Influenza Vaccine Effectiveness in Healthcare Workers

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HIV VACCINE TRIALS NETWORK

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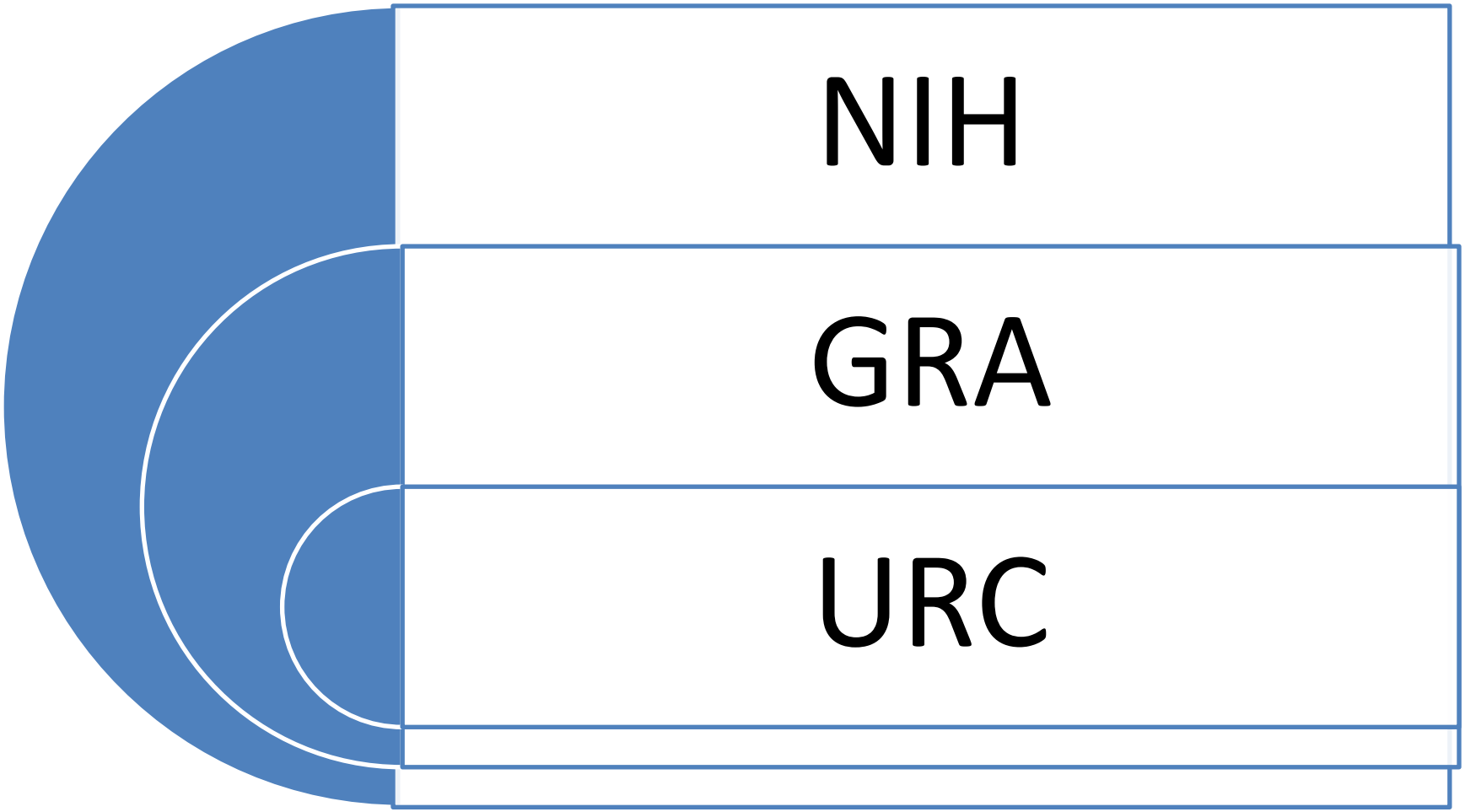
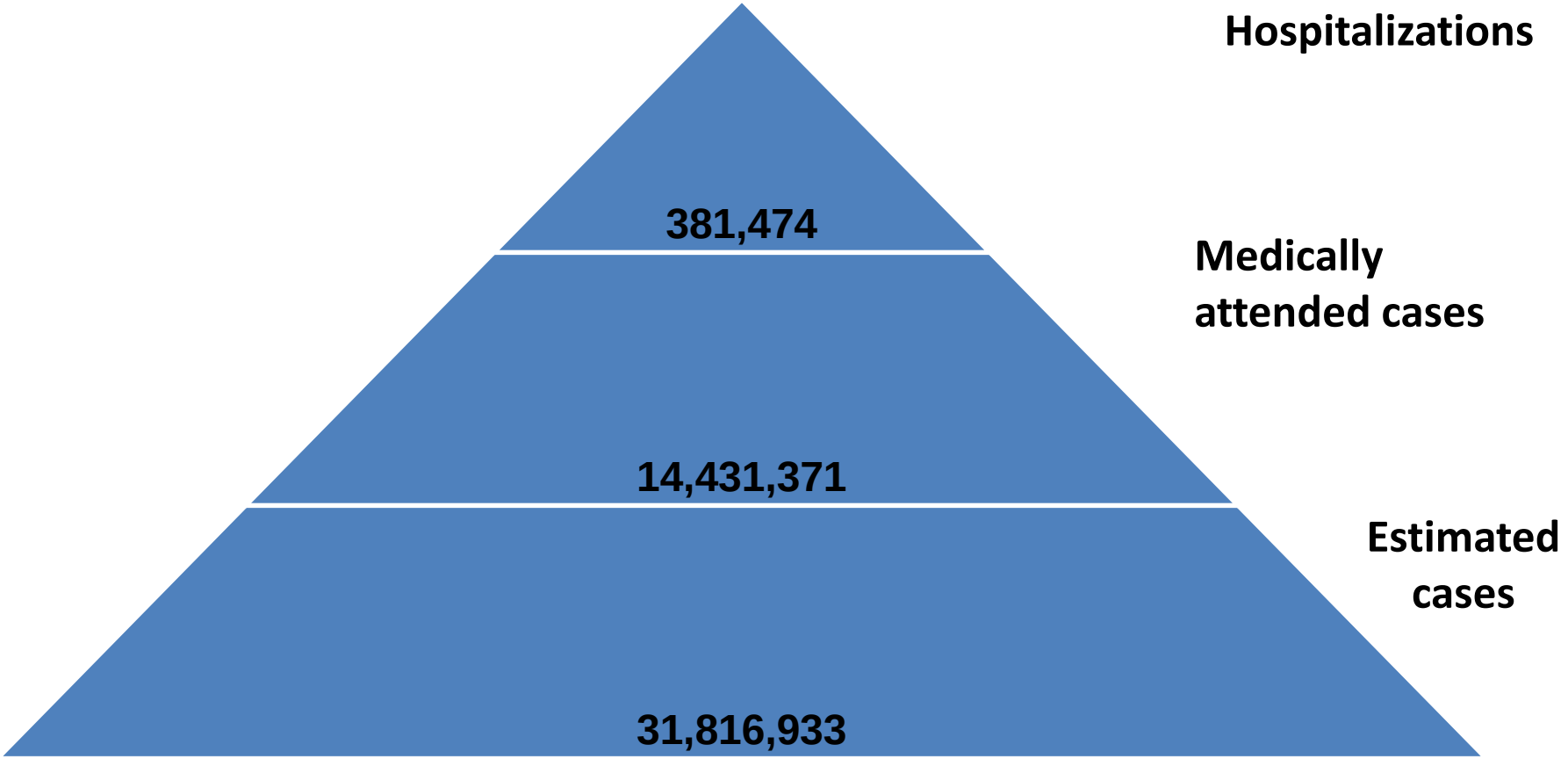


