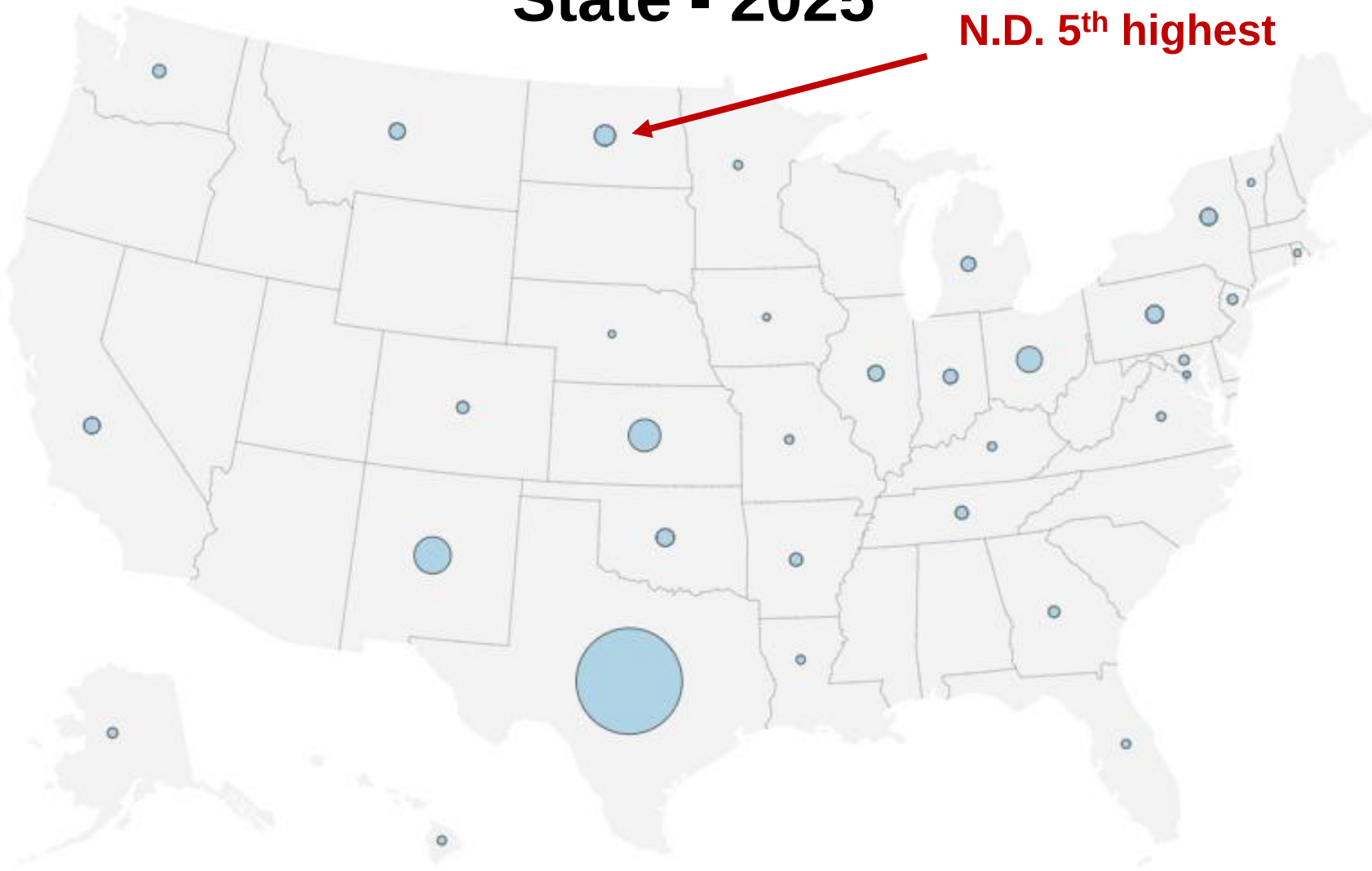
Measles cases in the U.S.

Notes: 2025 data is current as of May 27.
Source: NBC News tally of state health departments, CDC via Statista



U.S. Measles Cases by State - 2025

N.D. 5th highest



Notes: Data as of May 27.
Source: NBC News tally of state health departments
Graphic: Ash Reynolds / NBC News

Newborn babies exposed to measles in West Texas hospital amid outbreak

Hospital staff are giving infants barely three days old antibody injections to fight the virus.

By **Jennifer Flores**, *Digital Content Producer*
March 15, 2025

Measles, mumps, rubella vaccine in a vial, immunization and treatment of infection, scientific experiment.
Kittisak Kaewchalun /Getty Images

Presumptive evidence of immunity to measles

- Written documentation of vaccination with 2 doses of live measles virus-containing vaccine*, or
- Laboratory evidence of immunity† (IgG ab), or
- Laboratory confirmation of disease, or
- Birth before 1957§

*The first dose of MMR vaccine should be administered on or after age 12 months; the second dose of measles- or mumps-containing vaccine should be administered no earlier than 28 days after the first dose. Confers 98% protection rate.

†Measles IgG in serum; equivocal results should be considered negative.

§ Although most persons born <1957 will be immune to measles, 2-9% will not be. Healthcare facilities should consider vaccinating HCP born <1957 who lack evidence of measles immunity. Healthcare facilities should recommend 2 doses of MMR vaccine for such persons during a measles outbreak.

Mumps, Rubella, and Varicella

Mumps, Rubella, and Varicella

- Varicella is airborne spread, mumps and rubella are droplet

- **Presumption of Immunity:**
  - Documentation of 2 doses of live virus vaccine (1 dose adequate for rubella)
  - Laboratory evidence of immunity (IgG Abs, prior prenatal testing for Rubella ok), or
  - Laboratory confirmation of disease (doctor interview ok for Varicella), or
  - Birth before 1957 for rubella and mumps (not Varicella)

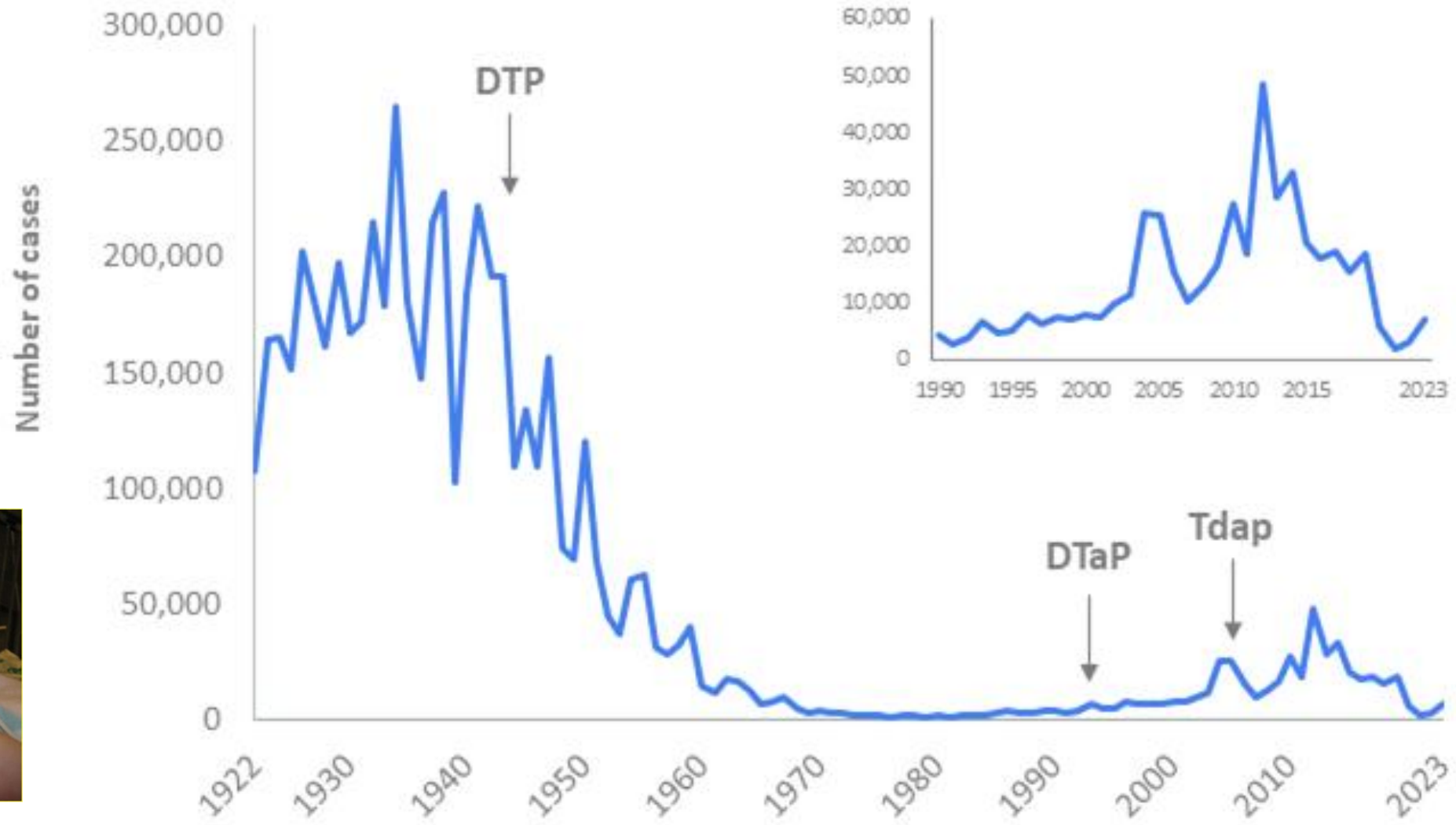
Transmission of Varicella vaccine virus from vaccine recipients <u>with vaccine rash</u>

- The risk is low, but transmission has been documented after exposure to persons with a vaccine rash in households and long-term care facilities

- No transmission documented after vaccination of HCP

- However, consider precautions for HCP in whom a vaccine rash occurs after vaccination
  - Avoid contact with persons without evidence of immunity at risk for severe disease and complications until all lesions resolve (i.e., are crusted over or fade away) or no new lesions appear in a 24-hour period

Reported NNDSS pertussis cases: 1922-2023



SOURCE: CDC, National Notifiable Diseases Surveillance System

Infant girl with whooping cough

https://www.youtube.com/watch?v=S3oZrMGDMMw

Layla's coughing spells - pertussis (whooping cough) despite vaccination

https://www.youtube.com/watch?v=Rmlo2to0ogs

“New normal” of pertussis in the United States

- Incidence increasing since the 1980s esp in infants
- Cyclical with peaks every 3-5 years – in 2014, California had an epidemic with >11,000 cases
- Immunity via vaccine or disease wanes over time; acellular pertussis vaccines (used since 1997) << whole cell vaccine
- Most adults are susceptible to pertussis; very few have received Tdap, and those who have received it are likely to be susceptible again within a few years
- Until there is a better pertussis vaccine, incidence will stay high and epidemics will occur every few years

