## KHC Office Hours for Clinics

*Vaccine Needs in Kansas - A Call to Action:*
*A look at Kansas data and recent national outbreaks.*

*April 26, 2023*

**Dr. Kellie Wark, MD, MPH**
**HAI/AR Expert and AS Co-Lead, KDHE**
**Asst Prof. Infectious Diseases, KUMC**

Kansas Medical Society · Kansas Healthcare Collaborative · Kansas Hospital Association

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## Welcome New Participants!

- What clinic or facility do you work for?
- What is your role?
- What type of clinic are you? What specialty? Primary Care? FQHC or RHC?


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## KHC Office Hours Agenda

- Welcome – 5 mins
- Content Presentation - 45-50 mins
- Q&A - 5 Mins
- Closing Comments - 2-5 mins

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## KHC Clinic Assistance Program

- **KHC CAP Technical Assistance**
  - Practices in transition or in urgent need
  - Onsite or virtual assessment, education and assistance
  - Bridge the gap until next Lunch and Learn session
  - Assistance customized to meet unique clinic needs
  - Rural Health Clinic Survey Readiness/Mock Surveys
- **Clinic Leader Lunch and Learn Bootcamp**
  - Targeted at both new and established leaders
  - KHC will facilitate virtual education series to mentor and educate leaders
  - KHC will work with partner organizations to provide content experts for the series
- **QI Mini Grants**
  - Practices who participate in the educational cohorts may apply for funding to support QI Projects
  - Population Health, HIT, Chronic Disease Self-Monitoring, Care Transitions using KHIN/HIE, Overdose Prevention
  - Allowable expenses may include training, staff time, supplies and materials, software/IT, and self-monitoring devices

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**Save the Date for August 24th, 2023**
**Wichita, KS**
**2023 Summit on Quality**
**Wichita State University**
**Rhatigan Student Center**

**Registration and Call for Poster Presentations coming soon**
https://www.khconline.org/31-event-descriptions/593-summit2022


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## Objectives

- Review the most impactful vaccines impacting state and national infectious disease epidemiology
- Review recent national vaccine preventable outbreaks (e.g., polio, meningitis)
- Examine how we can incorporate vaccines into Infection Prevention and Control (IPC) and Antimicrobial Stewardship (AS) programs



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## Vaccine Impact on Antibiotic Use

**Flu vaccination each season prevented:**

- 3.8% total abx for acute respiratory illness (ARI) (95% CI 3.6 – 4.1%)
- 4.2 million antibiotic courses
- 5.6% total outpatient ARI visits

**Systemic review + Meta analysis of randomized control trails (RCTs) flu vaccine vs placebo, vaccination:**

- ↓ 28% in duration antibiotics for febrile-illness
- ↓ 31% in antibiotics for kids

Sources: Smith E., et al. Clin Infect Dis. 2020; 71(11):e726-34; Buckley B, et al. Clin Microbiol Infect 2019;25:1213-25.00



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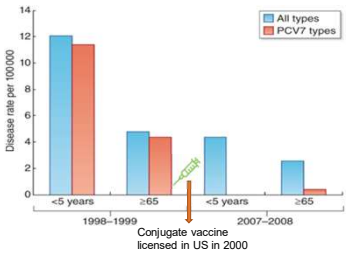
## Vaccine Impact on Antibiotic Resistance




**Pneumococcal vaccination**

Penicillin-resistant strains of *S. pneumoniae* (PCV7 types, seen in the orange color in the graph on the left) have virtually disappeared thanks to use of the pneumococcal vaccine.

So, ten years after conjugate vaccination introduced those serotypes *(and resistance)* have been almost eliminated!

Source: Jansen K et al. Nat Med. 2018;24(1):10-19.



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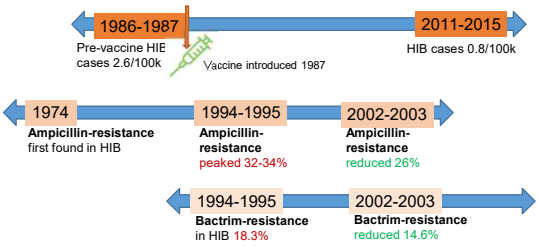
## Vaccine Impact on Antibiotic Resistance

*H. influenzae b* (HIB) vaccination




Sources: Buchy P, et al. Int J Infect Dis 2020;90:188-196; Jansen K et al. Nat Med. 2018;24(1):10-19; Wasserman M., et al Emerg Infect Dis 2021;27(6):1627-36

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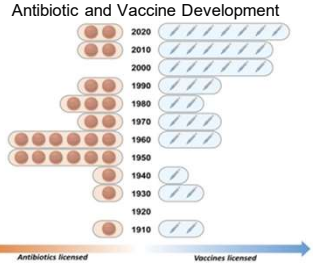
## Vaccine Impact on Antibiotic Resistance

Antibiotic and Vaccine Development




**Vaccines on the Horizon**

- Group B strep
- *E. coli*
- *S. aureus*
- *C. diff*

Sources: Jansen K et al. Nat Med. 2018;24(1):10-19; Buchy P, et al. Int J Infect Dis 2020;90:188-196

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## *Streptococcus pneumoniae*


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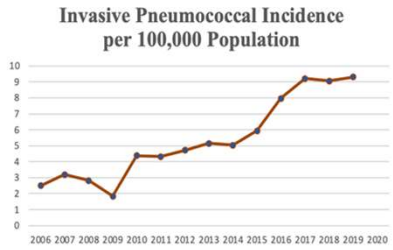
## Kansas Invasive Pneumococcal Epidemiology




Source: https://kdhe.ks.gov/Archive.aspx



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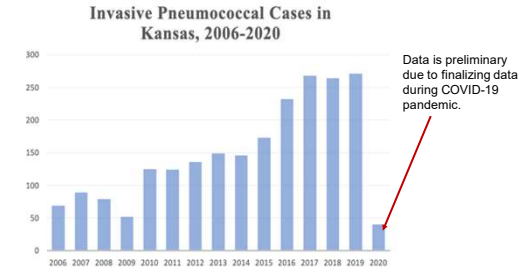
## Kansas Invasive Pneumococcal Epidemiology