Influenza Vaccination in HCW

- What are the risks and consequences of influenza infections in patients/HCW?
- How to prevent influenza infections in healthcare settings?
- What are the vaccine safety/efficacy in preventing influenza in healthcare workers?
- What is the likelihood that HCW immunization could prevent the spread of influenza to vulnerable patients?

What are the risks and consequences of influenza infections in patients?



CDC. MMWR 2013;62:997-1000

Courtesy of David Weber, MD, MPH

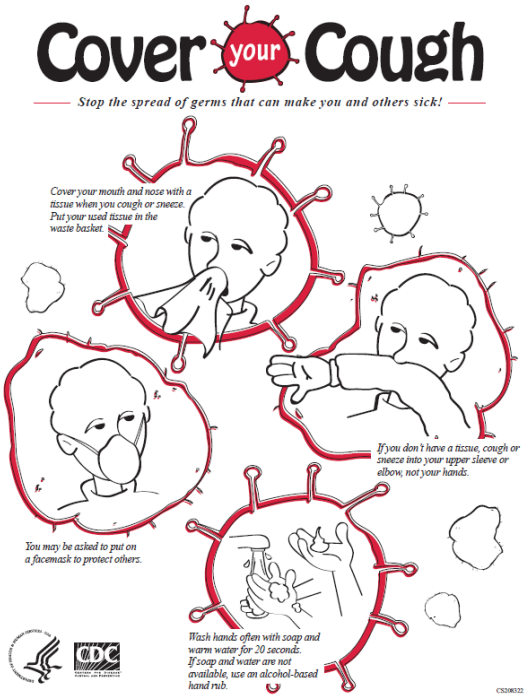
…HCW?

- Attack rate of 25%-80% in unimmunized HCW.
- HCW infected by patients frequently served as the source for secondary transmission of influenza to patients and other HCW. (more than 25 outbreaks described in literature in acute care hospitals and more than 15 outbreaks in long term care facilities).
- 28% increase in absenteeism in unvaccinated vs vaccinated HCW related to respiratory infections.
- 35% of staff shortage in acute care hospitals during influenza season.

Odelin M.R., Pozzetto B., Aymard M., et al. *Gerontology* 1993; 39:109-116.
Vanhems P., Voirin N., Roche S., et al. *Arch Intern Med* 2011; 171:151-157
Saxen H, Virtanen M. Pediatr Infect Dis J 1999;18:779.
Polland et al. Vaccine 2005; 23: 2251-5.

How to Prevent Influenza Infections in Healthcare Settings?

- HCW should stay home when sick:
  - >75% MDs RNs reported working while having ILI.
- Infection control techniques:
  - Individuals contagious for at least
    1 day before symptoms onset.
  - >25% who seroconverted did not recall
    an ILI or any respiratory tract illness.
- Antivirals.
- VACCINATION:
  - Patient.
  - HCW.



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

What are the vaccine safety/efficacy in preventing influenza in HCW?

- Safety: generally well-tolerated with very few serious side effects:
  - Most common side effect=arm soreness at the injection site.
  - Rare SAE in clinical trials.
  - GBS.
  - Allergic reactions.
- IIV reduced pneumonia and influenza hospitalizations by 48–57%, all acute and chronic respiratory conditions by 27–39%, and all cause mortality by 39–54%.
- Vaccine efficacy rate of 88% for influenza A and 89% for influenza B in HCW.

Table 3. Influenza Infection During Annual Epidemics, 1992-1995*

	Influenza A(H3N2), No. (%)		Influenza B, No. (%)	
Year of Study	Influenza Vaccine	Control	Influenza Vaccine	Control
1992-1993	2/52 (3.9)	10/50 (20)	0/52 (0)	4/50 (8)†
1993-1994	0/51 (0)	4/52 (7.1)	0/51 (0)	0/52 (0)
1994-1995	0/77 (0)	2/77 (2.6)	1/77 (1.3)	5/77 (6.5)
Total 1992-1995	**2/180 (1.1)**	**16/179 (8.9)**	**1/180 (0.6)**	**9/179 (5.0)**

Nichol KL, Margolis KL, Wuorenma J, Von Sternberg T. N Engl J Med 1994;331:778–84
Wilde JA, McMillan JA, Serwint J, et al. JAMA 1999; 281:908–13.
Osterholm MT, Kelley NS, Sommer A, Belongia EA. Lancet Infect Dis 2012; 12:36–44.