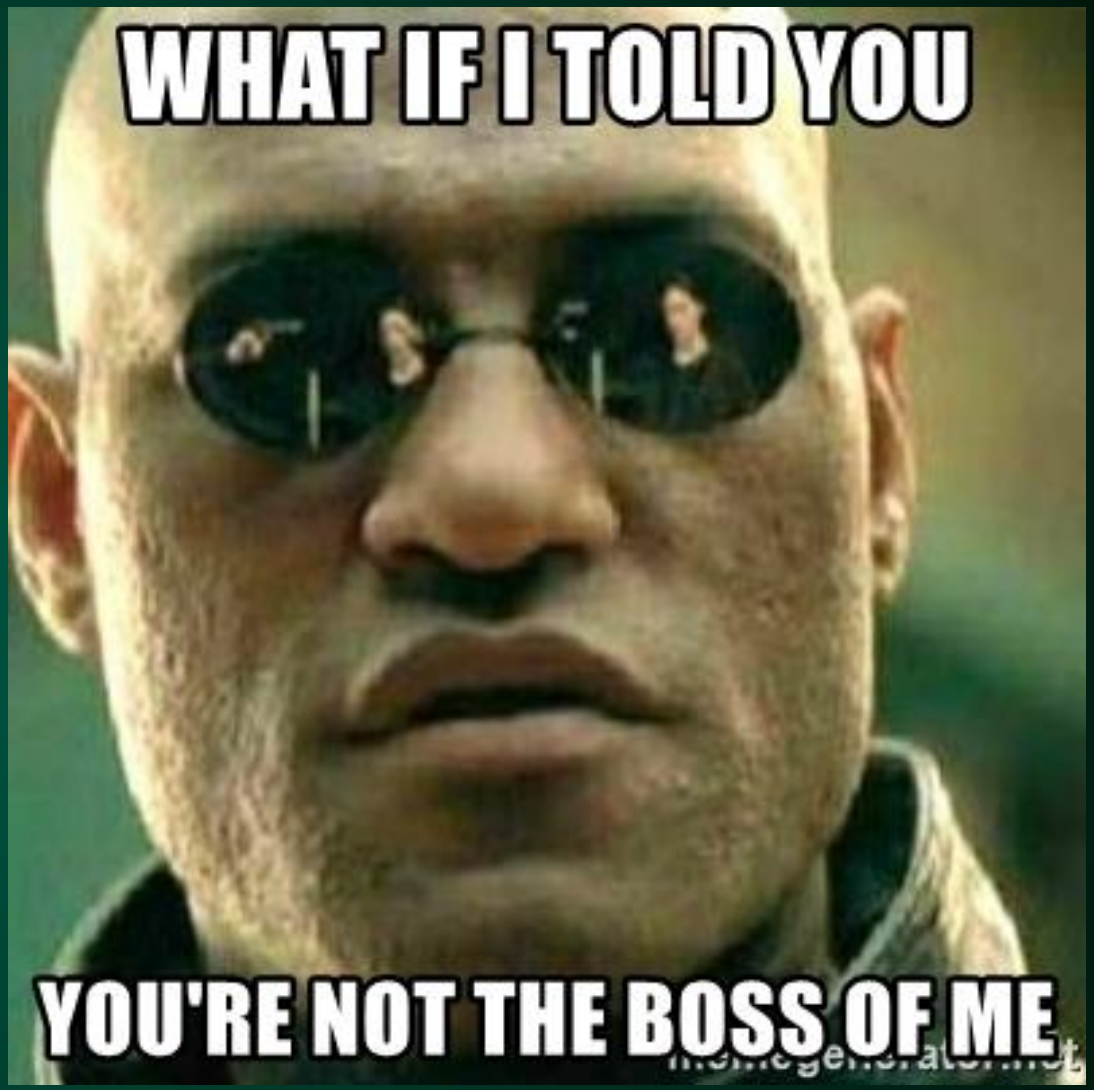
Tdap vaccine

- Tdap was licensed in 2005 and has been recommended for HCP with direct patient contact since 2006
- Reduced antigen levels for diphtheria and pertussis
- Regardless of age, HCP without documentation of Tdap immunization should receive it – there is no minimum interval between the last dose of Td and Tdap
- Only one dose of Tdap is currently recommended, including for HCP, other than for pregnant women who are recommended to receive Tdap in the third trimester of every pregnancy (so maternal antibodies can help protect young infants until they are old enough to be vaccinated themselves)


MY
BODY
MY
CHOICE
NO VACCINES
NO MASKS
NO MICROCHIP
NO MANDATES

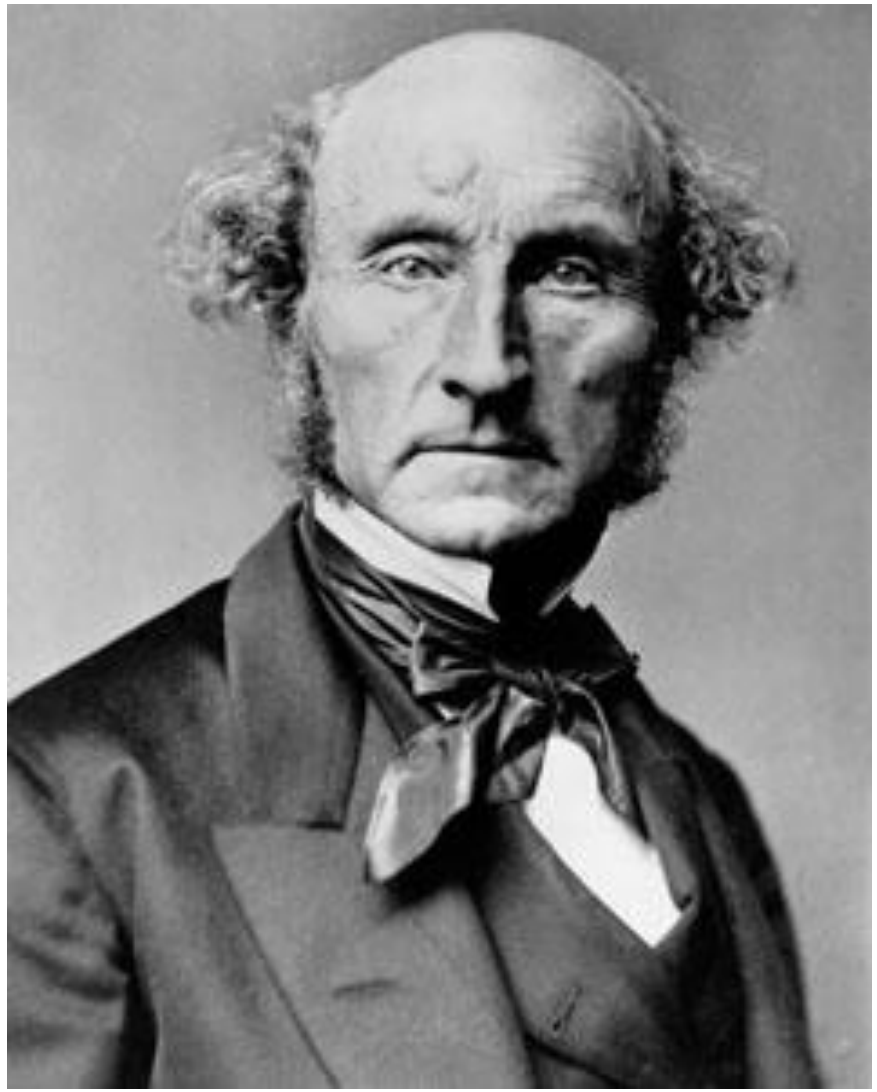

STOP
MANDATORY
VACCINES
I CALL
THE
SHOTS


World Freedom Now!
'truth over fear'
BEN, AGE 32
KILLED BY THE
JOHNSON&JOHNSON VACCINE
SHIREL, AGE 22
KILLED BY THE
PFIZER VACCINE
THE GREAT RESET
A New World Order Plan
Using the Created Pandemic
To Lock Down, Loot,
Control, And Enslave Us,
Through Their Surveillance State
Resist and
Take Control of Your Life,
Before They Do!
UNMASKED
UNVAXXED
UNAFRAID
Anthony Fauci
STAND UP FOR YOUR RIGHTS
NO MANDATORY VACCINES
NO VAX PASSPORTS


WHAT IF I TOLD YOU
YOU'RE NOT THE BOSS OF ME

Personal Liberty
Individual Choice
Medical Freedom

Common Good
Solidarity
Public Health



“The only purpose for which power can be rightfully exercised over any member of a civilized community, against his will, is to prevent harm to others”

John Stuart Mill
British Philosopher

Legality of Mandates

- Longstanding precedent for government mandates
  - Jacobson v Massachusetts, 1905, smallpox
  - School entry mandates for immunization

- Employer precedent
  - Doctrine of “employment at will”
  - Exception is collective bargaining agreements

New Texas law prohibits COVID-19 vaccine mandates by private employers

Idaho Capital Sun

GROWTH + AFFORDABILITY HEALTH

Responding to governor's veto, Idaho Legislature passes new 'medical freedom' bill

Bill would ban vaccine, medical diagnoses or treatment requirements by Idaho businesses, schools and governments

BY: **KYLE PFANNENSTIEL** - APRIL 4, 2025 4:45 PM

Making the Case for Mandatory Health Care Worker Immunization: Influenza? COVID?

Are There Unique Considerations for Healthcare Workers?

Protecting the Most Vulnerable

Elderly

Infants and Immunosuppressed

No vaccine is 100% - what about the child that didn't

Inconvenient Facts:

Fact #1: U.S. Population is not very good at getting the flu vaccine, worse about the COVID vaccine, and HCWs are only a little better

Facility mandates increase rates

CDC Recommendations

- 1981 CDC recommends all HCW's receive annual influenza immunization

- Clinics and Hospitals since then have put out massive efforts to educate and encourage HCW immunization
  - Influenza blitzes, "Drive-By Shootings", Education etc.

