# Vaccines-what's new

MARK H. SAWYER UCSD SCHOOL OF MEDICINE RADY CHILDREN'S HOSPITAL SAN DIEGO

### Disclosures

# I have no financial disclosures related to this presentation

# Objectives

- Discuss the discrepant recommendations regarding the return of LAIV in the United States for the 2018-19 influenza season
- State your rationale for recommending meningococcal B vaccine to adolescents
- Explain the remaining challenges in achieving community protection for HPV infection and how to use the 2-dose regimen
- Describe what is different about the new hepatitis B and zoster vaccines currently being used in adults so that you can decide whether to use them or get them

# Disease through 1st and 2nd Generation Pneumococcal Conjugate Vaccines (PCV)

Trends in invasive pneumococcal disease among children <5 years old, 1998-2016



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# Sometimes success needs interruption to regain focus and shake off complacency.

**LENNOX LEWIS** 

### HEALTH ALERT

#### Patient and visitor safety is our top priority.

Due to the rising number of confirmed measles cases in Clark County, guests under the age of 12 and those that are not vaccinated or are immunocompromised are respectfully asked to leave the facility immediately.

Thank you for your understanding.

Pracellestin Southwest Medical Carter

# New stuff you should know

- Live attenuated influenza vaccine (LAIV) is back
- College students are in fact at increased risk for meningococcal B infection but no change in recommendations
- We are still struggling to achieve optimal HPV vaccination rates
- HPV vaccine now FDA approved up through the age of 45 years
- New adjuvanted hepatitis B vaccine for adults-may be used in children in the future
- And for you rather than your patients....
   New adjuvanted zoster vaccine for adults 50 years of age an older

#### Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger

#### Vaccines in the Child and Adolescent Immunization Schedule\*

Vaccines	Abbreviations	Trade names
Diphtheria, tetanus, and acellular pertussis vaccine	DTaP	Daptacel Infanrix
Diphtheria, tetanus vaccine	DT	No Trade Name
Haemophilus influenzae type b vaccine	Hib (PRP-T) Hib (PRP-OMP)	ActHIB Hiberix PedvaxHIB
Hepatitis A vaccine	НерА	Havrix Vaqta
Hepatitis B vaccine	НерВ	Engerix-B Recombivax HB
Human papillomavirus vaccine	HPV	Gardasil 9
Influenza vaccine (inactivated)	IIV	Multiple
Influenza vaccine (live, attenuated)	LAIV	FluMist
Measles, mumps, and rubella vaccine	MMR	M-M-R II
Meningococcal serogroups A, C, W, Y vaccine	MenACWY-D	Menactra
	MenACWY-CRM	Menveo
Meningococcal serogroup B vaccine	MenB-4C	Bexsero
	MenB-FHbp	Trumenba
Pneumococcal 13-valent conjugate vaccine	PCV13	Prevnar 13
Pneumococcal 23-valent polysaccharide vaccine	PPSV23	Pneumovax
Poliovirus vaccine (inactivated)	IPV	IPOL
Rotavirus vaccine	RV1 RV5	Rotarix RotaTeq
Tetanus, diphtheria, and acellular pertussis vaccine	Tdap	Adacel Boostrix
Tetanus and diphtheria vaccine	тd	Tenivac Td vaccine
Varicella vaccine	VAR	Varivax
Combination Vaccines (Use combination vaccines instead of separate injections v	when appropriate)	
DTaP, hepatitis B, and inactivated poliovirus vaccine	DTaP-HepB-IPV	Pediarix
DTaP, inactivated poliovirus, and Haemophilus influenzae type b vaccine	DTaP-IPV/Hib	Pentacel
DTaP and inactivated poliovirus vaccine	DTaP-IPV	Kinrix Quadracel
Measles, mumps, rubella, and varicella vaccines	MMRV	ProQuad

\*Administer recommended vaccines if immunization history is incomplete or unknown. Do not restart or add doses to vaccine series for extended intervals between doses. When a vaccine is not administered at the recommended age, administer at a subsequent visit. The use of trade names is for identification purposes only and does not imply endorsement by the ACIP or CDC.

### How to use the child/adolescent immunization schedule

ł	1	2	3	4
1	Determine	Determine	Assess need	Review
	recommended	recommended	for additional	vaccine types,
	vaccine by age	interval for	recommended	frequencies,
	(Table 1)	catch-up	vaccines	intervals, and
		vaccination	by medical	considerations
		(Table 2)	condition and	for special
			other indications	situations
			(Table 3)	(Notes)

UNITED STATES

Recommended by the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/acip) and approved by the Centers for Disease Control and Prevention (www.cdc.gov), American Academy of Pediatrics (www.aap.org), American Academy of Family Physicians (www.aafp.org), and American College of Obstetricians and Gynecologists (www.acog.org).

