COMPLIANCE RATES OF RECOMMENDED VACCINES AMONG MIDDLE SCHOOL STUDENTS

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MPH Field Experience

Objectives

- Investigate low vaccine coverage of human papillomavirus (HPV) and Meningococcal disease (MCD) in local areas
- Compare local vaccine coverage with state and national statistics
- Explore possible reasons for decreased immunization compliance
- Suggest ways to bridge the disconnect between healthcare providers and general public

Human Papillomavirus

Background

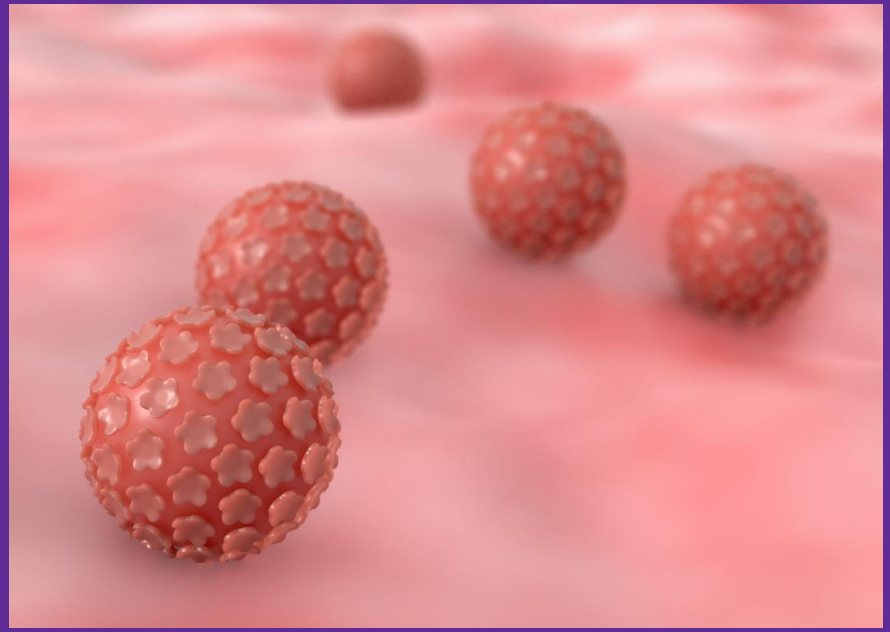


Image from: https://www.periodicoacceso.com/2016/08/09/%E2%80%8Bcrece-numero-de-casos-de-cancer-de-pene-por-virus-del-papiloma-humano/

HPV

- Non-enveloped, double stranded DNA virus
- Over 150 viruses in this family, each differing by the genetic sequence found in the outer capsid protein
- Most common STI in the United States
- Type 16 and 18 are responsible for 70% of cervical cancers

Screening

Image from: https://speakerdeck.com/khamphukhoatongquatgomnhunggi

- Generally women aged 30 and over are screened for HPV every 5 years.
- It is not recommended for women under 30 to be screened for HPV
- There are no tests to detect HPV in men

Vaccines

- There are currently 3 vaccines licensed to protect against HPV:
  - HPV2: Cerverix
  - HPV4: Gardasil
  - HPV9: Gardasil 9

Cerverix

- Approved by the FDA in 2009
- Recommended for females 9-26 years of age
- Covers 16 and 18 serotypes

Gardasil

- Quadrivalent vaccine
- FDA approved since 2006
- Labeled for males and females 9 to 26 years of age
- Also covers serotypes 6 and 11

Gardasil 9

- FDA approved since 2014
- In addition to the 4 strains covered by original Gardasil, also protects against types 31, 33, 45, 52, and 58
- Gardasil 9 is the only HPV vaccine used in the United States since 2017
- Cerverix and the original Gardasil are still used in other countries

Meningococcal Disease

Background

Image from: https://www.shutterstock.com/video/search/meningococcal-meningitis-bacteria

MCD

- *Neisseria Meningitidis*
- Aerobic, gram negative, diplococcus
- Polysaccharide capsule resistant to phagocytosis
- A, B, C, W, and Y serogroups
- Types B, C, and Y cause serious illness

MCD

- Spread by respiratory and throat secretions
- Commonly transferred between individuals in dense living populations
- Approximately 10% of individuals harbor *N. meningitidis* as carriers

Meningitis

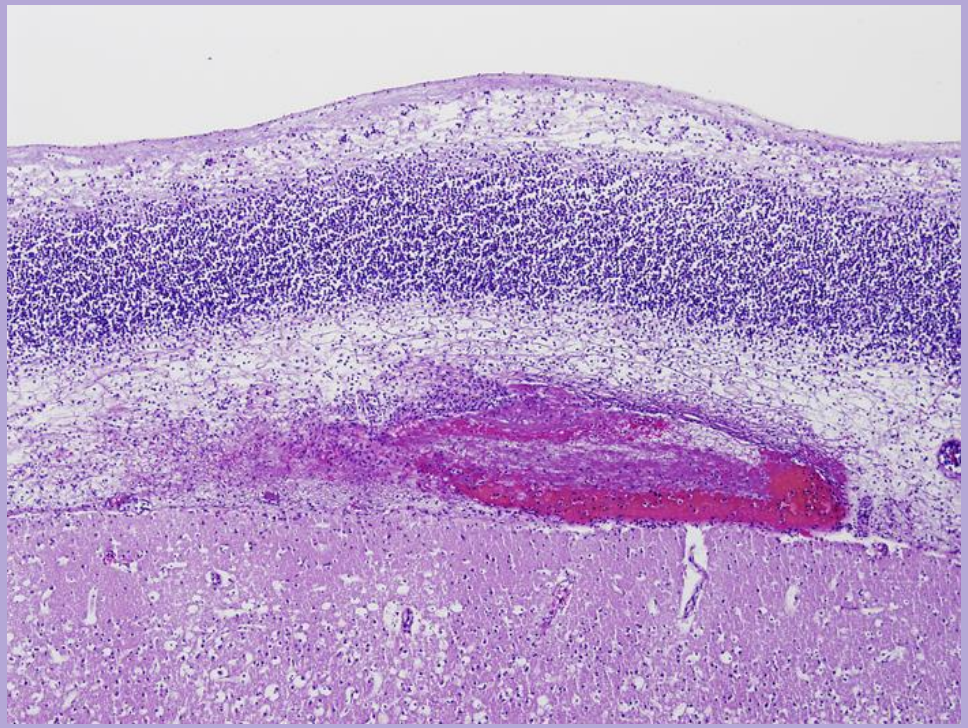


Image from: https://cellcode.us/quotes/germinal-matrix-histology.html

- Inflammation of the brain and spinal cord
- Symptoms include: headache, fever, nausea, and photophobia
- 10-15% fatality

Meningococcemia

- Rare form of meningococcal disease affecting 5-20%
- Lipopolysaccharides act as an endotoxin damaging blood vessels and RBCs
- Fatal in 40% of cases

Meningococcal Vaccines

- There are currently 3 approved meningococcal vaccines on the market:
  - Menactra
  - Menveo
  - MenHibrix

