

Lesson Plan: Looking Back to Look Ahead – The History of Disease Prevention

Overview and Purpose: The purpose of this lesson is to provide students with an opportunity to learn about vaccines and disease prevention from a historical point of view. Students will learn about vaccines by researching historical time periods, creating a time line, and presenting their findings to other students.

Grade Level: Grades 9-12

Estimated Time Allotment: 5 class periods

(based on 50-minute class periods, with 45 minutes of instructional time for this lesson; specific durations of activities are provided within the Lesson Procedures section)

Curriculum Focus: Health, Science, Social Studies

Learning Objectives

The student will be able to...

- utilize prior knowledge to answer questions about vaccines
- research the development of vaccinations throughout history
- use a variety of resources to synthesize, create, and communicate what they have learned on a time line
- negotiate with peers to select key events
- collaborate with other students

Standards Addressed

Health

American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) and American Association for Health Education (AAHE), National Health Education Standards

Health Education Standard 1: Students will comprehend concepts related to health promotion and disease prevention

1.12.5. (9-12) Propose ways to reduce or prevent injuries and health problems

1.12.8. (9-12) Analyze personal susceptibility to injury, illness or death if engaging in unhealthy behaviors

Health Education Standard 3: Students will demonstrate the ability to access valid information and products and services to

3.12.2. (9-12) Use resources from home, school and community that provide valid health information

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Health Education Standard 2: Students will analyze the influence of family, peers, culture, media, technology and other factors on health behavior

2.12.10. (9-12) Analyze how public health policies and government regulations can influence health promotion and disease prevention

Health Education Standard 8: Students will demonstrate the ability to advocate for personal, family and community health.

8.12.3. (9-12) Work cooperatively as an advocate for improving personal, family and community health

Mid-Continent Research for Education and Learning (McREL), Curriculum Standards for Health Education

Content Standard 2: Knows environmental and external factors that affect individual and community health

Level IV (Grade 9-12) Benchmark 4. Understands how the prevention and control of health problems are influenced by research and medical advances

Knowledge/skill statements

1. Understands how the prevention of health problems are influenced by research
2. Understands how the prevention of health problems are influenced by medical advances
3. Understands how the control of health problems are influenced by research
4. Understands how the control of health problems are influenced by medical advances

Content Standard 8: Knows essential concepts about the prevention and control of disease

Level IV (9-12) Benchmark 1. Understands how the immune system functions to prevent or combat disease

Knowledge/skill statements

1. Understands how the immune system functions to prevent disease
2. Understands how the immune system functions to combat disease

Curriculum Standards for Career Education/Health Education

Content Standard 9. Knows techniques to prevent the spread of illness and disease

Level IV (Grade 9-12) Benchmark 1. Knows the body's natural defense systems against infection such as barriers, the inflammatory response, and the immune response

Knowledge/skill statements

1. Knows the body's natural defense systems against infection
2. Understands the role of barriers as a natural defense against infection
3. Understands the inflammatory response as a natural defense against infection
4. Understands the immune response as a natural defense against infection

Content Standard 9. Knows techniques to prevent the spread of illness and disease

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Level IV (Grade 9-12) Benchmark 2. Knows common infectious diseases present at school or home and details of the diseases (e.g., signs and symptoms, means of transmission, causative microorganism, recommendations to prevent the spread of the diseases)

Knowledge/skill statements

1. Knows common infectious diseases present at school or home
2. Knows details of common infectious diseases present at school or home
3. Knows the signs and symptoms of common infectious diseases
4. Knows how common infectious diseases are transmitted
5. Knows the microorganisms that cause common infectious diseases
6. Knows recommendations to prevent the spread of common infectious diseases

Science

National Science Education Standards, Science Content Standards

Content Standard C (Life Science): As a result of their activities in grades 9-12, all students should develop understanding of the behavior of organisms

Content Standard F (Science in Personal and Social Perspectives): As a result of activities in grades 9-12, all students should develop understanding of personal and community health

Social Studies

National Center for History in the Schools

Historical Thinking Standards (5-12)

Standard 1: Chronological Thinking

- A. Distinguish between past, present, and future time
- B. Identify the temporal structure of a historical narrative or story
- C. Establish temporal order in constructing historical narratives of their own
- D. Measure and calculate calendar time
- E. Interpret data presented in time lines and create time lines
- F. Reconstruct patterns of historical succession and duration; explain historical continuity and change

Standard 3: Historical Analysis and Interpretation

- A. Compare and contrast differing sets of ideas
- B. Consider multiple perspectives
- C. Analyze cause-and-effect relationships and multiple causation, including the importance of the individual, the influence of ideas
- D. Draw comparisons across eras and regions in order to define enduring issues
- E. Distinguish between unsupported expressions of opinion and informed hypotheses grounded in historical evidence
- J. Hypothesize the influence of the past

Standard 4: Historical Research Capabilities

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- A. Formulate historical questions
- B. Obtain historical data from a variety of sources

Social Studies, Center for Civic Education, National Standards for Civics and Government
Content Standard K-12, V: What are the Roles of the Citizen in American
Democracy/What are important responsibilities of Americans

Social Studies, National Center for History in Schools
Historical Thinking Content Standard 3: Historical Analysis and Interpretation
C. Analyze cause-and-effect relationships and multiple causation, including the
importance of the individual, the influence of ideas

Curriculum Integrations

Reading and Language Arts, International Reading Association and National Council of
Teachers of English Standards, Standards for the English Language Arts

3: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)

4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes

5: Students employ a wide range of strategies as they write and use different writing process elements appropriately

to communicate with different audiences for a variety of purposes

6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts

7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience

8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge

11: Students participate as knowledgeable, reflective, creative, and critical members of a variety of literacy communities

12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Lesson Procedures for Teacher

Before teaching the Lesson

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Teacher Background: Content Background Resources, Lesson Vocabulary and Instructional Strategy Overview (Teacher Resources 1 - 3)

Teacher Preparation:

Materials and Planning Notes

Prepare for the students to work in small groups

Prepare for students to do Internet research (bookmark websites, test websites and links to be sure that the sites are not blocked or URL's have not changed) (Teacher Resource 1)

Prepare, Assemble and Review the Task Cards and Time Period Assignment Cards (Student Resources 1 and 2) (one per group)

Prepare, Assemble and Review the Vaccine Article Packets (Student Resource 3) (one per student)

Additional Materials: computers with Internet access, chart paper, markers, tape, butcher paper, scissors, glue, clip art, scrapbooking supplies, old magazines or catalogs (for students to cut apart – avoid magazines with inappropriate content)

During teaching of the Lesson

Opening Activity – Activate Prior Knowledge/Introduce the Topic 45 minutes

1. Read students the nursery rhyme Ring Around the Rosy (Teacher Resource 4). Ask students what they think this rhyme is about. Explain the historical context.
2. Survey the group, ask students when they think the first vaccine was invented and what it was for. Share smallpox story (Teacher Resource 4).
3. Ask students if they know about the most recent vaccine to come out. When and what? Share overview of HPV vaccine. (Teacher Resource 4)
4. Have a small group discussion activating prior knowledge about vaccines. Ask students if they know what vaccines are and how they work. Supplement the students' background knowledge by adding to the discussion. (Teacher Resource 1)
5. Introduce the term *epidemiology* and how it relates to the project. (Teacher Resource 2)
6. Introduce the term *historical context* and how it relates to this project. (Teacher Resource 2)
7. Introduce the Interactive Time Line project.