Source: https://kdhe.ks.gov/Archive.aspx



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## Kansas Pneumococcal Vaccines

### Capsular conjugated (PCV) vs unconjugated polysaccharide (PPSV)

- Conjugated = linked to protein carrier, more immunogenic, invokes memory B cells
- Unconjugated = contains sugar antigens
- Antigen spectrum/quantity provides coverage for different serotypes (>90 serotypes)

### Available pneumococcal vaccines:

- PCV13 (Prevnar 13; Pfizer)
- PPSV23 (Pneumovax 23; Merck)
- **FDA approved 2021:** PCV15 (Vaxneuvance; Merck)
- **FDA approved 2021:** PCV20 (Prevnar 20; Pfizer)

Source: https://cdc.gov/vaccines/acip/meetings/downloads/slides-2022-10-19-20/03-pneumococcal-kobayashi-508.pdf



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## Kansas Pneumococcal Serotypes

| | Serotypes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1, 3-5, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F | 6A | 22F | 33F | 8 | 10A | 11A | 12F | 15B | 2 | 9N | 17F | 20 |
| **PCV13** | x | x | | | | | | | | | | | |
| **PCV15** | x | x | x | x | | | | | | | | | |
| **PCV20** | x | x | x | x | x | x | x | x | x | | | | |
| **PPSV23** | x | | x | x | x | x | x | x | x | x | x | x | x |

**~30%** of invasive pneumococcal disease caused by non-PCV13 serotypes

**8-12%** of invasive pneumococcal disease remaining 4 serotypes

Source: https://cdc.gov/vaccines/acip/meetings/downloads/slides-2022-10-19-20/03-pneumococcal-kobayashi-508.pdf

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## Pneumococcal Serotypes

| | Serotypes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1, 3-5, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F | 6A | 22F | 33F | 8 | 10A | 11A | 12F | 15B | 2 | 9N | 17F | 20 |
| **PCV13** | x | x | | | | | | | | | | | |
| **PCV15** | x | x | x | x | | | | | | | | | |
| **PCV20** | x | x | x | x | x | x | x | x | x | | | | |
| **PPSV23** | x | | x | x | x | x | x | x | x | x | x | x | x |

Antibiotic-resistant serotypes

Source: https://cdc.gov/vaccines/acip/meetings/downloads/slides-2022-10-19-20/03-pneumococcal-kobayashi-508.pdf

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## 2022 ACIP Recommendations

- Age >/= 65 yo *OR*
- Age 19 – 64 yo with underlying medical condition or other risk factor for pneumococcal disease:

**PCV20** (1 dose)

**OR**

**PCV15** (1 dose) >/= 1 year **PPSV23** (1 dose)

Source: https://cdc.gov/vaccines/acip/meetings/downloads/slides-2022-10-19-20/03-pneumococcal-kobayashi-508.pdf

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## 2022 ACIP Recommendations

- Recommended interval of *at least 1 year* between PCV15 and PPSV23
  - Minimum of 8 weeks in vulnerable groups
- In those patients who have received a pneumococcal vaccine(s) as an adult in the past:

| Previous PPSV23 only | Previous PCV13 only | Previous PCV13 + PPSV23 (completed series) |
|---|---|---|
| Administer PCV15 or PCV20 >/=1 year after last PPSV23 dose | Complete series with PPSV23 *(may substitute with x1 dose of PCV20)* | No additional vaccinations recommended at this time |



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## Infections and Deaths Prevented


PCV Vaccine Introduced in 2000

Prevented since vaccine introduced

- 282,000 Invasive Pneumococcal Disease
- 16,000 cases meningitis
- 172,000 cases bacteremias
- **97 million visits** for otitis media (antibiotics avoided)
- 706,000 hospitalizations


Sources: https://prevnar20.pfizerpro.com/about-prevnar20 and Wasserman M., et al. Emerg Infect Dis. 2021;27(6):1627-36.



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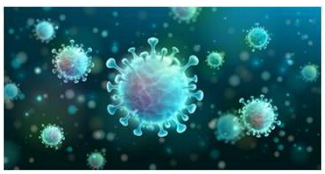
## COVID-19



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## SARS-CoV-2 a virus…so why so much antibiotic use?

% of COVID-19 infections with bacterial coinfections: **VS** % of COVID-19 infections who received antibiotics (regardless of presence of bacterial infection):

- 3.5-3.9% in those moderately ill → **59.4%**
- 8.3-14.3% in those severely ill → **83.3%**
- 34.5% in those critically ill → **92.9%**

Sources: Zerr D et al Antimicrob. Agents & Chemotherapy 2016; Jeon M. et al . Diagn Microbiol Infect Dis 2008; Falagas J Antimicrob Chemother. 2007; Zhu X., et al Virus Res 2020; Goyal D et al Open Forum Infect Dis 2019; Langford et al. Microbiol Infect 2020; Feng Y et al. Am J Respir Crit Care Med 2020

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## How much can antibiotic use increase antibiotic resistance?

| Ceftriaxone | Fluoroquinolones | Carbapenems |
|---|---|---|
| ↑ 15-fold ESBL* | ↑ 8-fold ESBL* | ↑ 6-fold CRE* |
| ↑ 4-fold ampC* | ↑ 4-fold CRE* | ↑ 28-fold CRAB* |

- extended spectrum beta-lactam (ESBL)
- ampC beta-lactamase (ampC)
- carbapenem resistant enterobacterales (CRE)
- carbapenem resistant *A. baumannii* (CRAB)

Sources: Langford et al. Microbiol Infect 2020; Feng Y et al. Am J Respir Crit Care Med 2020; Zhu X., et al Virus Res 2020; Goyal D et al Open Forum Infect Dis 2019; Zerr D et al Antimicrob. Agents & Chemotherapy 2016; Jeon M. et al . Diagn Microbiol Infect Dis 2008; Falagas J Antimicrob Chemother. 2007