Menactra

- Quadrivalent conjugate vaccine.
- Covers A, C, W, and Y
- Approved in 2005 for individuals 9 months to 55 years of age

Menveo

- Approved in 2010
- Quadrivalent vaccine covers serogroups A, C, W, and Y
- Labeled for individuals 2 months of age to 55 years of age

MenHibrix

- Approved in 2012
- Bivalent vaccine covers serogroups C and Y
- Also protect against *Haemophilus influenzae* type B
- Approved for children 6 weeks to 18 months of age

Booster

- Circulating antibodies decrease in 3-5 years after injection
- Health professionals recommend booster at 16 years of age
- High risk individuals should be boostered every 5 years

Image from: https://www.irishtimes.com/news/health/meningitis-b-parents-call-on-government-to-include-all-children-in-vaccine-1.3755374

N. meningitidis type B

- Rarely found in outbreaks but known for high mortality and devastating disease
- Difficult to vaccinate for due to genetic and antigenic diversity

N. meningitidis type B vaccines

- Trumenba
  - FDA approved in 2014
  - Uses surface protein fHBP as an antigen
- Bexsero
  - FDA approved in 2015
  - Uses 4 surface proteins as antigens

N. meningitidis type B vaccines

- Both Trumenba and Bexsero are only recommended to individuals with high risk exposure
- Neither vaccine has conformation of efficacy

Outbreak

- Antibiotics are strongly recommended prophylactically to individuals living with infected individuals
- Rifampin, ciprofloxacin, ceftriaxone are 90-95% effective in reducing the transmission of *N. meningitidis*

Immunization SOP of Fort Riley

Background

Image from https://iach.amedd.army.mil/

Standard Operating Procedures

- All children enrolled in Fort Riley schools must have documentation of immunizations based on the most recent guidelines published by the CDC
- If a child isn’t up-to-date on immunizations, documentation by a healthcare professional must be provided and include a schedule to update vaccinations

Exemptions

- Vaccination exemptions at Fort Riley are permitted for medical reasons only
- Religious exemptions acknowledged by clergy are considered on a case-by-case basis
- Usually denied by the Chief of the Department of Public health

Ten Day Notice

- Parents of children with outdated immunization records have ten days to update vaccination status
- Failure to comply within ten days will result in student suspension until immunizations are updated

Methods

Image from:https://decker.com/blog/raise-those-hands-high/

Sampling

- USD 475
- Data was of current vaccination status as of May 2016
- 888 students assessed
- 6th to 8th grade
- 12 to 15 years of age

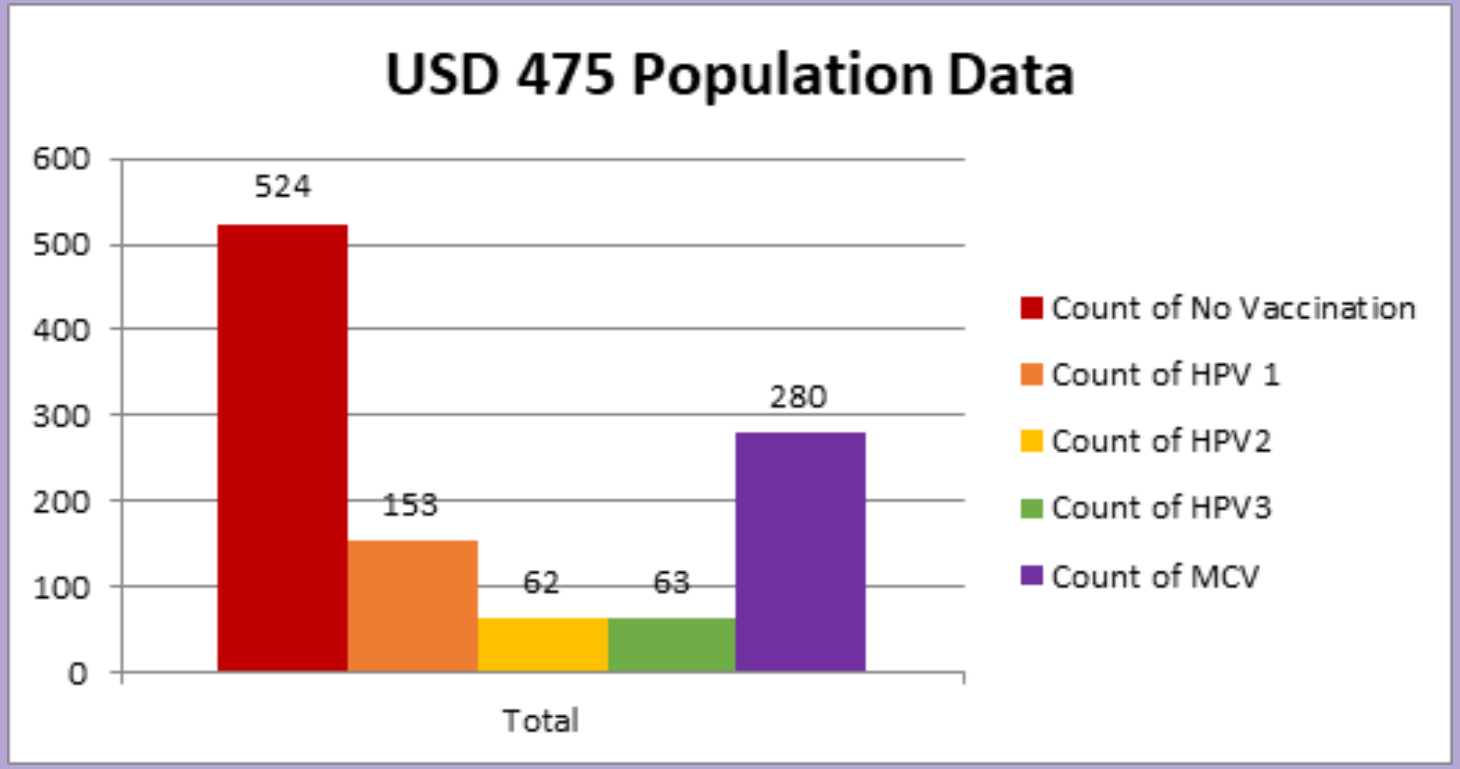
Results

Image from:
https://www.istockphoto.com/photos/graph?assettype=image&sort=mostpopular&mediatype=photography&phrase=graph