Learning Activities – Interactive Time Line Project 135 minutes

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1. Have the students sit in small groups.
2. Explain the procedures and conduct the Interactive Time Line Project with the students:
 - Each group will be responsible for learning about an assigned block of time in history from the first vaccine (smallpox) through the most recent development (HPV Vaccine).
 - Students will be given a Task Sheet and Time Period Assignment Card (Student Resources 1 and 2).
 - Students will develop a “Learning Plan” for their group work.
 - Students will create the time line for their group’s time period using butcher paper, markers, glue, scrapbook materials, pictures from magazines, and clip art.
 - All of the time lines will be put together to form one huge time line around the room.
 - Each group will develop a presentation about their assigned time period.
3. Continue to contribute to the Interactive Time Line
 - Students will add personal accounts and living history to the time line. They will create family surveys to take home to see if there are any stories about their own family member(s) which may fit on the time line. Students will write the stories, and they will be placed around the time line with a piece of yarn connecting the time period (like a web).
 - Form new groups and assign each group an article from the Vaccine Article Packet (Student Resource 3). Read articles and add relevant information to the time line.
 - Conduct a Gallery Walk to view the whole time line.

Closing Activity – Stately Letters and Time Line Quiz Swap

45 minutes

1. Explain to students that they will be writing letters to local politicians, advocating for the continuing advancement of disease prevention, referring to the time line project to support the message. Use the Internet to identify a government official, politician or Head of State to direct the letter to.
2. Explain and conduct Time Line Quiz Swap
 - Groups will create quizzes based on their part of the time line.
 - Groups swap quizzes and complete the quizzes.
 - Groups meet to discuss answers.

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Supplemental Materials

Resources to accompany this lesson plan have been created and are provided after this section. This lesson plan contains the following supplemental materials (as referenced throughout this section).

Student Resources

Student Resource 1: Historical Research Task Cards

Student Resource 2: Historical Research Time Period Assignment Cards

Student Resource 3: Vaccine Article Packet

Teacher Resources

Teacher Resource 1: Content Background and Resources for Vaccine Education

Teacher Resource 2: Lesson Vocabulary

Teacher Resource 3: Instructional Strategy Overview

Teacher Resource 4: Anecdotes

Teacher Resource 5: Group Work Evaluation Rubric

Teacher Resource 6: Reference List

Modifications

- For an independent or partner based project, assign each individual student a block of time, instead of small groups.

Assessment

- Assessment of Learning Process: Anecdotally observe students during class and small group discussion.
- Assessment of Group Skills: Informally observe students working together. If appropriate, use the Group Work Evaluation Rubric (Teacher Resource 5) or create your own.
- Assessment of Content Knowledge: Evaluate students' written work products from this lesson (Time Line Quiz Swap). Observe the students during presentations and information sharing.

After teaching the Lesson

Extension and Additional Activities (Take Home Component)

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- Have a Time Line Open House, invite parents and community members to view the time line and listen to the students share what they have learned. Students can plan the party and plan activities for the guests to use the time line.
- Have the students continue to exchange quizzes with other groups and/or compile the quizzes into one for individual students to complete.

Lesson At – A – Glance

Opening: Activate Prior Knowledge and Introduce Lesson	45 minutes
Learning Activity: Interactive Time Line Project	135 minutes
Closing: Stately Letters and Time Line Quiz Swap	45 minutes

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Student Resource 1: Task Cards

Historical Research Tasks

You must research the period of history you have been assigned using multiple sources, looking for key events during that time period (in the U.S. and worldwide) that somehow relate to or affected the advancement of vaccinations.

**You must include any vaccines that were discovered during your time period and any other relevant information.*

**You must include any discoveries and/or statistics about diseases during your time period.*

**You must include the following information in your time line:*

- One (or more) important/key scientific event(s) during your assigned time period*
- One (or more) important/key government or political event(s) during your assigned time period*
- One (or more) important/key social or “current” event(s) during your assigned time period*

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Student Resource 2: Time Period Assignment Cards

Group 1 - Time Period
1796 - 1826

Group 2 - Time Period
1827 - 1857

Group 3 - Time Period
1858 - 1888

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Student Resource 2: Time Period Assignment Cards

Group 4 - Time Period

1889 - 1929

Group 5 - Time Period

1930 - 1960

Group 6 - Time Period

1961 - 1981

Group 7 - Time Period

1982 - present

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Teacher Resource 1: Content Background and Resources

Expert Group 1

Polio Vaccine

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P

Poliomyelitis or polio is an infectious disease caused by a virus. It is spread by person-to-person contact. It enters the body through the mouth. It does not always cause serious illness, but in the most severe cases it can be fatal. The polio vaccine is the most effective way to prevent this disease.

According to information from the U.S. Centers for Disease Control and Prevention (CDC), a 1916 polio epidemic in the United States killed 6,000 people and paralyzed 27,000 more. In the early 1950's there were more than 20,000 cases of polio each year until the vaccination was introduced in 1955. From that point the number of cases each year began to drop. The first symptoms of polio are fever, sore throat, headache and a stiff neck. Polio has become very rare since the vaccine became available. The current version of the vaccine, which has been in place since 1987, protects 99% of children who receive a minimum of three doses. The U.S. was a leader in the success of the polio vaccine. Most other countries have eliminated polio as well. There are some areas of the world where the disease is still common. Until the disease has been completely eliminated we need to be vaccinated.

There are two types of vaccines for polio: a live oral vaccine that is swallowed (OPV – Oral Polio Vaccine) or a shot given in the arm or leg (IPV – Inactivated Polio Vaccine). Both vaccines give immunity to polio. Now that polio has been eradicated in the U.S., it is no longer necessary to use OPV. The polio shot is now the common method for vaccination. The most common age to receive the polio vaccine is as a young child. There are four doses provided throughout early childhood (2 months, 4 months, 6-18 months, and 4-6 years). The polio vaccine may be given at the same time as other vaccines. If the vaccine is not given in childhood, it is still effective when given to adults. In this case, three staggered doses would be given. There are three groups of adults considered high risk: people traveling to areas of the world where polio is common, laboratory workers who might handle the disease, and health care workers treating patients who might have polio. An adult fitting any of these three categories who was not vaccinated as a child should be vaccinated as an adult.

There are few side effects to the polio vaccine. Some people who get the shot get a sore spot where the shot is given. The vaccine used today has never been known to cause any serious problems, and most people don't have any problems at all with it. The risk of a polio shot causing serious harm, or death, is extremely small. One possible and rare side effect is a serious allergic reaction.

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Teacher Resource 1: Content Background and Resources

Expert Group 1

Polio Vaccine

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According to the CDC, if we stopped vaccinating for polio:

“Stopping vaccination against polio will leave people susceptible to infection with the polio virus. Polio virus causes acute paralysis that can lead to permanent physical disability and even death. Before polio vaccine was available, 13,000 to 20,000 cases of paralytic polio were reported each year in the United States. These annual epidemics of polio often left thousands of victims--mostly children--in braces, crutches, wheelchairs, and iron lungs. The effects were life-long. In 1988 the World Health Assembly unanimously agreed to eradicate polio worldwide. As a result of global polio eradication efforts, the number of cases reported globally has decreased from more than 350,000 cases in 125 countries in 1988 to 2,000 cases of polio in 17 countries in 2006, and only four countries remain endemic (Afghanistan, India, Nigeria, Pakistan). To date polio has been eliminated from the Western hemisphere, and the European and Western Pacific regions. Stopping vaccination before eradication is achieved would result in a resurgence of the disease in the United States and worldwide.”

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Teacher Resource 1: Content Background and Resources

Expert Group 2

MMR

Measles, Mumps, Rubella

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M

This vaccine prevents three diseases: measles, mumps, and rubella (German measles). The combined MMR vaccine was introduced to reduce the pain of three separate shots and to increase the likelihood that each vaccine will be given earlier (since they are given all at once).

