A Brief History to Celebrate 25 Years of Adult Immunizations in Massachusetts AND Implementation in Your Practice

April 14, 2020

Carolyn B. Bridges, MD, FACP
Bridges Med-Epi Consulting, LLC
Consulting physician for Immunization Action Coalition
Retired Captain, US Public Health Service

Disclosure

I, Carolyn B. Bridges, have been asked to disclose any significant relationships with commercial entities that are either providing financial support for this program or whose products or services are mentioned during this presentation.

I have no relationships to disclose.

I may discuss the use of vaccines in a manner not approved by the U.S. Food and Drug Administration, but in accordance with ACIP recommendations.

Learning Objectives

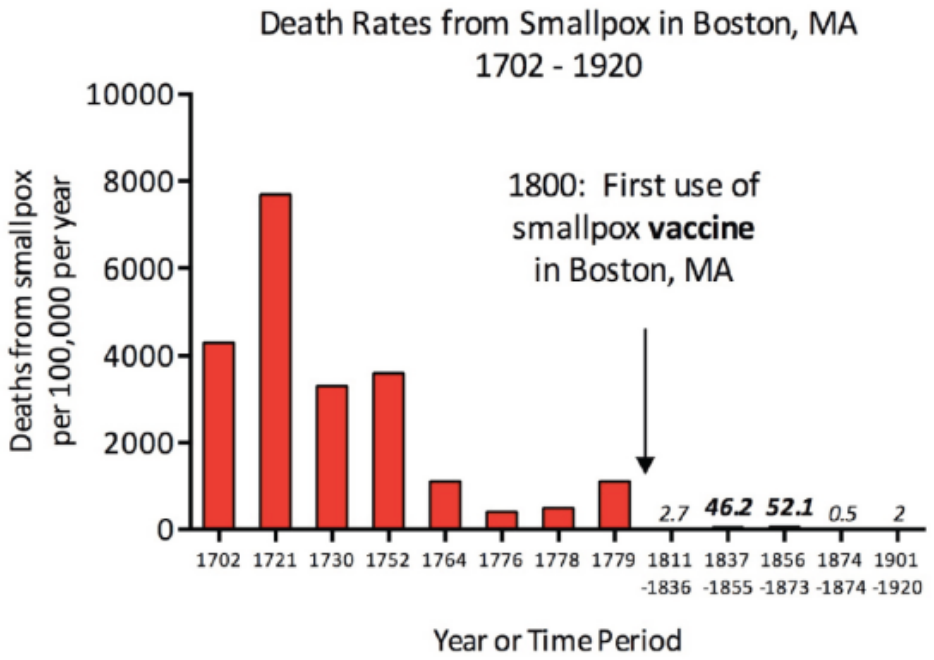
1. Provide examples of adult immunization recommendations and their impact
2. Identify challenges for vaccinating adults
3. Identify strategies for implementation of standards of adult immunization practices
4. Identify framework for discussing adult immunization with patients
5. Identify ways to prepare for new vaccines on horizon

Looking Back…

U.S. adult vaccine recommendations – a very brief history

Way Back Look…

- Vaccination against smallpox dates back before Edward Jenner in England in 1796[1,2]
- Boston smallpox outbreak in 1721 led Cotton Mather to advocate for variolation against great community opposition
- One physician, Boylston, took up the charge, inoculating 287, 2% of whom died compared to 15% of un-inoculated.
- Gen. Washington ordered inoculations when he realized quarantine was not working
- Development of safer vaccine against smallpox led to greater use and ultimately smallpox eradication in 1980.



1. Matthew Niederhuber. The fight over inoculation during 1702 smallpox outbreak in Boston. http://sitn.hms.harvard.edu/category/flash/special-edition-on-infectious-disease/. 2. History of vaccinations by Susan Plotkin and Stanely Plotkin in Plotkin, Orenstein, Offit, Eds. Vaccines 6th Ed, Elsevier, 2013.

CDC, NCIRD Historical Comparisons of Vaccine-Preventable Disease Morbidity in the U.S.

Disease	20th Century Annual Morbidity†	2019 Reported Cases † †	Percent Decrease
Smallpox	29,005	0	100%
Diphtheria	21,053	2	> 99%
Measles	530,217	1,287	> 99%
Mumps	162,344	3,509	98%
Pertussis	200,752	15,662	92%
Polio (paralytic)	16,316	0	100%
Rubella	47,745	3	> 99%
Congenital Rubella Syndrome	152	0	100%
Tetanus	580	19	97%
Haemophilus influenzae	20,000	14*	> 99%

† JAMA. 2007;298(18):2155-2163

† † National Notifiable Disease Surveillance System, Week 52 (2019 Provisional Data), Unpublished. Atlanta, GA. CDC Division of Health Informatics and Surveillance, 2020. Accessed on January 21, 2020.

* *Haemophilus influenzae* type b (Hib) < 5 years of age. An additional 12 cases of Hib are estimated to have occurred among the 243 notifications of Hi (< 5 years of age) with unknown serotype.

CDC, NCIRD Historical Comparisons of Vaccine-Preventable Disease Morbidity in the U.S.

Disease	Pre-Vaccine Era Annual Estimate	2016 Estimate (unless otherwise specified)	Percent Decrease
Hepatitis A	117,333 †	4,000 *	97%
Hepatitis B (acute)	66,232 †	20,900 *	68%
Pneumococcus (invasive)			
all ages	63,067 †	30,400 #	52%
< 5 years of age	16,069 †	1,700 #	89%
Rotavirus (hospitalizations, < 3 years of age)	62,500 † †	30,625 ##	51%
Varicella	4,085,120 †	102,128 ###	98%

† JAMA. 2007;298(18):2155-2163
†† CDC. MMWR. February 6, 2009 / 58(RR02);1-25
* CDC. Viral Hepatitis Surveillance - United States, 2016
# CDC. Unpublished, Active Bacterial Core Surveillance, 2016
New Vaccine Surveillance Network 2017 data (unpublished); U.S. rotavirus disease now has biennial pattern
CDC. Varicella Program 2017 data (unpublished)

Vaccines for Children

Protecting America's children every day

The Vaccines for Children (VFC) program helps ensure that all children have a better chance of getting their recommended vaccines. VFC has helped prevent disease and save lives.

CDC estimates that vaccination of children born between 1994 and 2018 will:

prevent **419 million** illnesses
(26.8 million hospitalizations)

more than the current population of the entire U.S.A.

help avoid **936,000** deaths

greater than the population of Seattle, WA

save nearly **$1.9 trillion** in total societal costs
(that includes $406 billion in direct costs)

more than $5,000 for each American

Updated 2018 analysis using methods from "Benefits from immunization during the Vaccines for Children Program Era—United States, 1994-2013"

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

www.cdc.gov/features/vfcprogram

Vaccines for Children Program

- Enacted in 1994 in response to measles resurgence
- Diagnosis: Failure to vaccinate mostly uninsured children
- Currently provides about half of US children with vaccines
- Adults not included in legislation

https://www.cdc.gov/mmwr/pdf/wk/mm6316.pdf#page=12.

Medicare and Adult Vaccination

- First influenza vaccination recommendation in United States in 1963 through recommendation from Surgeon General
- First vaccines covered by Medicare were:
  - Pneumococcal polysaccharide vaccine – 1981
    - PPSV14 in 1977, and PPSV23 in 1983
  - Influenza vaccine – 1993
- Medicare Part B includes coverage of influenza and pneumococcal vaccines, hepatitis B vaccine for high risk, and Td vaccine for wound management

Affordable Care Act, 2010 – Winners and a Missed Opportunity

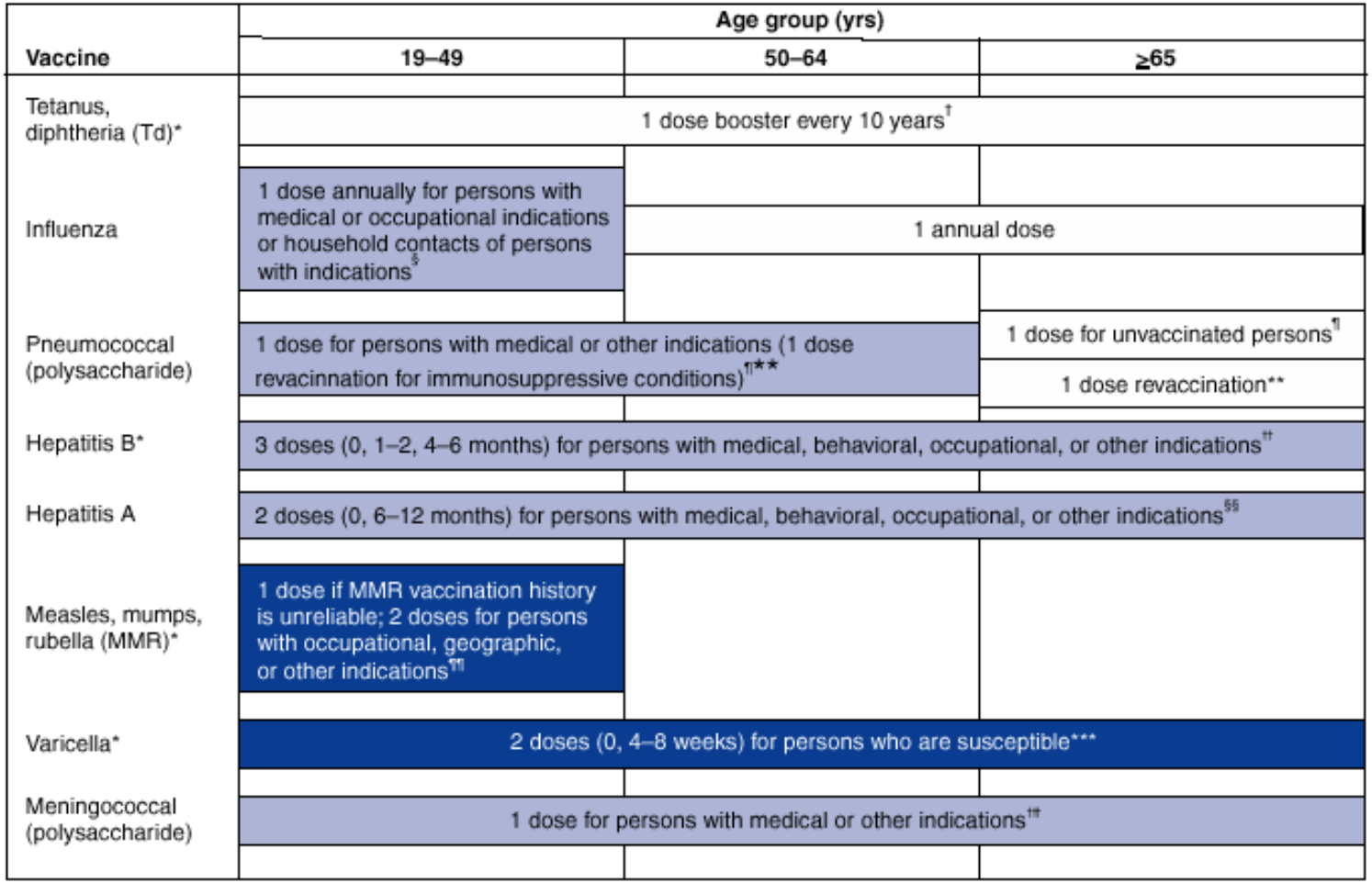
- Requires non-grandfathered private insurance plans cover vaccines in ACIP recommended adult schedule
- Includes vaccines on adult schedule as essential preventive services for expanded Medicaid programs
  - Coverage, patient OOP costs, provider payments vary by state
- But, does not expand Medicare Part B for all adult vaccines
- Vaccines not covered by Medicare B are included in Medicare Part D.