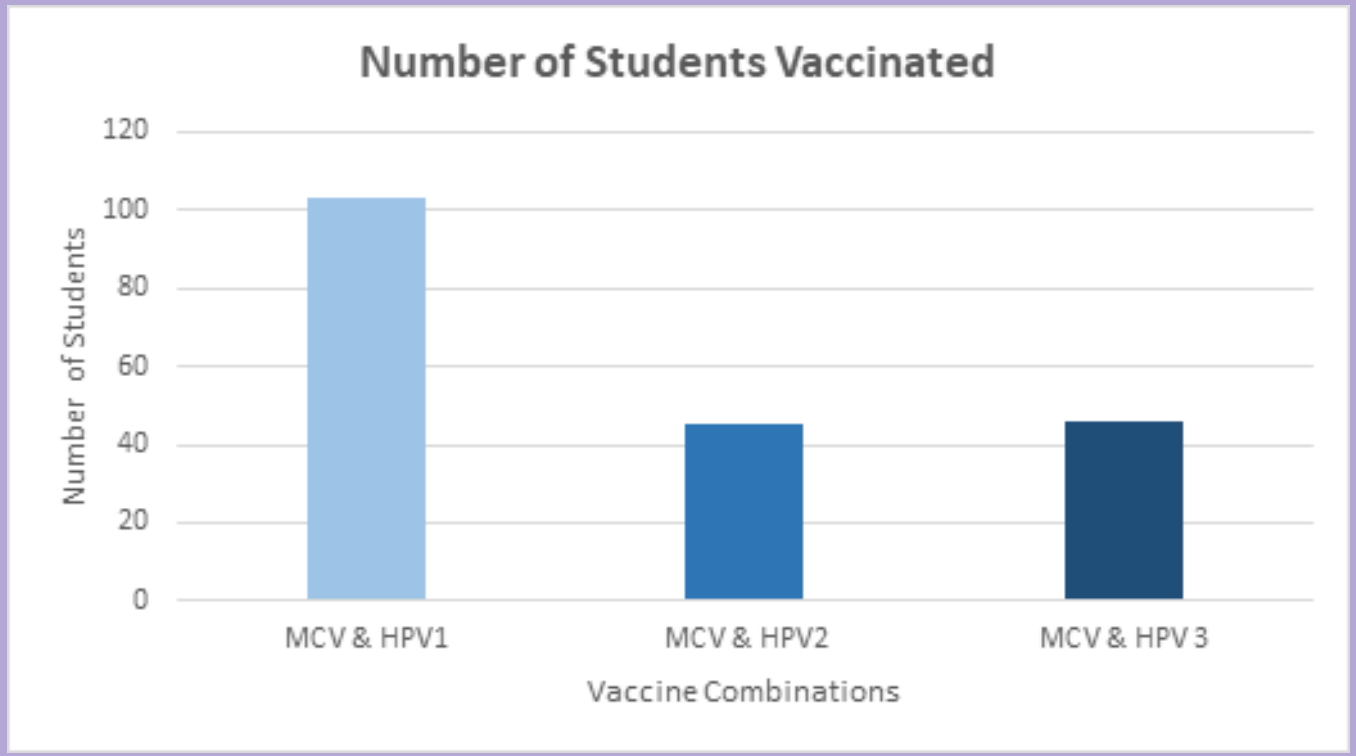
USD 475

Total Population	Total Unvaccinated Population	Total Population with first HPV Immunization	Total Population with second HPV Immunization	Total Population with third HPV Immunization	Total Population with MCV Immunization
888 Students	524 Students	153 Students	62 Students	63 Students	280 Students

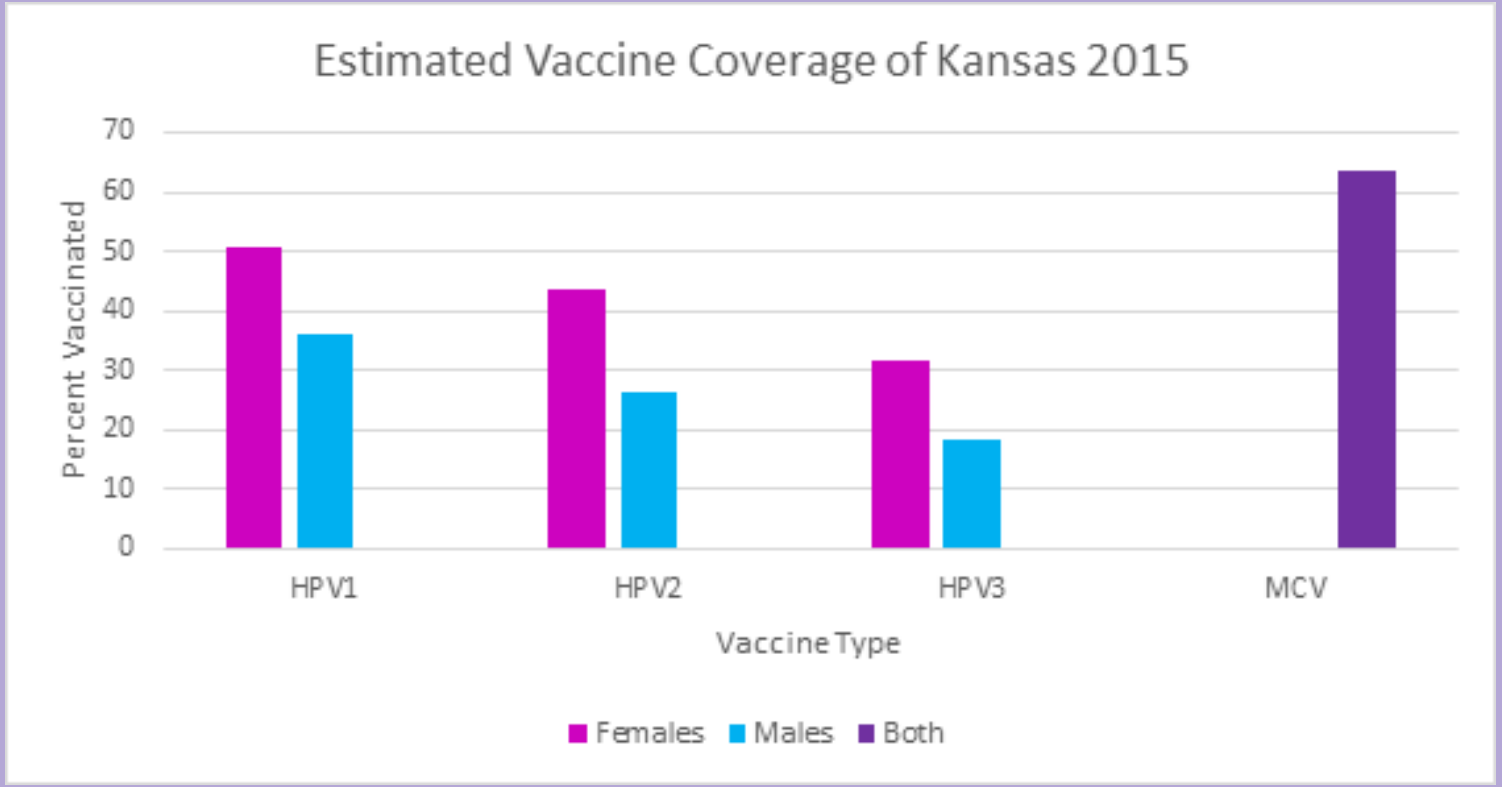
USD 475


USD 475 Population Data
600
500
400
300
200
100
0
524
153
62
63
280
Total
Count of No Vaccination
Count of HPV 1
Count of HPV2
Count of HPV3
Count of MCV