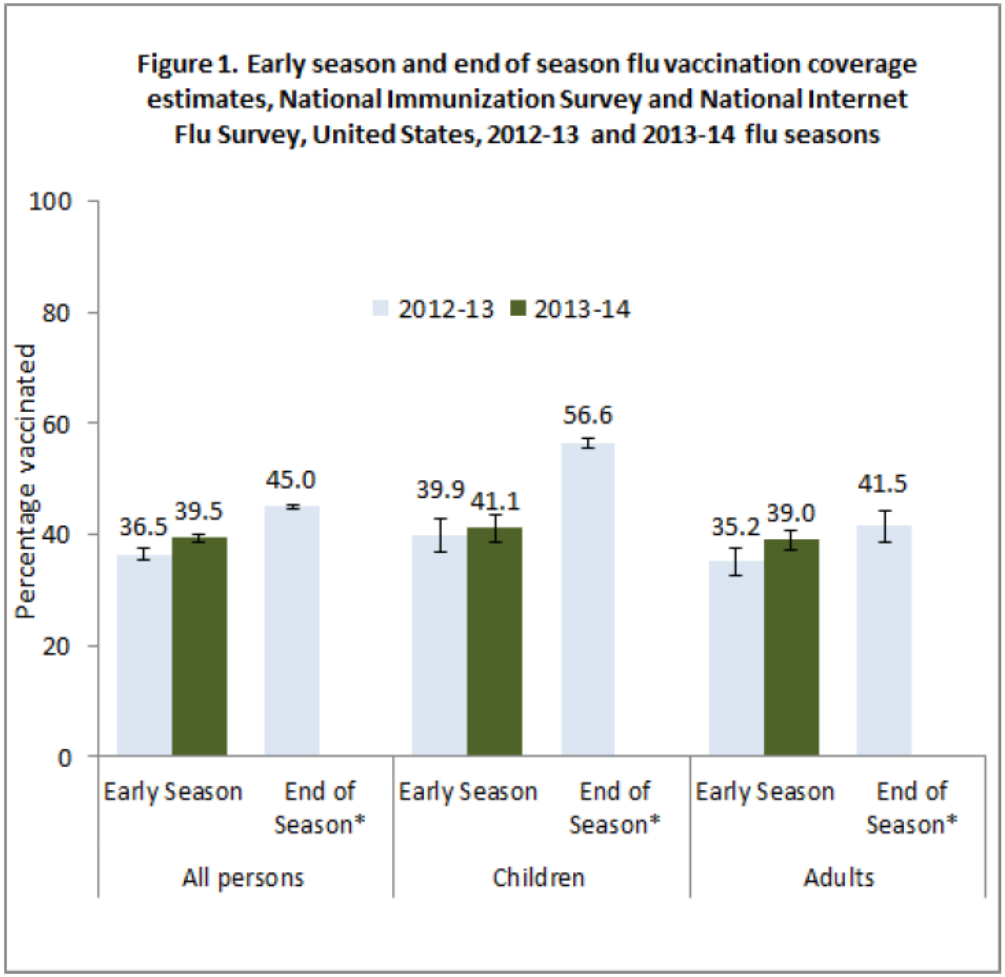
Different Influenza Vaccines

- IIV including cell based and recombinant hemaglutinin vaccine
- ID
- LAIV
  - Healthy, non pregnant HCW<50 years.
  - Vaccine shortage.
  - HCW with close contact with persons with a **some degree of immunosuppression** (e.g., persons with diabetes, persons with asthma taking corticosteroids, or persons infected with HIV) but **NOT severely immunocompromised patients in a protected environment** (e.g. BMT).
  - Transmission of LAIV has never been documented in healthcare settings.

Special Considerations

- Vaccination of HCW can specifically benefit patients:
  - who cannot receive vaccination (e.g., infants aged <6 months or those with severe, allergic reactions to prior influenza vaccination).
  - who respond poorly to vaccination (e.g., persons aged ≥65 years and immune-compromised persons).
  - for whom antiviral treatment is not available (e.g., persons with medical contraindications).