Measles is a highly contagious disease caused by a virus. Symptoms include fever, cough, red eyes, and a runny nose. A rash begins with white spots in the mouth and develops into a red rash that covers the entire body. The rash typically lasts four to seven days. Severe cases of measles can cause diarrhea, ear infection, pneumonia, encephalitis (swelling of the brain), and death. The measles virus is highly contagious because it is spread through airborne droplets from coughing or sneezing. The virus can live in the air for up to two hours after an infected person leaves the area. After exposure, the virus lives in the body for about two weeks before symptoms appear. More than 20 million people around the world are infected with measles each year. Due to immunizations, fewer than 150 cases in the U.S. have been reported since 1997. Most cases were reported by someone who had traveled abroad. The MMR vaccine is the most effective way to prevent this disease.

Mumps is also a highly contagious disease caused by a virus. Symptoms include painful swollen salivary glands (under the jaw), fever, fatigue, sore muscles and a headache. In severe cases, mumps can lead to meningitis, encephalitis (swelling of the brain), or hearing loss. In rare cases, mumps can lead to sterility in males. The mumps virus is spread like measles; it too has a long incubation period, with symptoms appearing more than two weeks after contact. Due to the introduction of the mumps vaccine in 1967, reported mumps cases have declined to fewer than 1,000 per year in the U.S. The MMR Vaccine is the most effective way to prevent this disease.

Rubella is also known as German measles. It is a relatively mild disease caused by a virus. Symptoms include fever and rash. The most severe threat of rubella is to women who are pregnant. It can pass through a pregnant woman's bloodstream to infect her unborn child. In such cases, rubella can lead to birth defects causing deafness, cataracts, heart defects, mental retardation, and liver and/or spleen damage. As with mumps and measles, rubella is spread through airborne droplets from coughing or sneezing. People who have rubella are most contagious from one week before to one week after the rash appears. The MMR vaccine is the most effective way to prevent this disease.

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Teacher Resource 1: Content Background and Resources

Expert Group 2

MMR

Measles, Mumps, Rubella

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Before a vaccine against rubella became available in 1969, epidemics occurred every six to nine years in the U.S. Children ages five to nine were primarily affected. Due to immunization, there are now far fewer cases of rubella.

The most common way to receive the MMR vaccine is in two doses as a young child. The first dose is given after the first birthday (12 to 15 months of age). The second dose is given before the start of kindergarten (four to five years). Adults or teenagers should get the vaccine if they have not had the measles (a blood test for the antibodies can be given) or have not had MMR vaccine. Adults such as college students or health care workers are considered high-risk and are strongly encouraged to have the vaccine.

There are few side effects to the MMR vaccine. The risk of the MMR vaccine causing serious harm, or death, is extremely small. Getting the MMR vaccine is much safer than getting any of the three diseases. Mild side effects include fever, mild rash, or swelling of glands. In rare cases side effects may include seizure caused by fever, temporary pain or stiffness in the joints, or bleeding disorder. Very rare severe side effects include serious allergic reactions, deafness, long-term seizures, coma, or brain damage. (These side effects are so rare that experts cannot be sure whether they are caused by the vaccine or not.)

According to the CDC, if we stopped vaccinating for measles:

“Before measles immunization was available, nearly everyone in the U.S. got measles. An average of 450 measles-associated deaths were reported each year between 1953 and 1963. In the U.S., up to 20 percent of persons with measles are hospitalized. Seventeen percent of measles cases have had one or more complications, such as ear infections, pneumonia, or diarrhea. Pneumonia is present in about six percent of cases and accounts for most of the measles deaths. Although less common, some persons with measles develop encephalitis (swelling of the lining of the brain), resulting in brain damage. As many as three of every 1,000 persons with measles will die in the U.S. In the developing world, the rate is much higher, with death occurring in about one of every 100 persons with measles. Measles is one of the most infectious diseases in the world and is frequently imported into the U.S. In the period 1997-2000, most cases were associated with international visitors or U.S. residents who were exposed to the measles virus while traveling abroad. More than 90 percent of people who are not immune will get measles if they are exposed to the virus. According to the World Health Organization (WHO), nearly 900,000 measles-related deaths occurred among persons

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Teacher Resource 1: Content Background and Resources

Expert Group 2

MMR

Measles, Mumps, Rubella

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in developing countries in 1999. In populations that are not immune to measles, measles spreads rapidly. If vaccinations were stopped, each year about 2.7 million measles deaths worldwide could be expected. In the U.S., widespread use of measles vaccine has led to a greater than 99 percent reduction in measles compared with the pre-vaccine era. If we stopped immunization, measles would increase to pre-vaccine levels.”

According to the CDC, if we stopped vaccinating for mumps:

“Before the mumps vaccine was introduced, mumps was a major cause of deafness in children, occurring in approximately one in 20,000 reported cases. Mumps is usually a mild viral disease. However, rare conditions such as swelling of the brain, nerves and spinal cord can lead to serious side effects such as paralysis, seizures, and fluid in the brain. Serious side effects of mumps are more common among adults than children. Swelling of the testes is the most common side effect in males past the age of puberty, occurring in up to 20 percent to 50 percent of men who contract mumps. An increase in miscarriages has been found among women who develop mumps during the first trimester of pregnancy. An estimated 212,000 cases of mumps occurred in the U.S. in 1964. After vaccine licensure in 1967, reports of mumps decreased rapidly. In 1986 and 1987, there was a resurgence of mumps with 12,848 cases reported in 1987. Since 1989, the incidence of mumps has declined, with 266 reported cases in 2001. This recent decrease is probably due to the fact that children have received a second dose of mumps vaccine (part of the two-dose schedule for measles, mumps, rubella or MMR) and the eventual development of immunity in those who did not gain protection after the first mumps vaccination. We cannot let our guard down against mumps. A 2006 outbreak among college students, most of whom had received two doses of vaccine, led to over 5,500 cases in 15 states. Mumps is highly communicable and it only takes a few unvaccinated to initiate transmission.”

According to the CDC, if we stopped vaccinating for rubella:

“While rubella is usually mild in children and adults, up to 90 percent of infants born to mothers infected with rubella during the first trimester of pregnancy will develop congenital rubella syndrome (CRS), resulting in heart defects, cataracts, mental retardation, and deafness. In 1964-1965, before rubella immunization was used routinely in the U.S., there was an epidemic of rubella that resulted in an estimated 20,000 infants born with CRS, with 2,100 neonatal deaths and 11,250 miscarriages. Of the 20,000 infants born with CRS, 11,600

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Teacher Resource 1: Content Background and Resources

Expert Group 2

MMR

Measles, Mumps, Rubella

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were deaf, 3,580 were blind, and 1,800 were mentally retarded. Due to the widespread use of rubella vaccine, only six CRS cases were provisionally reported in the U.S. in 2000. Because many developing countries do not include rubella in the childhood immunization schedule, many of these cases occurred in foreign-born adults. Since 1996, greater than 50 percent of the reported rubella cases have been among adults. Since 1999, there have been 40 pregnant women infected with rubella. If we stopped rubella immunization, immunity to rubella would decline and rubella would once again return, resulting in pregnant women becoming infected with rubella and then giving birth to infants with CRS.”

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Teacher Resource 1: Content Background and Resources

Expert Group 3

DTaP Vaccine

*D*iphtheria, *T*etanus, *a*cellular *P*ertussis

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D

This vaccine prevents three diseases, diphtheria, tetanus, and pertussis. The combined DTaP vaccine was introduced to reduce the pain of three separate shots and to increase the likelihood that each vaccine will be given earlier (since they are given all at once). The “a” in DTaP stands for “acellular,” meaning that the pertussis component of the vaccine contains only a part of the pertussis organism.

Diphtheria is a serious bacterial disease that affects the respiratory system or the skin. Respiratory diphtheria causes a sore throat and fever, and sometimes swelling of the neck. In severe cases it can cause an airway obstruction as it causes a membrane (thin layer) to form over the throat, which results in breathing problems. When diphtheria affects the skin, infected lesions form. In severe cases, when untreated, diphtheria can lead to pneumonia, heart failure, paralysis, coma or death. Diphtheria bacteria are spread through airborne droplets from coughing or sneezing. The CDC states, “Before the 1920s, diphtheria was very common in the U.S., with hundreds of thousands of cases occurring every year. Since the introduction of a vaccine in the 1920s, cases of diphtheria in the U.S. have declined greatly, with less than one case reported each year since 2000. But while mandatory vaccines for schoolchildren have gone a long way toward controlling diphtheria in the U.S., the disease is still endemic in many developing countries.”