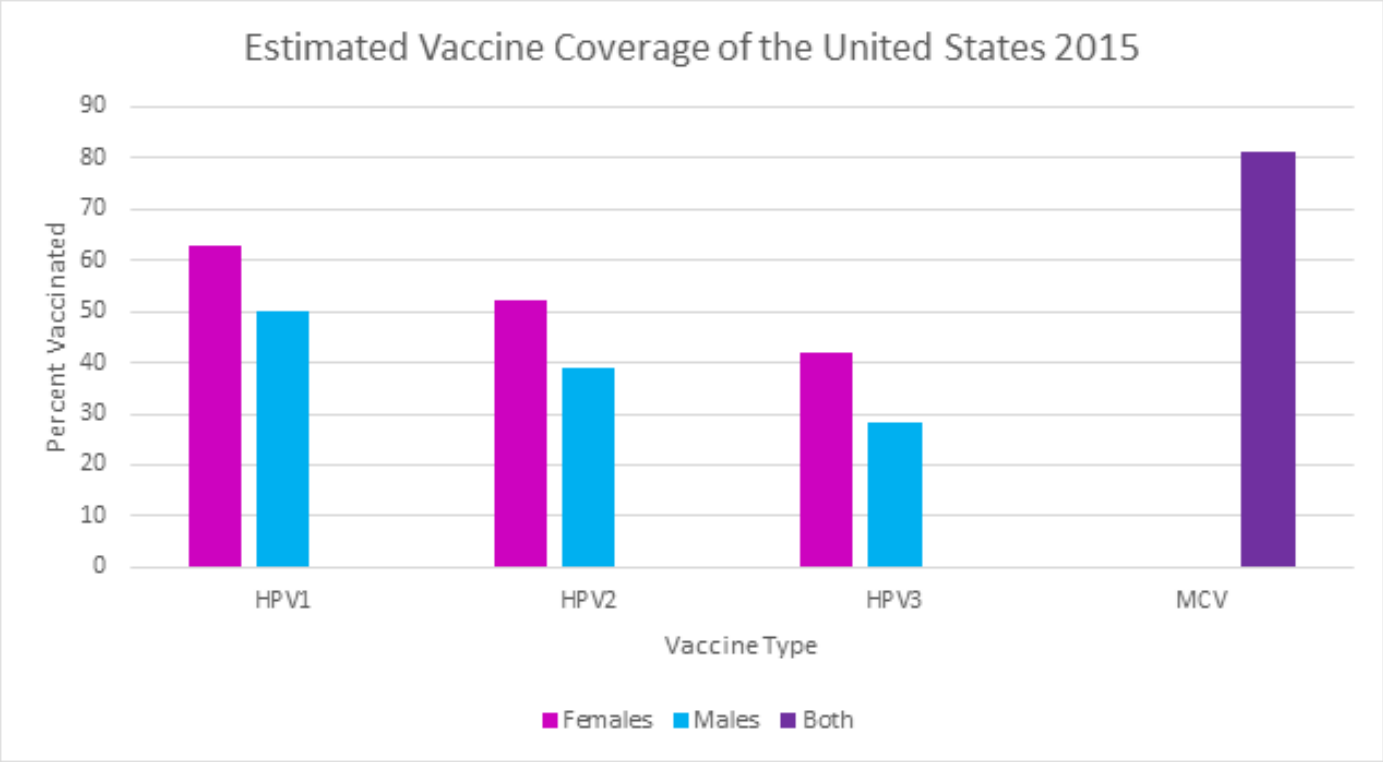
USD 475 MCV and HPV Combined



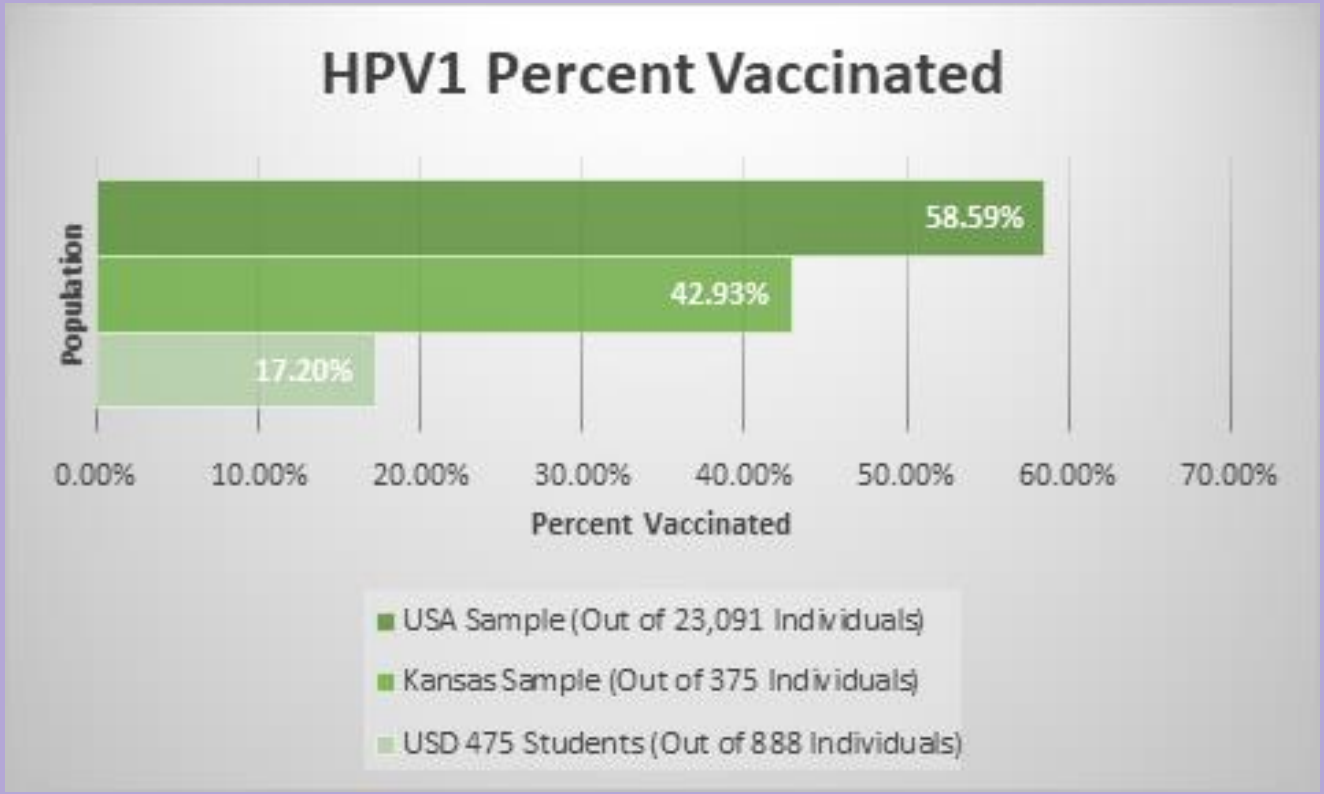
Kansas Adolescents (13-17 years of age)