Expansion of Adult Immunization Providers

- 2009 H1N1 pandemic highlighted importance of expanding number of adult vaccine providers and access to vaccines
- By 2009, all states allowed immunization-trained pharmacists to administer influenza vaccine to adults and some to children
  - Expanded rapidly to include other vaccines
- Obstetricians and gynecologists also expanded their implementation of vaccination services
  - Influenza severity among pregnant women better documented
  - 2011 Tdap vaccination during pregnancy recommendation

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6041a4.htm.

FIGURE 1. Recommended adult immunization schedule — United States, 2002–2003



First adult vaccine schedule in 2002

Included 8 vaccines, and 11 antigens.

FIGURE 2. Recommended immunizations for adults with medical conditions — United States, 2002–2003

Medical condition	Vaccine						
	Tetanus-diphtheria (Td)*	Influenza	Pneumo-coccal (poly-saccharide)	Hepatitis B*	Hepatitis A	Measles, mumps, rubella (MMR)*	Varicella*
Pregnancy		A					
Diabetes, heart disease, chronic pulmonary disease, and chronic liver disease, including chronic alcoholism		B	C		D		
Congenital immunodeficiency, leukemia, lymphoma, generalized malignancy, therapy with alkylating agents, antimetabolites, radiation, or large amounts of corticosteroids			E				F
Renal failure/end stage renal disease and recipients of hemodialysis or clotting factor concentrates			E	G			
Asplenia including elective sphlenectomy and terminal complement-component deficiencies			E,H,I				
Human immunodeficiency virus (HIV) infection			E,J			K	

For all persons in this age group

For persons with medical/exposure indications

Catch-up on childhood vaccinations

Contraindicated

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2020

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Influenza inactivated (IIV) or **Influenza recombinant** (RIV)	1 dose annually			
or				
Influenza live, attenuated (LAIV)	1 dose annually			
Tetanus, diphtheria, pertussis (Tdap or Td)	1 dose Tdap, then Td or Tdap booster every 10 years			
Measles, mumps, rubella (MMR)	1 or 2 doses depending on indication (if born in 1957 or later)			
Varicella (VAR)	2 doses (if born in 1980 or later)		2 doses	
Zoster recombinant (RZV) *(preferred)*			2 doses	
or			or	
Zoster live (ZVL)			1 dose	
Human papillomavirus (HPV)	2 or 3 doses depending on age at initial vaccination or condition	27 through 45 years		
Pneumococcal conjugate (PCV13)	1 dose			65 years and older
Pneumococcal polysaccharide (PPSV23)	1 or 2 doses depending on indication			1 dose
Hepatitis A (HepA)	2 or 3 doses depending on vaccine			
Hepatitis B (HepB)	2 or 3 doses depending on vaccine			
Meningococcal A, C, W, Y (MenACWY)	1 or 2 doses depending on indication, see notes for booster recommendations			
Meningococcal B (MenB)	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations			
	19 through 23 years			
***Haemophilus influenzae* type b** (Hib)	1 or 3 doses depending on indication			

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended vaccination for adults with an additional risk factor or another indication

Recommended vaccination based on shared clinical decision-making

No recommendation/ Not applicable

Adult vaccine schedule now published annually.

Includes 16 vaccines different vaccine types against 16 pathogens.

Table 2 Recommended Adult Immunization Schedule by Medical Condition and Other Indications, United States, 2020

Vaccine	Pregnancy	Immuno-compromised (excluding HIV infection)	HIV infection CD4 count		Asplenia, complement deficiencies	End-stage renal disease; or on hemodialysis	Heart or lung disease, alcoholism[1]	Chronic liver disease	Diabetes	Health care personnel[2]	Men who have sex with men
			<200	≥200							
IIV or RIV	1 dose annually										
or										or	
LAIV	NOT RECOMMENDED					PRECAUTION				1 dose annually	
Tdap or Td	1 dose Tdap each pregnancy	1 dose Tdap, then Td or Tdap booster every 10 years									
MMR	NOT RECOMMENDED	1 or 2 doses depending on indication									
VAR	NOT RECOMMENDED	2 doses									
RZV *(preferred)*	DELAY				2 doses at age ≥50 years						
or					or						
ZVL	NOT RECOMMENDED				1 dose at age ≥60 years						
HPV	DELAY	3 doses through age 26 years			2 or 3 doses through age 26 years						
PCV13		1 dose									
PPSV23		1, 2, or 3 doses depending on age and indication									
HepA					2 or 3 doses depending on vaccine						
HepB						2 or 3 doses depending on vaccine					
MenACWY	1 or 2 doses depending on indication, see notes for booster recommendations										
MenB	PRECAUTION	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations									
Hib		3 doses HSCT[3] recipients only			1 dose						

- Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection
- Recommended vaccination for adults with an additional risk factor or another indication
- Precaution—vaccination might be indicated if benefit of protection outweighs risk of adverse reaction
- Delay vaccination until after pregnancy if vaccine is indicated
- Not recommended/ contraindicated—vaccine should not be administered
- No recommendation/ Not applicable

1. Precaution for LAIV does not apply to alcoholism. **2.** See notes for influenza; hepatitis B; measles, mumps, and rubella; and varicella vaccinations. **3.** Hematopoietic stem cell transplant.

Rationale for investing in adult immunizations

Top 10 Reasons to Invest in Adult Vaccine Implementation

1. High burden of vaccine preventable disease among adults

Burden of Diseases, Selected Adult Vaccines, United States

- Zoster (shingles)[1] - 1 million cases per year, lifetime risk 32%, nearly all adults
- Pertussis (whooping cough)[3] - 19,000 cases reported in 2017; 4,080 among adults
- Hepatitis A[4] – Estimated 6,700 acute cases in 2017
- Hepatitis B[4] - Estimated 22,200 acute cases in 2017
  - Adults with diabetes at 2 times risk of hepatitis B
- Streptococcus pneumoniae[5]
  - Pneumococcal Pneumonia ~ 400,000 hospitalizations per year
    - Up to 36% of adult community-acquired pneumonias
  - Pneumococcal Bacteremia ~ 12,000 cases per year
  - Pneumococcal Meningitis ~ 3,000–6,000 cases per year

1. CDC. Prevention of Herpes Zoster. MMWR 2008;57(RR-5):1–30
2. CDC. www.cdc.gov/flu
3. https://www.cdc.gov/pertussis/downloads/pertuss-surv-report-2017.pdf
4. CDC. Viral Hepatitis Surveillance United States, 2017.
5. https://www.cdc.gov/vaccines/pubs/pinkbook/pneumo.html

CDC Estimates of Annual Influenza Disease Burden, United States, 2010-2019

9 million–49 million
Flu illnesses

4.3 million–20.7 million
Flu Medical Visits

140,000–960,000
Flu-related Hospitalizations

>75% adults

12,000–79,000
Flu-related Deaths

>90% adults ≥65y

https://www.cdc.gov/flu/about/burden/index.html.

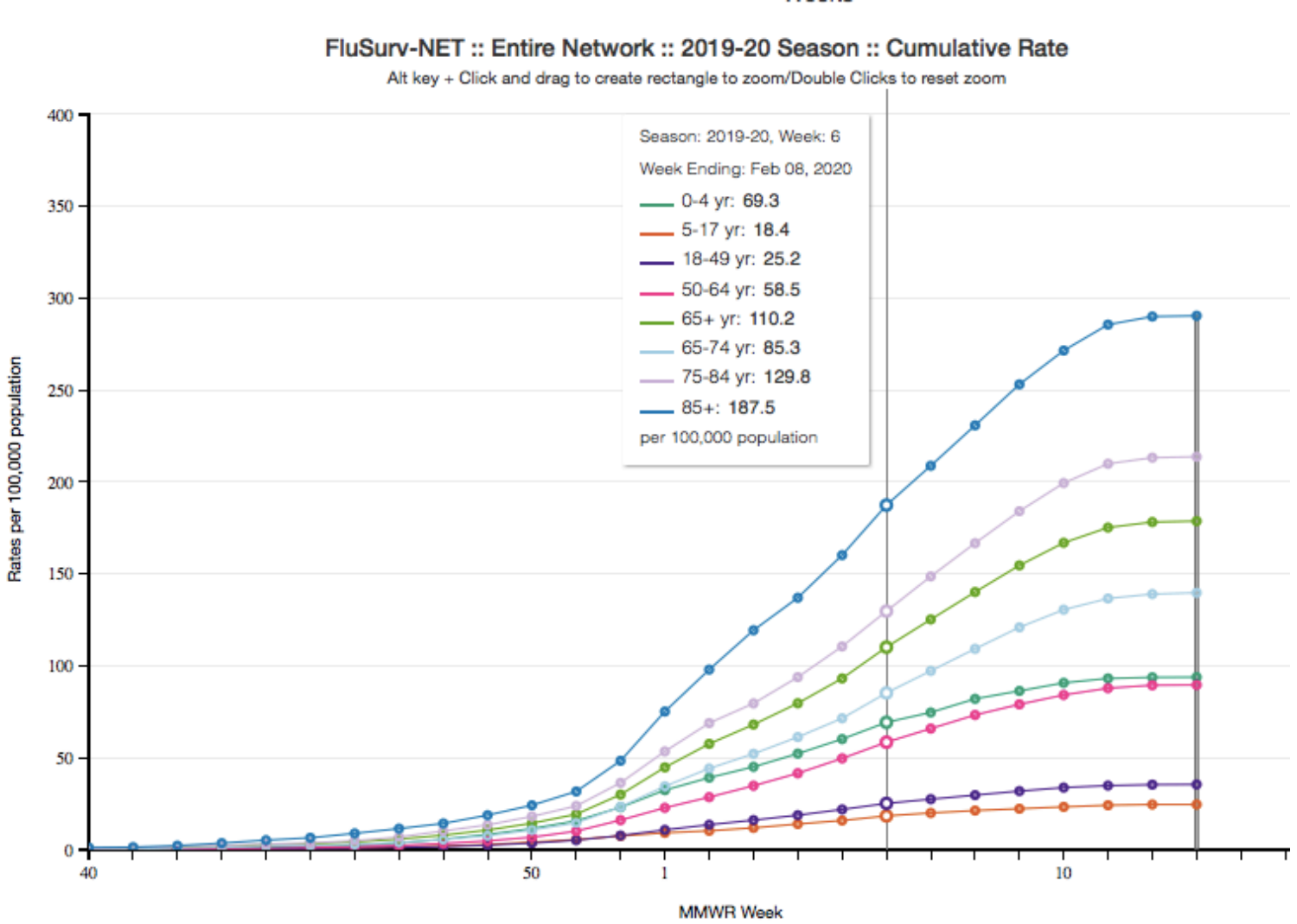
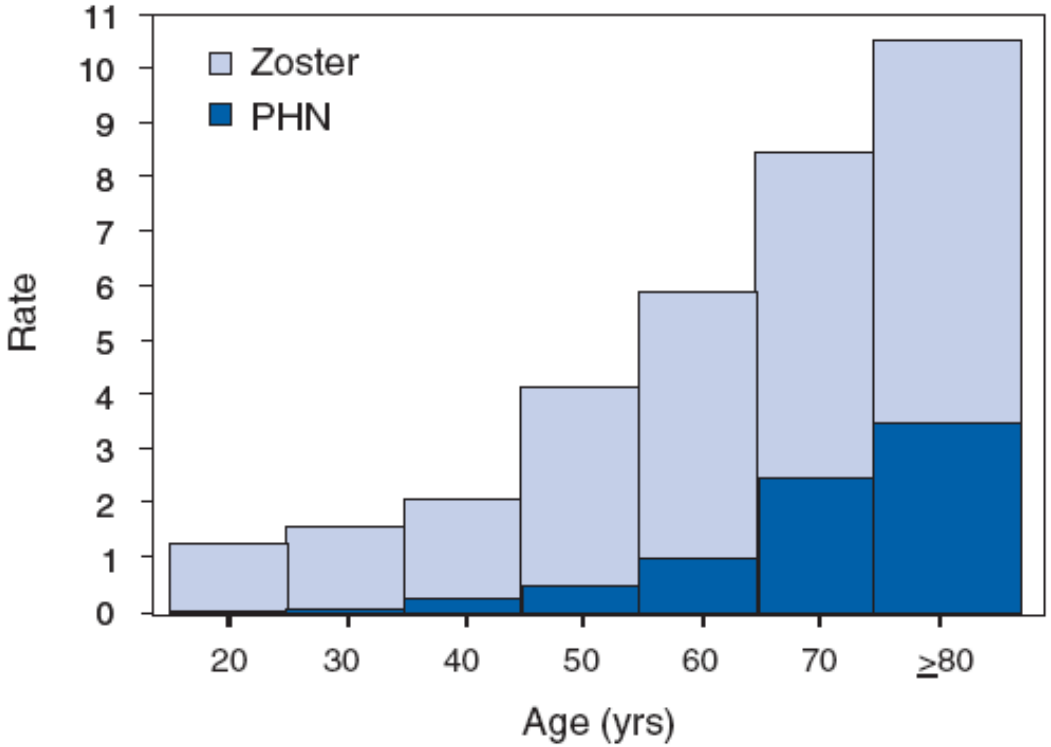