Relative Impact of Various Strategies on Health Care Worker Influenza Vaccination Coverage

Intervention and study	Preintervention immunization rate, %	Postintervention immunization rate, %	Overall change in vaccination rate, %	Randomized, controlled trial of intervention	Implemented with other interventions
Declination					
Polgreen et al [23]	54	65	+11	No	Yes
Bertin et al [25]	38	55	+17	No	Yes
Bibner et al [27]	43	65	+22	No	Yes
Mandatory vaccination					
Virginia Mason [37]	30	98	+68	No	Yes
BJC HealthCare [39]	71	99	+28	No	Yes
Education and promotion					
Harbarth et al [31]	13	37	+24	No	Yes
Thomas et al [32]	8	46	+38	No	Yes
Mobile cart					
Sartor et al [29]	7	32	+25	No	Yes
Cooper et al [30]	8	49	+41	No	Yes
Incentives (raffle) [35]	38[a]	42	NS	Yes	Yes
Educational letter from leadership [35]	38[a]	39	NS	Yes	Yes
On-site expert education [33]	21[a]	22	NS	Yes	Yes

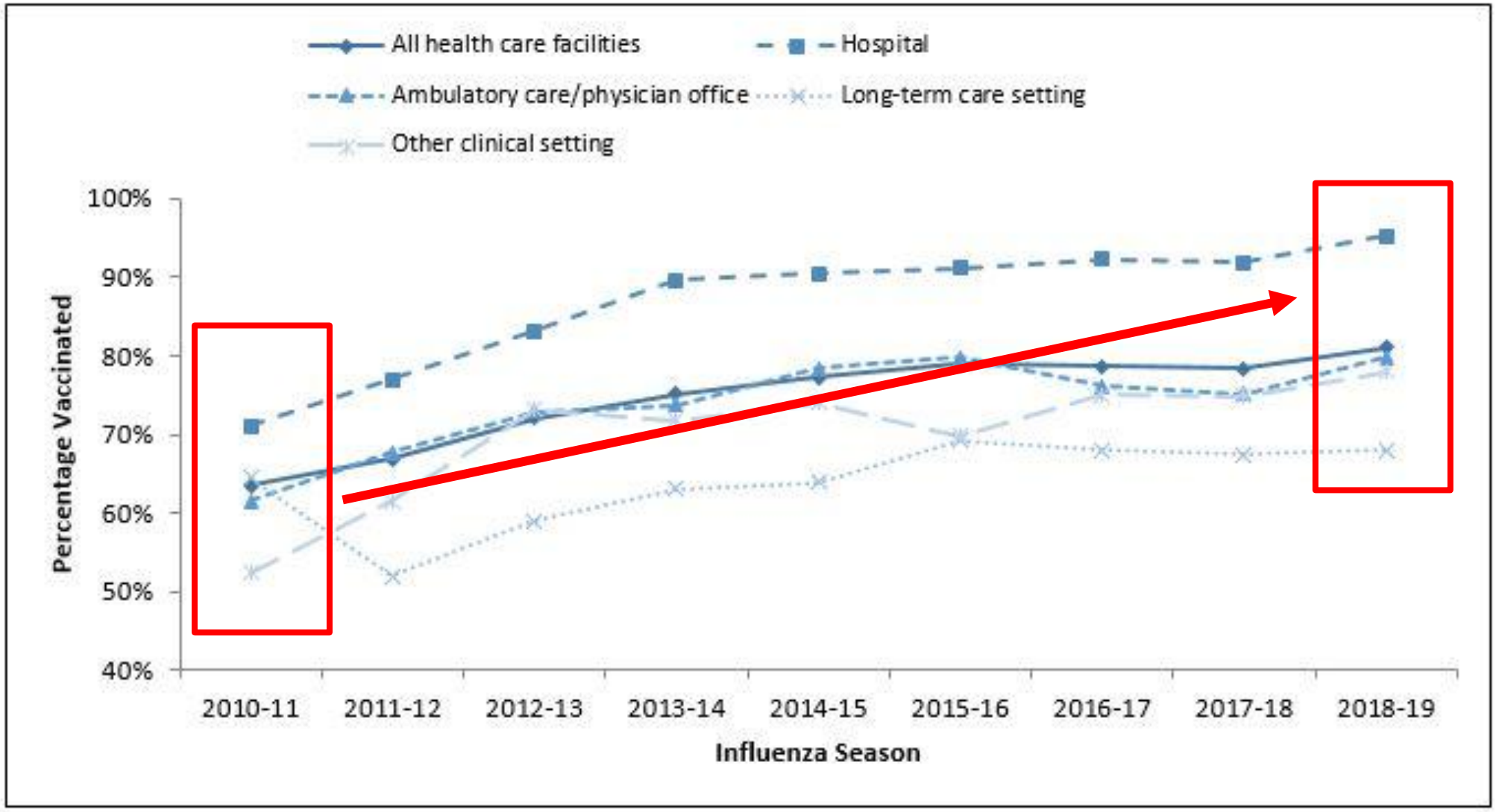
NOTE. NS, nonsignificant.

[a] Rate from nonintervention arm of concurrent randomized trial of intervention.

Clinical Infectious Diseases

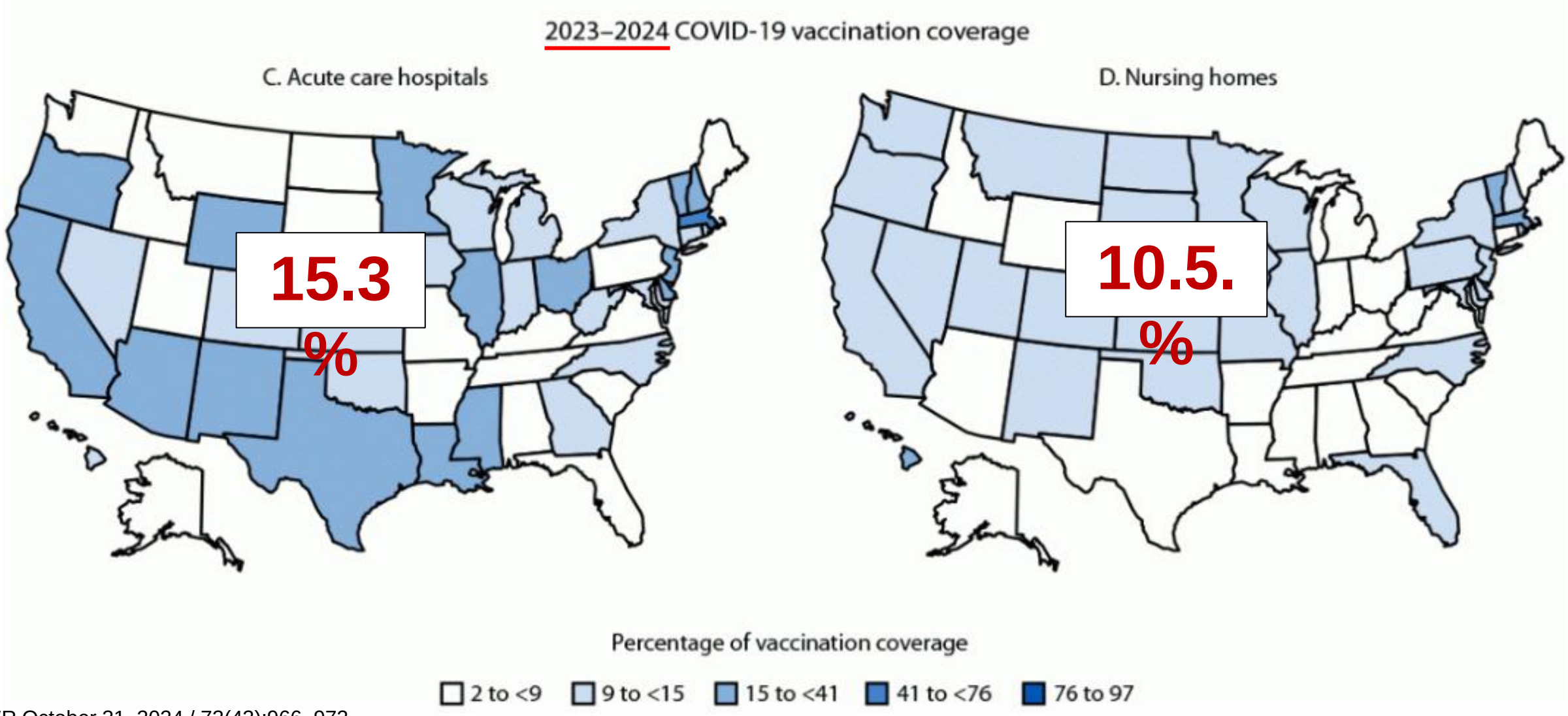
Weinstein R A , Talbot T R Clin Infect Dis. 2009;49:773-779

Uptake of Influenza Vaccination in HCWs



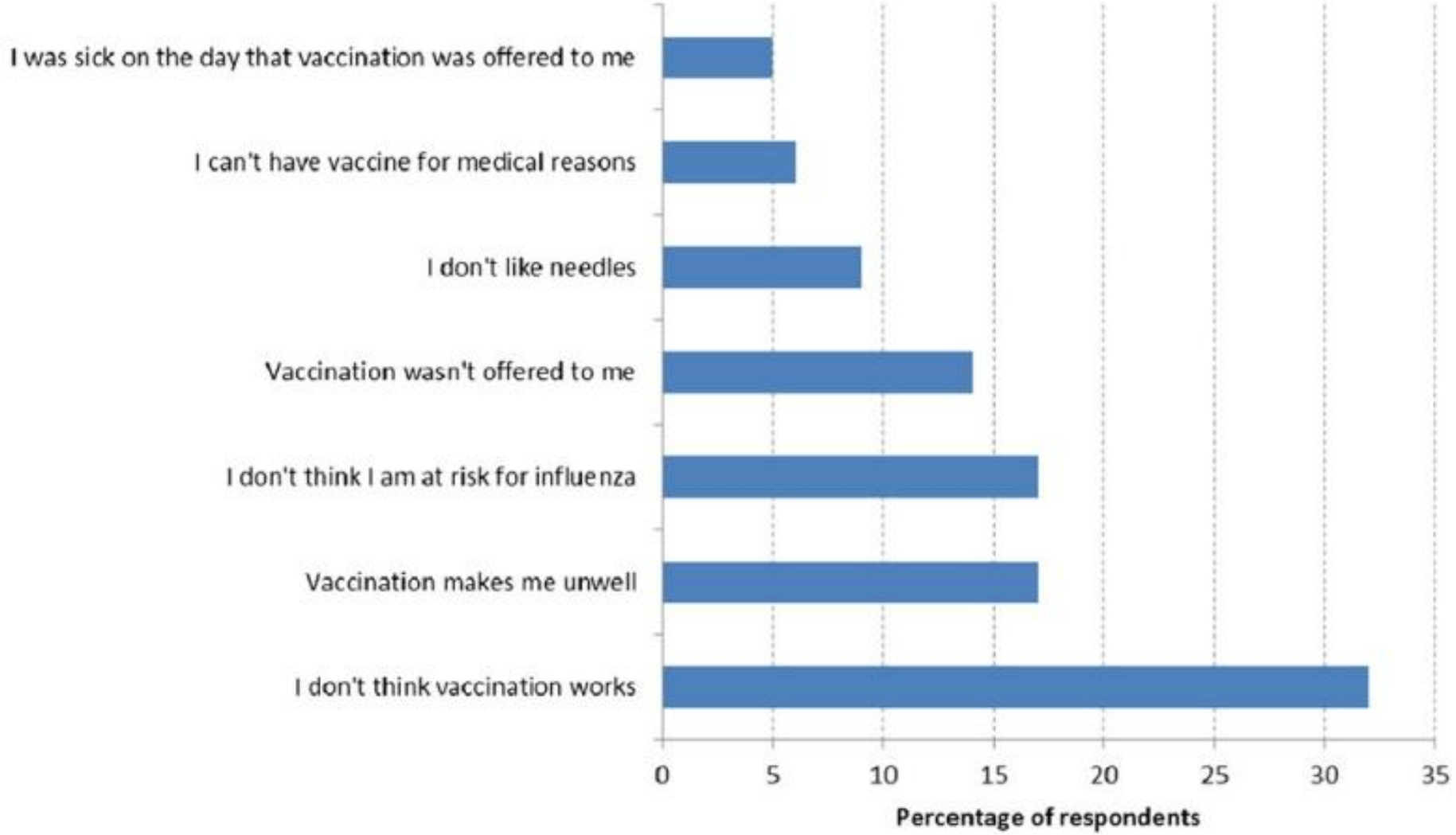
CDC: FluvaxView https://www.cdc.gov/fluvaxview/coverage-by-season/health-care-personnel-2019-2020.html

COVID-19 Vaccine Uptake in HC Facility Personnel



MMWR October 31, 2024 / 73(43);966–972

Main Reasons Cited by HCWs for Not Getting Immunized



Heinrich-Morrison *et al. BMC Infectious Diseases* (2015) 15:42

Knowledge Check

True or False?