#### Report

- Suspected cases of reportable vaccine-preventable diseases or outbreaks to your state or local health department
- Clinically significant adverse events to the Vaccine Adverse Event Reporting System (VAERS) at www.vaers.hhs.gov or (800-822-7967)

Download the CDC Vaccine Schedules App for providers at www.cdc.gov/vaccines/schedules/hcp/schedule-app.html.

#### **Helpful information**

- Complete ACIP recommendations: www.cdc.gov/vaccines/hcp/acip-recs/index.html
- General Best Practice Guidelines for Immunization: www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html
- Outbreak information (including case identification and outbreak response), see Manual for the Surveillance of Vaccine-Preventable Diseases: www.cdc.gov/vaccines/pubs/surv-manual



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

### Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger United States, 2019 United States, 2019

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 in Table 1. To determine minimum intervals between doses, see the catch-up schedule (Table 2). School entry and adolescent vaccine age groups are shaded in gray.

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* dose	2 <sup>nd</sup> c	dose		•		3 <sup>rd</sup> dose		>								
Rotavirus (RV) RV1 (2-dose series); RV5 (3-dose series)			1 <sup>#</sup> dose	2 <sup>nd</sup> dose	See Notes												
Diphtheria, tetanus, & acellular pertussis (DTaP: <7 yrs)			1ª dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose			<b>∢</b> 4 <sup>th</sup> d	oseÞ			5 <sup>th</sup> dose					
Haemophilus influenzae type b (Hib)			1ª dose	2 <sup>nd</sup> dose	See Notes		<a>3<sup>rd</sup> or 4 See №</a>	* <sup>h</sup> dose <sub>s</sub> Notes									
Pneumococcal conjugate (PCV13)			1* dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose		<b>∢</b> 4 <sup>th</sup> c	doseÞ									
Inactivated poliovirus (IPV: <18 yrs)			1* dose	2 <sup>nd</sup> dose	•		3ª dose		>			4 <sup>th</sup> dose					
Influenza (IIV)							A	nnual vacci	nation 1 or	2 doses				Annual	vaccination	n 1 dose on	ly
Influenza (LAIV)											Annua 1 o	l vaccinatio r 2 doses	n	Annual	vaccination	n 1 dose on	ly
Measles, mumps, rubella (MMR)					See N	lotes	<b>∢</b> 1# d	dose>				2 <sup>nd</sup> dose					
Varicella (VAR)							<b>∢</b> 1* d	doseÞ				2 <sup>nd</sup> dose					
Hepatitis A (HepA)					See N	lotes	2	2-dose serie	s, See Note	s							
Meningococcal (MenACWY-D ≥9 mos; MenACWY-CRM ≥2 mos)								See Notes						1* dose		2 <sup>nd</sup> dose	
Tetanus, diphtheria, & acellular pertussis (Tdap: ≥7 yrs)														Tdap			
Human papillomavirus (HPV)														See Notes			
Meningococcal B															See Not	es	
Pneumococcal polysaccharide (PPSV23)														See Notes			
Range of recommended ages for a children	11	Range of re up immuni	ecommend ization	ed ages for	catch-	Range of r certain hig	ecommend gh-risk grou	ded ages for	Ra	ange of reco ceive vacci	ommended ne, subject i	ages for no to individua	n-high-risk al clinical de	groups that cision-mak	t may ing	No recom	mendation

#### Catch-up immunization schedule for persons aged 4 months—18 years who start late or who are more than Table 2

Table 2 1 month behind, United States, 2019 The figure below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age. Always use this table in conjunction with Table 1 and the notes that follow.