FluSurv-NET :: Entire Network :: 2019-20 Season :: Cumulative Rate
Alt key + Click and drag to create rectangle to zoom/Double Clicks to reset zoom
Season: 2019-20, Week: 6
Week Ending: Feb 08, 2020
0-4 yr: 69.3
5-17 yr: 18.4
18-49 yr: 25.2
50-64 yr: 58.5
65+ yr: 110.2
65-74 yr: 85.3
75-84 yr: 129.8
85+: 187.5
per 100,000 population
Rates per 100,000 population
400
350
300
250
200
150
100
50
0
40
50
1
10
MMWR Week

FIGURE 3. Rate* of zoster and postherpetic neuralgia (PHN)†, by age — United States

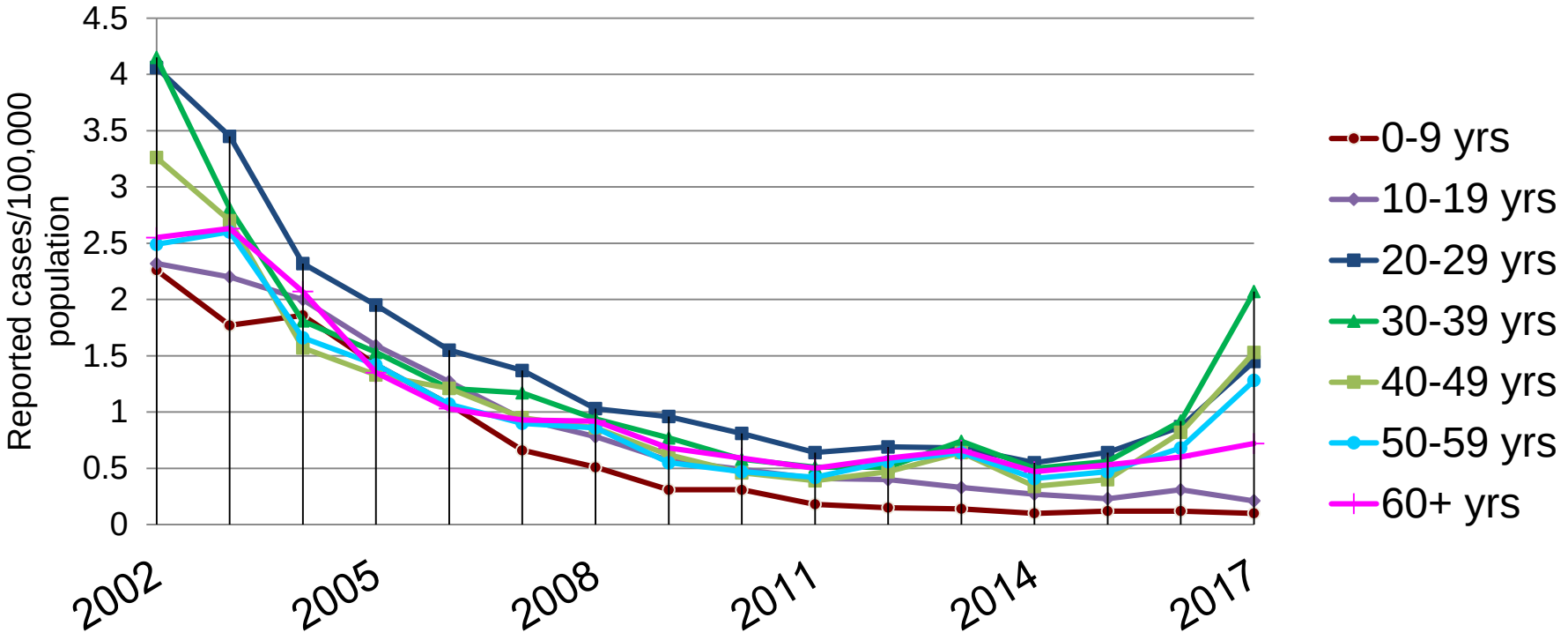


*Per 1,000 person-years.
†Defined as ≥30 days of pain.

- About 1 million cases of shingles annually in U.S.
- Lifetime risk: 32%
- Increases with age, beginning about age 50

1. CDC. Prevention of Herpes Zoster. MMWR 2008. 57(RR-5): 1-30.

Rates of reported hepatitis A, by age group — United States, 2002–2017



Source: CDC, National Notifiable Diseases Surveillance System.

Number of HPV-Associated Cancer Cases per Year

Cancer site	Ave. # Cancers per Year	Estimated % caused by 9vHPV	Estimated # caused by 9vHPV types
Cervix	12,015	81	9,700
Vagina	862	73	600
Vulva	4,009	63	2,500
Penis	1,303	57	700
Anus	6,810	88	6,000
Oropharynx	19,000*	66	12,600
Total Female	24,886	76	19,000
Total Male	19,113	69	13,100
TOTAL	43,999	73	32,100

https://www.cdc.gov/cancer/hpv/statistics/cases.htm. *82% among males.

Top 10 Reasons to Invest in Adult Vaccine Implementation

1. High burden of vaccine preventable disease among adults

2. Vaccines prevent suffering, hospitalizations, disability and death

Impact of Vaccination - Influenza

- Effectiveness varies based on antigenic match and age and health of person being vaccinated
  - ~50–60% effective in younger adults when good match
  - ~30% in adults ≥65 years against medically attended influenza when good match[1]
  - Reduces antibiotic use, medical visits, loss of work days
  - Reduces hospitalizations and deaths, including reducing deaths in children and adults[2,3]

https://phil.cdc.gov/phil/quicksearch.asp

1. CDC. Prevention and Control of Seasonal Influenza: Recommendations of the ACIP – U.S., 2016-17. MMWR 2016
2. https://www.cdc.gov/mmwr/volumes/67/wr/mm6706a1.htm?s_cid=mm6706a1_e
3. Nichol, et al. Vaccine 2018 Apr 12;36(16):2166-2175.

Influenza Disease Averted Through Vaccination

- CDC estimates annual disease burden averted considering vaccination rates and vaccine effectiveness estimates
- From 2010-2019, influenza vaccination prevented annual estimated
  - 1.4-7.5 million illnesses
  - 0.7 - 3.2 million medical visits
  - 39,000– 100,000 hospitalizations
  - 3,500 - 12,000 deaths

https://www.cdc.gov/flu/vaccines-work/past-burden-averted-est.html

Impact of Vaccination – Herpes Zoster

- Recombinant Zoster (RZV) subunit vaccine—Recommended by ACIP/CDC January 2018 ACIP for age 50 years and older
  - —96% (95% CI 93,98) efficacy among 50-, 60-, 70-year olds[2]
  - —Subsequent study 90% (95% CI 84,94) effectiveness among ≥70 years[3]
  - —Immunogenicity persists at least 9 years post-vaccination
- Compared to zoster vaccine live with 51% effectiveness and waning immunity

https://www.cdc.gov/mmwr/volumes/67/wr/mm6703a5.htm.

Pneumococcal Vaccines

- PPSV23 (polysaccharide vaccine) –
  - 50-80% effective in preventing invasive pneumococcal disease
  - Uncertain benefit in preventing non-invasive pneumococcal disease

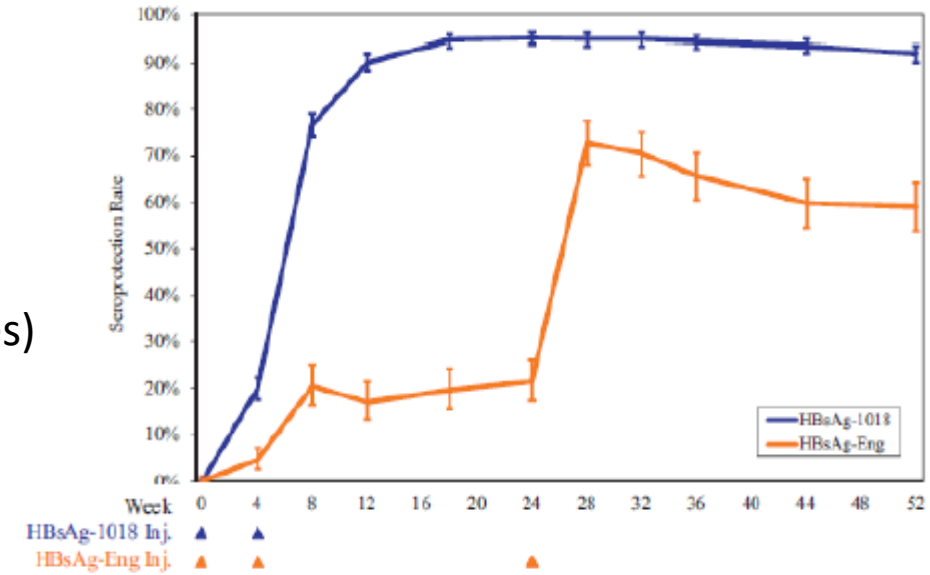
- PCV13 (conjugate vaccine)
  - CAPITA randomized placebo-controlled trial of PCV13 in adults showed
  - 75% reduction in invasive pneumococcal disease
  - 45% in non-invasive pneumonia due to vaccine serotypes

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6434a4.htm.
World Health Organization. 23-valent pneumococcal polysaccharide vaccine. WHO position paper. Wkly Epidemiol Rec 2008;83:373—84.
Bonten, et al. N Engl J Med 2015;372:1114-25. DOI: 10.1056/NEJMoa1408544

Hepatitis B Vaccination

- Improved Immunogenicity
  - 90%–100% (2 doses Heplisav-B) vs. 70%–90% in comparison group (3 doses Engerix-B)
  - Diabetes Type II: 90% (2 doses) vs. 65% (3 doses)
  - Chronic kidney disease: 90% (3 doses) vs. 81% (4 double doses)
- No preference in new vs prior hepatitis B vaccines as both are highly effective