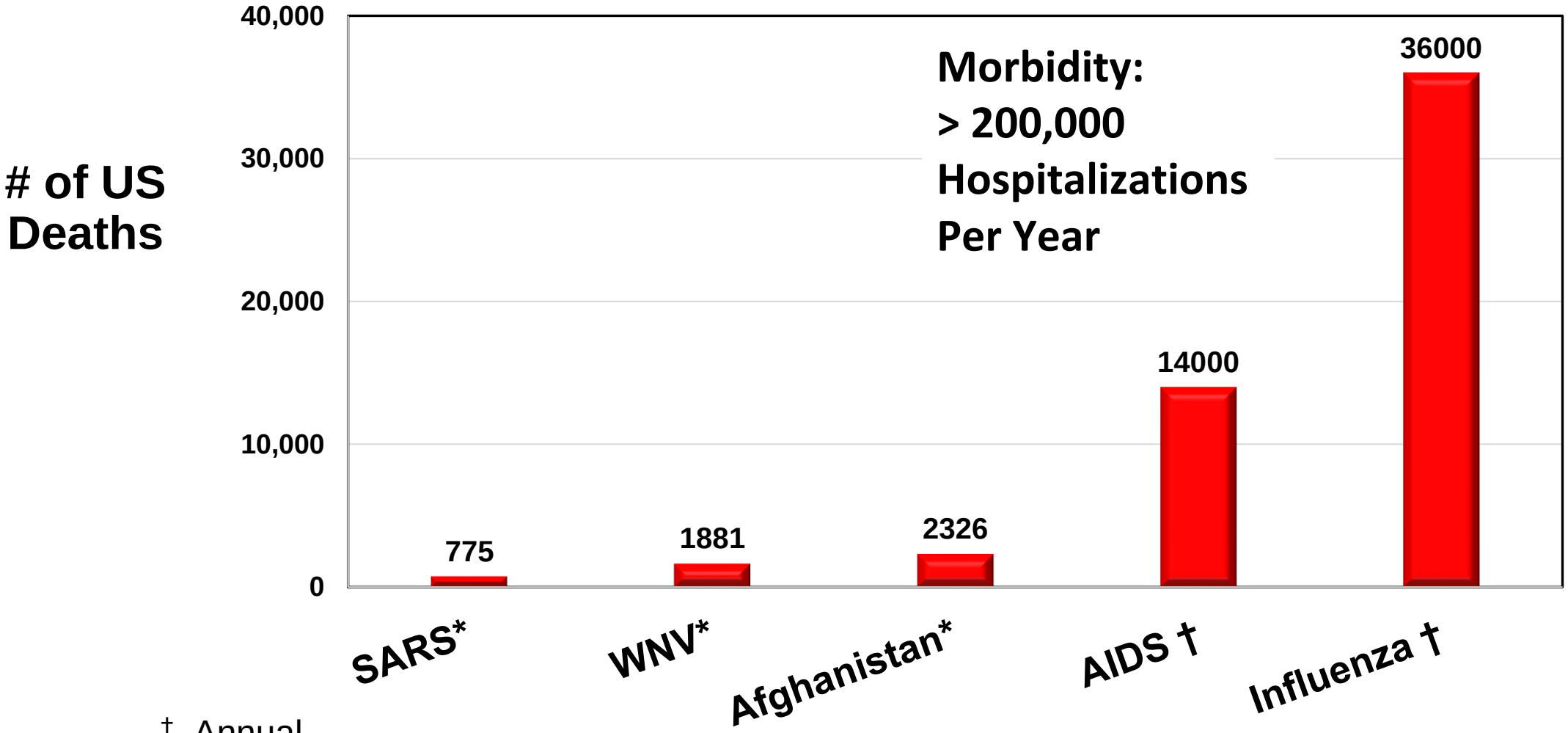
The CDC has the legal authority to mandate vaccines for all healthcare workers in the United States.

Correct answer: False

Fact #2:

Influenza and COVID are Killer Viruses

Influenza In Perspective



† Annual

* Entire epidemic through 2015

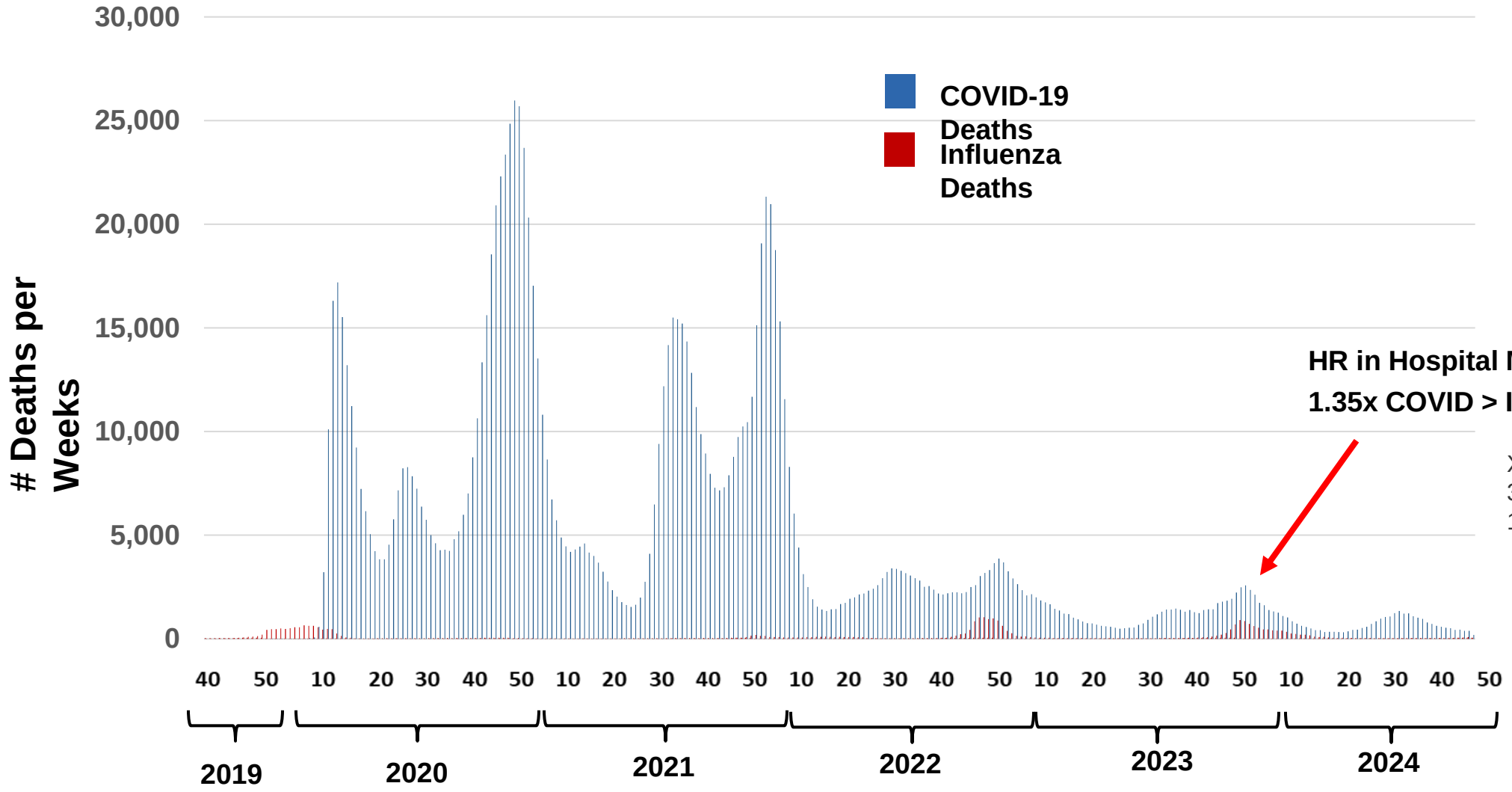
CDC - National Center for Health Statistics. *Deaths and Mortality*

Influenza Mortality

- Annual mortality ~ same as breast cancer
- Related to 1/20 deaths among Americans older than 65
- 1/10,000 Americans will die this winter from influenza
- Estimated direct costs to health care system annually in U.S. - $3-5 billion
- Disproportionately affects elderly, very young, and those with chronic diseases (exactly those people we hang out with all day)

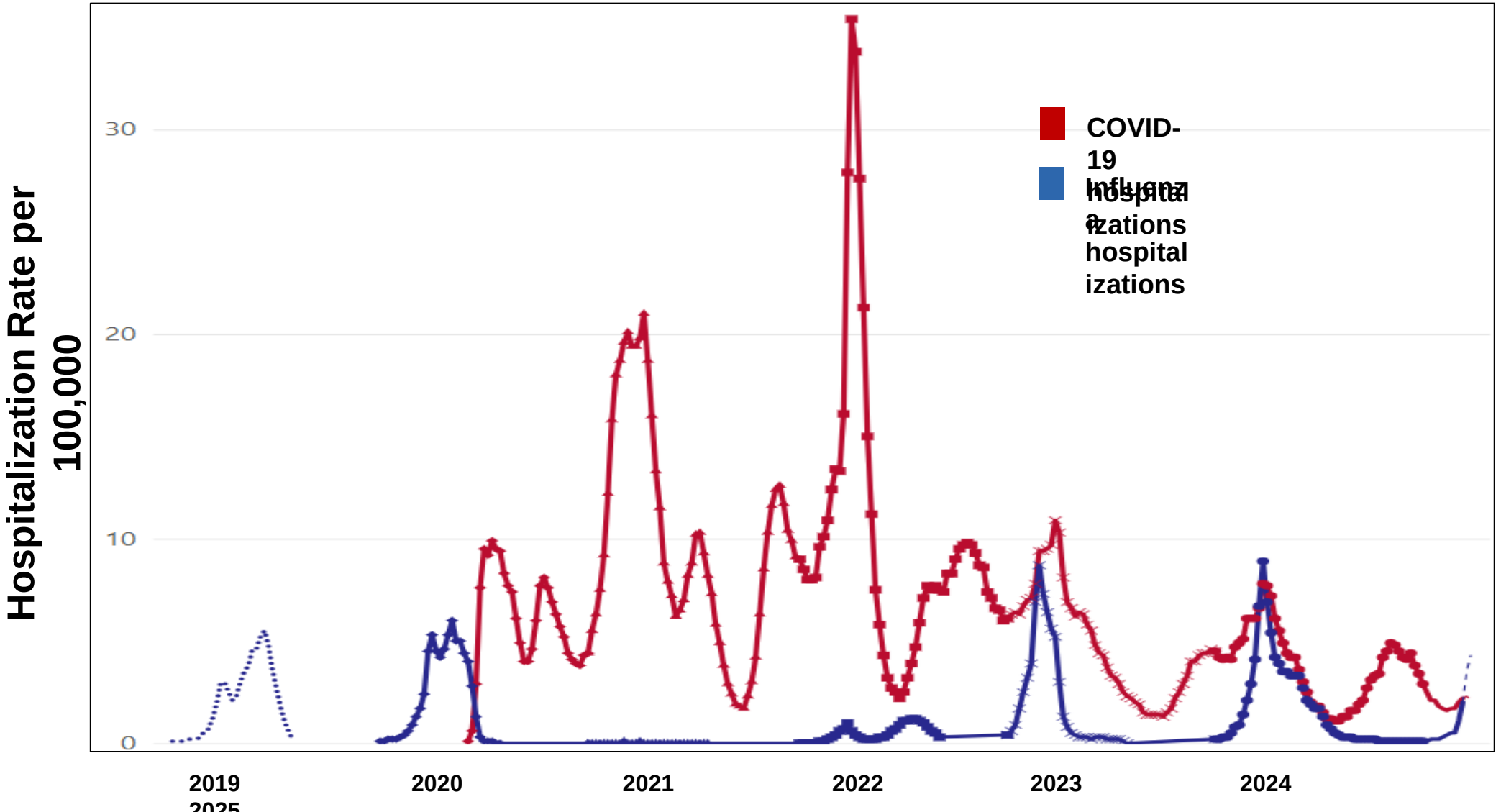
CDC - National Center for Health Statistics. *Deaths and Mortality*
Poland et al., *Vaccine* 2005;23:2251-5