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## Kansas COVID-19 Vaccinations

| | Receipt of ≥ 1 dose | Completed Primary Series | Completed bivalent booster |
|---|---|---|---|
| **Kansas** | 1,909,839 (**65.6%**) | 1,681,629 (**57.7%**) | 373,783 (**12.9%**) |
| **US** (National Average) | 269,971,358 (**81.3%**) | 230,485,008 (**69.4%**) | 55,499,012 (**16.7%**) |

Source: https://kansasvaccine.gov/158/Data

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## Bivalent Booster Efficacy

Bivalent booster clinical trials

- Moderna: 50 µg bivalent 25 µg ancestral + 25 µg BA.1
- Pfizer: 30 µg bivalent: 15 µg ancestral + 15 µg BA.1



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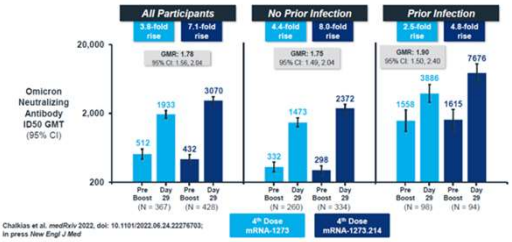
## Bivalent Booster Efficacy

Efficacy Results




Chalkias et al. *medRxiv* 2022, doi: 10.1101/2022.06.24.22276703; In press *New Engl J Med*



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## Bivalent Booster Effectiveness

Source: Wheeler et al. NEJM 2023; DOI: 10.1056/NEJMc2215471

Table 1. Estimates of Effectiveness of One Monovalent or Bivalent Booster Dose against Severe Omicron Infection.*

| Group | Vaccine Effectiveness against Hospitalization (95% CI) | | | Vaccine Effectiveness against Hospitalization or Death (95% CI) | | |
|---|---|---|---|---|---|---|
| | Monovalent Booster | Bivalent Booster | Difference | Monovalent Booster | Bivalent Booster | Difference |
| | percent | | percentage points | percent | | percentage points |
| All participants | 25.2 (-0.2 to 44.2) | 58.7 (43.7 to 69.8) | 33.5 (2.9 to 62.1) | 24.9 (1.4 to 42.8) | 61.8 (48.2 to 71.8) | 36.9 (12.6 to 64.3) |
| Age group | | | | | | |
| ≥18 yr | 27.3 (2.6 to 45.8) | 59.5 (44.7 to 70.3) | 32.2 (2.5 to 60.1) | 27.0 (4.2 to 44.4) | 62.4 (49.0 to 72.3) | 35.4 (11.8 to 62.1) |
| ≥65 yr | 21.0 (-7.7 to 42.1) | 58.8 (43.0 to 70.2) | 37.8 (3.2 to 69.9) | 20.3 (-6.0 to 40.1) | 61.5 (47.1 to 71.9) | 41.2 (9.9 to 71.7) |
| Primary vaccination with mRNA vaccine | 28.0 (2.9 to 46.7) | 58.8 (43.8 to 69.9) | 30.8 (1.0 to 61.1) | 27.2 (4.0 to 44.9) | 61.9 (48.3 to 71.9) | 34.7 (11.4 to 62.2) |
| No previous infection | 26.3 (-0.3 to 45.8) | 61.0 (45.4 to 72.2) | 34.7 (6.2 to 69.2) | 24.5 (-0.3 to 43.2) | 63.1 (48.8 to 73.4) | 38.6 (14.8 to 67.3) |
| Booster vaccine received | | | | | | |
| Moderna | 28.1 (-8.8 to 52.5) | 58.8 (33.8 to 74.3) | 30.7 (-17.0 to 79.1) | 25.2 (-9.2 to 48.8) | 63.8 (41.8 to 77.5) | 38.6 (4.2 to 75.8) |
| Pfizer–BioNTech | 22.2 (-16.8 to 48.1) | 58.7 (38.7 to 72.2) | 36.5 (-1.7 to 78.5) | 24.5 (-10.7 to 48.5) | 60.4 (42.1 to 73.0) | 35.9 (3.7 to 75.5) |
| Booster dose received | | | | | | |
| First | 15.8 (-39.5 to 49.1) | 54.0 (-6.3 to 80.1) | 38.2 (-36.9 to 99.4) | 4.2 (-50.1 to 38.8) | 54.0 (-0.3 to 78.9) | 49.8 (-37.5 to 125.8) |
| Second | 28.0 (-3.2 to 49.8) | 61.9 (43.6 to 74.3) | 33.9 (0.2 to 68.4) | 32.2 (4.5 to 51.8) | 64.0 (47.0 to 75.5) | 31.8 (7.3 to 71.1) |
| Third | — | 55.7 (12.0 to 77.7) | — | — | 63.1 (27.3 to 81.2) | — |

* Vaccine effectiveness was defined as (1 − hazard ratio) × 100 and was evaluated for the period from day 15 to day 99 after receipt of the booster dose. CI denotes confidence interval.



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FDA NEWS RELEASE

## Coronavirus (COVID-19) Update: FDA Authorizes Changes to Simplify Use of Bivalent mRNA COVID-19 Vaccines

**For Immediate Release:** April 18, 2023

Español

Today, the U.S. Food and Drug Administration amended the emergency use authorizations (EUAs) of the Moderna and Pfizer-BioNTech COVID-19 bivalent mRNA vaccines to simplify the vaccination schedule for most individuals. This action includes authorizing the current bivalent vaccines (original and omicron BA.4/BA.5 strains) to be used for all doses administered to individuals 6 months of age and older, including for an additional dose or doses for certain populations. The monovalent Moderna and Pfizer-BioNTech COVID-19 vaccines are no longer authorized for use in the United States.