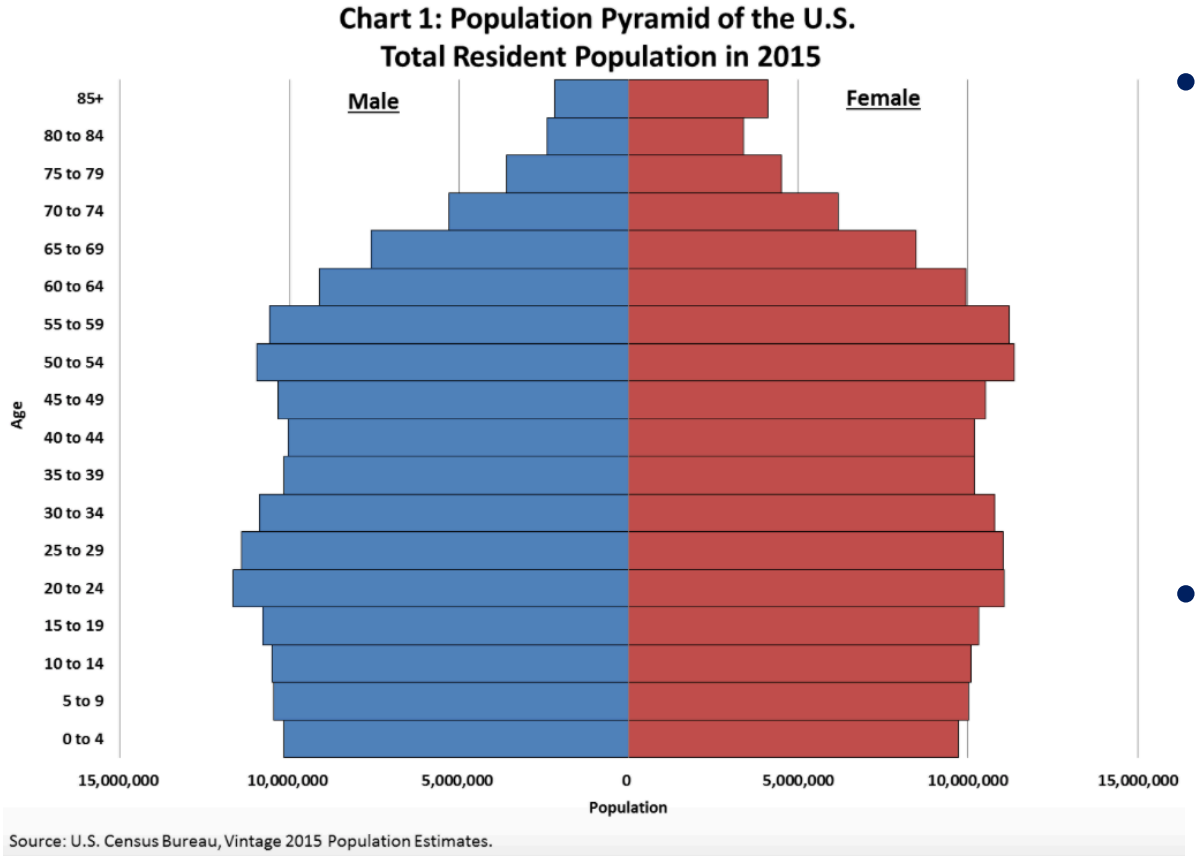
Healthy adults aged 40-70 years



1. Jackson S, Lentino J, Kopp J, et al.. Vaccine 2017; 36:668-74
2. Janssen R, Bennett S, Namini H, et al. Journal of Hepatology 2013; 58(Suppl 1):S574

Top 10 Reasons to Invest in Adult Vaccine Implementation

1. High burden of vaccine preventable disease among adults
2. Vaccines prevent suffering, hospitalizations, disability and death
3. Rising proportion of US population ≥65 years increases importance of
   - Maintaining health and
   - Reducing illness and loss of independence



- US Census estimates population ≥ 65 years
  - 16% in 2015
  - ~21% by 2030
- 16.5% persons in MA are age 65 years or older

https://www.census.gov/content/dam/Census/newsroom/blogs/2016/06/americas-age-profile-told-through-population-pyramids/Chart-1.png.

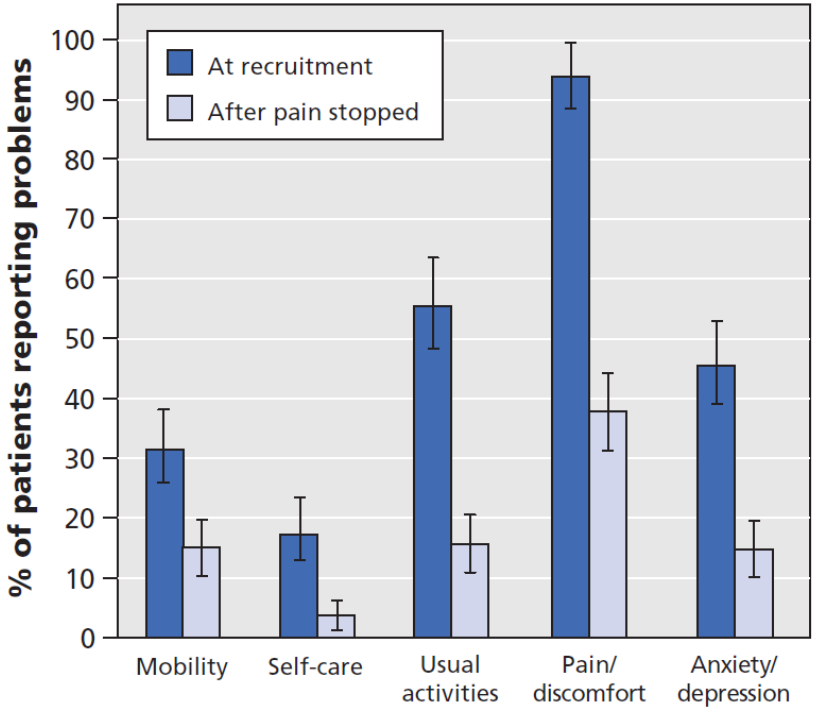


Figure 1: Impact of herpes zoster on health-related quality of life. Shown are the percentages of participants (n = 261) who reported problems in the EuroQol EQ-5D domains at the time of recruitment (< 14 days after rash onset) and after the pain stopped. Median duration of pain was 32.5 days. Error bars = 95% confidence intervals.

Drolet M, et al. The impact of herpes zoster and postherpetic neuralgia on health-related quality of life: a prospective study. CMAJ 2010.

Jhung M, et al. American Journal of Infection Control 42 (2014) 7-11

Table 2
Clinical course and treatment for hospital-onset and community-onset influenza hospitalizations: FluSurv-NET sites, 2010-2011 influenza season

	Hospital onset (n = 172)	Community onset (n = 5,912)	*P* value
Intensive care unit admission, n (%)	72/171 (42)	1,021/5,894 (17)	<.01
Mechanical ventilation, n (%)	46/171 (27)	465/5,894 (7.9)	<.01
Antiviral treatment, n (%)	110/171 (64)	4,255/5,903 (72)	.026
Pneumonia, n (%)	56 (33)	1,828 (31)	.65
Acute respiratory distress syndrome, n (%)	14 (8.1)	189 (3.2)	<.01
Died, n (%)	27/171 (16)	170/5,894 (2.9)	<.01
Discharged home, n (%)	91/140 (65)	4,704/5,595 (84)	<.01
Discharged to long-term care facility/hospice, n (%)	49/140 (35)	874/5,595 (16)	<.01
Median length of stay (range), days	7 (4-101)	3 (0-164)	<.01
Median length of stay after influenza test (range), days	7.5 (0-66)	3 (0-164)	<.01

- Among persons admitted from home with influenza, about 6% discharged to LTCF
- Persons with hospital acquired influenza had substantially poorer outcomes

Top 10 Reasons to Invest in Adult Vaccine Implementation

1. High burden of vaccine preventable disease among adults
2. Vaccines prevent suffering, hospitalizations, disability and death
3. Rising proportion of US population ≥65 years increases importance of
   - Maintaining health and
   - Reducing illness and loss of independence
4. Vaccination of pregnant women prevents illness in themselves and their infants

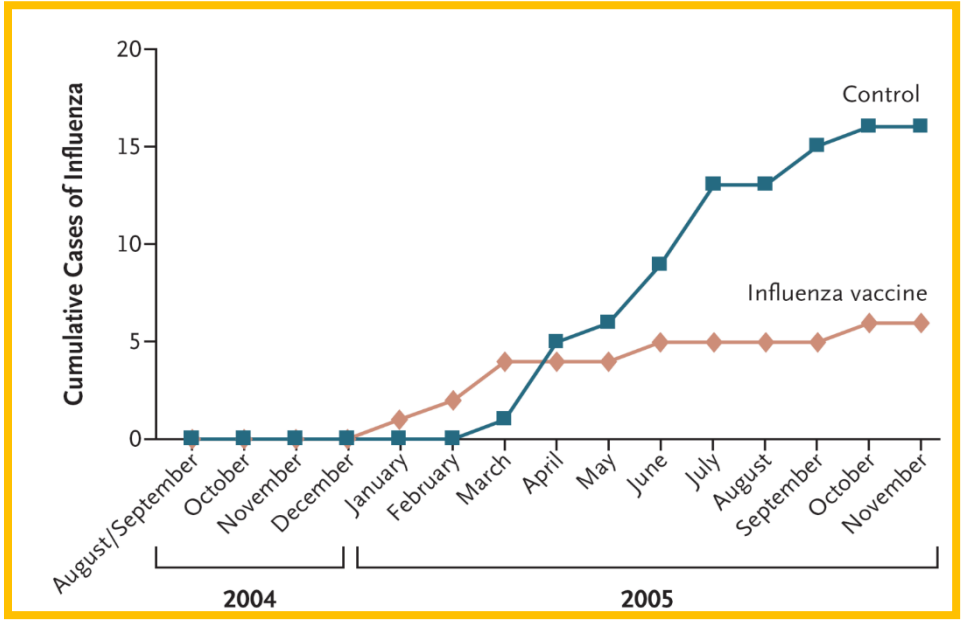
Influenza severity in pregnant women and fetus

- During seasonal influenza,
  - 19.5% - 33.5% of lab-confirmed influenza hospitalizations among women 15-44 years are pregnant[1]
  - Risk of influenza-related hospitalization increases with trimester[2]
- During 2009 H1N1 pandemic, 6.3% of influenza-related hospitalizations and 6.7% of deaths among pregnant women[3,4]
- Fetus at increased risk of congenital defects if maternal febrile illness
- Pregnancy risks include preterm labor and birth, and small for gestational age

1. https://gis.cdc.gov/grasp/fluview/FluHospChars.html.
2. Neuzil KM, et al. Am J Epidemiol 1998; 148:1094–1102.
3. Memoli MJ, Harvey H, Morens DM, Taubenberger JK. Influenza Other Respir Viruses. 2013 Nov;7(6):1033-9.
4. Rasmussen SA, Jamieson DJ, Uyeki TM. Am J Obstet Gynecol. 2012 Sep;207(3 Suppl):S3-8.
5. Rasmussen, Jamieson and Bresee, Emerg Infect Dis 14:95-100, 2008

Impact of Influenza Vaccination During Pregnancy on Infants

- Sentinel RCT in Bangladesh in 2004-05
  - Arms: inactivated influenza vaccine vs pneumococcal vaccine (PPSV23) in 2nd or 3rd trimester
- Results: Lower rates of febrile influenza, small for gestational age, and low birth weight in infants of influenza vaccinated mom
  - VE 63% vs infant influenza
  - VE 29% vs infant febrile resp illness
  - VE 36% vs maternal febrile resp illness



1. Steinhoff MC, et al, CMAJ. 2012;184(6):645-53.
2. Zaman, et al, N Engl J Med 2008;359:1555-64.

Tdap Vaccination of Pregnant Women

- Tdap recommended for each pregnancy during weeks 27-36 gestation to protect infants
  - highest risk of severe illness/death during first months of life
- Rationale – protection of infants through passive immunization
- Cocooning and post-partem vaccination (vaccinating those around the infants) was less successful strategy – waning immunity
- Maternal Tdap vaccination 88% effectiveness preventing pertussis in infants before their first dose of DTaP

https://www.cdc.gov/pertussis/pregnant/research.html
www.cdc.gov/tetanus/images/tetanus-vacc-media.jpg.