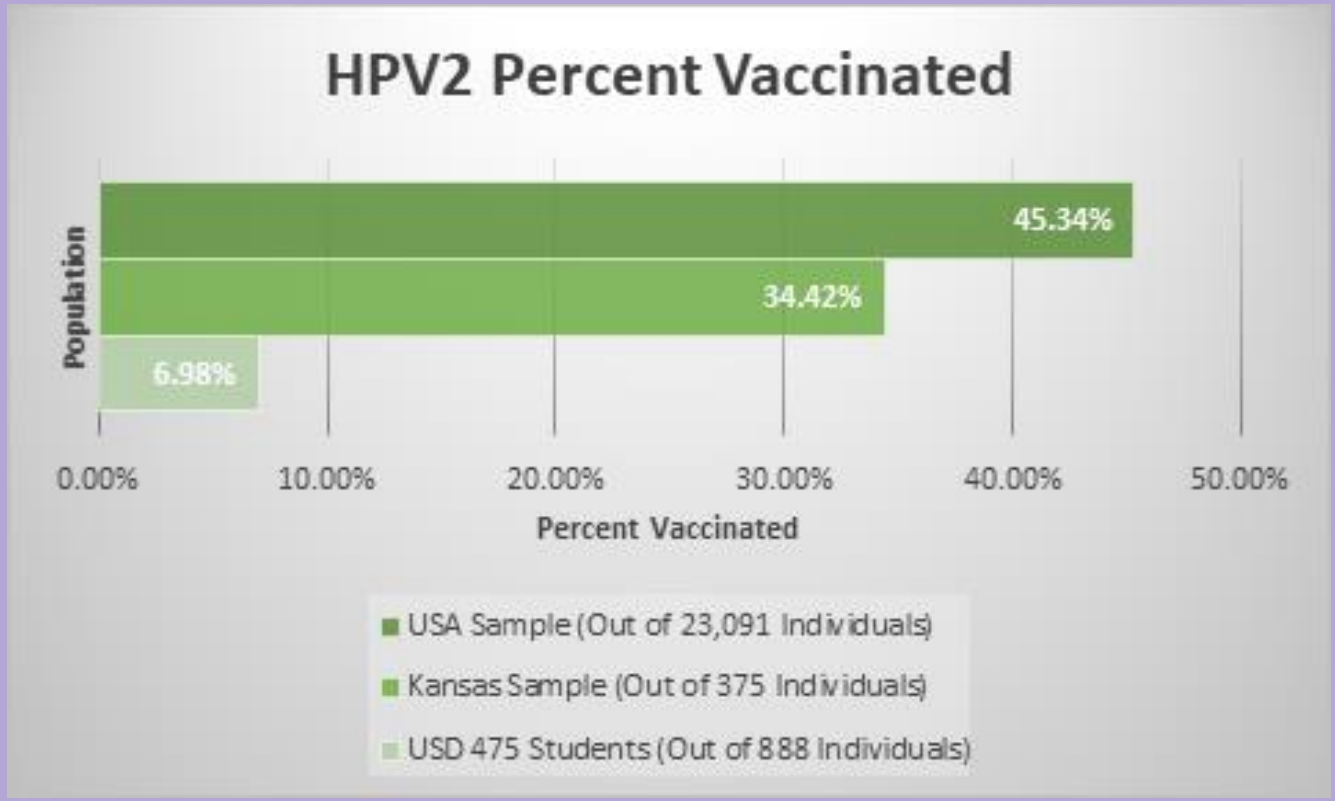
USA Adolescents (13-17 years of age)



