

Grown-Up Shots: Selected Stories and Anecdotes About Vaccines for Adults

René F. Najera, MPH, DrPH
Director, Public Health and History of Vaccines Project
College of Physicians of Philadelphia

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Conflict(s) of interest?

- *History of Vaccines* has received funding from several sources since its inception:
 - Bill & Melinda Gates Foundation
 - GlaxoSmithKline
 - Merck Sharp & Dohme Corp., a subsidiary of Merck & Co., Inc.
 - Pfizer Inc.
 - The Independence Foundation
 - Sanofi Pasteur
 - Read more at: <https://historyofvaccines.org/overview>
- I do not have any personal investments in any pharmaceutical company
- Views and opinions may not necessarily reflect those of my employers, family, friends, academic affiliations, etc. (You know the deal.)

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Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2022

These recommendations must be read with the notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars. To determine minimum intervals between doses, see the catch-up schedule (Table 2).

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19-23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13-15 yrs	16 yrs	17-18 yrs
Hepatitis B (HepB)	1 st dose	← 2 nd dose →								← 3 rd dose →							
Rotavirus (RV): RV1 (2-dose series), RV5 (3-dose series)			1 st dose	2 nd dose	See Notes												
Diphtheria, tetanus, acellular pertussis (DTaP <7 yrs)			1 st dose	2 nd dose	3 rd dose				← 4 th dose →			3 rd dose					
Haemophilus influenzae type b (Hib)			1 st dose	2 nd dose	See Notes		3 rd or 4 th dose	See Notes									
Pneumococcal conjugate (PCV13)			1 st dose	2 nd dose	3 rd dose		← 4 th dose →										
Inactivated poliovirus (IPV <18 yrs)			1 st dose	2 nd dose					← 3 rd dose →			4 th dose					
Influenza (IV4)										Annual vaccination 1 or 2 doses							
Influenza (LAIV4)													Annual vaccination 1 or 2 doses	Annual vaccination 1 dose only			
Measles, mumps, rubella (MMR)					See Notes		← 1 st dose →					2 nd dose					
Varicella (VAR)							← 1 st dose →					2 nd dose					
Hepatitis A (HepA)					See Notes					2-dose series, See Notes							
Tetanus, diphtheria, acellular pertussis (Tdap ≥7 yrs)														1 dose			
Human papillomavirus (HPV)														See Notes			
Meningococcal (MenACWY-D ≥9 mos, MenACWY-CRM ≥2 mos, MenACWY-TT ≥2 years)										See Notes						1 st dose	2 nd dose
Meningococcal B (MenB-4C, MenB-FHbp)																	
Pneumococcal polysaccharide (PPSV23)																	
Dengue (DENACYD; 9-16 yrs)																	

Range of recommended ages for all children
 Range of recommended ages for catch-up vaccination
 Range of recommended ages for certain high-risk groups
 Recommended vaccination can begin in this age group
 Recommended vaccination based on shared clinical decision-making
 No recommendation/ not applicable

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Vaccines for Children



<https://bit.ly/3Y8P1WI>



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What about adults?



Photo by [Humayra Mubha](#) on [Unsplash](#)



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Table 2 Recommended Adult Immunization Schedule by Medical Condition or Other Indication, United States, 2022

Vaccine	Pregnancy	Immuno-compromised (excluding HIV infection)	HIV infection CD4 percentage and 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
IIV4 or RIV4 or LAIV4										1 dose annually
Tdap or Td	1 dose Tdap each pregnancy									1 dose Tdap, then Td or Tdap booster every 10 years
MMR	Contraindicated ³	Contraindicated								1 or 2 doses depending on indication
VAR	Contraindicated ³	Contraindicated								2 doses
RZV			2 doses at age ≥19 years							2 doses at age ≥50 years
HPV	Not Recommended ³	3 doses through age 26 years				2 or 3 doses through age 26 years depending on age at initial vaccination or condition				
Pneumococcal (PCV15, PCV20, PPSV23)										1 dose PCV15 followed by PPSV23 OR 1 dose PCV20 (see notes)
HepA										2 or 3 doses depending on vaccine
HepB	3 doses (see notes)									2, 3, or 4 doses depending on vaccine or condition
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.
 Recommended vaccination based on shared clinical decision-making.
 Precaution—vaccination might be indicated if benefit of protection outweighs risk of adverse reaction.
 Contraindicated or not recommended—vaccine should not be administered.
 No recommendation/Not applicable.