		Children age 4 months through 6 years							
Vaccine	Minimum Age for Dose 1	Dara 1 to Dara 2	Minimum Interval Between Doses	Dere 2 to Dere 4	Dara 4 to Dara 5				
Hepatitis B	Birth	4 weeks	8 weeks and at least 16 weeks after first dose. Minimum age for the final dose is 24 weeks.	Dose 3 to Dose 4	Dose 4 to Dose 5				
Rotavirus	6 weeks Maximum age for first dose is 14 weeks, 6 days	4 weeks	4 weeks Maximum age for final dose Is 8 months, 0 days.						
Diphtheria, tetanus, and acellular pertussis	6 weeks	4 weeks	4 weeks	6 months	6 months				
Haemophilus Influenzae type b	6 weeks	No further doses needed if first dose was administered at age 15 months or older. 4 weeks if first dose was administered before the 1 <sup>st</sup> birthday. 8 weeks (as final dose) if first dose was administered at age 12 through 14 months.	No further doses needed if previous dose was administered at age 15 months or older. 4 weeks if current age is younger than 12 months and first dose was administered at younger than age 7 months, and at least 1 previous dose was PRP-T (ActHib, Pentacel, Hibertx) or unknown. 8 weeks and age 12 through 59 months (as final dose) If current age is younger than 12 months and first dose was administered at age 7 through 11 months; OR if current age is 12 through 59 months and first dose was administered before the 1 <sup>st</sup> birthday, and second dose administered at younger than 15 months; OR if both doses were PRP-OMP (PedvaxHiB; Comvax) and were administered before the 1 <sup>st</sup> birthday.	8 weeks (as final dose) This dose only necessary for children age 12 through 59 months who received 3 doses before the 1 <sup>st</sup> birthday.					
Pneumococcal conjugate	6 weeks	No further doses needed for healthy children if first dose was administered at age 24 months or older. 4 weeks If first dose administered before the I <sup>st</sup> birthday. 8 weeks (as final dose for healthy children) If first dose was administered at the I <sup>st</sup> birthday or after.	No further doses needed for healthy children if previous dose administered at age 24 months or older. 4 weeks If current age is younger than 12 months and previous dose given at <7 months old. 8 weeks (as final dose for healthy children) If previous dose given between 7-11 months (wait until at least 12 months old); OR If current age is 12 months or older and at least 1 dose was given before age 12 months.	8 weeks (as final dose) This dose only necessary for children age 12 through 59 months who received 3 doses before age 12 months or for children at high risk who received 3 doses at any age.					
Inactivated poliovirus	6 weeks	4 weeks	4 weeks if current age is < 4 years. 6 months (as final dose) if current age is 4 years or older.	6 months (minimum age 4 years for final dose).					
Measles, mumps, rubella	12 months	4 weeks							
Varicella	12 months	3 months							
Hepatitis A	12 months	6 months							
Meningococcal	2 months MenACWY- CRM 9 months MenACWY-D	8 weeks	See Notes	See Notes					
			Children and adolescents age 7 through 18 years						
Meningococcal	Not Applicable (N/A)	8 weeks							
Tetanus, diphtheria; tetanus, diphtheria, and acellular pertussis	7 years	4 weeks	4 weeks If first dose of DTaP/DT was administered before the 1 <sup>st</sup> birthday. 6 months (as final dose) If first dose of DTaP/DT or Tdap/Td was administered at or after the 1 <sup>st</sup> birthday.	6 months If first dose of DTaP/ DT was administered before the 1 <sup>st</sup> birthday.					
Human papillomavirus	9 years	Routine dosing intervals are recomme	nded.						
Hepatitis A	N/A	6 months							
Hepatitis B	N/A	4 weeks	8 weeks and at least 16 weeks after first dose.						
Inactivated poliovirus	N/A	4 weeks	6 months A fourth dose is not necessary if the third dose was administered at age 4 years or older and at least 6 months after the previous dose.	A fourth dose of IPV is indicated if all previous doses were administered at <4 years or if the third dose was administered <6 months after the second dose.					
Measles, mumps, rubella	N/A	4 weeks							
Varicella	N/A	3 months If younger than age 13 years. 4 weeks If age 13 years or older.							

### Table 3 Recommended Child and Adolescent Immunization Schedule by Medical Indication United States, 2019 Commended Child and Adolescent Immunization Schedule by Medical Indication

	INDICATION									
			HIV infection (	CD4+ count <sup>1</sup>				Asplenia and		
VACCINE	Pregnancy	Immunocom- promised status (excluding HIV infection)	<15% and total CD4 cell count of <200/mm3	≥15% and total CD4 cell count of ≥200/mm3	Kidney failure, end-stage renal disease, on hemodialysis	Heart disease, chronic lung disease	CSF leaks/ cochlear implants	persistent complement component deficiencies	Chronic liver disease	Diabetes
Hepatitis B										
Rotavirus		SCID <sup>2</sup>								
Diphtheria, tetanus, & acellular pertussis (DTaP)										
Haemophilus influenzae type b										
Pneumococcal conjugate										
Inactivated poliovirus										
Influenza (IIV)										
Influenza (LAIV)						Asthma, wheezing: 2-4yrs <sup>3</sup>				
Measles, mumps, rubella										
Varicella										
Hepatitis A										
Meningococcal ACWY										
Tetanus, diphtheria, & acellular pertussis (Tdap)										
Human papillomavirus										
Meningococcal B										
Pneumococcal polysaccharide										
Vaccination Rec according to the with routine schedule for recommended be i	ommended for p n an additional ri which the vaccin ndicated	persons <mark>d</mark> Vaccinat isk factor addition ne would based o Notes.	tion is recommende aal doses may be ne n medical condition	ed, and ■Co ecessary rec n. See sho be adi	ntraindicated or use n commended—vaccine ould not be administe cause of risk for seriou verse reaction	ot Precaution—vaccine be indicated if benef red protection outweigh s adverse reaction	might ■D itof a sriskof in	elay vaccination until fter pregnancy if vaccine dicated	No recomm	endation