Tetanus is an infection caused by bacteria found in dirt, gravel and rusty metal. It usually enters the body through a cut. Symptoms include muscle spasms. If tetanus attacks the jaw muscles it causes lockjaw (the inability to open and close your mouth). In severe cases it can lead to breathing muscle spasms, which can be deadly.

Pertussis, also known as whooping cough, is a bacterium that clogs the lungs with mucus. Symptoms include a severe cough that sounds like a “whoop.” The cough can last for two months. It can lead to pneumonia.

Children should get five doses of DTaP, (two, four, six, and 15-18 months and four to six years). Adults and teenagers also need protection from diphtheria, tetanus, and pertussis. This vaccine should be given to any adult or teenager who was not vaccinated as a child. Td is a tetanus-diphtheria vaccine given to adolescents and adults as a booster shot every 10 years, or after an exposure to tetanus such as an injury. Tdap is similar to Td but it also contains protection against pertussis. A single dose of Tdap is recommended for adolescents

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Teacher Resource 1: Content Background and Resources

Expert Group 3

DTaP Vaccine

Diphtheria, Tetanus, acellular Pertussis

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11 or 12 years-of-age, or in place of one Td booster in older adolescents and adults age 19 through 64.

There are few side effects to the DTaP vaccine. Getting diphtheria, tetanus or pertussis disease is much riskier than getting DTaP vaccine. Mild side effects include fever, redness/swelling/soreness/tenderness where the shot was given, fussiness, tiredness, poor appetite, or vomiting. After the fourth or fifth dose the entire arm or leg where the shot was given may swell. Rare side effects include seizure, excessive crying in babies, or very high fever. Very rare side effects include a serious allergic reaction, long-term seizures, coma, or brain damage. (These side effects are so rare, experts cannot be sure whether they are caused by the vaccine or not).

According to the CDC, if we stopped vaccinating for diphtheria:

“Diphtheria is a serious disease caused by a bacterium. This germ produces a poisonous substance or toxin which frequently causes heart and nerve problems. The case fatality rate is five percent to 10 percent, with higher case-fatality rates (up to 20 percent) in the very young and the elderly. In the 1920's, diphtheria was a major cause of illness and death for children in the U.S. In 1921, a total of 206,000 cases and 15,520 deaths were reported. With vaccine development in 1923, new cases of diphtheria began to fall in the U.S., until in 2001 only two cases were reported. Although diphtheria is rare in the U.S., it appears that the bacteria continue to get passed among people. In 1996, 10 isolates of the bacteria were obtained from persons in an American Indian community in South Dakota, none of whom had classic diphtheria disease. There was one death reported in 2003 from clinical diphtheria in a 63-year-old male who had never been vaccinated. There are high rates of susceptibility among adults. Screening tests conducted since 1977 have shown that 41 percent to 84 percent of adults 60 and over lack protective levels of circulating antitoxin against diphtheria. Although diphtheria is rare in the U.S., it is still a threat. Diphtheria is common in other parts of the world and with the increase in international travel, diphtheria and other infectious diseases are only a plane ride away. If we stopped immunization, the U.S. might experience a situation similar to the Newly Independent States of the former Soviet Union. With the breakdown of the public health services in this area, diphtheria epidemics began in 1990, fueled primarily by persons who were not properly vaccinated. From 1990-1999, more than 150,000 cases and 5,000 deaths were reported.”

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Teacher Resource 1: Content Background and Resources

Expert Group 3

DTaP Vaccine

Diphtheria, Tetanus, acellular Pertussis

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According to the CDC, if we stopped vaccinating for tetanus:

“Tetanus is a severe, often fatal disease. The bacteria that cause tetanus are widely distributed in soil and street dust, are found in the waste of many animals, and are very resistant to heat and germ-killing cleaners. From 1922-1926, there were an estimated 1,314 cases of tetanus per year in the U.S. In the late 1940's, the tetanus vaccine was introduced, and tetanus became a disease that was officially counted and tracked by public health officials.

In 2000, only 41 cases of tetanus were reported in the U.S. People who get tetanus suffer from stiffness and spasms of the muscles. The larynx (throat) can close causing breathing and eating difficulties, muscle spasms can cause fractures (breaks) of the spine and long bones, and some people go into a coma and die.

Approximately 20 percent of reported cases end in death. Tetanus in the U.S. is primarily a disease of adults, but unvaccinated children and infants of unvaccinated mothers are also at risk for tetanus and neonatal tetanus, respectively. From 1995-1997, 33 percent of reported cases of tetanus occurred among persons 60 years of age or older and 60 percent occurred in patients greater than 40 years of age. The National Health Interview Survey found that in 1995, only 36 percent of adults 65 or older had received a tetanus vaccination during the preceding 10 years. Worldwide, tetanus in newborn infants continues to be a huge problem. Every year tetanus kills 300,000 newborns and 30,000 birth mothers who were not properly vaccinated. Even though the number of reported cases is low, an increased number of tetanus cases in younger persons have been observed recently in the U.S. among intravenous drug users, particularly heroin users. Tetanus is infectious, but not contagious, so unlike other vaccine-preventable diseases, immunization by members of the community will not protect others from the disease. Because tetanus bacteria are widespread in the environment, tetanus can only be prevented by immunization. If vaccination against tetanus were stopped, persons of all ages in the U.S. would be susceptible to this serious disease.”

According to the CDC, if we stopped vaccinating for pertussis:

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Expert Group 3

DTaP Vaccine

Diphtheria, Tetanus, acellular Pertussis

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“Since the early 1980s, reported pertussis cases have been increasing, with peaks every three to four years; however, the number of reported cases remains much lower than levels seen in the pre-vaccine era. Compared with pertussis cases in other age groups, infants who are 6 months old or younger with pertussis experience the highest rate of hospitalization, pneumonia, seizures, encephalopathy (a degenerative disease of the brain) and death. From 1990 to 1996, 57 persons died from pertussis; 49 of these were less than six months old. Before pertussis immunizations were available, nearly all children developed whooping cough. In the U.S., prior to pertussis immunization, between 150,000 and 260,000 cases of pertussis were reported each year, with up to 9,000 pertussis-related deaths. Pertussis can be a severe illness, resulting in prolonged coughing spells that can last for many weeks. These spells can make it difficult for a child to eat, drink, and breathe. Because vomiting often occurs after a coughing spell, infants may lose weight and become dehydrated. In infants, it can also cause pneumonia and lead to brain damage, seizures, and mental retardation. The newer pertussis vaccine (acellular or DTaP) has been available for use in the United States since 1991 and has been recommended for exclusive use since 1998. These vaccines are effective and associated with fewer mild and moderate adverse reactions when compared with the older (whole-cell DTP) vaccines. During the 1970s, widespread concerns about the safety of the older pertussis vaccine led to a rapid fall in immunization levels in the United Kingdom. More than 100,000 cases and 36 deaths due to pertussis were reported during an epidemic in the mid 1970s. In Japan, pertussis vaccination coverage fell from 80 percent in 1974 to 20 percent in 1979. An epidemic occurred in 1979 and resulted in more than 13,000 cases and 41 deaths. Pertussis cases occur throughout the world. If we stopped pertussis immunizations in the U.S., we would experience a massive resurgence of pertussis disease. A recent study found that in eight countries where immunization coverage was reduced, incidence rates of pertussis surged to 10 to 100 times the rates in countries where vaccination rates were sustained.”