**What You Need to Know:**

- **Most individuals, depending on age, previously vaccinated with a monovalent COVID-19 vaccine** who have not yet received a dose of a bivalent vaccine may receive a single dose of a bivalent vaccine.

https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-changes-simplify-use-bivalent-mrna-covid-19-vaccines

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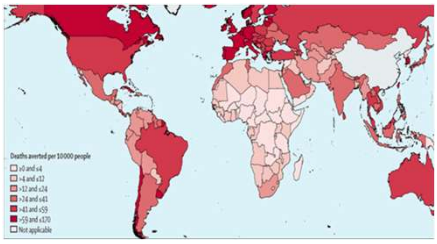
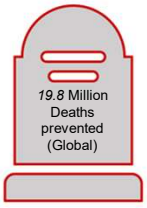
## Deaths Prevented and Vaccine Inequity

Greatest Deaths prevented = High-Income Countries




Source: Watson O., et al. Lancet; 2022(9):p1293-1302.

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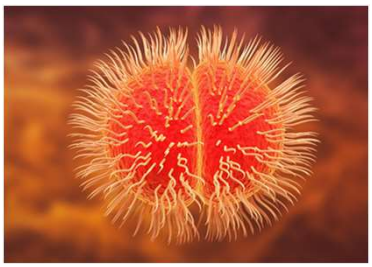
## *Neisseria meningitidis*



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CDC Centers for Disease Control and Prevention
Meningococcal Disease
Meningococcal Home
About the Disease
Meningococcal Vaccination
Surveillance
Meningococcal Outbreaks
Meningococcal Disease Outbreak, Florida, 2021–23
Clinical Information
Laboratory Information
Meningococcal Disease in Other Countries
Publications & Multimedia
Meningococcal Disease Outbreak among Gay, Bisexual Men in Florida, 2021–23
CDC investigates 'one of the worst outbreaks of meningococcal disease' in US history among gay and bisexual men in Florida
An Outbreak of Meningococcal Disease in Florida Is Growing, the C.D.C. Says
Source: https://cdc.gov/meningococcal/outbreaks/FL2022.html
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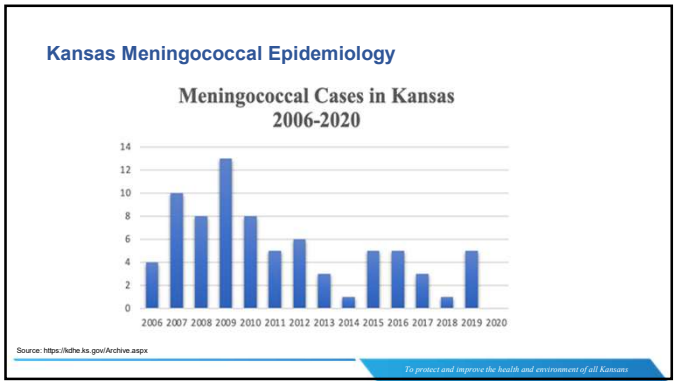
Kansas Meningococcal Epidemiology
Meningococcal Cases in Kansas 2006-2020
14
12
10
8
6
4
2
0
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
Source: https://kdhe.ks.gov/Archive.aspx
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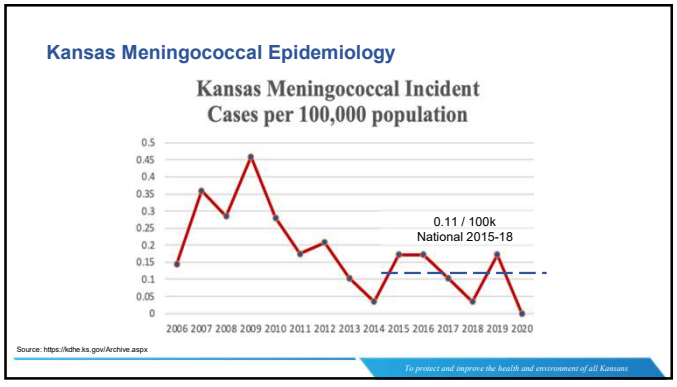
Kansas Meningococcal Epidemiology
Kansas Meningococcal Incident Cases per 100,000 population
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0.11 / 100k
National 2015-18
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
Source: https://kdhe.ks.gov/Archive.aspx
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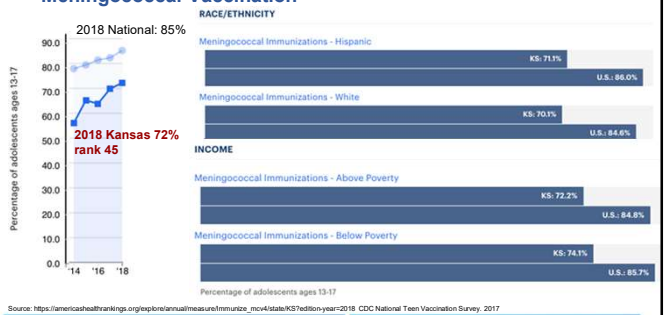
## Meningococcal Vaccination




Source: https://americashealthrankings.org/explore/annual/measure/Immunize_mcv4/state/KS?edition-year=2018 CDC National Teen Vaccination Survey. 2017

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## Meningococcal Serotype Epidemiology

**Table 1: Reported *Neisseria meningitidis* cases and isolates serogrouped — Kansas, 2005-2015**

| Year | Cases | Isolates Serogrouped | B | C | Y | W-135 |
|---|---|---|---|---|---|---|
| 2015 | 5 | 4 | 1 | 1 | 0 | 2 |
| 2014 | 1 | 1 | 0 | 0 | 1 | 0 |
| 2013 | 3 | 3 | 0 | 0 | 2 | 1 |
| 2012 | 6 | 5 | 1 | 0 | 2 | 2 |
| 2011 | 5 | 4 | 1 | 0 | 3 | 0 |
| 2010 | 8 | 7 | 5 | 1 | 1 | 0 |
| 2009 | 13 | 6 | 1 | 2 | 3 | 0 |
| 2008 | 8 | 5 | 2 | 2 | 1 | 0 |
| 2007 | 10 | 7 | 3 | 0 | 1 | 1 |
| 2006 | 4 | 3 | 1 | 1 | 1 | 0 |
| 2005 | 11 | 11 | 6 | 1 | 4 | 0 |