¹Precaution for LAIV4 does not apply to alcoholism. ²See notes for influenza; hepatitis B; measles, mumps, and rubella; and varicella vaccinations. ³Hematopoietic stem cell transplant. *Vaccinate after pregnancy.

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Epidemiological Transitions: Measles/Rubella/Chickenpox

- You have a very young population (fat-bottomed population pyramid)
- You set a cut-off age for mass vaccine campaign instead of vaccinating everyone
- Everyone within the cut-off gets vaccinated and incidence of disease in that age cohort and subsequent cohorts is low
- But those above the cut-off remain at risk
- Result: Susceptible age distribution shifts upward
- Rubella: Shift into childbearing age means increased CRS risk
- This is happening now in developing nations
- China's experience with measles

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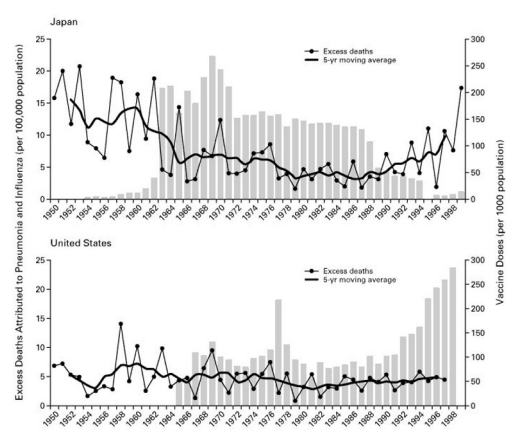
Shingles at a younger age?

- Before chickenpox vaccine, most of us got it
 - "Right of passage" that meant most got through it okay
 - Plenty of complications and deaths
- After chickenpox vaccine, levels in the community dropped
- Those who had disease have latent virus
 - If virus is activated, immune system fights it off
 - Immune system "boosted" through community exposure
- What if immune system has not "seen" varicella virus in a while?
 - Or if immune system is compromised?
- Shingles
 - Shifting to younger age groups because of less community boosting?
 - Because of more virus activation through stressors?
 - Something else?

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Chain of infection: The Japan Experience

- 1962 to 1987: Most children were vaccinated against influenza (50-85%)
- 1988 to 1994: Requirement relaxed and then repealed
- 1994 onwards: Increased morbidity and mortality in... The grandparents!
- “The vaccination of Japanese children prevented about 37,000 to 49,000 deaths per year, or about 1 death for every 420 children vaccinated.”