COVID-19 Continues to Kill Significantly More People than Influenza



Xie Y. *JAMA.* 2024; 331(22):1963–1965.

Hospitalization Rates for Influenza and COVID-19



Fact #3:

HCW's Frequently Get Influenza and COVID-19, and Spread it to Their Patients

Influenza in HCW's

- Cross sectional study of housestaff
- 37% reported ILI during an 8 month period
- 9% had more than 1 illness
- Illness duration averaged 7 days
- Missed work averaged 0.7 days
- ILI was common in healthy resident physicians, and most continued to work most of the days of their sx's

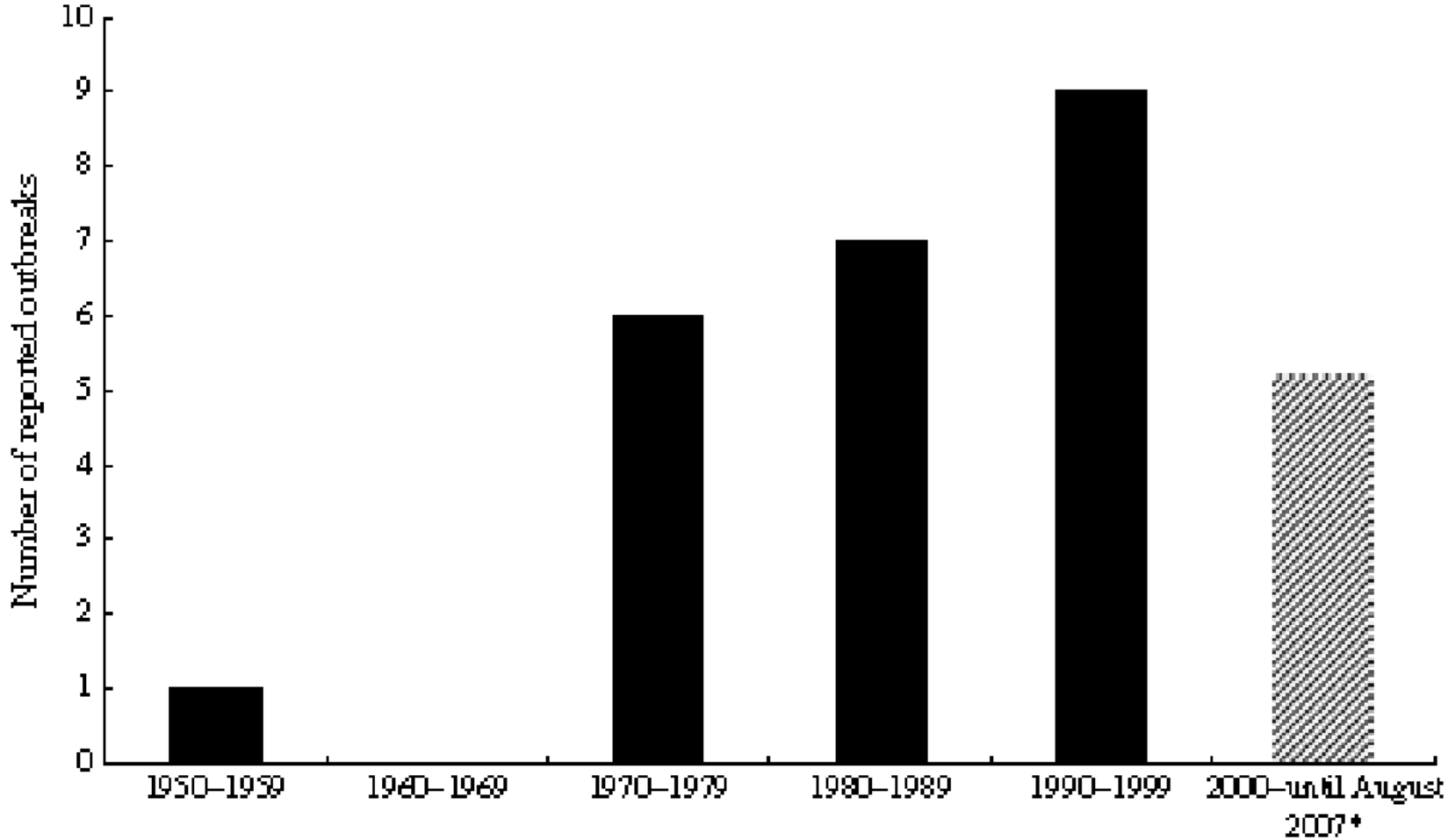
Weingarten, AJIC, 1989
Foy, Am J Epi, 1987

HCW Compliance in a NICU

- U.S. NICU study found staff immunization rates of 15-20%
- 76% of employees who reported flu-like symptoms during study period continued to care for patients

Eisenfeld L. Am J Infect Control 1994

Number of Nosocomial Influenza Outbreaks Reported by Decade



Journal of Hospital Infection (2009) 71, 1–14

Risk of Nosocomial Influenza in Lyon France 2004-2007

- Daily observation for ILI in 36 short stay units of 1100 bed Univ Hospital
- 64 cases of HA-ILI during observation period
- Assessed risk per exposure to others with ILI
- Relative Risk
  - Exposure to another patient - 4.8
  - **Exposure to a HCW - 12.3**

Vanhems. ICAAC 2009

Asymptomatic Influenza in HCW's

- Serosurvey of HCW's in Baltimore Hospital system

- After mild season, 23% of workers showed laboratory evidence of having had infection
  - 59% could not recall any influenza like illness
  - 28% could not recall any respiratory illness

- **Asymptomatic or minimally symptomatic infection is common!**

Asymptomatic Infection with Influenza

- German study of 122 patients with newly diagnosed influenza
- Followed them and all household contacts daily with RT-PCR and viral cultures, minimum 8 days

FINDINGS:

- 21% of adults acquired infection by culture or PCR, and never developed symptoms
- 30% of secondary cases had high viral loads on the day prior to the first day of symptoms

Suess T. PloS ONE 2012.

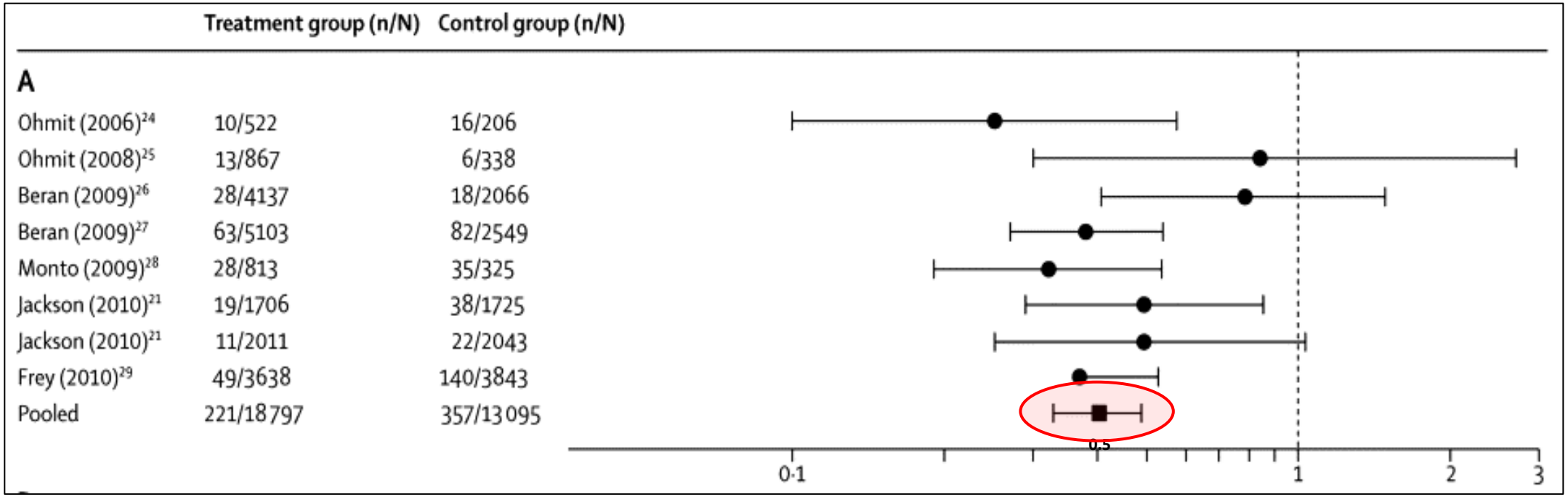
Fact #4:

HCW Influenza and COVID-19 Immunization Protects Both Worker and Patients

Meta-Analysis of TIV Vaccine Efficacy in Adults 18-64

Figure 5: Efficacy of influenza vaccine in healthy adults

59% reduction in PCR confirmed, symptomatic influenza infection (95%CI 51-67%)



Osterholm Lancet ID 2012;12:36

Influenza Vaccination in Healthy Workers

- 50-80% reduction in laboratory confirmed influenza
- 25% reduction in URI's
- 44% fewer doctor visits
- 43% fewer sick days off
- Employers save in absenteeism ~$2.58 for every dollar spent on influenza immunization programs

Buxton Bridges, C. JAMA 2000
Nichol, K. NEJM 1995

Current Status of Vaccine Necessity and Efficacy

- Nearly all the population has some degree of immunity to SARS CoV-2 (> 97% seroprevalence by Fall 2022)

- Morbidity and mortality markedly reduced due to less virulent strains and baseline cross-protective immunity from prior infections +/- vaccines

- mRNA vaccine efficacy is limited due to rapid waning of immune response, changing variants, and overall less morbidity
  - 2023 Monovalent XBB.1.5 vaccine **VE = 60%** against symptomatic SARS Cov-2 infxn and **49%** against JN.1 strain in 2023-2024
  - **50%** protection against hospitalization and **67%** against critical illness for 4-6 mos in elderly and immunosuppressed

Roper LE. MMWR Morb Mortal Wkly Rep 2024;73:1118–1123
Link-Gelles R. MMWR Morb Mortal Wkly Rep 2024;73:77–83.