1 For additional information regarding HIV laboratory parameters and use of live vaccines, see the General Best Practice Guidelines for Immunization "Altered Immunocompetence" at www.cdc.gov/vaccines/hcp/acip-recs/general-recs/immunocompetence.html, and Table 4-1 (footnote D) at: www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html.

2 Severe Combined Immunodeficiency

3 LAIV contraindicated for children 2-4 years of age with asthma or wheezing during the preceding 12 months.

#### Notes Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2019

For vaccine recommendations for persons 19 years of age and older, see the Recommended Adult Immunization Schedule.

#### Additional information

- Consult relevant ACIP statements for detailed recommendations at www.cdc.gov/vaccines/hcp/acip-recs/ index.html.
- For information on contraindications and precautions for the use of a vaccine, consult the General Best Practice Guidelines for Immunization and relevant ACIP statements at www.cdc. gov/vaccines/hcp/acip-recs/index.html.
- For calculating intervals between doses, 4 weeks = 28 days. Intervals of ≥4 months are determined by calendar months.
- Within a number range (e.g., 12–18), a dash (–) should be read as "through."
- Vaccine doses administered ≤4 days before the minimum age or interval are considered valid. Doses of any vaccine administered ≥5 days earlier than the minimum age or minimum interval should not be counted as valid and should be repeated as age-appropriate. The repeat dose should be spaced after the invalid dose by the recommended minimum interval. For further details, see Table 3-1, Recommended and minimum ages and intervals between vaccine doses, in General Best Practice Guidelines for Immunization at www. cdc.gov/vaccines/hcp/acip-recs/general-recs/timing.html.
- Information on travel vaccine requirements and recommendations is available at wwwnc.cdc.gov/travel/.
- For vaccination of persons with immunodeficiencies, see Table 8-1, Vaccination of persons with primary and secondary immunodeficiencies, in General Best Practice Guidelines for Immunization at www.cdc.gov/vaccines/hcp/acip-recs/ general-recs/immunocompetence.html, and Immunization in Special Clinical Circumstances (In: Kimberlin DW, Brady MT, Jackson MA, Long SS, eds. *Red Book: 2018 Report of the Committee on Infectious Diseases.* 31<sup>st</sup> ed. Itasca, IL: American Academy of Pediatrics; 2018:67–111).
- For information regarding vaccination in the setting of a vaccine-preventable disease outbreak, contact your state or local health department.
- The National Vaccine Injury Compensation Program (VICP) is a no-fault alternative to the traditional legal system for resolving vaccine injury claims. All routine child and adolescent vaccines are covered by VICP except for pneumococcal polysaccharide vaccine (PPSV23). For more information, see www.hrsa.gov/ vaccinecompensation/index.html.

#### Diphtheria, tetanus, and pertussis (DTaP) vaccination (minimum age: 6 weeks [4 years for Kinrix or Quadracel])

#### Routine vaccination

- 5-dose series at 2, 4, 6, 15–18 months, 4–6 years
   Prospectively: Dose 4 may be given as early as age 12 months if at least 6 months have elapsed since dose 3.
- Retrospectively: A 4<sup>th</sup> dose that was inadvertently given as early as 12 months may be counted if at least 4 months have elapsed since dose 3.

#### Catch-up vaccination

- Dose 5 is not necessary if dose 4 was administered at age 4 years or older.
- For other catch-up guidance, see Table 2.