<https://bit.ly/3kKGwIZ>



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Cholera

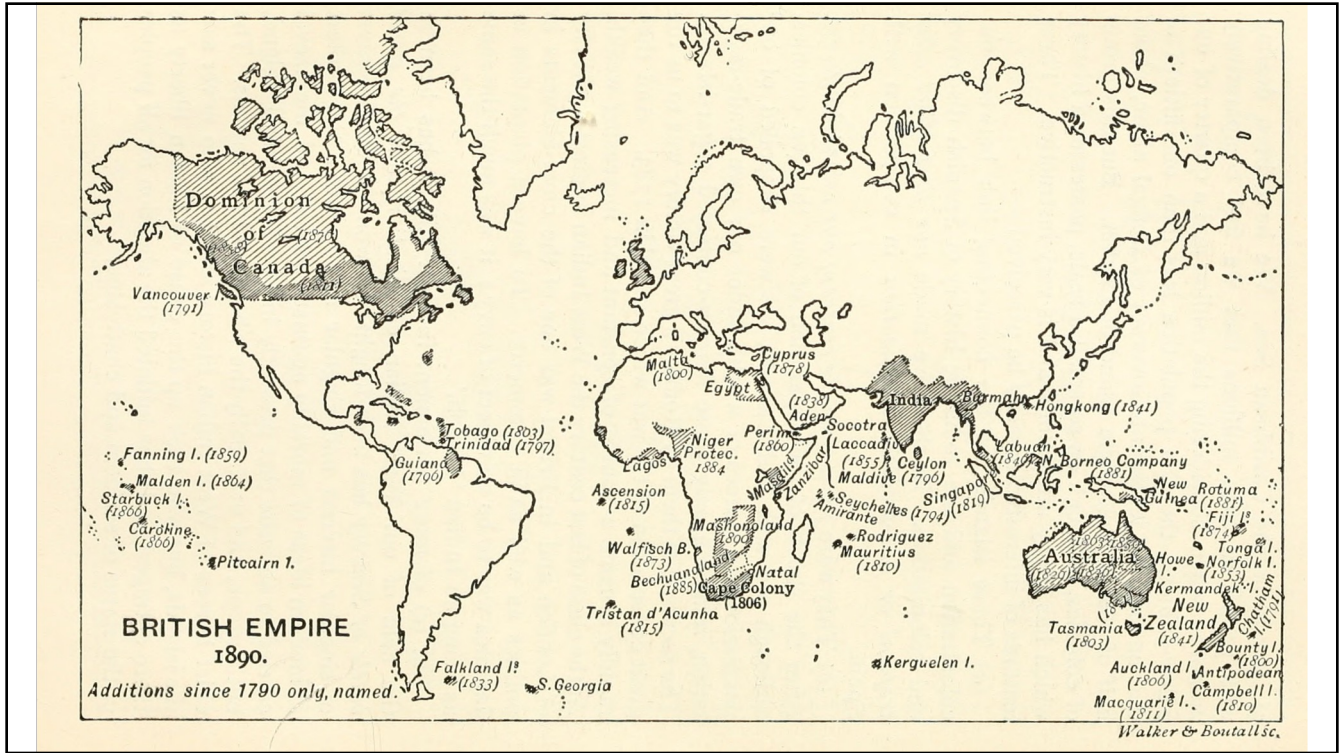
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HPV: A Natural Experiment

- Early 80s: Link between HPV and cervical cancer
- First US vaccine licensed in 2006... Backlash almost immediate
 - “Compromise” vaccine only for cancer strains... So you’ll still pay the consequence
 - Vaccine targeted at young females (males starting in 2015)
 - In US, states regulate requirements
- Texas
 - Gov. Perry mandates HPV vaccine but reverses course after political pressure
 - Texas now at or below average compared to national coverage
 - Rates of cervical cancer in Texas 9 per 100,000 (2019)
- Australia
 - National, cost-free required for females in 2007, males in 2013
 - Tied to social benefits (“no jab, no pay”)
 - Rate of cervical cancer in Australia 4 per 100,000 (elimination threshold)
 - Projected to be <1 in 100,000 by 2060s if nothing changes

Texas Tribune:
<https://bit.ly/3X8mnr>



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College kids? Meningitis!

- *Meningococcus* serogroup B most recently in the news
- Spread via respiratory droplets
 - Asplenic, complement deficient, +HIV highest risk
- High fatality rate, 4-20%
 - W-13%, C-12%, Y-11%, B-7%
- Treatment: Antibiotics, Supportive
- Prevention: Trumenba or Bexsero
 - Previous vaccines only covered serogroups A, C, Y & W



"Tumbler test" shows non-blanching rash

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MENINGITIS VACCINATION

Meningococcal Conjugate- ACWY

- All 11-12yo *should get* with booster at 16-18yo
- If first year living on college campus and no prior immunization, give shot at any age
- Menactra, Menveo

Meningococcal Serogroup B

- *May give* 16-23yo
- *Should give* if asplenia or complement deficiency (or if outbreak)
- MenB-FHbp (Trumenba) 3 dose series
- MenB-4C (Bexsero) 2 dose series

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Vaccines for National Defense