Source: https://kdhe.ks.gov/ArchiveCenter/ViewFile/Item/7260

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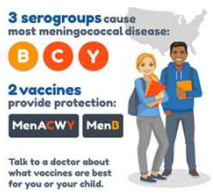
## Meningococcal Outbreaks

### Serogroup B

- Mostly college, university students
- Military recruits




### Serogroup C

- FL outbreak 26 cases
- Gay and bisexual men
- Largest meningococcal outbreak among MSM in US history
- MSM in FL should get vaccinated with MenACWY vaccine (I rec. all MSM +PLWHA given increased travel)
- Africa - meningitis belt

Source: https://www.cdc.gov/meningococcal/vaccine-info.html

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## Meningococcal Vaccines

**Monovalent Meningococcal serogroup B vaccine (inactivated) "MenB"**

- Recombinant protein vaccine
- Age 10-25 who have **risk** for meningococcal disease
  - 2 dose >1 mo
  - +/- booster q5y
- **Bexsero**
- **Trumenba**

***Not* interchangeable**

**Meningococcal serogroup A,C,W,Y (inactivated)**

- Conjugated Quadrivalent meningococcal capsular polysaccharide vaccine
- Age 2 mos - 55 yrs
  - 1 dose +/- booster q5y
  - 2 dose >2 mos (immunosuppressed)
- **Menactra**
- **Menveo**
- **MenQuadfi**

***Interchangeable***

Mbaeyi S., et al. MMWR Recomm Rep 2020;69(No. RR-9): 1-41

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## Who gets it?

**High risk for exposure**

- Dorm or residential habitation (if unvax > 16)
- Military recruits
- Microbiologists exposed to *N. meningitidis*
- Travelers or persons living in areas meningococcal infection is hyperendemic or epidemic (sub-Saharan Africa)

**High risk for severe infection**

- Asplenic or functionally asplenic (sickle cell disease)
- Complement deficiencies
- Complement inhibitors eculizumab (Solaris), ravulizumab (Ultomiris)
- MSM with exposures in FL, NY, LA
- HIV(+)

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## Additional Benefits

**Gonorrhea cross-protection**

- 26-40% vaccine efficacy (MenB) against gonorrhea
  - 2-dose: aPR 0.60 (95% CI 0.47-0.77)
  - 1-dose: aPR 0.74 (95% CI 0.63-0.88)
- Additional study suggests MenB in those at greatest gonorrhea risk **could be most impactful + cost effective method of averting gonorrhea**

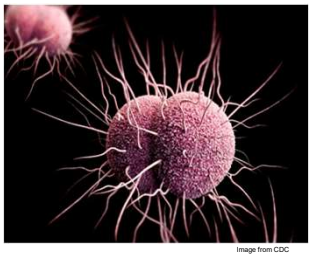

Image from CDC

Sources: Abara W., et al. Lancet 2022;22(7):p1021-29; Whittles L., et al. Lancet 2022;22(7):1030-41.

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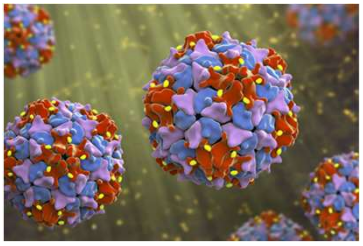
## Polio



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## Polio


NEW YORK CITY DEPARTMENT OF HEALTH AND MENTAL HYGIENE
Ashwin Vasan, MD, PhD
Commissioner

**2022 Health Alert #20: Update on Poliovirus in New York City**

- An unvaccinated adult with poliovirus infection and acute flaccid paralysis was reported in Rockland County, New York, highlighting the critical importance of being up to date with recommended immunizations.
- Testing of sewersheds in New York City indicate likely circulation of poliovirus in the city.
- Immediately identify and schedule appointments for children in your practice who are behind on poliovirus and other routine immunizations.
- Report all Acute Flaccid Myelitis to the NYC Department of Health and Mental Hygiene's Provider Access Line at 866-692-3641. If you suspect paralytic polio, report the case immediately.

August 12, 2022

Dear Colleague,

On July 18, 2022, a case of poliovirus with acute flaccid paralysis was confirmed in an unvaccinated adult in Rockland County, New York. The infection was not travel-related. Paralytic cases are an indicator of likely underlying poliovirus transmission in a community.

Source: https://health.ny.gov/press/releases/2022/2022-09-09_polio_immunization.htm



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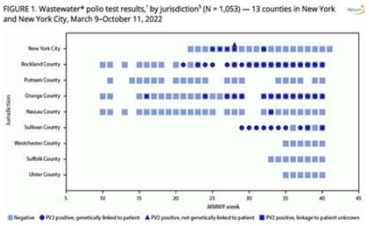
## Surveillance

### Wastewater sampling

- 8/2022 poliovirus type 2, genetically linked to the Rockland case was detected in Rockland County and neighboring Orange County




Source: Ryerson B., et al. MMWR 2022;71(44):1418-24.



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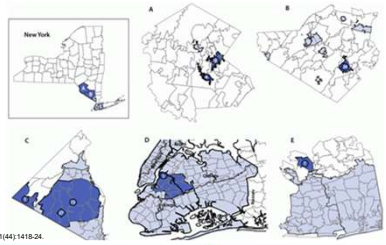
## Surveillance

### Wastewater sampling

- 8.3% (89 / 1,076 samples) from 10 watersheds had detectable PV2




Source: Ryerson B., et al. MMWR 2022;71(44):1418-24.