Top 10 Reasons to Invest in Adult Vaccine Implementation

5. Vaccination is an important part of chronic disease management, prevention of complications from infections, and protection of vulnerable populations

Hepatitis A Outbreaks in U.S. Starting 2016

- From October 2016 through February 2020:
  - Cases: 31,485
  - Hospitalizations: 19,242 (61%)
  - Deaths: 320 (1%)

- Risk factors:
  - Use of injection and non-injection drugs
  - Unstable housing or homelessness
  - Men who have sex with men
  - Currently or recently incarcerated
  - Chronic liver disease, including cirrhosis, hepatitis B or hepatitis C

Herpes Zoster (Shingles) Complications

- Thoracic, cervical, and ophthalmic involvement are most common
- Approximately 10-25% with shingles have herpes zoster ophthalmicus
  - Can lead to permanent eye damage
- Post-herpetic neuralgia (severe pain lasting >1 month)

FIGURE 2. Case of herpes zoster ophthalmicus

Photo/MN Oxman, University of California, San Diego

1. CDC. Prevention of Herpes Zoster. MMWR 2008. 57(RR-5): 1-30.

Influenza and Heart Disease

- Influenza vaccination effectiveness among persons with existing cardiovascular disease: Meta-analyses
  - Case control studies: 29% (95%CI 9,44) against acute MI[1]
  - Randomized studies: 36% (95%CI 14,53) against major cardiac events[2]

- Recommended by American College of Cardiology and American Heart Association[1]
  - Comparable preventive measure as:
    statins (36%), anti-hypertensives (15–18%), smoking cessation (26%)

1. Barnes et al. Heart 2015;101:1738–1747
2. Udell et al. JAMA 2013;310:1711–1720.

ORIGINAL ARTICLE

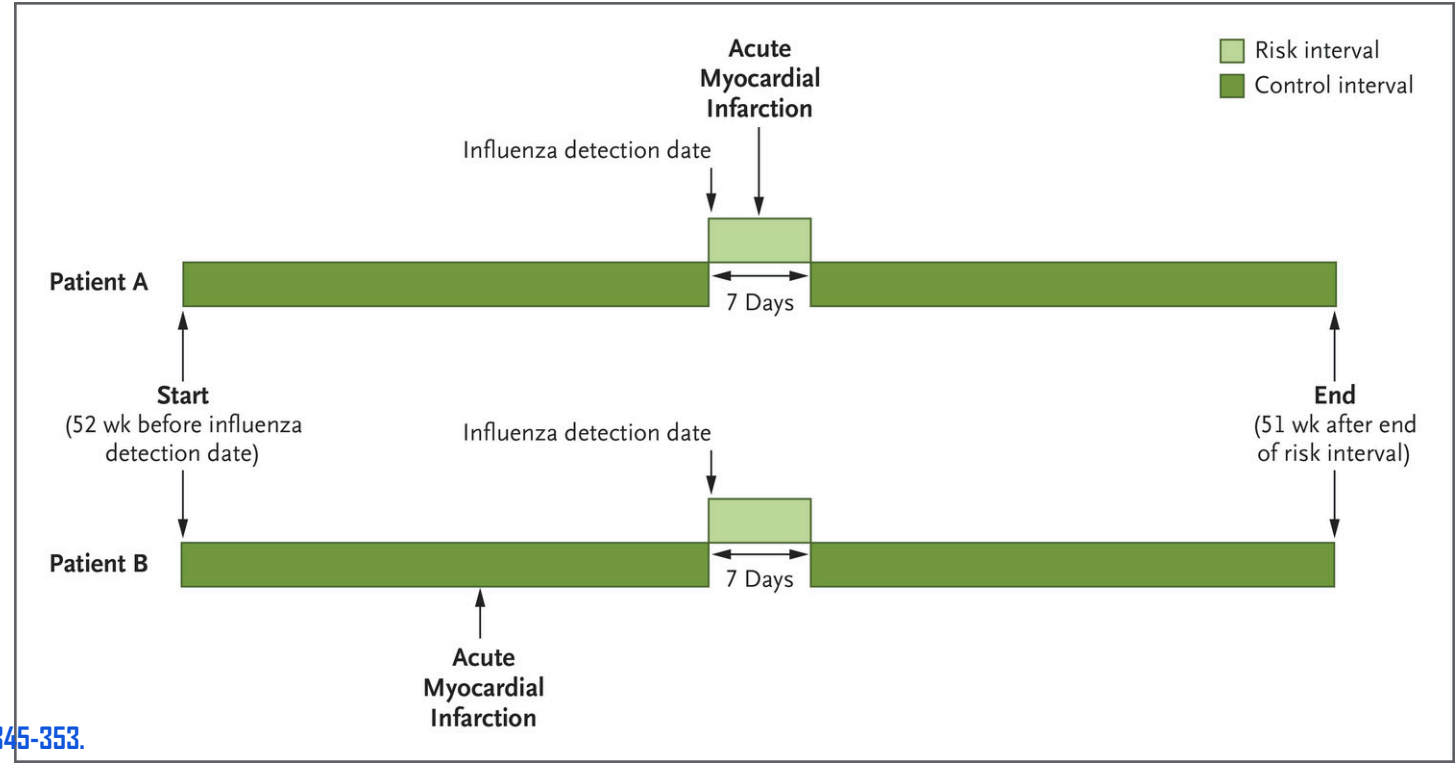
Acute Myocardial Infarction after Laboratory-Confirmed Influenza Infection

Jeffrey C. Kwong, M.D., Kevin L. Schwartz, M.D., Michael A. Campitelli, M.P.H., Hannah Chung, M.P.H., Natasha S. Crowcroft, M.D., Timothy Karnauchow, Ph.D., Kevin Katz, M.D., Dennis T. Ko, M.D., Allison J. McGeer, M.D., Dayre McNally, M.D., Ph.D., David C. Richardson, M.D., Laura C. Rosella, Ph.D., M.H.Sc., et al.

Study among persons

1. 35 yrs+,
2. tested for respiratory virus,
3. hospitalized for acute MI,
4. 2008-15

Risk window defined as 7 days after positive test



JC Kwong et al. N Engl J Med 2018;378:345-353.

Top Reasons for Investing in Adult Immunization

6. New vaccines available with greater protection against common illnesses and their complications
   - Influenza HD and Adjuvanted vaccines
   - Inactivated shingles vaccine
   - Hepatitis B adjuvanted, and
   - Pneumococcal conjugate vaccine (PCV13)

Rationale for Investing Time and Resources

7. Incentives for healthcare systems
   - Vaccines improve population health
   - Influenza and pneumococcal vaccines included in MIPS Medicare Quality Program
   - New HEDIS©2019 quality measures available
     - Maternal vaccination with Tdap and influenza vaccines
     - Adult composite (influenza, Td/Tdap, shingles, and pneumococcal vaccines)
   - High proportion of adults not up-to-date

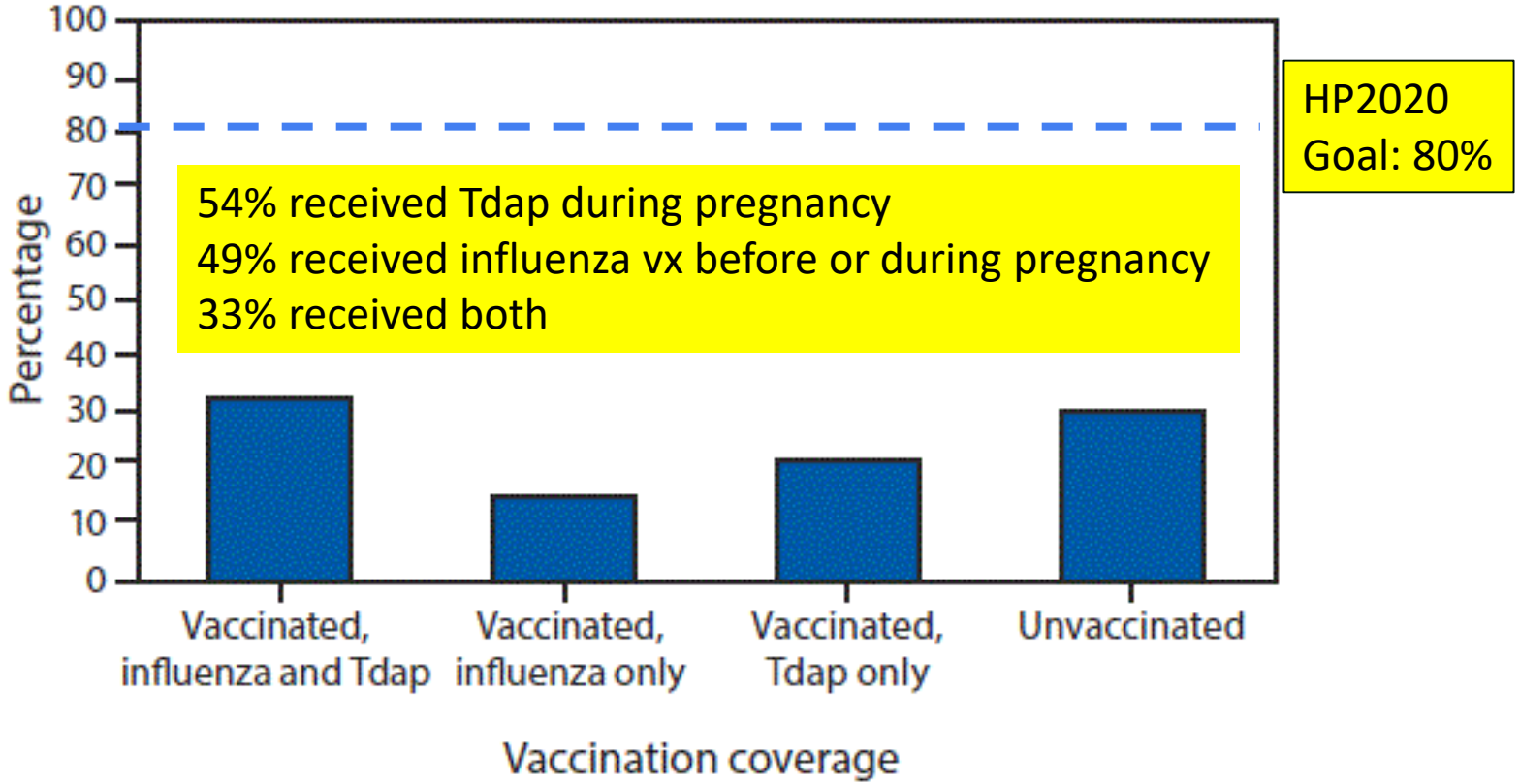
Vaccination coverage estimates using an age-appropriate adult vaccination composite measure, by age group — National Health Interview Survey, United States, 2017*

	≥19 years	19-59 years	60-64 years	≥65 years
	(n†=26,430)	(n†=16,651)	(n†=2,445)	(n†=7,334)
Method 1: Tdap only	16.4	18.1	9.7	12.8
	(15.5-17.3)§	(17.1-19.2)	(8.0-11.7)	(11.5-14.3)
Method 2: Td or Tdap	25.2	26.7	14.5	24.3
	(24.4-26.1)¶	(25.8-27.7)	(12.9-16.2)	(22.9-25.8)

*Estimates for tetanus toxoid-containing, pneumococcal, herpes zoster, and influenza vaccines. Td/Tdap vaccination was “receipt in the past 10 years”. Pneumococcal and zoster vaccination were “ever received” at least one dose. Influenza vaccination in past 12 months.

https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/pubs-resources/NHIS-2017.html#adult-vaccination-composite-measure.

Tdap and influenza vaccination coverage* among women with a recent live birth — Internet panel survey, United States, April 2018



MMWR *Weekly* September 28, 2018;67(38);1055–1059.