#### Haemophilus influenzae type b vaccination (minimum age: 6 weeks)

#### Routine vaccination

 ActHIB, Hiberix, or Pentacel: 4-dose series at 2, 4, 6, 12–15 months

#### PedvaxHIB: 3-dose series at 2, 4, 12–15 months Catch-up vaccination

- Dose 1 at 7–11 months: Administer dose 2 at least 4 weeks later and dose 3 (final dose) at 12–15 months or 8 weeks after dose 2 (whichever is later).
- Dose 1 at 12–14 months: Administer dose 2 (final dose) at least 8 weeks after dose 1.
- Dose 1 before 12 months and dose 2 before 15 months: Administer dose 3 (final dose) 8 weeks after dose 2.
- 2 doses of PedvaxHIB before 12 months: Administer dose 3 (final dose) at 12–59 months and at least 8 weeks after dose 2.
- Unvaccinated at 15–59 months: 1 dose
- For other catch-up guidance, see Table 2.

#### Special situations

- Chemotherapy or radiation treatment:
- 12–59 months
- Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
- 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

Doses administered within 14 days of starting therapy or during therapy should be repeated at least 3 months after therapy completion.

- Hematopoletic stem cell transplant (HSCT):
- 3-dose series 4 weeks apart starting 6 to 12 months after successful transplant regardless of Hib vaccination history

 Anatomic or functional asplenia (including sickle cell disease):

#### 12-59 months

- Unvaccinated or only 1 dose before 12 months: 2 doses, 8 weeks apart
- 2 or more doses before 12 months:1 dose at least 8 weeks after previous dose

#### Unvaccinated\* persons age 5 years or older

- 1 dose
- Elective splenectomy:
- Unvaccinated\* persons age 15 months or older
- 1 dose (preferably at least 14 days before procedure)

#### HIV Infection:

- 12–59 months
- Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
- 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose
- Unvaccinated\* persons age 5–18 years
- -1 dose
- Immunoglobulin deficiency, early component complement deficiency:

#### 12-59 months

- Unvaccinated or only 1 dose before age 12 months: 2 doses, 8 weeks apart
- 2 or more doses before age 12 months: 1 dose at least 8 weeks after previous dose

\*Unvaccinated = Less than routine series (through 14 months) OR no doses (14 months or older) A Weekly Influenza Surveillance Report Prepared by the Influenza Division

Influenza Positive Tests Reported to CDC by U.S. Public Health Laboratories, National Summary, 2018-2019 Season





# Influenza-take home points

- Last year's vaccine worked well
- New strains for the 2019-2020 season
- This year younger adults sicker than usual (H1N1)
- LAIV is back
- New products and doses for young children

# 2019-2020 Influenza vaccine effectiveness

Overall=47% Influenza A H3N2=44% Influenza A H1N1=46% Influenza B-not enough cases LAIV-not enough data

#### Influenza Vaccine Products for the 2018–2019 Influenza Season

Manufactures	Trade Name	Ham Supplied	Mercury	Are Dance	Vaccine Product Billing Code <sup>2</sup>		
Manufacturer	(vaccine abbreviation) <sup>1</sup>	How Supplied	(mcg Hg/0.5mL)	Age Kange	СРТ	Medicare	
GlaxoSmithKline	Fluarix (IIV4)	0.5 mL (single-dose syringe)	0	6 months & older	90686	90686	
ID Biomedical Corp. of Quebec,	Flui aval (IIVA)	0.5 mL (single-dose syringe)	0	6 months & older	90686	90686	
a subsidiary of GlaxoSmithKline	(IIVI)	5.0 mL (multi-dose vial)	<25	6 months & older	90688	90688	
MedImmune	FluMist (LAIV4)	0.2 mL (single-use nasal spray)	0	2 through 49 years	90672	90672	
Protein Sciences Corporation, a Sanofi company	Flublok (RIV4)	0.5 mL (single-dose syringe)	0	18 years & older	90682	90682	
			gh 35 months	90685	90685		
		Infant dose of Fluzone v	& older	90686	90686		
Con C Danta and Inc	Fluzone (IIV4)	0.5ml next year	& older	90686	90686		
Sanon Pasteur, Inc.				gh 35 months	90687	90687	
		5.0 mL (multi-dose vial)	25	3 years & older	90688	90688	
	Fluzone High-Dose (IIV3-HD)	0.5 mL (single-dose syringe)	0	65 years & older	90662	90662	
	A.Q.,	0.5 mL (single-dose syringe)	0	E	90656	90656	
	Anuna (IIV5)	5.0 mL (multi-dose vial)	24.5	5 years & older	90658	Q2035	
	A	0.5 mL (single-dose syringe)	0	5	90686	90686	
Seqirus	Anuna (IIV4)	5.0 mL (multi-dose vial)	24.5	5 years & older	90688	90688	
	Fluad (allV3)	0.5 mL (single-dose syringe)	0	65 years & older	90653	90653	
	Threadman (as II)(4)	0.5 mL (single-dose syringe)	0	Auron & alder	90674	90674	
	Tucelvax (ccl1v4)	5.0 mL (multi-dose vial)	25	4 years & older	90756	90756	