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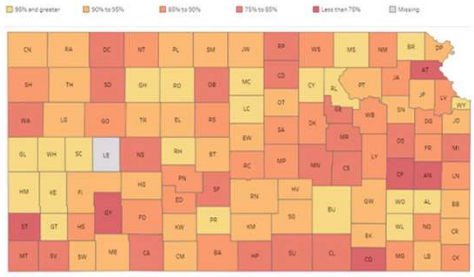
## PV4 Kindergarten Vaccine Coverage, 2018-2019

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## Polio Vaccines

**Live Attenuated**

- Monovalent, bivalent or trivalent polioviruses
- **Oral Polio Vaccine (OPV)**

***OPV viruses shed OP up to 14 days Most circulating poliovirus now vaccine-derived poliovirus (as is NY case), LIC/LMIC primary polio vaccine → wastewater, communication circulation → unvaccinated, opportunities for dissemination → mutates → pathogenic strains***

**Inactivated**

- Wild type virus, formalin inactivated
- Combinable with many other vax (Hib, HBV, DTaP) or standalone
- **Inactive Polio Vaccine (IPV)**

***1997 phased out US***
***2000 completely stopped distribution***
***No longer licensed in US***

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## Who gets Polio vaccines?

**Children**
- 4-dosed (6 wks→ 2 -4 mos → 6-18 mos → 4-6 yrs)

**Kids starting >4 yrs**
- 3-dosed OR unsure prior vaccination (if <4) complete subsequent doses for 3-total

**Adults**
- 3-dosed

**Partially vaccinated**
- Finish 3-doses

**Everyone!**

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## Boosters or Unaware of Prior Vaccine Status

**Boosters**
- Close or household contacts
- HCWs in areas were detected
- Virologists or lab handlers of poliovirus
- Travels to endemic countries (Pakistan, Afghanistan)

**Consider**
- Occupational exposure to wastewater
- HCWs close contact patients excrete poliovirus (neuro, urgent or ED care)

**Unknown Vaccination High-risk (HCWs)**
- Most adults born in US, "unless specific reasons to believe they were not vaccinated" assume childhood vaccinated
- Incomplete: complete 2nd IPV → 3rd IPV (6-12 months)
- Mix of OPV + IPV: receive either 3 or 4 doses depending age of last dose (3 OK as long as last dose > 4yrs)

Source: https://cdc.gov/vaccines/vpd/polio/hcp/recommendations.html

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## Unknown Prior Vaccine Status

**Can I check serologies?**
- 2011 ACIP - option for serologies to poliovirus types 1, 2, 3
- ARUP, Mayo - neutralizing antibody poliovirus **1, 3**
- Poliovirus 1 & 2 do NOT reliably indicate protection to type 2 → if vaccinated ***outside*** US in a country not reliably using trivalent (i.e., mOPV, bOPV) either check with state health lab for poliovirus 3 ab, OR re-vaccinate
- US used tOPV and the IPV is trivalent, so if vaccinated in United States *and* poliovirus 1 and 2 antibody (+) = immune

Marin M., MMWR 2017;66(01);23-25.

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## Infections and Deaths Prevented

1963 Vaccine Introduced

OPV IPV

Aseptic meningitis

Paralysis

Respiratory failure (bulbar paralysis)

Prevented since vaccine introduced

29 Million Paralytic Cases

1.5 million Deaths prevented (global)

Sources: Olshansky S., Hayflic L. AIMS Public Health. 2017;4(2): 127-38. Badizadegan K, et al. J Infect Dis. 2022;226(8):1309-18. https://cdc.gov/globalhealth/newsroom/topics/polio/index.html#:~:text=Since%201988%2C%20more%20than%2018,thanks%20to%20vaccines%20and%20immunization.



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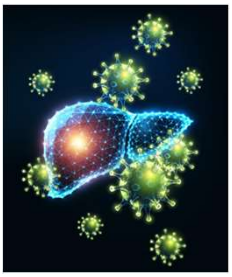
## Hepatitis A



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## Hepatitis A Virus (HAV) Outbreaks


Source: https://cdc.gov/hepatitis/outbreaks/2017/March-HepatitisA.htm



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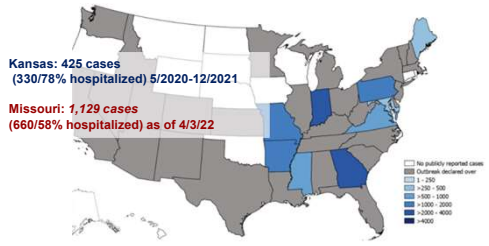
## HAV Outbreaks

State-Reported HAV Outbreak Cases as of April 3, 2023




Source: Widespread outbreaks of hepatitis A across the U.S. | CDC

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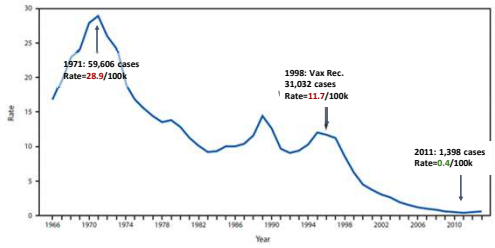
## National HAV Epidemiology




Source: MMWR 2018;66:1171-77

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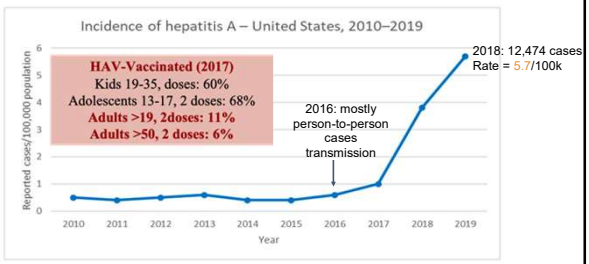
## National HAV Epidemiology




Source: MMWR 2018;66:1171-77

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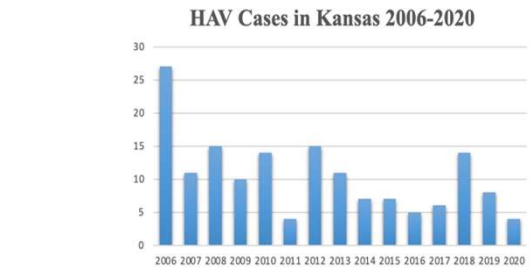
## Kansas HAV Epidemiology