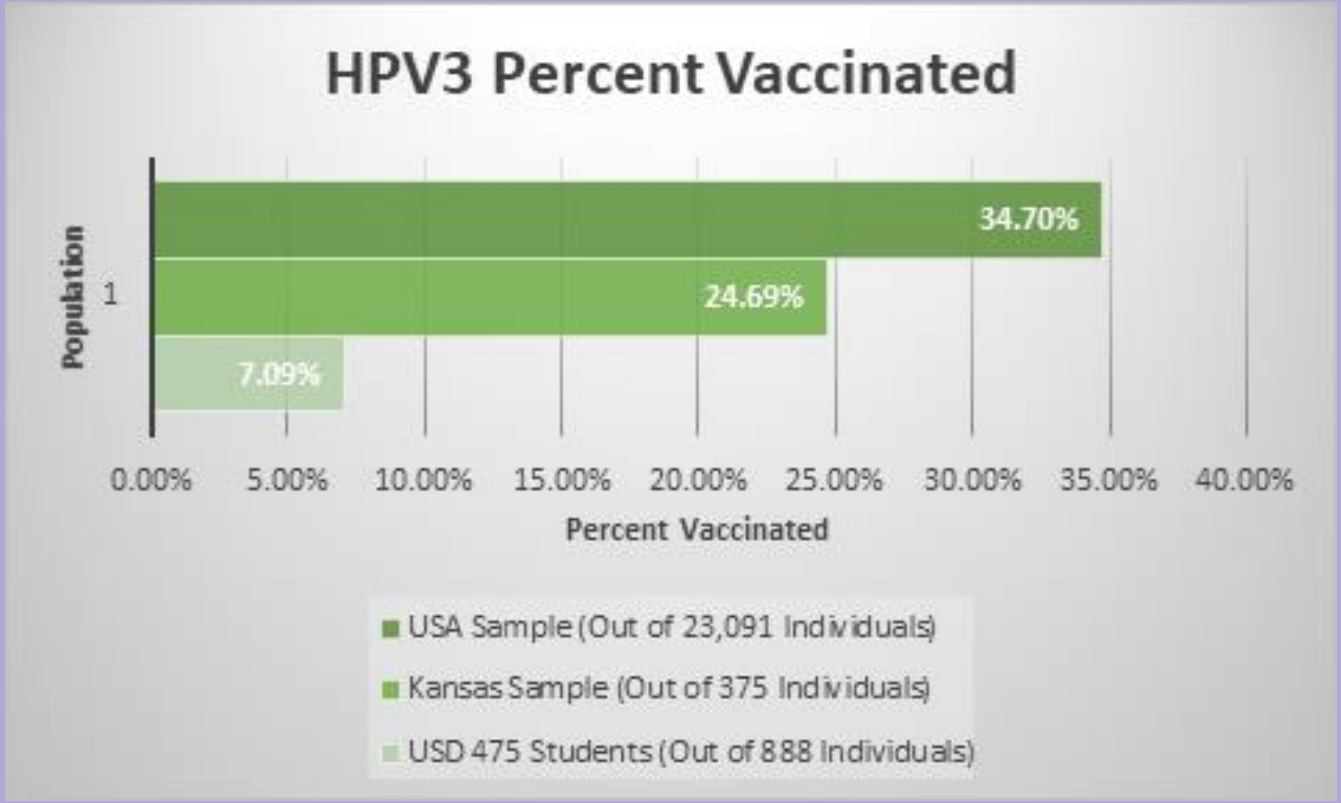
Comparison of HPV1 Vaccinated



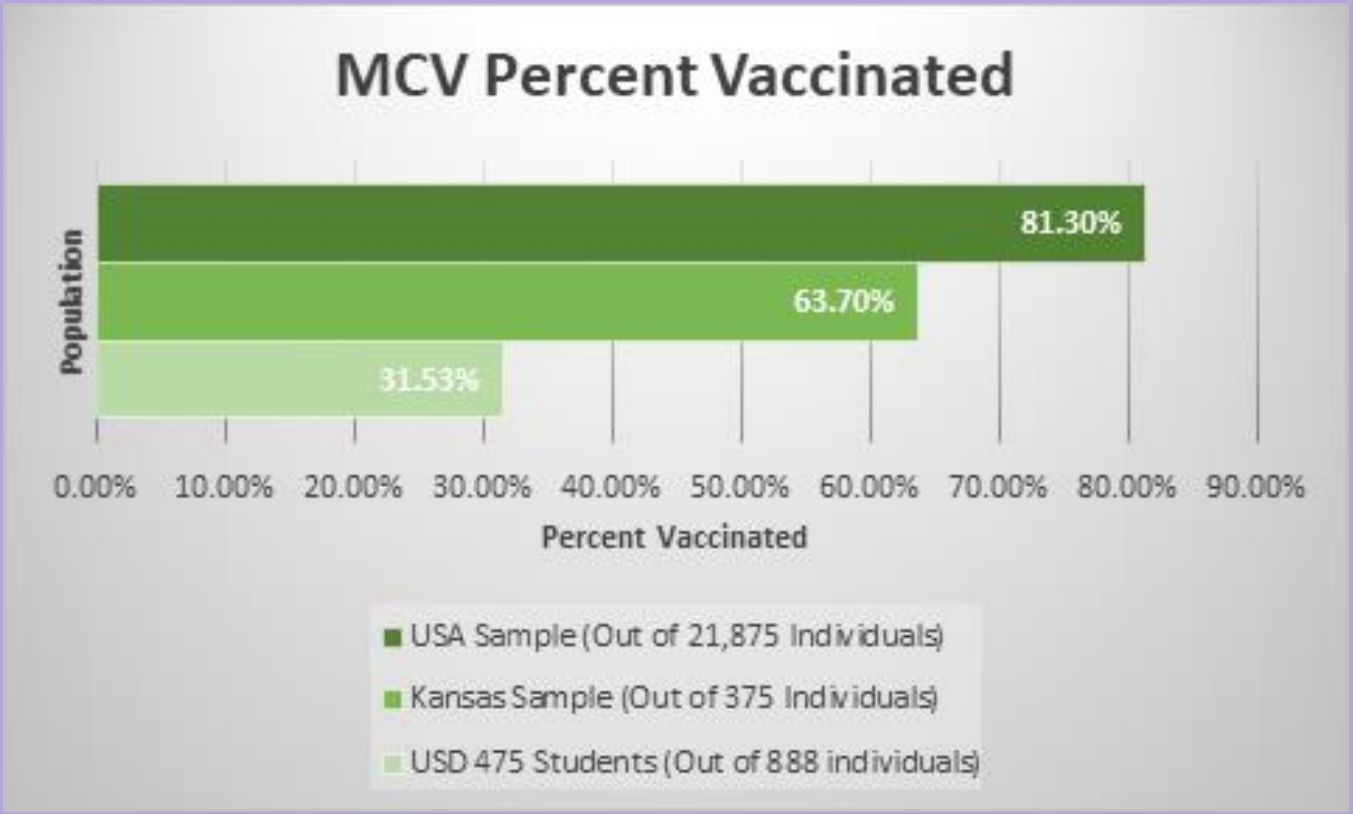
Comparison of HPV2 Vaccinated



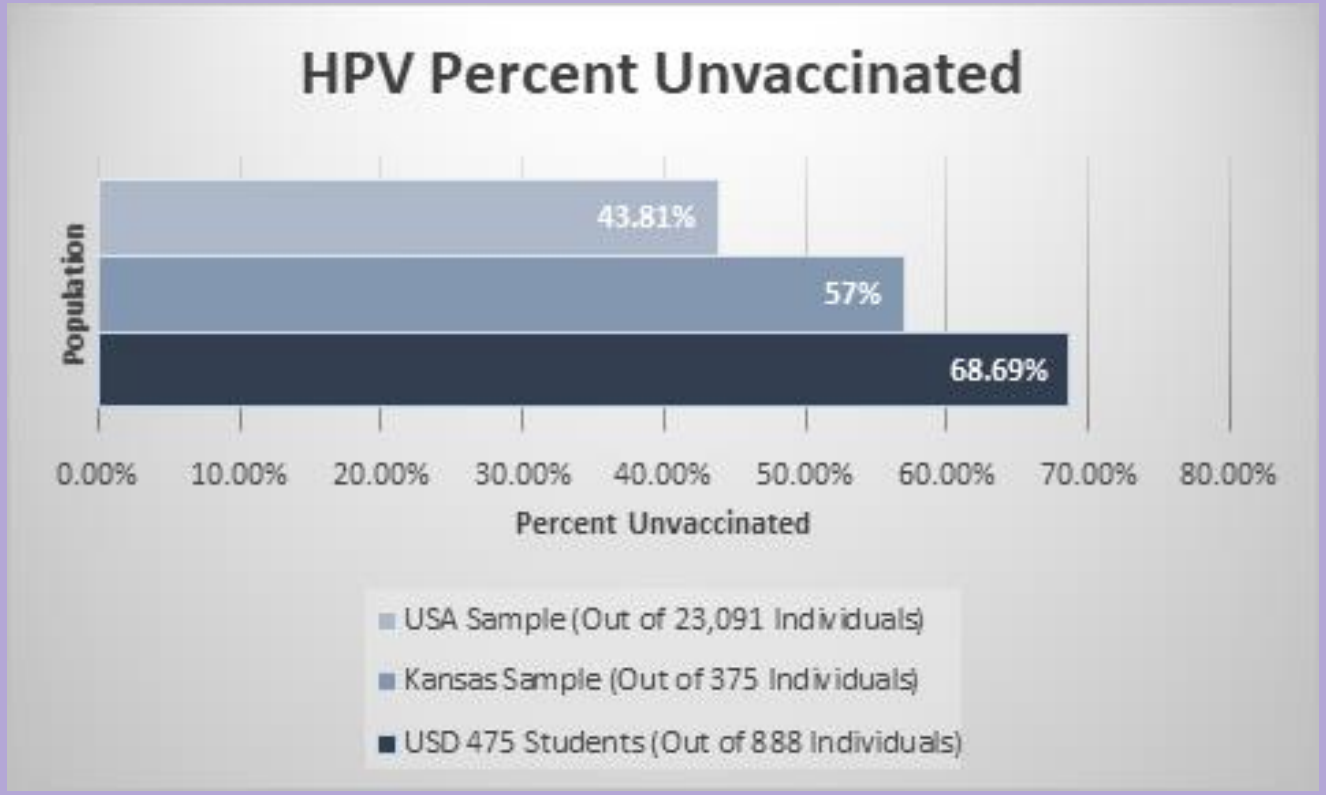
Comparison of HPV3 Vaccinated



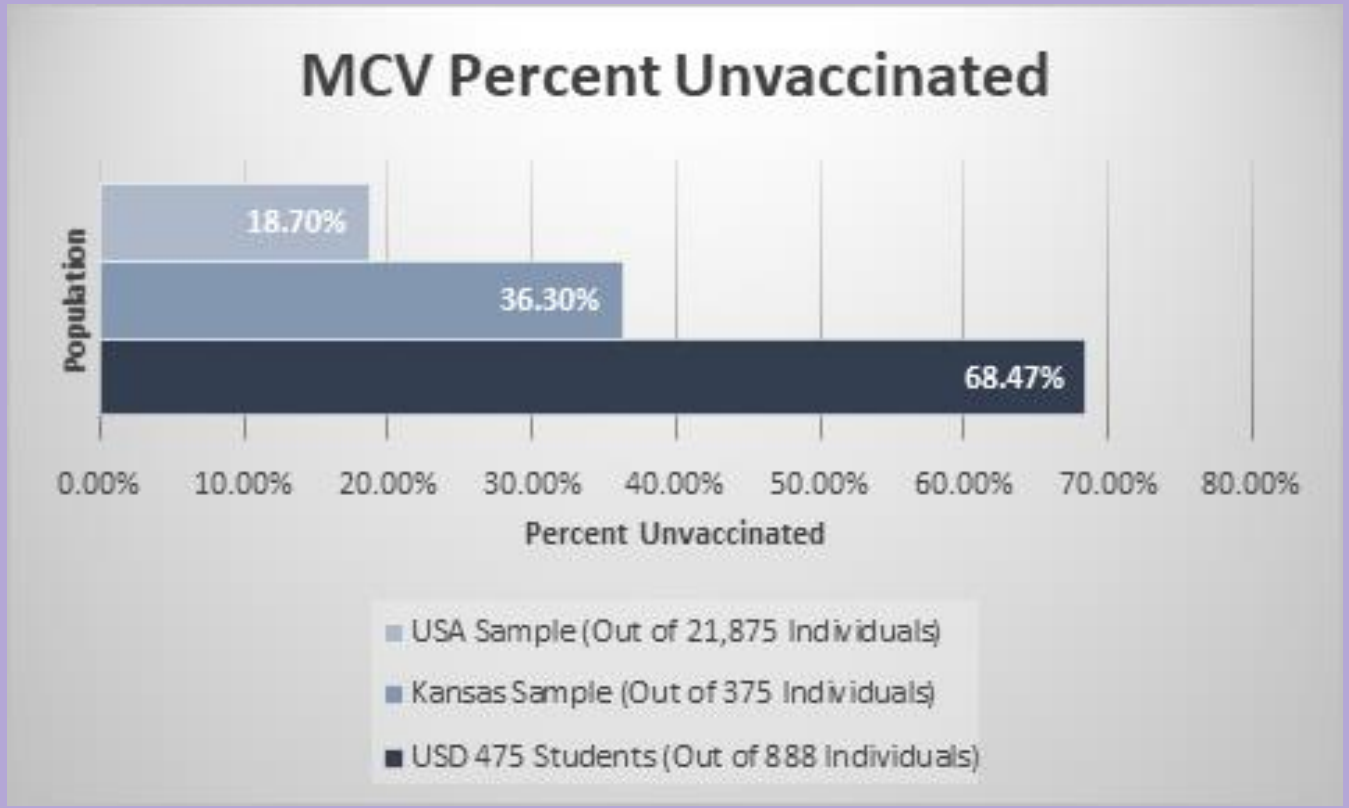
Comparison of MCV Vaccinated



Comparison of HPV Unvaccinated



Comparison MCV Unvaccinated



Discussion

Image from: https://www.freepik.com/free-photos-vectors/discussion

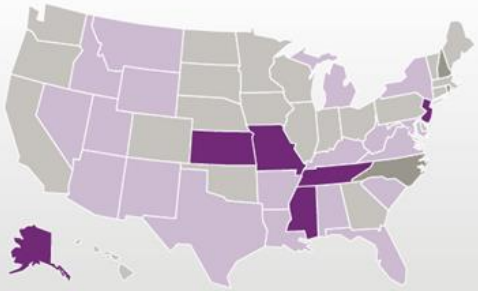
Lack in Coverage

- Analyzing data from the CDC shows that Kansas as a whole is lacking on immunization coverage
- The United States is also lacking considering Healthy People 2020 suggests a goal of 80% population coverage for HPV

HPV VACCINATION IS THE BEST WAY TO PREVENT MANY TYPES OF CANCER
MANY ADOLESCENTS HAVEN'T STARTED THE HPV VACCINE SERIES

NATIONWIDE
4 OUT OF 10
GIRLS ARE UNVACCINATED

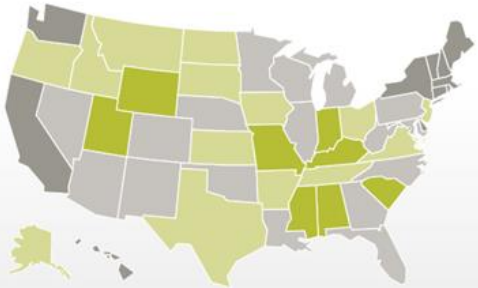
Percentage of adolescent girls who have received one or more doses of HPV vaccine*



National coverage is 60%
Coverage by state:
- 49% or less
- 50-59%
- 60-69%
- 70% or greater

NATIONWIDE
6 OUT OF 10
BOYS ARE UNVACCINATED

Percentage of adolescent boys who have received one or more doses of HPV vaccine*



National coverage is 42%
Coverage by state:
- 29% or less
- 30-39%
- 40-49%
- 50% or greater

IMPROVING HPV VACCINATION RATES WILL HELP SAVE LIVES.
A high national Tdap vaccination rate of 88% shows that it is possible to achieve high HPV vaccination coverage.

*Estimated coverage with ≥1 dose of Human Papillomavirus (HPV) vaccine, either quadrivalent or bivalent, among adolescents aged 13-17 years, National Immunization Survey–Teen (NIS–Teen), United States, 2014