#### FOOTNOTES

- IIV3/IIV4 = egg-based trivalent/quadrivalent inactivated influenza vaccine (injectable); where necessary to refer to cell culture-based vaccine, the prefix "cc" is used (e.g., ccIIV4); RIV4 = quadrivalent recombinant hemagglutinin influenza vaccine (injectable); aIIV3 = adjuvanted trivalent inactivated influenza vaccine.
- An administration code should always be reported in addition to the vaccine product code. Note: Third party payers may have specific policies and guidelines that might require providing additional information on their claim forms.
- Afluria is approved by the Food and Drug Administration for intramuscular administration with the PharmaJet Stratis Needle-Free Injection System for persons age 18 through 64 years.

#### www.immunize.org





What is happening with LAIV?

### Effectiveness of LAIV compared to IIV

Season (Predominant Strain)	Age Range (y)	Adjusted VE 9	6 (95% CI)
		LAIV4	IIV3/IIV4
2013–2014 <sup>a</sup> (H1N1pdm09)	2–17	7 (-46 to 40)	60 (41 to 73)
	2-8	-36 (-151 to 27)	59 (30 to 76)
	9-17	41 (-21 to 72)	61 (27 to 79)
2014-2015 <sup>b</sup> (H3N2)	2-17	9 (-18 to 29)	31 (16 to 44)
	2-8	9 (-28 to 35)	26 (2 to 44)
	9-17	17 (-27 to 46)	33 (9 to 51)
2015–2016 <sup>c</sup> (H1N1pdm09)	2-17	5 (-47 to 39)	60 (47 to 70)
	2-8	0 (-75 to 43)	56 (42 to 71)
	9–17	17 (-84 to 63)	66 (44 to 80)

TABLE 2 Vaccine Effectiveness Against any Influenza in Children, by Age and Vaccine Type

VE, vaccine effectiveness.

# So what is new? WHY IS LAIV BACK!

#### Shedding of A/H1N1 strains: All subjects



February ACIP meeting- https://www.cdc.gov/vaccines/acip/meetings/slides-20l18-02.htm

### AAP 2018-2019 Influenza Recommendations

The AAP recommends IIV as the primary choice for influenza vaccination in children

LAIV effectiveness against H1N1 influenza strains was inferior in past seasons and the effectiveness of the new formulation is unknown

Pregnant women may receive influenza vaccine at any time during pregnancy

Vaccination of health care workers is a crucial step in preventing influenza

Special effort to immunize

- Household contacts of children with high-risk conditions, especially contacts of infants <6 months</li>
- American Indians and Alaskan natives
- Pregnant women

# Stay tuned....

#### Meningococcal Disease, College Outbreaks, Meningococcal Vaccines



# Meningococcal vaccines-take home messages

Important to keep the two vaccines straightmenACWY v menB

Disease is rare

Immunity may only last a few years

- Booster doses needed for some people
- College population at increased risk
- Routine use for menACWY v selected use for menB



### Meningococcal vaccines-Be careful!

- Two very different vaccine types
  - Men ACWY (Menveo, Menactra)
  - Men B (Trumenba, Bexero)
- Two very different recommendations
  - Men ACWY-routine for adolescents and high-risk individuals including infants
  - Men B-routine only for a subset of high-risk individuals and not infants
- Men ACWY products-difference in recommendations for use under 2 years of age due to vaccine interference
- Men B vaccines-two very different vaccines products
  - Different schedules and different intervals between doses
  - Can't be interchanged

# Why do we have these crazy discrepant recommendations?

Cost Effectiveness: How do Meningococcal B vaccines compare?



Men B vaccine: >\$4,000,000 per QALY saved

• NNV 788,000 at 16 years of age to prevent one death

Lung transplantation: >\$100,000 per QALY saved

MRI for dementia screening: >\$500,000 per QALY saved

Annual (as opposed to less frequent) Pap smear: \$800,000 per QALY saved

Ultrasound screening for aortic aneurism: \$800,000 per QALY

Meningococcal ACWY conjugate vaccine (1 dose): \$120,000 per QALY

MMR vaccine saves money

# Adolescents/Young adults-most disease is now serogroup B

Estimated incidence of meningococcal disease among young adults by age and serogroup – United States, 2014-2016



ACIP Meeting. February 2018 https://www.cdc.gov/vaccines/acip/meetings/slides-20l18-02.htm

# Increased risk of meningococcal B disease in college students

Incidence of meningococcal disease by serogroup in persons aged 18-24 years and relative risk among college students – United States, 2014-2016