Source: https://kdhe.ks.gov/Archive.aspx

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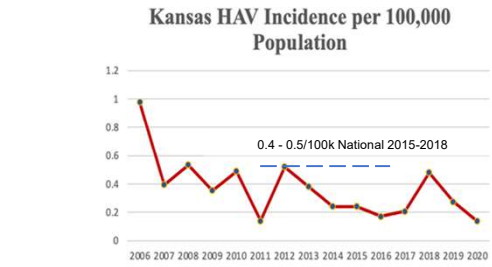
## Kansas HAV Epidemiology




Source: https://kdhe.ks.gov/Archive.aspx

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## HAV Vaccine

**Combination inactivated HAV + HBV vaccine**

- 3 dose (0, 1 & 6 mos)
- >18 years
- **Twinrix**

**Inactivated antigenic HAV vaccines**

- 2 doses (0 & 6-12 mos apart)
- Lifelong immunity
- >1 year
- **Havrix**

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## Vaccine Efficacy

### HAV Havrix

- Seroconversion following primary series ~100% (healthy adults)
- Ab persistence 20+ years in >95% healthy adults
- Since HAV vaccination available in '95, HAV prevalence decreased 95%

Yet… ¾ of Americans remain susceptible

### Highest Risk

- Homeless
- Drug abuse/IVDU
- Cirrhosis
- HIV
- MSM
- HCWs / work with high-risk people
- Endemic regional travels

Sources: Barker L, et al CID 2020;71(10):e571-e579; Heins N et al. Vaccine 2014(32)13:1807-13

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## Infections and Deaths Prevented

1996 Vaccine Introduced


Prevented since vaccine introduced

- 3.67 Million Cases


Source: Olshansky S., Hayflic L. AIMS Public Health. 2017;4(2: 127-38

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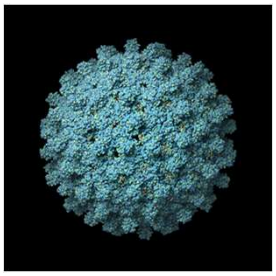
## Hepatitis B

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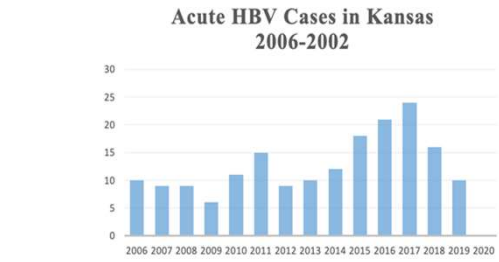
## Kansas Hepatitis B Virus HBV Epidemiology




Source: https://kdhe.ks.gov/Archive.aspx

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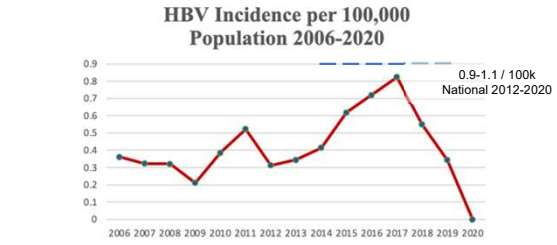
## Kansas Hepatitis B Virus HBV Epidemiology




Source: https://kdhe.ks.gov/Archive.aspx

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## HBV Vaccine

**Recombinant**
- Aluminum adjuvanted
- 0,1,6 mos
- **Recombivax-B**
- **Engerix-B**

***Aluminum adjuvanted in pregnant females (because CpG not studied)***

**Recombinant**
- Cytosine phosphoguanine **[CpG]** motif adjuvanted (synthetic DNA) TLR9 agonist mimics natural innate immune response to bacterial + viral DNA → **enhanced B & T cell responses**, co-administered same ag as Engerix-B & Recombivax-B
- 0,1 mos
- **Heplisav-B**

***Excluded Pregnancy (planned or current), breastfeeding, h/o autoimmune disease***

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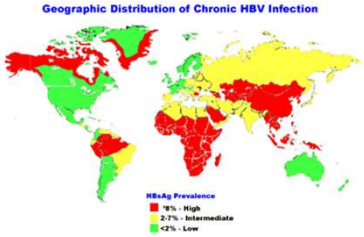
## Who gets HBV vaccine?

### High risk for exposure

- Drug use/IVDA
- MSM, multiple sex partners
- HIV
- ESRD
- Cirrhosis
- Immunocompromised including DM
- Families adopting from countries of high-intermediate endemicity
- HCWs, public safety workers
- Incarcerated
- Infants born to HBsAg(+) mothers




Source: https://web.stanford.edu/group/virus/hepadna/2004tansilvis/Epidemiology.htm



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## Hypo-responders to HBV vaccination

### Lower HBV responders

- Males
- Obesity BMI ≥30
- Age ≥40
- Smokers
- Autoimmune deficient
- HIV(+)

### Surrogate of protection

- anti-HBs ≥ 10 mIU/mL



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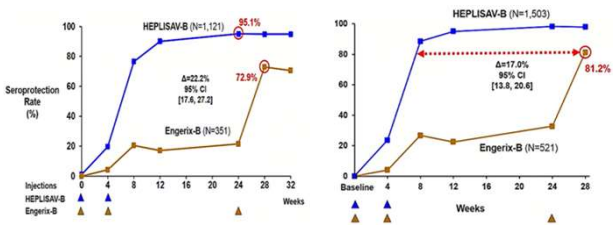
## Heplisav-B




**Heplisav-B induced significantly higher peak protective ab's *and* achieved sero-response much earlier (8 vs 24-28 wks)**

Source: FDA Advisory Committee Briefing Document Presented to ACIP, 2017: https://fda.gov/media/107096/download



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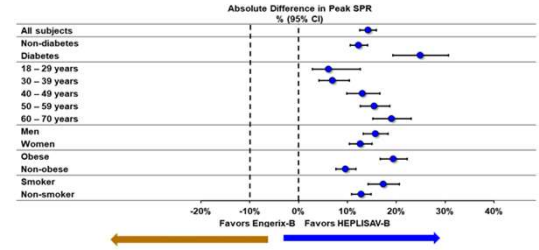
## Heplisav-B




Source: FDA Advisory Committee Briefing Document Presented to ACIP, 2017: https://fda.gov/media/107096/download