Rationale for Investing Time and Resources: Payment and Cost Effectiveness

8. Payment concerns often cited as barriers by providers[a], however reducing errors and costs can reduce provider financial concerns

a. Lindley MC, et al. Vaccine financing and billing in practices serving adult patients: A follow-up survey. Vaccine. 2018 Feb 14;36(8):1093-1100.
b. Bridges CB, et al. Meeting the Challenges of Immunizing Adults. Vaccine. 2015 Nov 27;33 Suppl 4:D114-20.

Rationale for Investing Time and Resources: Payment and Cost Effectiveness

- ACA requires insurance coverage for vaccines in private health plans
- Medicare B includes influenza, pneumococcal, hepatitis B for high risk and Td vaccine for wound management
- Other vaccines covered by Medicare Part D – separate billing mechanism for medical providers
- Medicaid payments for adult vaccinations is most challenging in many states
  - Strategies for improving vaccination in FQHCs/Medicaid from NACHC: https://www.izsummitpartners.org/content/uploads/2019/12/adult-imm-fqhc-white-paper-11-01-2019.pdf.

Rationale for Investing Time and Resources: Payment and Cost Effectiveness

- Eliminating vaccine coding and billing errors key to prevent claims rejection
- Most claims rejection due to giving vaccine without ACIP recommended indication
  - E.g. PCV13 given to person <65 years with diabetes instead of PPSV23
  - E.g. High-dose influenza vaccination given to person <65 years
- Reducing vaccine purchase cost through group purchasing
- Reducing fixed cost per dose by routinely offering vaccines to patients

Hutton DW, et al. *Am J Manag Care*. 2019;25(11):e334-e341.
Goodman RM, et al. *Vaccine* 2019;37 (45):6803-6813

Rationale for Investing in Adult Immunization Implementation

9. Vaccines for adults are cost effective (CE) and some are cost saving[a]
   - Comparable CE to colorectal cancer screening, HTN screening and treatment, and other common preventive services

ELSEVIER

Vaccine

Volume 37, Issue 2, 7 January 2019, Pages 226-234

Review

Cost-effectiveness of adult vaccinations: A systematic review

Andrew J. Leidner [a], Neil Murthy [b, c], Harrell W. Chesson [d], Matthew Biggerstaff [b], Charles Stoecker [c], Aaron M. Harris [d], Anna Acosta [b], Kathleen Dooling [b], Carolyn B. Bridges [a]

Show more

a. Leidner AJ, et al. Cost-effectiveness of adult vaccinations: a systematic review. Vaccine 2019;37:226-34.

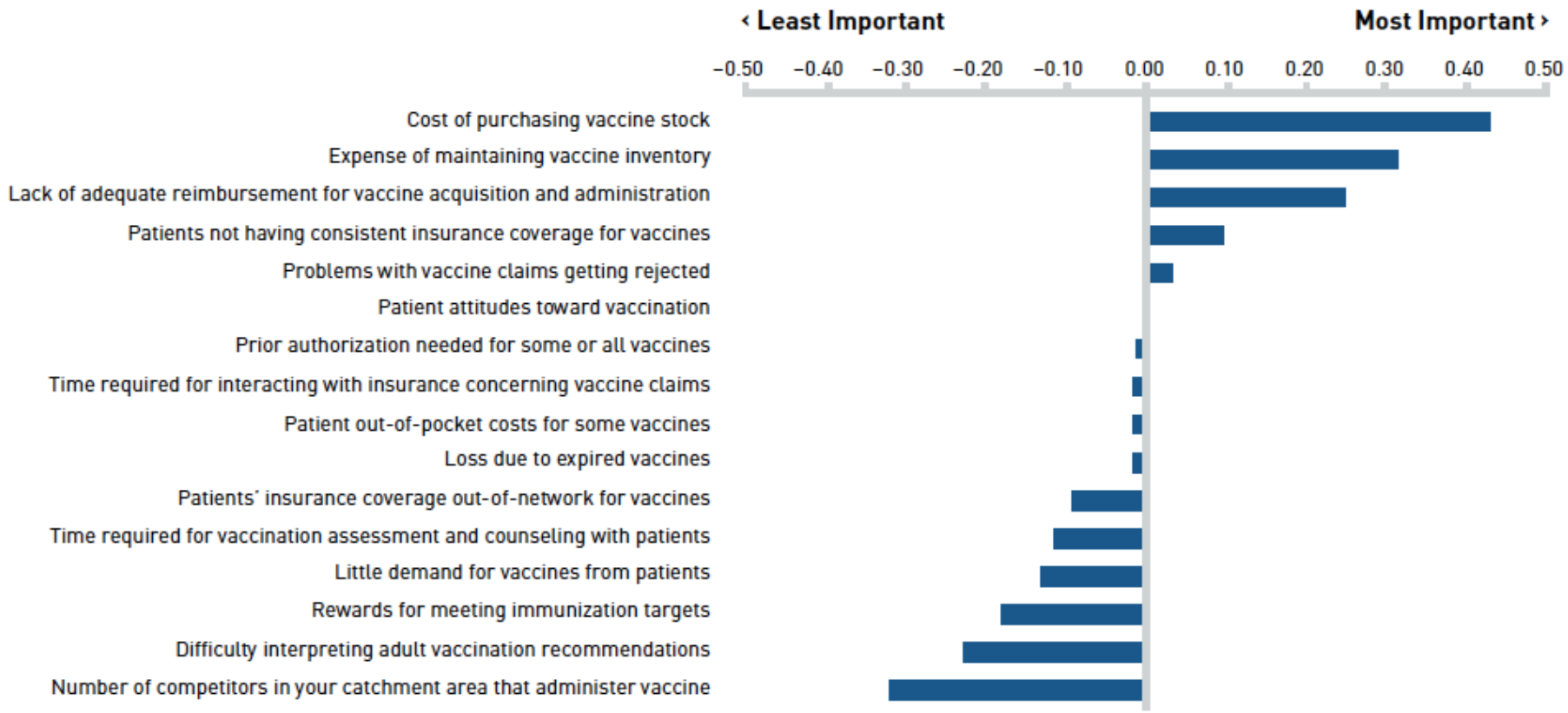
Top Reasons for Investing in Adult Immunization

10. Patients, for the most part, agree vaccines are important, but want a recommendation from their provider. Providers believe vaccines are important, but implementation is challenging.

Implementation can be done using a team approach

Yay Team!

FIGURE 2. Most and Least Important Factors in Deciding to Stock Adult Vaccines



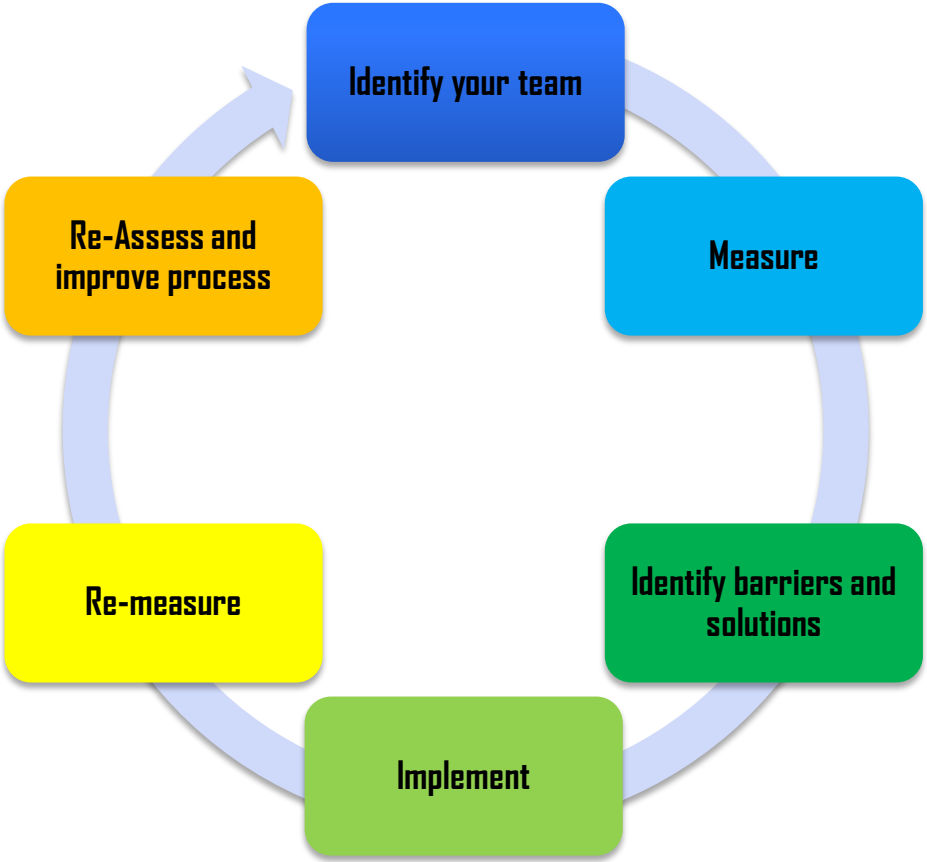
Hutton DW, et al. *Am J Manag Care*. 2019;25(11):e334-e341.

Provider and Healthcare System Implementation Barriers and Challenges

- Challenges with adding new interventions into patient flow
  - Competing priorities
- Adult vaccine financing confusing, billing and coding errors
- Multiple sources for medical care and vaccination and challenges with vaccination tracking
  - Limited familiarity and use of immunization registries

Hurley, et al. Annals Intern Med 2014
Lutz CS, et al. Am J Prev Med 2018
Srivastav A, et al. Vaccine 2018

Components of Implementation Success



- Have support from all levels of organization
- Establish Chief Vaccination Officer
- Identify team members from nursing, IT/HER (MISS), billing/coding, reception
- Assess and optimize patient flow
- Review claims rejections and how to prevent vaccination, billing and coding errors
- Use MIIS for vaccine assessment and reduce over vaccination

https://www.izsummitpartners.org/content/uploads/2017/06/making-preventative-priority-becker-hospital-review-2017.pdf.

BECKER'S HOSPITAL REVIEW
Sponsored by: National Adult and Influenza Immunization Summit
Making Prevention the Priority – How to Boost Adult Immunization Rates

Patient Motivators and Barriers

- HCP recommendation number one reported factor in influencing vaccination decisions, but adults perceive receiving few recommendations for vaccines from HCPs
- Most adults are motivated to get vaccines to protect their own health and many would get a vaccine in order to protect loved ones as well.
  - A strong, clear recommendation is what they want
- However, some adults have concerns about safety and side effects of vaccines as well as questions about effectiveness and cost.
- Adults want TAILORED information to make an informed decision. Is the vaccine right for me?

From Aparna Ramakrishnan, CDC, focus groups on adult immunizations

Bridges CB, et al. Vaccine 2015;33 Suppl 4:D114-20

Hesitant Patients?

- Question the value or necessity of the recommended vaccination schedule or specific vaccines
- Want information to make the best choice
- BUT may not identify themselves as vaccine-hesitant
- Engage in active listening and answer questions
- Consider using SHARE to help answer questions and concerns

SHARE the tailored reasons why the recommended vaccine is right for the patient given his or her age, health status, lifestyle, occupation, or other risk factors.

HIGHTLIGHT positive experiences with vaccines (personal or in your practice), as appropriate, to reinforce the benefits and strengthen confidence in vaccination.

ADDRESS patient questions and any concerns about the vaccine, including side effects, safety, and vaccine effectiveness in plain and understandable language.

REMIND patients that vaccines protect them and their loved ones from many common and serious diseases

EXPLAIN the potential costs of getting the disease, including serious health effects, time lost (such as missing work or family obligations), and financial costs.