What Effect Does Immunizing HCWs Have on Patient Outcomes?

Effect of HCW Influenza Immunization on Nosocomial Influenza Rates

Observational study at the Univ of Virginia over 13 seasons

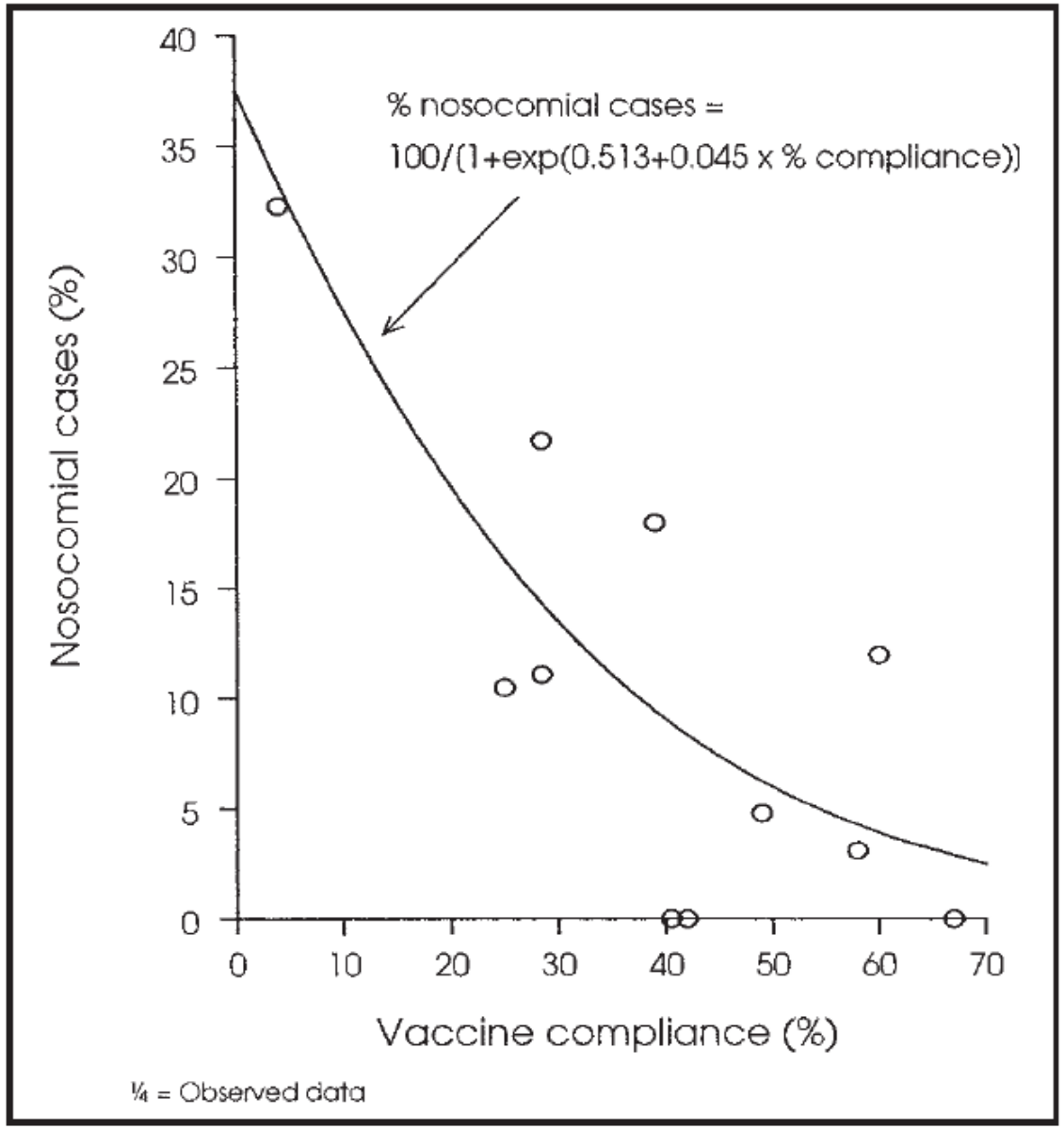
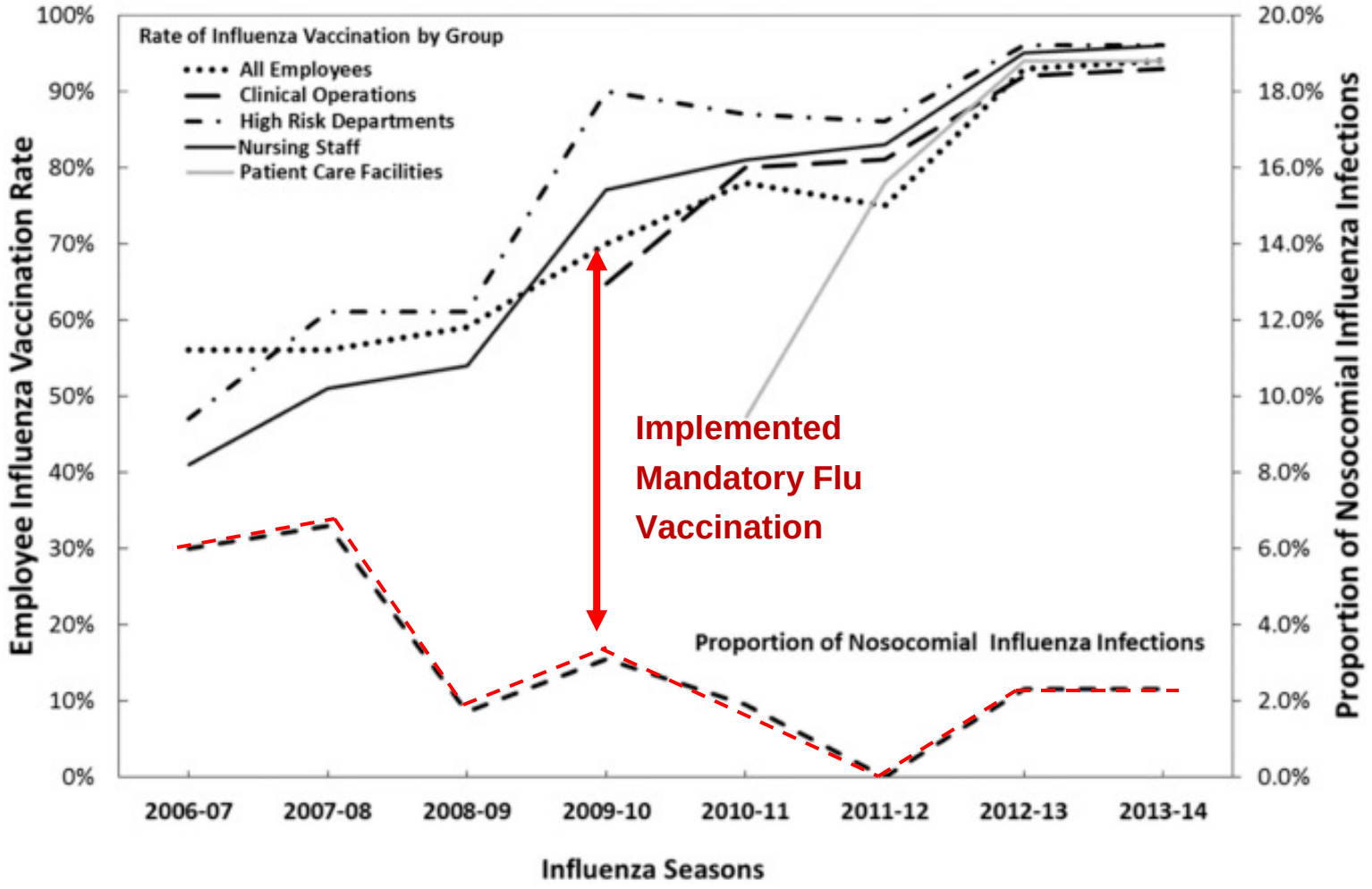


FIGURE 4. Estimated logistic regression model of the predicted proportion of influenza cases that were nosocomial among patients based on health-care worker vaccine compliance.

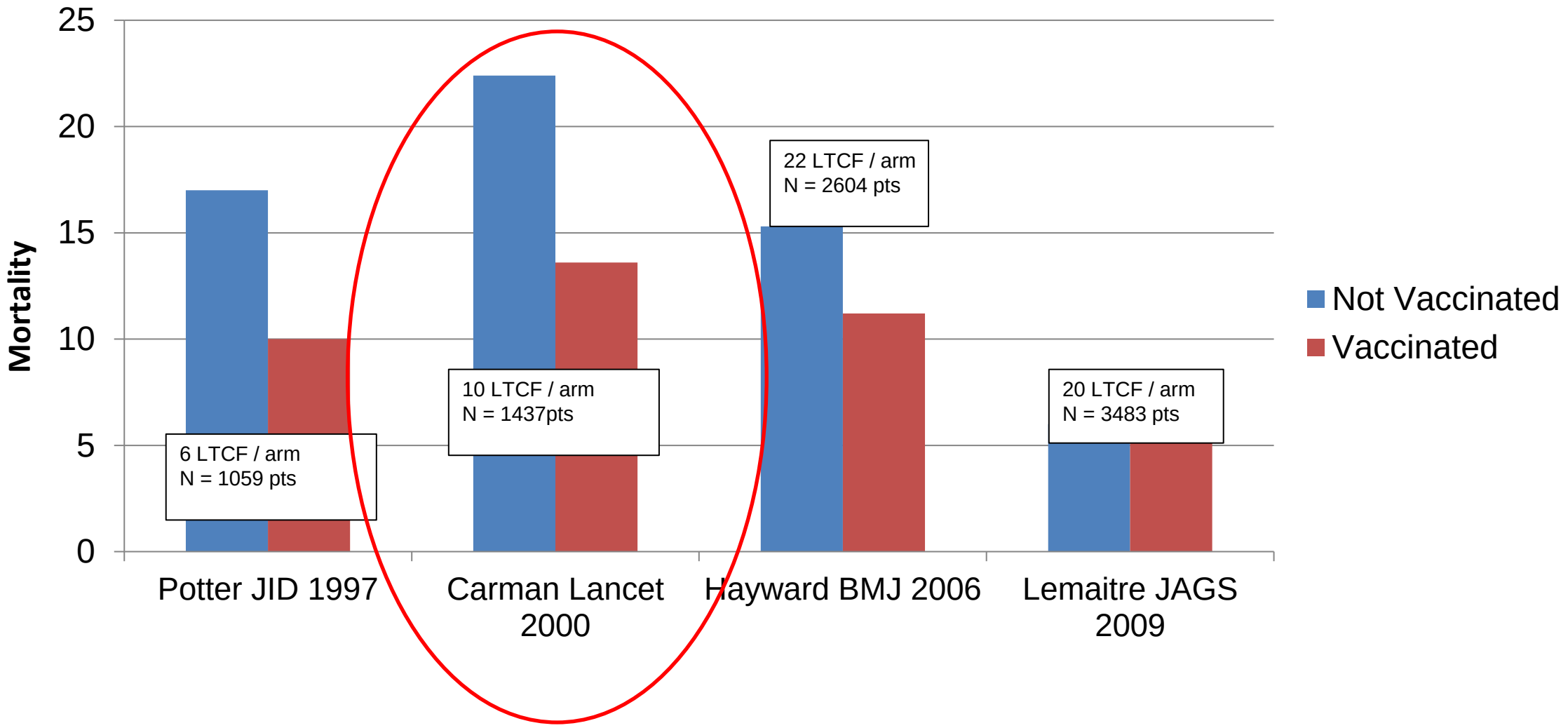
Salgado. ICHE 2004

Association of Increased Influenza Vaccination in HCWs with Reduction in Nosocomial Infection in Cancer Patients