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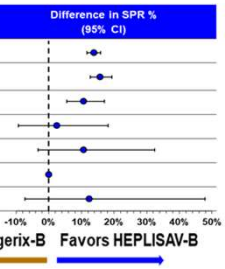
## Heplisav-B

| Race | HEPLISAV-B N | HEPLISAV-B SPR (%) | Engerix-B N | Engerix-B SPR (%) |
|---|---|---|---|---|
| White | 3084 | 94.4 | 1675 | 80.6 |
| Black | 1169 | 98.1 | 554 | 82.3 |
| Hispanic or Latino | 391 | 94.9 | 183 | 84.2 |
| Asian | 45 | 95.6 | 29 | 93.1 |
| Native American | 46 | 95.7 | 20 | 85.0 |
| Pacific Islander | 12 | 100.0 | 3 | 100.0 |
| Other | 18 | 100.0 | 8 | 87.5 |




Source: FDA Advisory Committee Briefing Document Presented to ACIP, 2017: https://fda.gov/media/107096/download



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## Special Situations

- Non-responders (anti-HBs <10 mIU/mL)
  - Complete second series. Retest anti-HBs after second series. If still negative, recheck HBsAg to ensure no undiagnosed chronic HBV is present.
    - Second 3 course series is effective 50-70% of patients.
    - If fail to respond, unlikely to respond to additional vaccines.
    - Give HBIG with hep B vaccine if exposure occurs.
- **I was exposed**
  - Unvaccinated
    - HBIG: one dose, rapid protection until vaccine-induced immunity develops
    - Give within one week of exposure
- **I missed a dose**
  - Start where you left off, regardless of delay



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## Infections and Deaths Prevented

1982 Vaccine Introduced


Prevented since vaccine introduced

- 428,485 acute HBV cases
- 34,200 chronic HBV cases
- 59,477 liver cancer cases

78,808 Deaths Prevented (US)

Source: Ladak F., et al. Infection. 2012; 40(4): 405-13.

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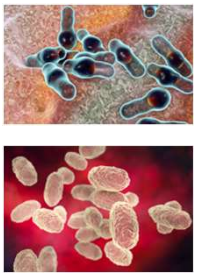
## Tetanus, Diphtheria, Pertussis (TDaP)

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## Pertussis

# Pertussis

Pertussis Incidence per 100,000 Population

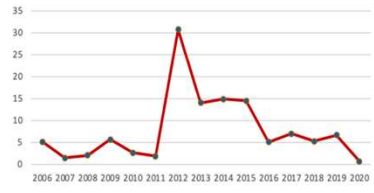


Image source CDC

Child with broken blood vessels in eyes and bruising on face due to pertussis coughing

Source: https://kdhe.ks.gov/Archive.aspx

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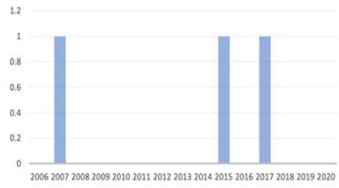
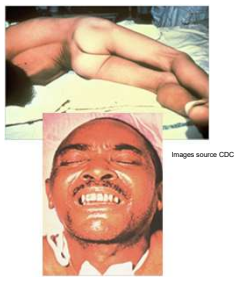
## Tetanus



Images source CDC

Source: https://kdhe.ks.gov/Archive.aspx

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## TDaP Vaccine

**Tetanus toxoid**
**Reduced diphtheria toxoid**
**acellular pertussis**

- Adults not previously having received Tdap:
- Tdap x1 → Td booster q10 y
  - Alt: pertussis immunity wanes at 5-10 years, so with increasing rates in our state, consider Tdap q10y

- Tdap each pregnancy (3rd tri)
- Household contacts, grandparents, care providers

***Regardless of interval from last Tdap***

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## How can we improve immunization rates?

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## Strategies to improve patient and worker vaccinations

### Hospital-Based

- Standing orders (e.g., on admit or discharge) rather than requiring physician's signature
- High-risk patients by diagnoses and age (identified by EHR or physician, nurse, pharmacist or IPC)
- Leadership support (visibly vaccinate institutional leaders)

### Provider-Based

- Practice-based tracking systems ID high-risk adults and remind during visit
- Preventative checklists
- Meta-analysis of 41 studies: reminders improved vaccination rates 80%

### Quality of Care Metric

- IDSA issued Executive Summary on Immunization Coverage, citing need to care and other organization promote immunization as indicator of healthcare quality in managed s

### Occupational Health Partnership

- Offer flexible worksite vaccine delivery (e.g., multiple locations and times, via mobile carts)
- Offer free access w/o out of pocket expense to HCWs
- Monitor and report rates (ID areas/sectors with low coverage for targeted intervention)

Sources: Szilagyi P., JAMA 2000; 284(14):1820; IDSA Executive Summary. CID. 2007;44(12):1529-31

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## Resources and More Information

**We want to help with AS/AR, contact**

**Kellie Wark**
Kellie.Wark@ks.gov

**Bryna Stacey**
Bryna.Stacey@ks.gov

Healthcare-Associated Infections & Antimicrobial Resistance Program

**HAI/AR Section General Contact**
KDHE.HAIAR@ks.gov
(785) 296-4167

**24/7 Epidemiology Hotline**
KDHE.EpiHotline@ks.gov
(877) 427-7317

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## Thank You/Questions

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## Upcoming Education and Important Dates

- 4/26 CMS MIPS Overview Webinar
- 5/4-6/1 SUD 2023 ECHO Series - Overdose Prevention and Harm Reduction in Kansas
- 5/3 Syndromic Antimicrobial Stewardship: Focused Initiatives for Wounds, Skin & Soft Tissue
- 5/9 Compass HQIC Topic Focused Office Hours for Hospitals
- 5/23-5/25 KDHE DSMES Bootcamp
- 6/7 Syndromic Antimicrobial Stewardship: Focused Initiatives for Upper and Lower Respiratory Infections
- 8/24 KHC Summit on Quality, Wichita

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