Standards for Adult Immunization Practice

- In response to low adult vaccination rates, multi-sector partners from NAIIS developed and National Vaccine Advisory Committee updated standards in 2014

- Recognizes that
  - not all medical providers stock all recommended vaccines,
  - importance of providers' recommendation, and
  - need to accurately track patients vaccinations, including in immunization information systems (i.e. vaccine registries)

Public Health Reports 2014;129:115–123

Standards for Adult Immunization Practice

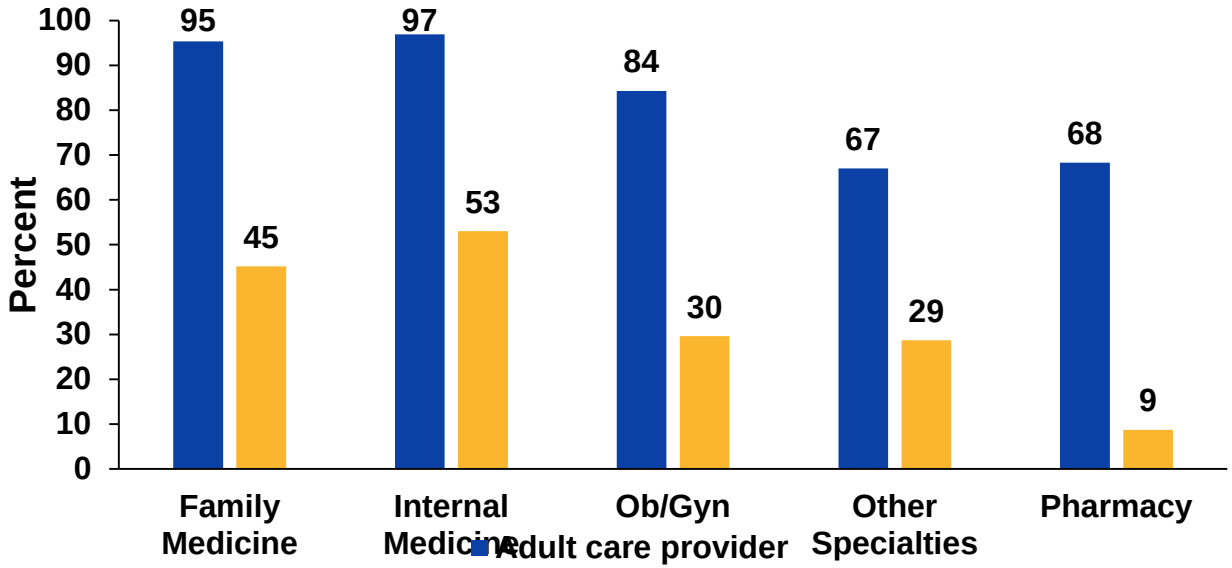
The Standards were revised to emphasize the responsibility of all HCP who treat adults to:

- Conduct routine **assessments** of a patient's vaccination needs during every clinical encounter
- Strongly **recommend** vaccines that patients need
- **Administer** needed vaccines or **refer** patients for vaccination
- **Document** administered vaccinations in IIS (state vaccine registries)

How well do medical providers think they do assessing patients for vaccines they need? How well do patients think providers do?

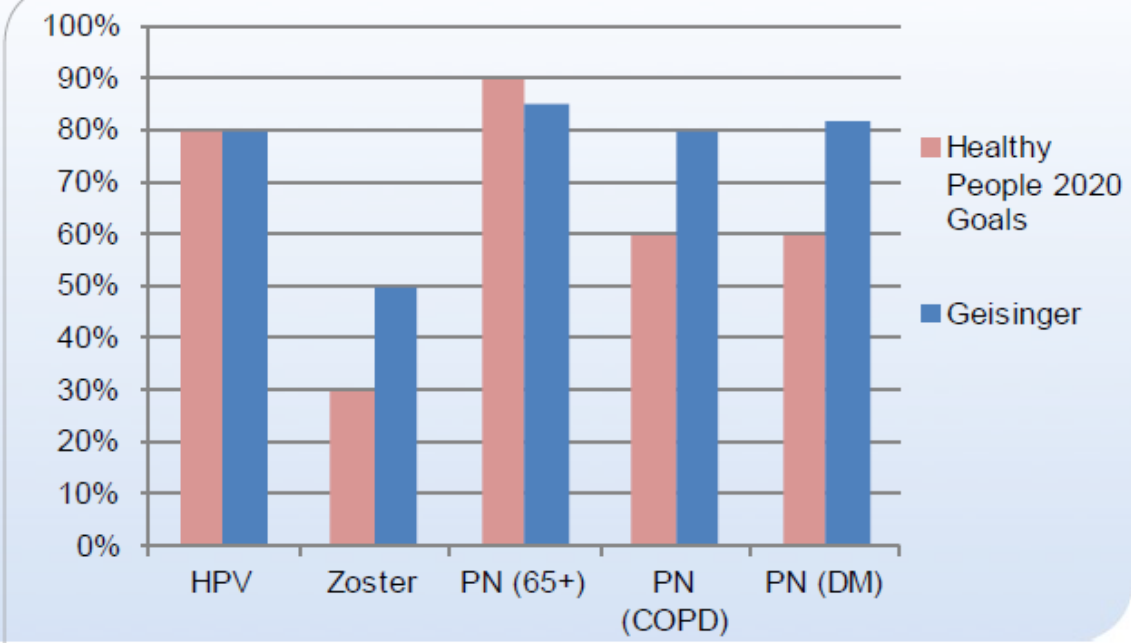
1. 95/95 providers/patients
2. 80/60
3. 95/50
4. 80/20
5. Other guesses?

Adult vaccination assessments reported by HCPs and reported by general adult population, United States, 2016



CDC, unpublished data, 2017

Healthy People 2020 Goals vs. Geisinger



Geisinger

Source: Geisinger Health System; Health & Human Services Healthy People 2020; www.hhs.gov

Slide courtesy Dr. John Bulger, Geisinger Health, May 2015

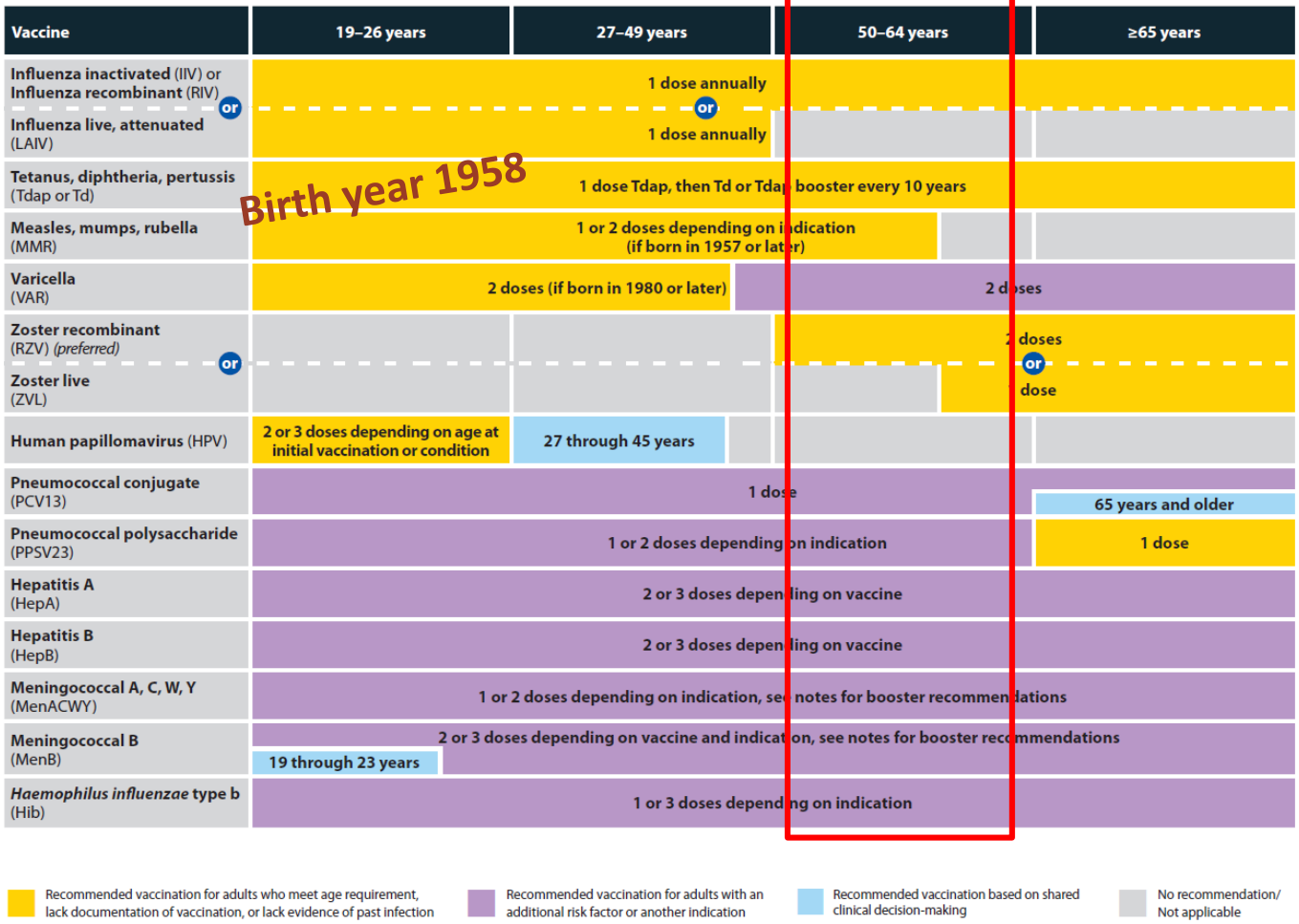
Case Study

Jake is a 60 year old man recently diagnosed with early-stage multiple myeloma with progressive renal insufficiency. He was previously healthy.

He cannot recall which vaccines he had as a child, but he thinks he got all of his shots as a child and some when he was in the military at age 18-20. He hasn’t had any vaccines since then.

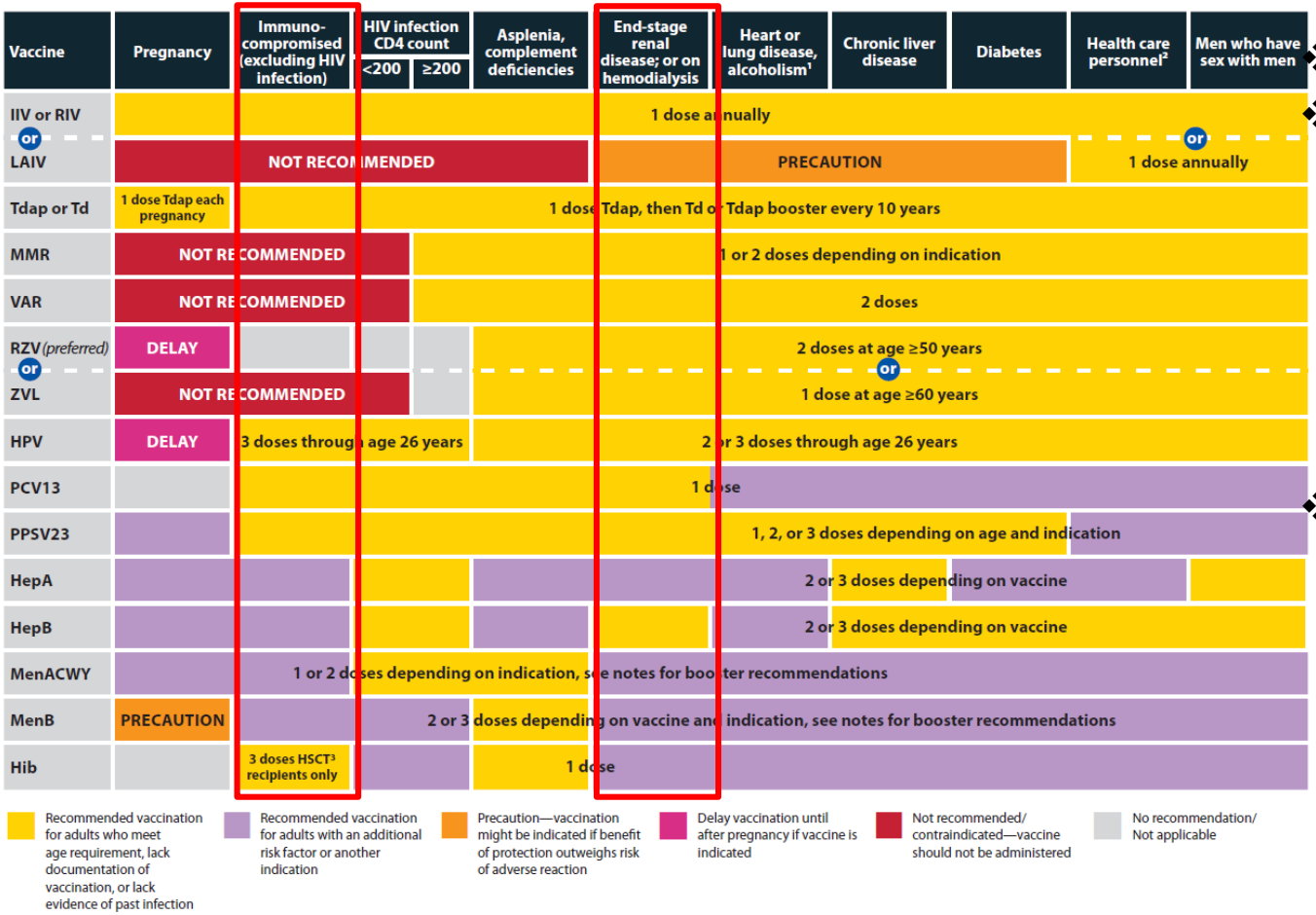
Which vaccines is he recommended to receive?