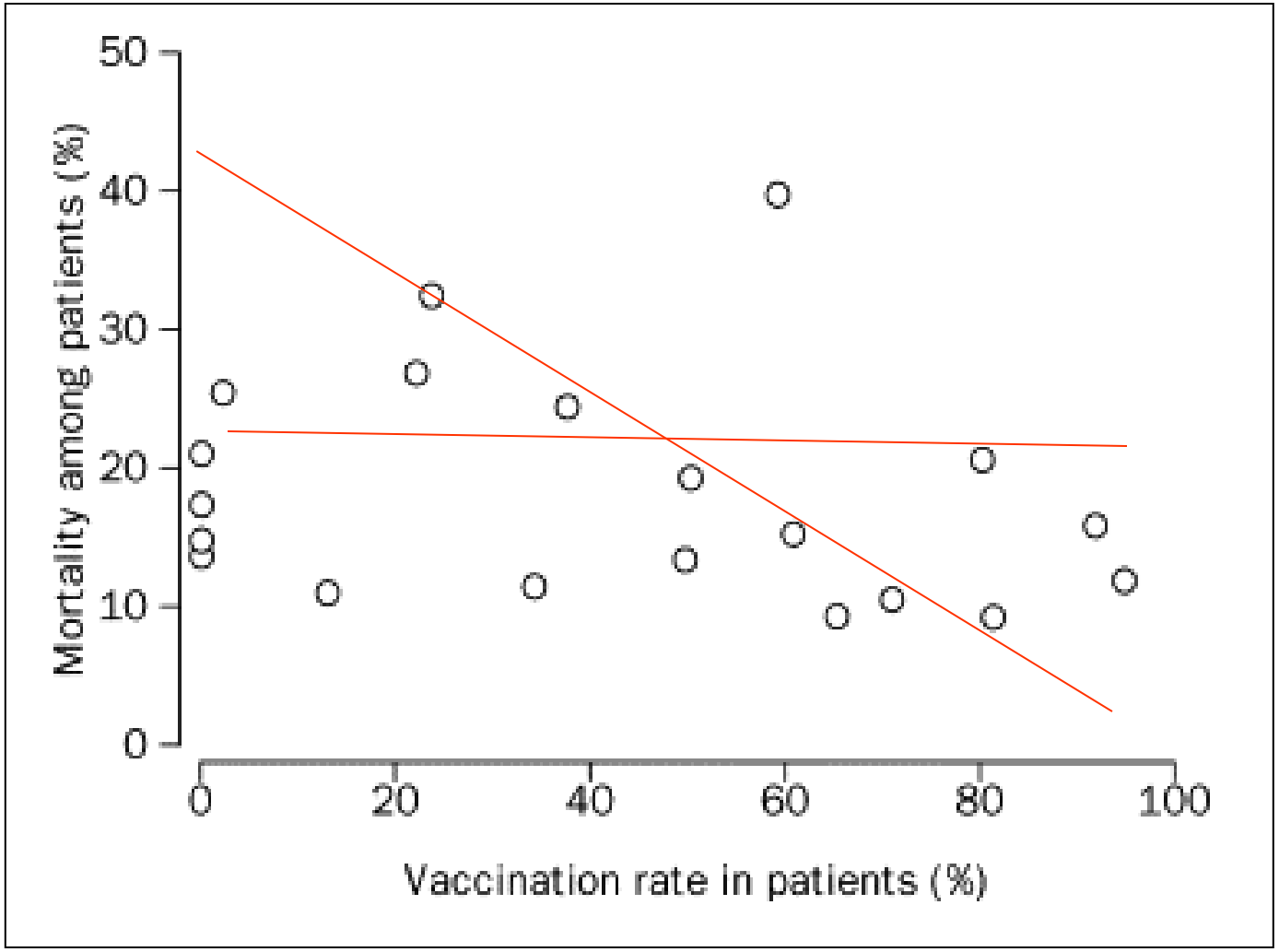


Frenzel E, et al. Am J of Infection Control, Volume 44, Issue 9, 1016

Impact of HCW Vaccination on Patient Mortality

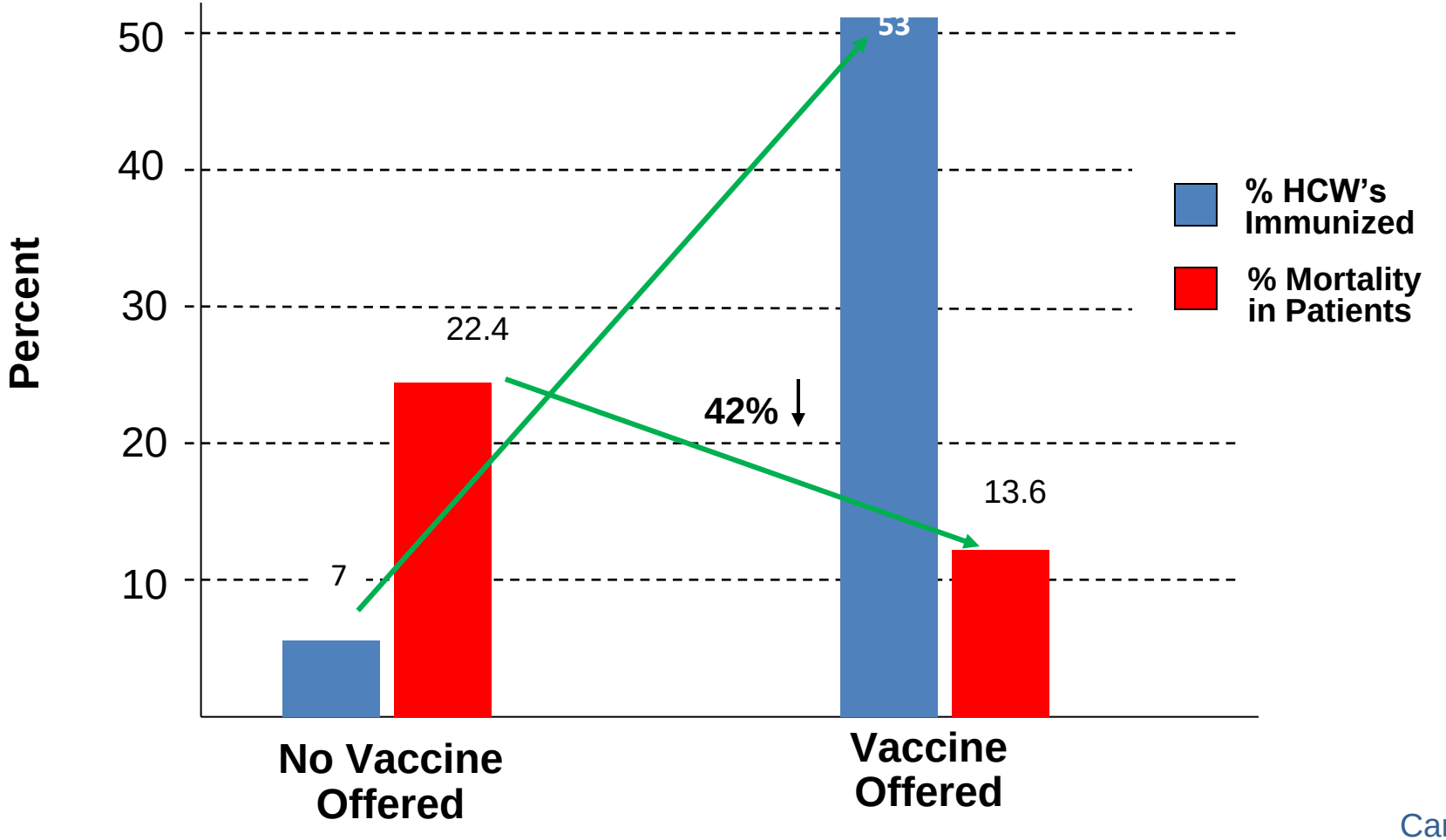


Scottish Nursing Home Study



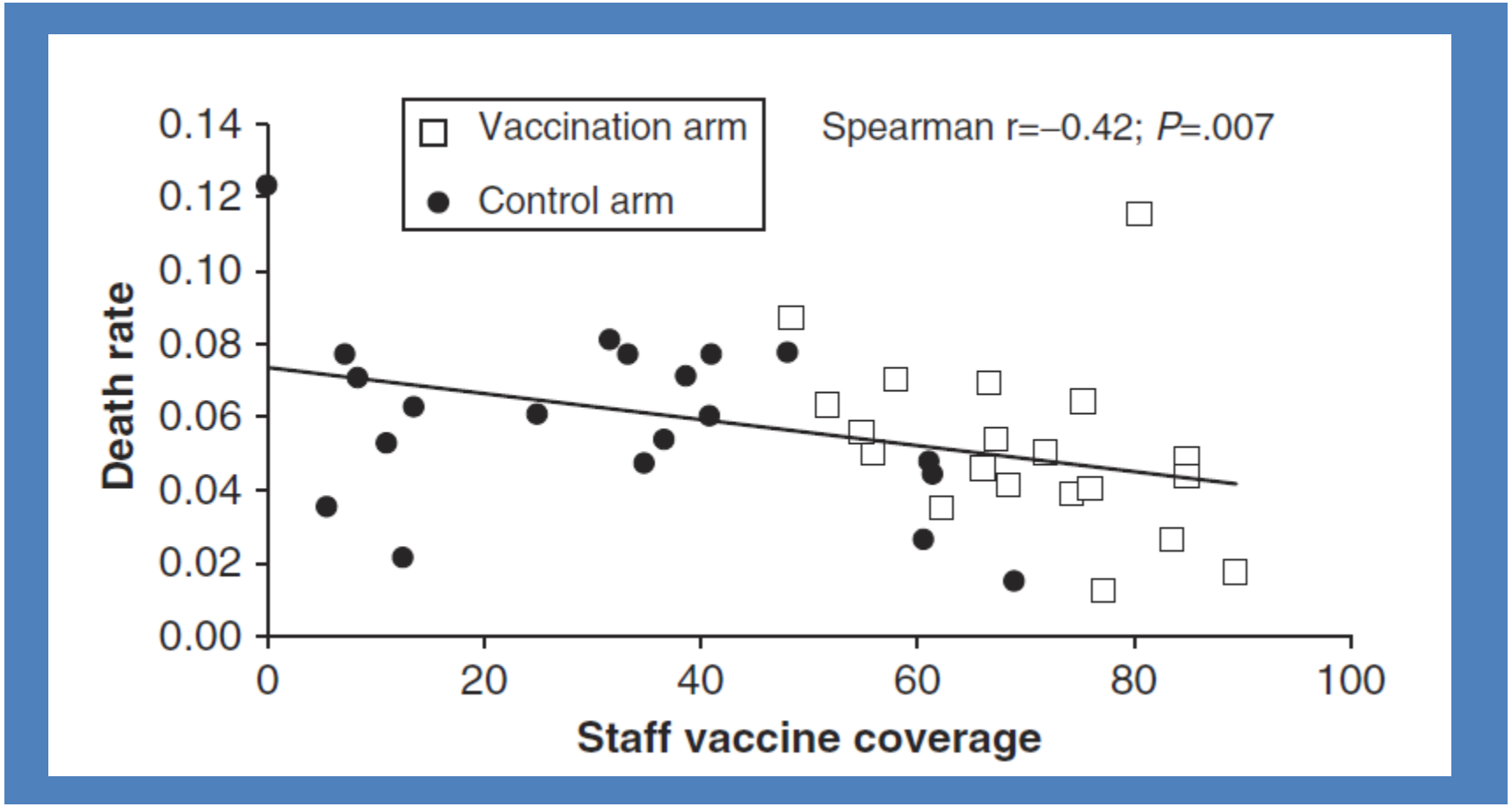
Carman WF. Lancet 2000.