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Expert Group 4

Hepatitis B

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H

Hepatitis B is a virus that attacks the liver. Symptoms vary greatly from mild flu-like symptoms, tiredness, and poor appetite to nausea, vomiting, extreme tiredness, and jaundice (all the white parts on your body, like your eyes, teeth and nails, turn yellow). Symptoms may last for months. Hepatitis B can lead to liver damage, scarring, and/or failure. It is the number one cause of liver cancer. It can be fatal. Some people who are infected with hepatitis B become "carriers." They can spread the virus without knowing

they have it. Carriers are at higher risk of having liver failure later in life. There are several ways of spreading the virus: at birth - from an infected mother to her baby, coming in contact with the blood or bodily fluids of an infected person, living in the same household for a long time with someone who has hepatitis B virus, or injecting drugs with contaminated (dirty) needles. The hepatitis B vaccine is the most effective way to prevent this disease. Since hepatitis B can lead to liver cancer, this vaccine is significant because it was the first anti-cancer vaccine.

All children should get two doses of the hepatitis B vaccine (birth and 6-18 months). Children and adolescents through 18 years of age who did not get the vaccine when they were younger should also be vaccinated. All unvaccinated adults at risk for hepatitis B should be vaccinated. This includes adults having more than one sex partner; adults living in the same house as a person with hepatitis B virus infection; adults seeking care in a clinic for sexually transmitted diseases, HIV testing or treatment, or drug treatment; people with jobs that involve contact with human blood; or people who travel for more than six months a year in countries where hepatitis B is common.

There are few side effects to the hepatitis B vaccine. The risk of the hepatitis B vaccine causing serious harm or death is extremely small. Getting the hepatitis B vaccine is much safer than getting hepatitis B. Mild side effects include soreness where the shot was given and/or fever. In very rare cases a serious allergic reaction may develop.

According to the CDC, if we stopped vaccinating for hepatitis B:

"More than 2 billion persons worldwide have been infected with the hepatitis B virus at some time in their lives. Of these, 350 million are life-long carriers of the disease and can transmit the virus to others. One million of these people die each year from liver disease and liver cancer. National studies have shown that about 12.5 million Americans have been infected with hepatitis B virus at some point in their lifetime. One and one quarter

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Expert Group 4

Hepatitis B

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million Americans are estimated to have chronic (long-lasting) infection, of which 20 percent to 30 percent acquired their infection in childhood. Chronic hepatitis B virus infection increases a person's risk for chronic liver disease, cirrhosis, and liver cancer. About 5,000 persons will die each year from hepatitis B-related liver disease resulting in over \$700 million in medical and work loss costs. The number of new infections per year has declined from an average of 450,000 in the 1980s to about 80,000 in 1999. The greatest decline has occurred among children and adolescents due to routine hepatitis B vaccination. Infants and children who become infected with hepatitis B virus are at higher risk of developing lifelong infection, which often leads to death from liver disease (cirrhosis) and liver cancer. Approximately 25 percent of children who become infected with lifelong hepatitis B virus would be expected to die of related liver disease as adults. CDC estimates that one-third of the lifelong hepatitis B virus infections in the United States resulted from infections occurring in infants and young children. About 16,000 - 20,000 hepatitis B antigen infected women give birth each year in the United States. It is estimated that 12,000 children born to hepatitis B virus infected mothers were infected each year before the implementation of infant immunization programs. In addition, approximately 33,000 children (10 years of age and younger) of mothers who are not infected with hepatitis B virus were infected each year before routine recommendation of childhood hepatitis B vaccination."

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Teacher Resource 1: Content Background and Resources

Expert Group 5

Varicella Vaccine

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V

Varicella is a virus also known as chickenpox. It causes an itchy rash and a fever. You can catch it from someone who already has it if you touch an open blister on that person's skin or if that person sneezes or coughs around you. Not everyone gets the vaccine, so a lot of kids still get chickenpox. Chickenpox vaccine is the best way to prevent chickenpox. The chickenpox vaccine is very effective: about eight to nine of every 10 people who are vaccinated are completely protected from chickenpox. If a vaccinated person does get chickenpox, it is usually a very mild case lasting only a few days and involving less of a rash, mild or no fever, and few other symptoms. Children who have never had chickenpox are usually given two doses of the varicella vaccine (12 -15 months and four to six years of age) (it may be given earlier if at least three months after the first dose). People 13 years of age and older (who have never had chickenpox or received varicella vaccine) should get two doses at least 28 days apart. Children or adolescents who are not fully vaccinated should receive one or two doses of varicella vaccine.

There are few side effects from the varicella vaccine. Getting the vaccine is much safer than getting chickenpox. The risk of varicella vaccine causing serious harm, or death, is extremely small. Mild side effects are soreness or swelling where the shot was given, fever, or mild rash. Two rare side effects are seizures caused by fever and pneumonia. There are two extremely rare side effects: severe neurological problems and low blood count. (These side effects are so rare, experts cannot be sure whether they are caused by the vaccine or not.)

According to the CDC, if we stopped vaccinating for chickenpox:

“Prior to the licensing of the chickenpox vaccine in 1995, almost all persons in the United States had suffered from chickenpox by adulthood. Each year, the virus caused an estimated 4 million cases of chickenpox, 11,000 hospitalizations, and 100-150 deaths. A highly contagious disease, chickenpox is usually mild but can be severe in some persons. Infants, adolescents and adults, pregnant women, and immunocompromised persons are at particular risk for serious complications including secondary bacterial infections, loss of fluids (dehydration), pneumonia, and central nervous system involvement. The availability of the chickenpox vaccine and its subsequent widespread use has had a major impact on reducing cases of chickenpox and related morbidity, hospitalizations, and deaths. In some areas, cases have decreased as much as 90% over prevaccination numbers. In 2006, routine two-dose vaccination against chickenpox was recommended for all children,

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Expert Group 5

Varicella Vaccine

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adolescents, and adults who do not have evidence of immunity to the disease. In addition to further reducing cases, this strategy will also decrease the risk for exposure to the virus for persons who are unable to be vaccinated because of illness or other conditions and who may develop severe disease. If vaccination against chickenpox were to stop, the disease would eventually return to prevaccination rates, with virtually all susceptible persons becoming infected with the virus at some point in their lives.”

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Expert Group 6

HPV Vaccine

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H

HPV (human papillomavirus) is a common virus passed on through genital contact. HPV is the most common sexually transmitted virus in the United States. More than six million people get HPV each year, and most new infections are in 15–24 year olds. There are about 100 types of HPV, 40 of which can impact the genital areas of men and women.

Most types of HPV cause no symptoms and go away on their own. Some types of HPV can cause cervical cancer and other less common cancers as well. These types of HPV are known as high risk because they can last for many years and cause changes in the cells of the cervix. When left untreated, these cell changes can lead to cancer. Other types of HPV can cause warts (called genital warts) on the genital area of men and women. These types of HPV do not lead to cancer. The types of HPV that can cause cervical cancer are not the same as the types that can cause genital warts.

Anyone who has ever had genital contact with another person can get HPV. You do not need to have intercourse to spread HPV. Any skin-to-skin contact with the genital area of another person can allow HPV to spread. A person is more likely to get HPV if they have sex at an early age, have many sex partners, or have a sex partner who has had many partners. Since HPV often causes no symptoms, both men and women can have it and pass it on without knowing it.

There is no cure for HPV. There are treatment options for the health problems HPV causes such as genital warts and cervical cancer. Cervical cancer is a cancer that begins in a woman's cervix, the opening to the uterus or womb. Approximately 10,000 women each year in the U.S. will develop cervical cancer, and about 500,000 women will experience serious cervical lesions that may need treatment. Vaccination against HPV makes it much less likely that a woman will develop cervical cancer and other HPV related illnesses. There is currently one HPV vaccine on the market. Others are in development. The HPV vaccine is given in three doses to pre-teenage girls (11-12 years). The vaccine also is given to girls and women who have not been vaccinated (13-26 years). The HPV vaccine does not appear to cause any serious side effects. The mild side effects are pain, itching or swelling at the injection site, and fever. One very rare side effect of the HPV vaccine is an allergic reaction. Research shows that women who are already sexually active can still get some benefit from vaccination, but the vaccine protects best in females who have never been exposed to any type of HPV. Therefore, the vaccine is most effective in girls and young women who receive it before becoming sexually active.