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2020



- Needs Flu and Tdap
- No varicella needed (US born before 1980)
- Immune compromised
  - No live vaccines like MMR
  - No RZV or VZL
- PCV13
- PPSV23 8 weeks after PCV13
- Hepatitis B (dialysis may be needed)

Table 2 Recommended Adult Immunization Schedule by Medical Condition and Other Indications, United States, 2020



1. Precaution for LAIV does not apply to alcoholism. **2.** See notes for influenza; hepatitis B; measles, mumps, and rubella; and varicella vaccinations. **3.** Hematopoietic stem cell transplant.

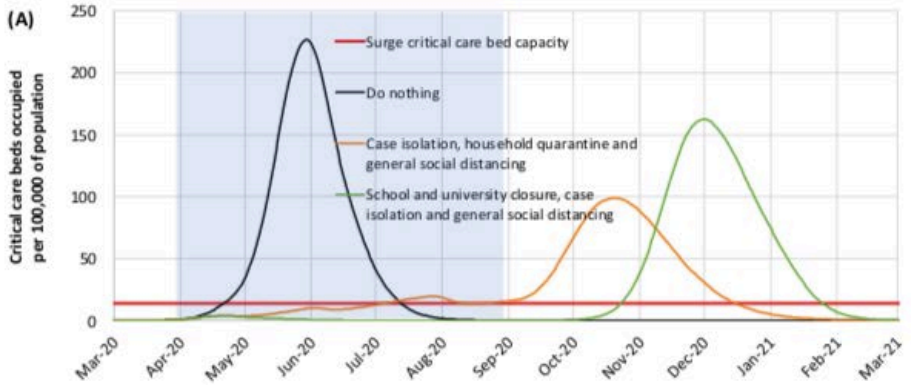
- Needs Flu and Tdap
- Immune compromised
  - No live vaccines
  - No RZV recommendation
  - Needs PCV13
  - PPSV23 8 weeks after PCV13
- Consider Hepatitis B (dialysis may be needed)

Looking Forward…

Multiple Vaccines in Development for SARS-CoV-2

- Per WHO's "DRAFT landscape of COVID-19 candidate vaccines, 4 April 2020"… two vaccines in phase 1 and 60 vaccines in pre-clinical studies
  - Multiple approaches
- Need to prepare to vaccinate and track dose-series completion in adults

Figure A1: Suppression strategy scenarios for US showing ICU bed requirements. The black line shows the unmitigated epidemic. Green shows a suppression strategy incorporating closure of schools and universities, case isolation and population-wide social distancing beginning in late March 2020. The orange line shows a containment strategy incorporating case isolation, household quarantine and population-wide social distancing. The red line is the estimated surge ICU bed capacity in US. The blue shading shows the 5-month period in which these interventions are assumed to remain in place. (B) shows the same data as in panel (A) but zoomed in on the lower levels of the graph.



Ferguson N, et al. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand. Imperial College, UK. DOI: https://doi.org/10.25561/77482

Reminder: Checklist for Safe and Effective Vaccination Clinics is available from CDC and the National Adult and Influenza Immunization Summit

- Consider using the checklist if you conduct vaccination clinics at sites other than your regular clinic/office

- Use of the checklist designed to help prevent vaccine storage, handling and administration errors

https://www.izsummitpartners.org/content/uploads/2019/02/off-site-vaccination-clinic-checklist.pdf.

Other Pathogens with Vaccine Research

- RSV – leading cause of hospitalization in children <1 year old and severe illness in older adults
- Malaria
- HIV
- Gonorrhea
- Group A strep
- Norovirus
- Zika
- Dengue
- MERS
- Others

Summary and Immunization Resources

Discussion

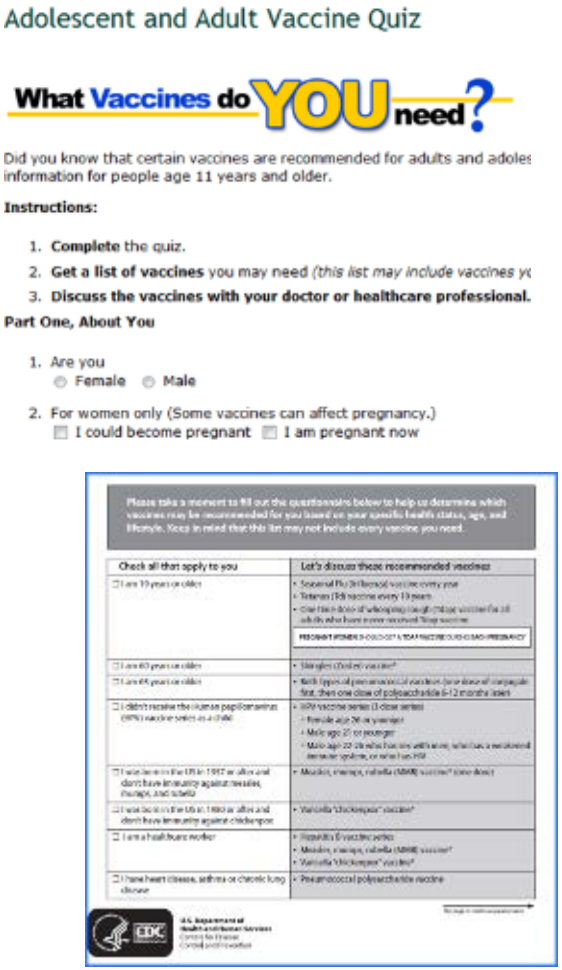
- Adult immunizations are widely supported and cost-effective preventive measures for adults
- Implementation is challenging, but team approaches can lead to success
  - Only 1 in 4-5 adults are up-to-date
- Providers recommendations are the most important predictor
- Expanded routine implementation of the Standards for Adult Immunization Practices, measuring vaccine coverage, and giving feedback to providers can improve vaccination

Resources and How to Get Questions Answered

- ACP
  - Clinical resources hub for immunizations: www.acponline.org/clinical-information/clinical-resources-products/adult-immunization.
- CDC
  - Providers, parents and patients can email www.cdc.gov/cdcinfo.
  - Website www.cdc.gov/vaccines.
  - Influenza www.cdc.gov/flu.
  - Vaccine Safety. www.cdc.gov/vaccinesafety
- Immunization Action Coalition
  - Website: www.immunize.org.
  - National Adult and Influenza Immunization Summit website: www.izsummitpartners.org.
  - Vaccines billing and coding guide: www.izsummitpartners.org/naiis-workgroups/access-provider-workgroup/coding-and-billing/.

Resources For Assessment

- Patient check-in vaccine questionnaire to be used at clinics: http://www.cdc.gov/vaccines/hcp/patient-ed/adults/downloads/patient-intake-form.pdf.
- Patient on-line quiz – direct patients to complete the quiz before coming to their appointment – gives them and you a starting point for talking about which vaccines they might need. http://www2.cdc.gov/nip/adultimmsched/.
- CDC adult vaccine schedule app at: http://www.cdc.gov/vaccines/schedules/hcp/schedule-app.html.
- Massachusetts Immunization Information System (MIIS)



Adolescent and Adult Vaccine Quiz

What Vaccines do YOU need?

Did you know that certain vaccines are recommended for adults and adoles
information for people age 11 years and older.

Instructions:

1. **Complete** the quiz.
2. **Get a list of vaccines** you may need *(this list may include vaccines yo*
3. **Discuss the vaccines with your doctor or healthcare professional.**

Part One, About You

1. Are you
   Female Male
2. For women only (Some vaccines can affect pregnancy.)
   I could become pregnant I am pregnant now

Please take a moment to fill out the questionnaire below to help us determine which vaccines may be recommended for you based on your specific health status, age, and lifestyle. Keep in mind that this list may not include every vaccine you need.

Check all that apply to you	Let's discuss these recommended vaccines
I am 19 years or older	• Seasonal flu (influenza) vaccine every year • Tetanus (Td) vaccine every 10 years • One time dose of whooping cough (Tdap) vaccine for all adults who have never received Tdap vaccine PREGNANT WOMEN: DO NOT GET A TDAP VACCINE DURING PREGNANCY
I am 60 years or older	• Shingles (Zoster) vaccine*
I am 65 years or older	• Both types of pneumococcal vaccines (one dose of each type, first, then one dose of polysaccharide 6–12 months later)
I didn't receive the human papillomavirus (HPV) vaccine series as a child	• HPV vaccine series (3 dose series) – Female age 26 or younger – Male age 21 or younger – Male age 22–26 who has sex with men, who has a weakened immune system, or who has HIV
I was born in the USA in 1957 or after and don't have immunity against measles, mumps, and rubella	• Measles, mumps, rubella (MMR) vaccine* (one dose)
I was born in the USA in 1980 or after and don't have immunity against chickenpox	• Varicella ("chickenpox") vaccine*
I am a healthcare worker	• Hepatitis B vaccine series • Measles, mumps, rubella (MMR) vaccine* • Varicella ("chickenpox") vaccine*
I have heart disease, asthma or chronic lung disease	• Pneumococcal polysaccharide vaccine

CDC U.S. Department of Health and Human Services Centers for Disease Control and Prevention

Vaccine Administration Resources

- **CDC General Immunization Training**
  www.cdc.gov/vaccines/ed/courses.htm
- **Immunization Skills Self-Assessment**
  www.immunize.org/catg.d/p7010.pdf
- **Storage and Handling**
  www.cdc.gov/vaccines/recs/storage
- **Dose and Route Chart**
  www.immunize.org/catg.d/p3084.pdf
- **Vaccine Information Statements (VIS)**
  www.cdc.gov/vaccines/hcp/vis
- **Guide to Infection Prevention for Outpatient Care**
  www.cdc.gov/HAI/settings/outpatient/outpatient-care-guidelines.html
- **Chart of Medical Management of Vaccine Reactions in Patients**
  www.immunize.org/catg.d/p3082.pdf

Thank you!

Questions about this presentation?

Carolyn Bridges, MD, FACP
Carolyn.bridges@immunize.org
carolyn@bridges-family.com

BRIDGES
MED - EPI
CONSULTING