HCW Immunization Rates and Patient Mortality in Scottish NH's



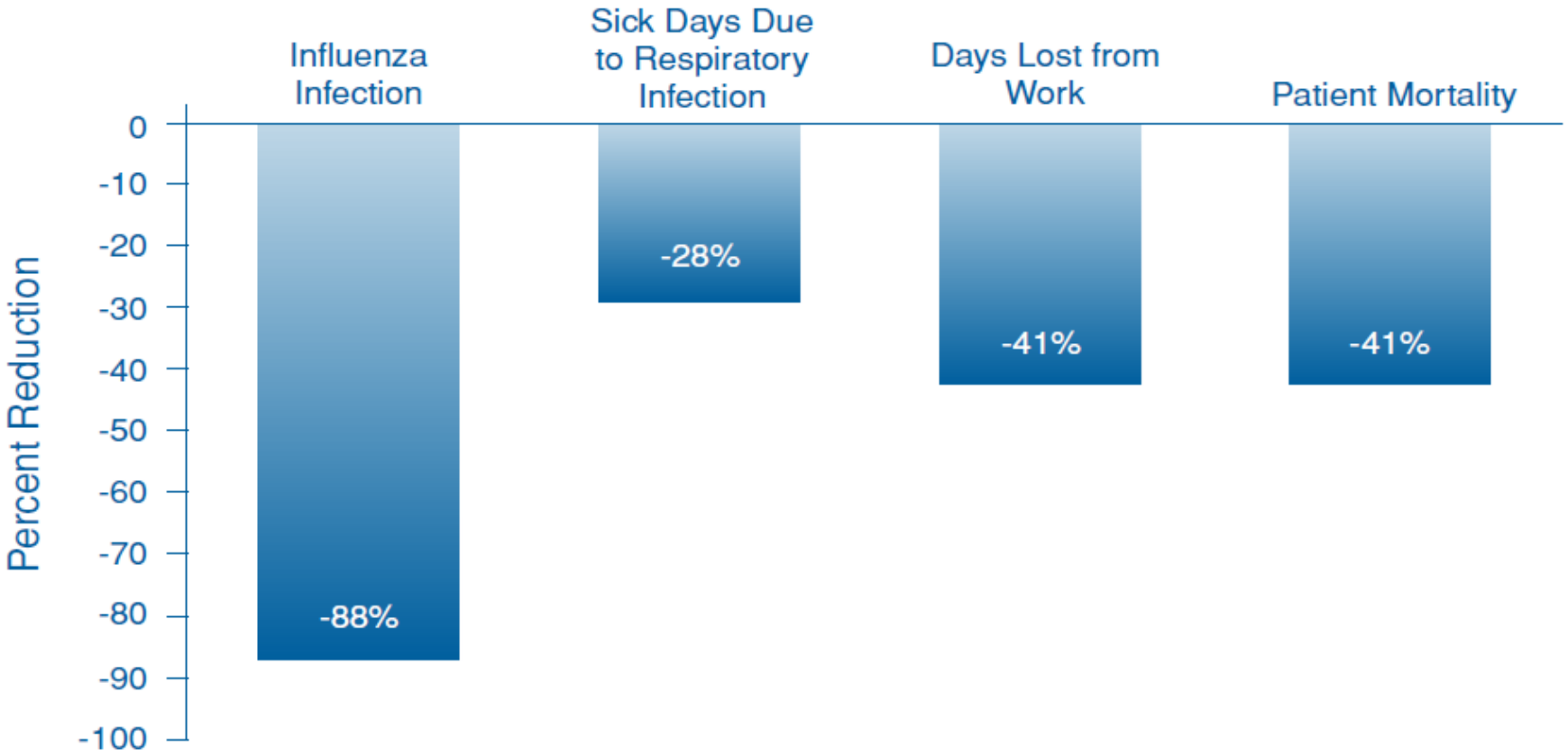
Carman WF. Lancet 2000

Significantly Lowered All Cause Mortality Correlated with Higher HCP Vaccination Rates in RCT of 40 NHs



Lemaitre et al. JAGS 2009

Putting it All Together



Adapted from: Talbot TR, Bradley, SF, and Cosgrove SE, et al. SHEA Position Paper: Influenza Vaccination of Healthcare Workers and Vaccine Allocation for Healthcare Workers During Vaccine Shortages. Society for Healthcare Epidemiology of America. *Infect Control Hosp Epidemiol*. 2005; 26:882-890.

Knowledge Check

Which of the following best describes the impact of healthcare worker vaccination on the prevention of nosocomial (hospital-acquired) infections?

A. Vaccinating healthcare workers has no significant effect on the transmission of infectious diseases in healthcare settings.

B. Vaccination of healthcare workers primarily protects only the workers themselves and does not affect patient outcomes.

C. Healthcare worker vaccination significantly reduces the risk of transmitting vaccine-preventable diseases to vulnerable patients, thereby lowering rates of nosocomial infections.

D. Only patients need to be vaccinated to prevent nosocomial infections; healthcare worker vaccination is not necessary.

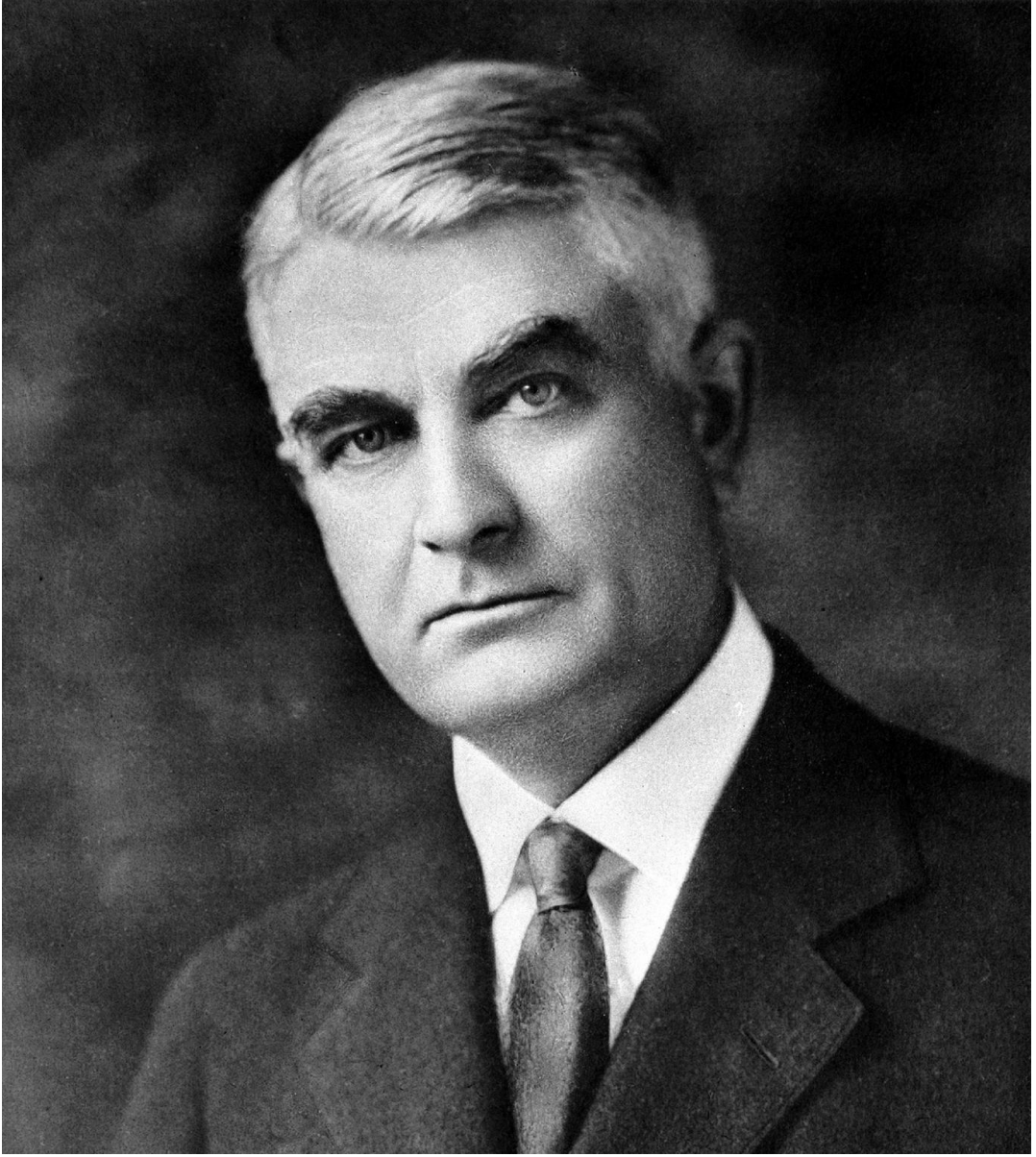
Correct answer: C

Fact #5:

Influenza and COVID-19 Vaccines are Safe

https://www.youtube.com/watch?v=5Gxb7cpHCXY

In the context of a communicable disease that might reasonably be spread by a HCW who cares for the sick, frail, elderly, immunosuppressed - is the language of personal autonomy appropriate, “my body my choice”?



“The needs of the patient come first“

William Mayo, MD


ANY
QUESTIONS
?