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Expert Group 6

HPV (Human Papillomavirus)

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With early diagnosis, cervical cancer can be treated and cured. Because treatment is more successful with early detection, it is important for women to get regular Pap tests to detect any changes in the cervix caused by HPV. Doctors recommend that young women begin getting annual Pap tests three years after first sexual contact or at age 21 – whichever comes first.

Although men can get and transmit HPV to their sexual partners, there is currently no U.S. Food and Drug Administration (FDA) approved test to detect HPV in men. The agency states that "there is no clear health benefit to knowing if men have this virus, since HPV is unlikely to affect their health and cannot be treated. For most men, there would be no need to treat HPV, even if treatment were available, since it usually goes away on its own." However, research is ongoing to see how well vaccinating men against HPV may work in preventing HPV infection and diseases in men, and whether it can be an effective strategy for decreasing cervical cancer in women.

According to the CDC, we should vaccinate for HPV because:

"Approximately 20 million Americans are currently infected with HPV, and another 6.2 million people become newly infected each year. At least 50% of sexually active men and women acquire genital HPV infection at some point in their lives. About 1% of sexually active adults in the U.S. have genital warts at any one time. The American Cancer Society estimates that in 2008, 11,070 women will be diagnosed with cervical cancer in the U.S. Other HPV-related cancers are much less common than cervical cancer."

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Teacher Resource 1: Content Background and Resources

Expert Group 7

Meningococcal Vaccine

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M

Meningococcal vaccination protects against most types of meningococcal disease. Meningococcal disease is a severe bacterial illness that can cause meningitis and blood infections (Meningococcal Bacteremia). Meningitis is an infection of the fluid of a person's spinal cord and the fluid that surrounds the brain. It is sometimes called spinal meningitis. Symptoms of meningitis are fever, headache, stiff neck, nausea, vomiting, and mental status changes. Meningitis is contagious. The bacteria are

spread person to person through things like coughing, sneezing, or kissing. There is also a form of meningitis caused by a virus. The viral form is much less severe and usually resolves without treatment. There is no vaccine for viral meningitis.

Meningococcal disease affects 1,000 – 2,600 people each year. It can be a deadly disease, fatal to about every one out of 10 people who get it. Even with treatment, 10-15% die and 11-19% of those who live are severely impacted (loss of arms or legs, deafness, nervous system problems, mental disabilities, seizures, and stroke). Meningococcal disease can be treated with penicillin. The most effective way to prevent meningococcal disease is the meningococcal vaccine.

There are two kinds of vaccines. The vaccine given to adolescents is MCV4 (meningococcal conjugate vaccine). It prevents four types of meningococcal disease including the most common types in the U.S. MCV4 is given to young people at their preadolescent pediatrician visit (11 - 12 years). For anyone who has not yet been vaccinated, it is given before starting high school. Meningococcal vaccine is also given to other groups of people considered high risk due to certain medical conditions. College freshmen who live in dormitories and teenagers 15-19 are also considered high risk.

There are few side effects to the meningococcal vaccine. The risk of the meningococcal vaccine causing serious harm, or death, is extremely small. Getting the meningococcal vaccine is much safer than getting meningococcal disease. Mild side effects include redness or pain where the shot was given and fever. One possible side effect is an allergic reaction. One very rare, severe side effect is a nervous system disorder called GBS (Guillain-Barre Syndrome). This is so rare, experts cannot be sure whether the vaccine causes it or not.

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Expert Group 7

Meningococcal Vaccine

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The following story illustrates why the meningococcal vaccination is so important:

The following excerpt is from a story originally published in the December 1, 1999, edition of *The Collegian* as "Ordinary College Student Shares Horror of Meningitis" by Ryan Hockensmith, who was then a senior at Penn State majoring in journalism and a staff writer for *The Collegian*. His story is reprinted with permission from the newspaper.

"The doctor was squeezing my toes hard. I could see his face clench up as he went from toe to toe, tightening two fingers around each of the toes on my left foot. To my horror, in the most excruciating few seconds of my life, I didn't feel anything. It's hard to express in words how I felt at that moment, how it feels to have someone grab a part of your body and not feel anything. It's terrifying. That was the end result of my three-week battle with meningococcal meningitis, a form of meningitis that claims [many] of its victims. I'm alive and well now, two weeks into a long recovery process. I will lose only those four toes I had no feeling in. But I look back now and wonder, why me? Meningitis only attacks a minuscule percentage of people every year, but a high percentage of those are college students. I am now a part of that statistic. If I had spent \$75 and gone ...for a meningitis vaccine like I should have last year, I wouldn't have to look at my body and nearly cry every day. Please make the most of your opportunity to avoid what happened to me."

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“Disease prevention is the key to public health. It is always better to prevent a disease than to treat it. Vaccines prevent disease in the people who receive them and protect those who come into contact with unvaccinated individuals. Vaccines help prevent infectious diseases and save lives. Vaccines are responsible for the control of many infectious diseases that were once common in this country, including polio, measles, diphtheria, pertussis (whooping cough), rubella (German measles), mumps, tetanus, and Haemophilus influenzae type b (Hib).

“Parents are constantly concerned about the health and safety of their children and take many steps to protect them. These steps range from child-proof door latches to child safety seats. In the same way, vaccines work to protect infants, children, and adults from illnesses and death caused by infectious diseases. While the US currently has record, or near record, low cases of vaccine-preventable diseases, the viruses and bacteria that cause them still exist. Even diseases that have been eliminated in this country, such as polio, are only a plane ride away. Polio, and other infectious diseases, can be passed on to people who are not protected by vaccines.

“Vaccine-preventable diseases have a costly impact, resulting in doctor's visits, hospitalizations, and premature deaths. Sick children can also cause parents to lose time from work.”

*Statement from the US Department of Health and Human Services
Centers for Disease Control and Prevention (CDC)*

What is a vaccine?

A vaccine is made from the antigen—either a bacteria or a virus—that causes the disease. Some vaccines use live or active but weakened versions of the antigen. Some are made from killed or inactive antigens, and others are made from parts of the antigen or one that closely resembles the targeted bacteria or virus. In any form, a vaccine does not contain enough antigens to cause the disease. It has just enough to trigger the body's immune system to produce antibodies against that disease. In most cases, these antibodies remain active and protective against the disease for a person's lifetime. This protection is called immunity. In some cases, a vaccine requires booster shots, doses given at regular intervals.

What are some common vaccines? When do children typically get them?

Explain that usually, children receive several vaccinations during the first 10 years of their lives, most of them before the age of one: polio, MMR (measles, mumps, rubella), DTaP (diphtheria, tetanus, pertussis), hepatitis B, varicella (chickenpox). CDC and the American Academy of Pediatrics (AAP) recommend that pre-teens get

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Teacher Resource 1: Content Background and Resources

several vaccines at their 11 or 12-year-old check-up: tetanus-diphtheria-acellular pertussis vaccine (Tdap), meningococcal conjugate vaccine (MCV4), and human papillomavirus (HPV) vaccine for girls.

How do vaccines work? What does a vaccine do? How do vaccines prevent disease?

A weakened form of the disease germ is injected into the body. The body makes antibodies to fight these invaders. If and when the actual disease germs attack the body, the antibodies will still be there to destroy them.

What is an immune system? What is immunity?