Source: MMWR July 31, 2015

www.cdc.gov/hpv

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

NCIRDig524 | July 31, 2015

Reasons for Low Coverage

- Socioeconomic
- Medical
- Religious
- Philosophical

Philosophical Exemptions

- States that allow philosophical exemptions have the highest rates of adolescents unvaccinated for HPV and MCD

Vaccine Hesitancy

- Social media plays a big role in spreading misleading information
- Groups form between individuals with similar beliefs
- Validation of these beliefs can pose a danger to public health

Vaccine Mandates

- Some states have created mandates for public school students to be vaccinated with at least the first series of HPV before the start of 6th grade

Intervention Strategies

- Increase community demand for vaccination
- Increase access to vaccination services
- Health-provider interventions

Conclusions

Image from: https://www.cancercenter.com/community/blog/2018/01/cancer-vaccines-do-exist-but-dont-expect-the-impossible

Study Limitations

- Restrictions in data collection
- Difficult to obtain vaccine records of minors
- Not the same studied population as CDC data

Recommendations

- Utilize events such as Public Health Day to communicate with soldiers
- Health-provider intervention

Field Experience

Fort Riley Department of Public Health

Image taken by: Stefanie Campbell

Rotations

- Veterinary Services
- Environmental Health
- Industrial Hygiene
- Occupational Health
- Army Public Health Nursing
- Army Wellness Center
- Army Hearing Program

Veterinary Services

- Focusing on preventative medicine for military animals and soldiers’ pets
- Commissary food inspections