Age group	Serogroup B			Serogroups C, W, or Y combined				
	Average annual	Average annual	<b>Relative Risk</b>	Average annual	Average annual	<b>Relative Risk</b>		
	cases	incidence*	(95% CI)	cases	incidence*	(95% CI)		
All 18-24 year olds								
College student	20	0.17	3.54	3	0.03	0.56		
Non-college student	9	0.05	(2.21-5.41)	10	0.05	(0.27-1.14)		
18-19 year olds								
College student	12	0.28	3.10	2	0.05	2.76		
Non-college student	4	0.09	(1.58-6.07)	1	0.02	(0.56-13.78)		
20-21 year olds								
College student	7	0.18	4.14	1	0.02	0.48		
Non-college student	2	0.04	(1.68-10.20)	2	0.05	(0.13-1.87)		
22-24 year olds								
College student	<1	0.01	0.28	<1	0.01	0.16		
Non-college student	4	0.03	(0.04-2.18)	7	0.06	(0.02-1.15)		

# Recommended routinely for high risk individuals but what about everyone else?

A Men B vaccine series MAY be administered to adolescents and young adults aged 16-23 years to provide SHORT-TERM protection against MOST strains of serogroup B meningococcal disease. The preferred age for Men B vaccination is 16-18 years.

### WE'VE GOT ISSUES

## Meningococcal B vaccine-issues

- The vaccine doesn't cover all circulating strains of Men B
- Immunity wanes over a few years
- May not reduce nasopharyngeal carriage
- Long-term safety unknown
- Epidemiology of meningococcal disease is changing



So, who should you give Men B vaccine to?

- 16-23 year olds who request it
- Kids whose college or other institution requires it
- College students?
- Those living in dormitories or other crowded conditions?
- Those who smoke or drink alcohol?
- Everyone?
- Nobody?

# HPV vaccine-it shouldn't be this hard!

### HPV vaccine-take home messages

HPV causes lots of cancer

HPV vaccine prevents cancer



We are doing a terrible job of immunizing our population with HPV vaccine to prevent cancer

### Teen Vaccine Coverage-2017

FIGURE. Estimated coverage with selected vaccines and doses\* among adolescents aged 13–17 years, by survey year and ACIP recommendations<sup>†</sup> — National Immunization Survey-Teen, United States, 2006–2017<sup>§</sup>



### **HPV Immunization Recommendations**

Routine immunization at age 11-12 years for all

All Females aged 13-26 years

All Males aged 13-21 years

Men who have sex with men aged 13-26 years

No routine recommendation to revaccinate those who have already completed a series with HPV2 or HPV4

No recommendation YET for those 27-45 years of age

**FDA News Release** 

### FDA approves expanded use of Gardasil 9 to include individuals 27 through 45 years old

For Immediate Release

October 5, 2018



# 2-dose HPV Vaccine

Age at dose #1 is key!

- If dose #1 at 14 years of age or younger, then 2-dose regimen is OK
- If dose #1 at 14 years of age or younger, then long intervals between doses doesn't matter (e.g. dose #2 could be at age 16)
- If dose #1 at 15 years of age or older, then a 3-dose interval required

Recommendation counts retrospectively

2-dose regimen not indicated for immunocompromised patients (congenital immunodeficiency, HIV infection, malignancy, transplant recipients, autoimmune disease) Should I revaccinate teens with HPV9 who have already completed an HPV2 or HPV4 vaccine series?

No routine recommendation to revaccinate those who have already completed a series

Lack of a recommendation is based largely on a cost-benefit assessment

Focus is on just getting 3 doses into all teens

No safety concerns identified with revaccination

Will increase cancer prevention

May not be covered by insurance

# And now for a whole new chapter in the vaccine story.....

# Adjuvanted vaccines-take home points

Three new adjuvanted vaccines-Influenza (Fluad), Hepatitis B (Heplisav), Zoster (Shingrix)

All induce a more robust immune response than their nonadjuvanted equivalents

All have more side effects than their non-adjuvanted equivalents

All work better in elderly patients

Adjuvant 'a-jə-vənte 1: serving to aid or contribute 2: one that helps or facilitates

# Adjuvanted Hepatitis B Vaccine



HepB-CPG/HEPLISAV-B®

# New Hepatitis B (HepB-CPG) Vaccine

- Antigen is standard hepatitis B surface antigen
- Adjuvent is a CpG repeat called 1018 which stimulates Tolllike receptor 9
- 2-dose regimen (Heplisav B)
- Predicted to induce higher immune responses in adults
- Licensed by FDA on 11/9/2017 for adults
- ACIP has recommended this vaccine as an option
- Can interchange with current vaccines but if you do 3 total doses will be needed