Explain that the immune system is the body's method of protecting itself from foreign substances that invade the body. Vaccines work with our immune system to protect against diseases. A vaccine helps your body create antibodies, or cells that fight off antigens, and foreign substances like bacteria or viruses. Sometimes your body creates antibodies by itself, but not enough to fight a serious disease like polio. Immunity to a disease is achieved through the presence of antibodies to that disease in a person's system. Antibodies are proteins produced by the body to neutralize or destroy toxins or disease-carrying organisms. Antibodies are disease-specific. For example, measles antibody will protect a person who is exposed to measles disease, but will have no effect if he or she is exposed to mumps.

There are two types of immunity: active and passive. Active immunity results when exposure to a disease organism triggers the immune system to produce antibodies to that disease. Exposure to the disease organism can occur through infection with the actual disease (resulting in natural immunity), or introduction of a killed or weakened form of the disease organism through vaccination (vaccine-induced immunity). Either way, if an immune person comes into contact with that disease in the future, their immune system will recognize it and immediately produce the antibodies needed to fight it. Active immunity is long-lasting, and sometimes lifelong. Passive immunity is provided when a person is given antibodies to a disease rather than producing them through his or her own immune system. A newborn baby acquires passive immunity from its mother through the placenta. A person can also get passive immunity through antibody-containing blood products such as immune globulin, which may be given when immediate protection from a specific disease is needed. This is the major advantage to passive immunity; protection is immediate, whereas active immunity takes time (usually several weeks) to develop. However, passive immunity lasts only for a few weeks or months. Only active immunity is long-lasting.

What are the potential side effects of vaccinations?

While vaccines are very safe, like any medicine they do sometimes cause reactions. Mostly, these are mild "local" reactions (soreness or redness where the shot is given) or a low-grade fever. They may last a day or two and then go away. Sometimes more serious reactions are associated with vaccines. These are much less

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common. Some of them are clearly caused by the vaccine. Some have been reported after vaccination but are so rare that it is impossible to tell if they were caused by the vaccine or would have happened anyway. There is a very small risk that any vaccine could trigger a severe allergic reaction.

Why should vaccinations be required?

Immunizing individual children also helps to protect the health of our community, especially those people who are not immunized. People who are not immunized include those who are too young to be vaccinated (e.g., children less than a year old cannot receive the measles vaccine but can be infected by the measles virus), those who cannot be vaccinated for medical reasons (e.g., children with leukemia), and those who cannot make an adequate response to vaccination. Also protected, therefore, are people who received a vaccine, but who have not developed immunity. In addition, people who are sick will be less likely to be exposed to disease germs that can be passed around by unvaccinated children. Immunization also slows down or stops disease outbreaks.

To explore the concept of community disease prevention, Garrett Hardin's classic essay *The Tragedy of the Commons* describes the challenges presented when societal interest conflicts with the individual's interest. Hardin notes: *"...a community free of an infectious disease because of a high vaccination rate can be viewed as a common. The very existence of this common leads to tension between the best interests of the individual and those of the community. Increased immunization rates result in significantly decreased risk for disease. Although no remaining unimmunized individual can be said to be free of risk from the infectious disease, the herd effect generated from high immunization rates significantly reduces the risk for disease for those individuals. Additional benefit is conferred on the unimmunized person because avoidance of the vaccine avoids the risk for any adverse reactions associated with the vaccine. As disease rates drop, the risks associated with the vaccine come even more to the fore, providing further incentive to avoid immunization. Thus, when an individual in this common chooses to go unimmunized, it only minimally increases the risk of illness for that individual, while conferring on that person the benefit of avoiding the risk of vaccine induced side effects. At the same time, however, this action weakens the herd effect protection for the entire community. As more and more individuals choose to do what is in their 'best' individual interest, the common eventually fails as herd immunity disappears and disease outbreaks occur. To avoid this 'tragedy of the commons', legal requirements have been imposed by communities (in recent times, by states) to mandate particular vaccinations."*

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Teacher Resource 1: Content Background and Resources

WEB RESOURCES

Content Background

<http://www.cdc.gov/vaccines>
<http://www.cdc.gov/vaccines/vpd-vac/default.htm>
<http://kidshealth.org/parent/general/body/vaccine.html>
<http://www.vaccineinformation.org>
<http://www.cancer.org>
<http://www.neahin.org>

Vaccine Information Statements

<http://www.cdc.gov/vaccines/pubs/vis/default.htm>

Time Line Resources

<http://www.eduplace.com/graphicorganizer/>
http://www.educationworld.com/a_lesson/lesson/lesson044.shtml
<http://www.history.com/classroom/classroom.html>
<http://www.jud.ct.gov/LawLib/education.htm>

Lesson Plans & Resources on Internet Safety

<http://bnetsavvy.org/>
www.netsmartz.org/educators.htm
www.media-awareness.ca/english/games/index.cfm
<http://ilearn.isafe.org/>
www.cybersmartcurriculum.org/home

Group Work Rubric

http://www.uen.org/Rubric/rubric.cgi?rubric_id=12916

Create your own rubric

<http://rubistar.4teachers.org/index.php>

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Teacher Resource 1: Content Background and Resources

Resources for Bookmarking Websites for Students on the Internet

(How to create “bookmarks” of websites for the students to conduct Internet research)

<http://iKeepBookmarks.com>

<http://pagekeeper.teachingmatters.org/home>

<http://teachingtoday.glencoe.com/howtoarticles/social-bookmarking>

Suggested Websites to Bookmark for this Activity

<http://inventors.about.com/library/inventors/blvaccination.htm>

<http://www.fightmeningitis.com/meningitis-meningococcal-history.html>

<http://www.cdc.gov/>

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Teacher Resource 2: Vocabulary

antibody

Definition: A substance that fights a disease by protecting the body from a virus or bacteria.

Context: Vaccines cause the body to develop antibodies to fight a disease.

antigen

Definition: A substance such as bacteria or a virus that invades the body and stimulates the production of an antibody.

Context: Recognized as a threat by the immune system, an antigen, such as the streptococcus bacteria, triggers the production of an antibody.

bacteria

Definition: Simple one-celled organisms classified as prokaryotes.

Context: Although many bacteria live in the human body without causing harm, some cause tuberculosis, typhoid fever, whooping cough, and other diseases.

contagious

Definition: Capable of being transmitted by bodily contact with an infected person or object

Context: Measles is highly contagious. Infected people are usually contagious from about four days before their rash starts to four days afterwards.

endemic

Definition: The continual, low-level presence of disease in a community

Context: Cutaneous diphtheria is endemic in tropical countries but unusual in the United Kingdom.

epidemiology

Definition: The branch of medicine dealing with the incidence and prevalence of disease in large populations and with detection of the source and cause of epidemics of infectious disease

Context: The accurate dissemination of epidemiological information on cases and outbreaks is very important to public health in preventing emerging or re-emerging infections.

herd immunity

Definition: Having a large percentage of the population vaccinated in order to prevent the spread of certain infectious diseases. Also known as community immunity.

Context: Herd immunity benefits individuals not vaccinated (such as newborns and those with chronic illnesses) because the disease has little opportunity to spread within the community.

Looking Back to Look Ahead - The History of Disease Prevention

Teacher Resource 2: Vocabulary

historical context

Definition: Historical context reflects the time in which something takes place or was created and how that influences how you interpret it.

Context: To determine the historical context of Shakespeare's birth, we will need to know his birth date/year and determine what major things were happening in that year.

immunity

Definition: Protection against a disease. There are two types of immunity, passive and active. Immunity is indicated by the presence of antibodies in the blood and can usually be determined with a laboratory test.

Context: Without evidence of immunity, it is beneficial to give the vaccine within three to five days of exposure.

immunization

Definition: The process of protecting the body against disease using vaccines or serums.

Context: Most children begin their immunization schedule as babies and continue before they begin elementary and middle school.

incubation period

Definition: The time from contact with infectious agents (bacteria or viruses) to onset of disease.