Environmental Health

- Food service sanitation and inspections
- Water quality and surveillance
- Disease vector surveillance
- Hospital waste management
- Child development center sanitation and inspections

Industrial Hygiene

- Workplace surveying and safety
- Occupational noise exposure in aircraft hangars
- Compromised ventilation of warehouse

Occupational Health

- Physicals
- Immunizations
- Tuberculosis screening
- Vision and hearing checks
- Reproductive health

Army Public Health Nursing

- On- site daycare inspections
- Preventable disease surveillance and prevention
- Meetings with community partners

Army Wellness Center

- Health assessment reviews
- Physical fitness testing
- Metabolic testing
- Stress management
- Tobacco education

Army Hearing Program

- Trained soldiers on using protective equipment to preserve hearing
- Tests with an audiologist
- Diagnose hearing loss
- Soldiers given hearing aids if necessary

MPH Foundational Competencies

- #4: Interpret results of data analysis for public health research, policy or practice
- #7: Assess population needs, assets and capacities that affect communities' health
- #18: Select communication strategies for different audiences and sectors
- #19: Communicate audience-appropriate public health content, both in writing and through oral presentation
- #21: Perform effectively on inter-professional teams

Competency #4

Interpret results of data analysis for public health research, policy or practice

- Collected data from USD 475
- Interpreted national and regional data from CDC to compare to community results
- Recognised a need for intervention to improve vaccine rates and overall public health

Competency #7

Assess population needs, assets and capacities that affect communities' health

- Meetings with Colonel Benne discussing low rates of HPV and MCD immunization at Fort Riley
- 2014 Community Health Assessment of Fort Riley
  - Stress
  - Suicide
  - Alcohol abuse

Competency #18

Select communication strategies for different audiences and sectors

- Discussed the dangers of burn pit exposures in Iraq to soldiers of various ranks
- Communications between soldiers and civilians
- Communications between health professionals and individuals with minimal health literacy

Competency #19

Communicate audience-appropriate public health content, both in writing and through oral presentation

- Written article for APHN team newspaper discussing alcohol abuse and intervention strategies
- Oral presentation of alcohol abuse at APHN team meeting

Competency #21

Perform effectively on inter-professional teams

- Seven rotations working with public health professionals at Fort Riley. Each rotation had a new team to work with.
- Worked with teams of other graduate students from K-State

MPH Emphasis Area Competencies

Infectious Disease and Zoonosis

- Pathogens/ pathogenic mechanisms
- Host response to pathogens/ immunology
- Environmental/ ecological influences
- Disease surveillance
- Disease vectors

Pathogens/ Pathogenic Mechanisms

Evaluate modes of disease causation of infectious agents.

- DMP 812: Veterinary Bacteriology and Mycology
- DMP 822: Veterinary Virology

Host Response to Pathogens/ Immunology

Investigate the host immune response to infection.

- DMP 705: Principles of Veterinary Immunology
- DMP 850: Domestic Animal Immunology

Environmental/ Ecological Influences

Examine the influence of environmental and ecological forces on infectious diseases.

- DMP 801: Toxicology
- DMP 806: Environmental Toxicology

Disease Surveillance

Analyze disease risk factors and select appropriate surveillance.

- DMP 753: Veterinary Public Health
- MPH 754: Introduction to Epidemiology
- MPH 854: Intermediate Epidemiology

Disease Vectors

Investigate the role of vectors, toxic plants and other toxins in infectious diseases.

- DMP 801: Toxicology
- MPH 840: Field Experience

References

Center for Biologics Evaluation and Research. “Approved Products - TRUMENBA.” *U S Food and Drug Administration Home Page*, Center for Biologics Evaluation and Research, 2018, www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/ucm421020.htm.

“Control and Prevention of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP).” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 2001, www.cdc.gov/mmwr/preview/mmwrhtml/00046263.htm.

Dr. Rachel Tompa / Fred Hutch News Service. “HPV Vaccines Work – so Why Do so Few States Require Them?” *Fred Hutch*, 14 July 2015, www.fredhutch.org/en/news/center-news/2015/07/why-few-states-require-HPV-vaccines.html.

“Epidemiology and Prevention of Vaccine-Preventable Diseases.” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 30 Dec. 2016, www.cdc.gov/vaccines/pubs/pinkbook/index.html.

“HPV VACCINE: STATE LEGISLATION AND STATUTES.” *NCSL*, 2017, www.ncsl.org/research/health/hpv-vaccine-state-legislation-and-statutes.aspx.

“Human Papillomavirus (HPV).” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 24 Aug. 2017, www.cdc.gov/hpv/infographics/vacc-coverage.html.

“Kansas State Vaccine Requirements – National Vaccine Information Center.” *National Vaccine Information Center (NVIC)*, 2018, www.nvic.org/Vaccine-Laws/state-vaccine-requirements/kansas.aspx.

References

McCarthy, MD Claire. “Why Public Schools Should Require the HPV Vaccine.” *Harvard Health Blog*, 14 Sept. 2015, www.health.harvard.edu/blog/why-public-schools-should-require-the-hpvvaccine 201509148268.

“National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13–17 Years - United States, 2014.” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 31 July 2015, www.cdc.gov/mmwr/preview/mmwrhtml/mm6429a3.htm.

Racloz, V N, and S J Luiz. “The Elusive Meningococcal Meningitis Serogroup: a Systematic Review of Serogroup B Epidemiology.” *BMC Infectious Diseases.*, U.S. National Library of Medicine, 17 June 2010, www.ncbi.nlm.nih.gov/pubmed/20565757.

“Sexually Transmitted Diseases.” *Sexually Transmitted Diseases | Healthy People 2020*, www.healthypeople.gov/2020/topics-objectives/topic/sexually-transmitted diseases/objectives.

“STATES WITH RELIGIOUS AND PHILOSOPHICAL EXEMPTIONS FROM SCHOOL IMMUNIZATION REQUIREMENTS.” *NCSL*, 2017, www.ncsl.org/research/health/school immunization-exemption-state-laws.aspx.

“‘The Truth About Cancer’ Series Is Untruthful About Cancer.” *Science-Based Medicine*, 29 Jan. 2017, www.sciencebasedmedicine.org/the-truth-about-cancer-series-is-untruthful-about cancer/.

“Vaccination Coverage Among Children in Kindergarten - United States, 2013–14 School Year.” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 17 Oct. 2014, www.cdc.gov/mmwr/preview/mmwrhtml/mm6341a1.htm.

Ventola, C. Lee. “Immunization in the United States: Recommendations, Barriers, and Measures to Improve Compliance: Part 1: Childhood Vaccinations.” *Pharmacy and Therapeutics*, MediMedia USA, Inc., July 2016, www.ncbi.nlm.nih.gov/pmc/articles/PMC4927017/.

“What Is HPV?” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 20 Dec. 2016, www.cdc.gov/hpv/parents/whatishpv.html.

Thank You!!

- Colonel Benne
- Kristen Bourland
- Kristi Sherbert
- Dr. Robert Larson
- Dr. Mary McElroy
- Dr. Ellyn Mulcahy
- Barta Stevenson