- February 5, 1777: George Washington orders all troops to be variolated (inoculated with smallpox)
 - Up to 1% died (compared to up to 10% or higher in non-inoculated)
- Yellow Fever in Spanish-American War (Caribbean)
- Influenza in WWI
 - 1918 pandemic started in Kansas?
- Today
 - Vaccination depends on deployment



Center for Military History

USAFRICOM

Vaccine	Required for AFRICOM
COVID-19	Recommend vaccination IAW current CDC guidelines.
Hepatitis A	Required.
Hepatitis B	Required.
Influenza, Northern Hemisphere (NH)	Required if you are residing in / traveling to a designated NH vaccine country by the WHO for 14 or more days from October through March.
Influenza, Southern Hemisphere (SH)	Required if you are residing in / traveling to a designated SH vaccine country by the WHO for 14 or more days from April through September.
M-M-R	Required.
Meningococcal	Required.
Pneumococcal	Required for high risk health conditions per ACIP .
Polio	Required. See additional guidance for travel to and from USAFRICOM countries affected by polio . See also CDC Guidance for Travel to high risk countries.
Rabies	Required for personnel at high risk for exposure IAW Service-Specific guidelines.
Tdap or Td	Required.
Typhoid	Required.
Varicella (chickenpox)	Required.
Yellow Fever	Required except for Comoros, Morocco and Tunisia. All YF vaccinations must be documented on a CDC 731. See exception for Ascension Island .

USINDOPACOM

Vaccine	Required for INDOPACOM
Anthrax	Required for travel of 15 days or longer to Korea, to include forward deployed Naval forces. Required for III MEF. All others per DoD policy.
COVID-19	Recommend vaccination IAW current CDC guidelines.
Hepatitis A	Required.
Hepatitis B	Required.
Influenza, Northern Hemisphere (NH)	Required if you are residing in / traveling to a designated NH vaccine country by the WHO for 14 or more days from October through March.
Influenza, Southern Hemisphere (SH)	Required if you are residing in / traveling to a designated SH vaccine country by the WHO (including Diego Garcia) for 14 or more days from April through September.
Japanese encephalitis	Required for all Air Force, Army Special Operations Forces (ARSOF), Navy and Marine Corps personnel stationed, deployed, or TAD (ashore or afloat) to Japan or Korea for 30 or more consecutive days. Recommended for all others. Every effort should be made to complete the vaccine series prior to arrival.
M-M-R	Required.
Meningococcal	Specific countries only - See National Center for Medical Intelligence (NCMI) recommendations (CAC authentication required).
Pneumococcal	Required for high risk health conditions per ACIP .
Polio	Required. In the setting of a polio outbreak, comply with CDC or WHO recommendations and if in-country deployment is > 4 weeks, vaccination is required prior to arriving in country.
Rabies	Required for personnel at high risk for exposure IAW Service-Specific guidelines.
Tdap or Td	Required.
Tick-Borne Encephalitis	Required when traveling to forested areas where the disease is endemic, and considered if personal protective measures to prevent insect bites are difficult or suspect.
Typhoid	Required for Korea, III MEF and Operational Forces. All others per DoD policy.
Varicella (chickenpox)	Required.
Yellow Fever	Required only for entry into some USINDOPACOM countries (per CDC Yellow Book) if traveling from, or transiting through, endemic areas (Africa & South America). CDC 731 Stamp required.

Travelers, Refugees, and Immigrants

- Most countries in Latin America have childhood vaccination programs & refugees/immigrants from there are relatively young
 - Issue is documentation
 - General health, overcrowded settings, access to screening and care
- Travelers, refugees and immigrants from other parts of the world
 - Eastern Europe (Ukraine) and MDR-TB
 - Middle East and Cholera
 - Africa and Meningitis
 - Influenza
- Public Health surveillance and data on emerging infectious diseases

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I lost my shot record ㄟ(ツ)ㄏ

- Check with your state health department
 - Moved? Check will previous
 - International? Call embassy or consulate for guidance
- Check with school systems you've attended
- Check with previous healthcare providers
- Talk to a healthcare provider
 - Titers to determine immune status
 - Re-start series to get you all caught up
 - Start series of adults vaccines



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