# Seroprotection rate of Hep B-CpG compared to current vaccine

Population	HBsAg-10	18 (2 Doses)	HBsAg-E	ing (3 Doses)	Difference in SPR (95% CI)
	Ν	SPR (%)	Ν	SPR (%)	
All Subjects	4376	95.40%	2289	81.30%	14.20% (12.5%-15.9%)
18—29 years	174	100.00%	99	93.90%	6.10% (2.8%-12.6%)
30—39 years	632	98.90%	326	92.00%	6.90% (4.2%-10.4%)
40—49 years	974	97.20%	518	84.20%	<b>13.10%</b> (9.9%-16.6%)
50—59 years	1439	95.20%	758	79.70%	15.50% (12.6%-18.7%)
60—70 years	1157	91.60%	588	72.60%	<b>19.00%</b> (15.2%-23.0%)
Men	2203	94.50%	1150	78.80%	15.70% (13.2%-18.3%)
Women	2173	96.40%	1139	83.80%	12.60% (10.4%-15.0%)
Diabetes <sup>a</sup>	640	90.00%	321	65.10%	<b>24.90%</b> (19.3%-30.7%)
No diabetes	3762	96.20%	1968	83.90%	12.30% (10.6%-14.1%)
Obese <sup>b</sup>	2165	94.70%	1076	75.40%	<b>19.40%</b> (16.7%-22.2%)
Non-obese	2208	96.10%	1212	86.60%	9.60% (7.6%-11.7%)
Smoker	1371	95.90%	711	78.60%	17.30% (14.2%-20.6%)
Non-smoker	3005	95.20%	1578	82.40%	12.80% (10.8%-14.8%)

Jackson et al. Vaccine 2018;36:668 doi: https//10.1016/j.vaccine.2017.12.038.Epub 2017 Dec 27

# Zoster 2.0







#### Vaccine efficacy and effectiveness against HZ for HZ/su and ZVL, by age group, during the first 4<sup>‡</sup> years following vaccination



\* Median follow up may be less than 3 yrs: Schmader 2012= 1.3 yrs

^ ZOE 50/70= 50-59 & 60-69yr: Lal 2015, 70+yrs: Cunningham 2016

\* RCTs= 50-59 yrs: Schmader 2012, 60-69 and 70+ yrs: Oxman 2005,

Dooling, ACIP MeetingC, October 2017-https://www.cdc.gov/vaccines/acip/meetings/slides-2017-10.htmlc; MMWR 2018;67(3): 103-108 19

# Why do these new vaccines work better?

# Adjuvants and the immune system

The immune system responds to some things better than others

- Live, replicating agents induce better immunity than inert subunit protein or carbohydrate (MMR>tetanus)
- Proteins are better than carbohydrates (PCV13>PPSV23)
- More complex formulations better than purified formulation (Whole cell pertussis>DTaP)
- Certain molecules stimulate the immune system

Adjuvants	
Alum	CpG oligonucleotides
Liposomes	Lipid molecules
Squalene	LPS
Nanocarriers	Natural toxins

# Adjuvants-concerns

#### **Enhanced local reactions**

- Swelling
- Tenderness
- Redness

#### Enhanced systemic reactions

- Fever
- Malaise
- Achiness

Autoimmune reactions (theorhetical)

# RZV local side effects

#### ZOE-50 and ZOE-70

Reactogenicity Subgroups<sup>1,2</sup>



N= Number of subjects with at least one documented dose

%= Percentage of subjects reporting the symptom at least once when the intensity is maximum

1. Lal H, Cunningham A, Godeaux O, et al. Efficacy of an adjuvanted herpes zoster subunit vaccine in older adults. NEJM 2015;372:2087-96.

2. Cunningham AL, Lal H, Kovac M, et al. Efficacy of the Herpes Zoster Subunit Vaccine in Adults 70 Years of Age and Older. NEJM 2016;375:1019-32

Dooling, ACIP MeetingC, October 2017-https://www.cdc.gov/vaccines/acip/meetings/slides-2017-10.htmlc; MMWR 2018;67(3): 103-108

# Summary

- LAIV is an option for influenza vaccination in 2018-2019 but concerns remain
- Meningococcal B vaccine recommendations are challenging and you need to have criteria for its use
- HPV vaccination is important and should start at age 11
- We have new adjuvanted influenza, hepatitis and zoster vaccines for adults. Stay tuned for use in children

# Questions or Comments