National Influenza Vaccine Coverage



CDC, NIFS Nov 2103

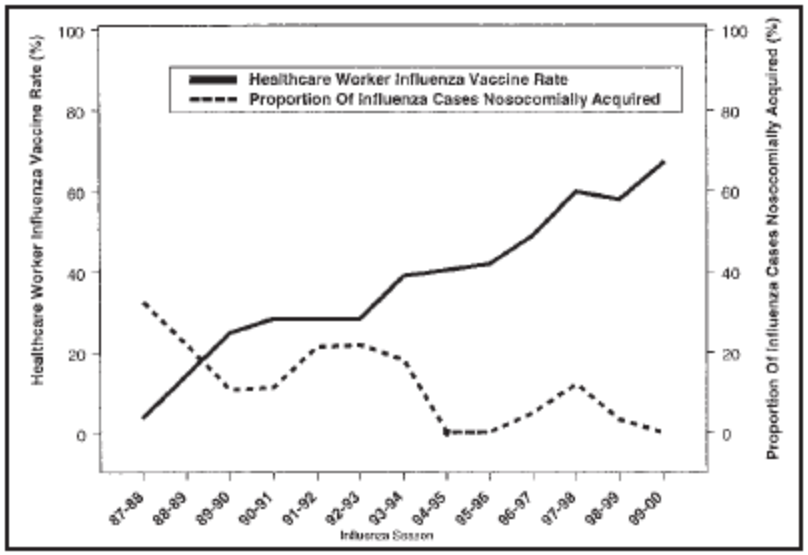
HCP Influenza Vaccine Coverage

- Coverage:
  - 72.0% vaccination coverage for the 2012-13 season.
  - 66.9% vaccination coverage for the 2011-12 season.
- By occupational setting
  - 83.1% hospital-based.
  - 58.9% long-term care facilities.
- By occupation type:
  - 92.3% physicians.
  - 89.1% pharmacists.
  - 88.5% nurse practitioners/physician assistants.
  - 84.8% nurses.

MMWR 2013 Sep 27;62(38):781-6.

What is the likelihood that HCW immunization could prevent the spread of influenza to vulnerable patients?

- Over 12 year period, vaccination coverage in HCW increased from 4% to 67%:
  - Laboratory –confirmed influenza cases among HCW decreased from 42% to 9%.
  - Nosocomial cases among hospitalized patients decreased 32% to 0 (P<0.0001).



Salgado CD, Giannetta ET, Hayden FG, et al. Infect Control Hosp Epidemiol 2004;25:923–8.

Cluster RCT in LTCF: Effect on Mortality

Study	Coverage Control	Coverage Intervention	Mortality Control	Mortality Intervention	Mortality Difference
Potter J, 1997	4.9%	61%	17%	10%	**7%**
Carman W, 2000	13.6%	50.9%	22.4%	13.6%	**8.8%**
Hayward A, 2006	5.9%	43.2%	15.3%	11.2%	**4.1%**
Lemaitre M, 2009	31.8%	69.9%	6%	5.2%	**0.8%**

Courtesy of David Weber, MD, MPH

Systemic Review in LTCF
ILI and Lab confirmed Influenza

- Pooled results from 4 cluster randomized controlled trials and 4 observational studies in long term care facilities:
  - All-cause death reduced by 29%.
  - ILI reduced by 42%.
  - Laboratory-confirmed influenza lower but not statistically significant.
- Limitations:
  - Years with low influenza activity.
  - Baseline differences in facilities despite randomization.
  - Lab confirmed influenza often lacking, or methods used insensitive.

Ahmed F, Lindley MC, Allred N, Weinbaum CM, Grohskopf L. Clin Infect Dis. 2014 Jan;58(1):50-7.
Carman WF, Elder AG, Wallace LA, et al.. Lancet 2000;355:93–7.
Potter J, Stott DJ, Roberts MA, et al. *J Infect Dis* 1997;175(1):1–6.
Hayward AC, Harling R, Wetten S, et al. *BMJ* 2006;333(7581):1241.
Lemaitre M, Meret T, Rothan-Tondeur M, et al. *J Am Geriatr Soc* 2009;57(9):1580–1586.

Herd Immunity

- Cluster randomized trial in Canadian Hutterite communities:
  - Vaccination of 83% of 3- to 15-year-olds in intervention communities.
  - Protection of vaccinated children.
  - Reduction in influenza- confirmed illness by 61% in vaccinated vs nonvaccinated community members.

Table 2. Protective Effectiveness on Nonrecipients of Immunizing Children and Adolescents With Influenza Vaccine

Study Group	Nonrecipients in Vaccine Colony: Influenza (n = 1271)	Nonrecipients in Vaccine Colony: Hepatitis (n = 1055)	Protective Effectiveness of Influenza Vaccine (95% CI), %	*P* Value
Influenza detected by PCR, No. (%)	39 (3.1)	80 (7.6)		
Person-day of follow-up, No. (%)	182 866	151 902		
No. of cases/10 000 person-days	2.13	5.27	Simple, 61 (8-83)[a]	.03
			Adjusted, 61 (8-83)[b]	.03

Loeb M, Russell ML, Moss L, et al. JAMA 2010; 303:943–50.

Conclusions

- Burden of Influenza in the US in substantial.
- Vaccination is the best way to prevent influenza infection.
- Influenza vaccine is safe and effective in preventing influenza infection.
- HCW immunization reduced the all cause mortality and ILI in patients.
- Well designed studies are needed to determine the effect on patients laboratory confirmed influenza cases.