Context: The typical incubation period for measles from exposure to rash onset is approximately 10 days.

infectious

Definition: Likely to spread to others. Capable of spreading disease. Also known as communicable.

Context: Measles is an infectious disease.

vaccine

Definition: A substance that protects a body against a disease by causing the body's immune system to produce antibodies.

Context: Some vaccines provide lifelong protection against infection, while others require several doses given at regular intervals.

virus

Definition: An infectious agent that lives in a cell of another living thing.

Context: Viruses are a major cause of disease and can infect human beings with measles, influenza, and the common cold.

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Teacher Resource 3: Instructional Strategy Overview

Interactive Time Line

Interactive Time Line

An interactive time line is a cooperative learning strategy. Students are assigned a block of time during a historically significant time period for the topic being studied. A large time line for the topic is posted in the classroom. The time line should be large enough for students to see from their desks. There should also be enough room for the students to stand in front of the time line.

Following an introduction to the topic, students will have a basic knowledge of the significance of the history of the given topic. Tell students they will be researching a block of time on the time line. Divide students into groups, with each group assigned to a different block of time. Instruct groups to research the events that occurred during their respective time blocks. Once they have done their research, have them place the events and key information on the time line using words, pictures, definitions, and drawings. Once all groups have created their own sections of the time line, post all of the pieces together on the wall to form one long time line. The time line should remain posted throughout the unit. The time line can be used to facilitate learning in a variety of ways. It can be used for individual, partner, small group and whole class activities.

Interactive Time Line Secret: If you have access to PowerPoint, have students re-create the entire time line as a PowerPoint presentation at the conclusion of the unit of study.

Looking Back to Look Ahead - The History of Disease Prevention

Teacher Resource 4: Anecdotes

Ring Around the Rosy

Have you ever heard the nursery rhyme Ring Around the Rosy?
AKA Ring-a-Ring o'Rosies

* Ring around the rosy
A pocketful of posies
"Ashes, Ashes"
We all fall down!

Older version...

* Ring-a-Ring o'Rosies
A Pocket full of Posies
"A-tishoo! A-tishoo!"
We all fall Down!

What is the historical context of this nursery rhyme?

Ring around the rosy goes back to the black plague in England, circa 1665 (or perhaps earlier in the 1300s when the bubonic plague first hit).

The symptoms of the plague included a rosy red rash in the shape of a ring on the skin (ring around the rosy), and violent sneezing (a-tishoo, a tishoo).

It was believed that the disease was spread by bad smells. Therefore people carried pockets and pouches of sweet smelling herbs (posies).

The death rate was over 60% (we all fall down) and the plague was only halted by the Great Fire of London in 1666 which killed the rats that carried the disease.

After death the bodies were cremated (ashes ashes).

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Teacher Resource 4: Anecdotes

Smallpox Vaccine

In 1776, Edward Jenner, a British scientist and surgeon, had an idea that led to the development of the first vaccine. A young milkmaid told him people who contracted cowpox never got smallpox. Cowpox is a harmless disease from contact with cows. Smallpox, however, is a deadly disease. With this in mind, Jenner took samples from the open cowpox sores on the hands of a young milkmaid named Sarah Nelmes. He made a shot from the pus taken from Sarah and gave the shot to eight-year-old James Phipps. (Keep in mind that this was the 18th century. We would not do this today.)

The boy developed a slight fever and a few sores but remained healthy. A few months later, Jenner gave the boy another injection containing smallpox. James failed to develop the disease, and the idea behind the modern vaccine was born. Giving shots to prevent smallpox soon became a common practice. It would be another 50 years before doctors understood why vaccines work.

Today we give vaccinations to prevent many diseases. Some of the sicknesses vaccines help to stop are the measles, the mumps, polio, and chickenpox.

Incidentally, Jenner's name for these injections was not an accident. He called the injections "vaccines" because in Latin the word "vaccinus" means "from cows".

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Teacher Resource 4: Anecdotes

HPV Vaccine

The Yellow Umbrella story

Human papillomavirus (HPV) is a virus that is spread through sexual contact. Usually, HPV has no symptoms. There are many types of HPV some of which lead can lead to cervical cancer or genital warts. According to the Centers for Disease Control and Prevention, by the age of 50 more than 80% of American women will have contracted at least one type of genital HPV. Both men and women can be carriers of HPV.

There is now a vaccine that prevents the types of HPV that cause most cases of cervical cancer and genital warts. Work on the vaccine began in the mid 1980. In 2006, the U.S. Food and Drug Administration approved the first preventive HPV vaccine. Every year, about 3,700 women die per year of cervical cancer. This is a story of one young survivor's journey.

"I'm going to be a rock star! That was my dream in January of 2000, when I quit my day job to pursue fulltime my one true passion, music. My band was doing great, and I could not have been happier. One week later, I saw blood. Immediately, I called my gynecologist, who chalked it up to stress, told me not to worry and said he would see me at my annual exam in March. Of course, he's the doctor, so I trusted him and happily continued to write songs and book my band to play. I felt so lucky to be able to pursue my dreams.

"This was not to last. Although all of my previous Pap tests had been normal, the results from my Pap in March showed some abnormal cell growth on my cervix. My doctor ordered a colposcopy, a more advanced exam that allowed him to take a biopsy and test my cells for problems. At that point, I barely knew where my cervix was, much less about cell mutations that could turn into cancer many years down the road if not treated!

"My doctor assured me that because of my history of normal Paps, he was sure I did not have cancer. It was, he said, probably just "dysplasia" – pre – cancerous cells that can be easily treated. We were to meet the following week to discuss the results of the colposcopy and biopsy, and I was scheduled to have a simple follow-up procedure to remove the bad cells.

"The doctor was wrong. On April 18, 2000, I was diagnosed with advanced cervical cancer with extensive lymphatic invasion. Everything happened so quickly after that. Ten days later, I had a radical hysterectomy. One month after that, I had a laparoscopic procedure to move my ovaries out of the "frying zone." Then, I had five weeks of daily pelvic radiation, concurrent with four rounds of chemotherapy followed by three rounds of internal radiation (brachytherapy). They basically gave me everything they had to save me. Within four months, I was done with everything. Except, that is, for the deep, dark depression to follow.

Looking Back to Look Ahead - The History of Disease Prevention

Teacher Resource 4: Anecdotes

“Everyone knows that the treatment is hard and it takes an awful toll on the body. But for me, the depression was undoubtedly the worst. I felt like I lost everything. Music, the one passion that always centered me and guided my life, was gone. I couldn't play, sing or write; I didn't know who I was anymore. Like my cancer treatment, I attacked the depression with full force, using individual therapy, group therapy, anti-depressants, acupuncture, yoga, journaling and more. Time and perseverance gradually began to work; I had already worked so hard to stay alive and I refused to quit. I wanted my life back. However, the music seemed to have left my body with my uterus and I felt like it would never return.

“My life-altering moment occurred while watching the movie Harold and Maude. The character of Maude is an older woman who embraces all that life has to offer – every sensation, touch, smell, feel. She lives in the moment while teaching a young boy, Harold, to do the same. Maude's spirit and the Cat Stevens soundtrack drew me back to the piano. I felt the song, "Trouble," had been written for me, and described what the last year and a half of my life had been. That moment, in the fall of 2001, changed my life. I knew I needed to help others through my music and my voice. That's what motivated me to start using my music to educate other women about cervical cancer and what they could do to prevent it.

“In 2003, I created The Yellow Umbrella (concert) tour (named after the cheery yellow umbrella Maude carried in the movie). Since then, I have performed with a variety of singers across the country – telling my story through my music, educating women and the men who care for them about cervical cancer, HPV and the HPV test.”

-Christine Baze, Founder/Executive Director, Yellow Umbrella Organization

Source: <http://www.thehpvtest.com/>

TEEN SEXUAL HEALTH AND VACCINE EDUCATION

A CURRICULUM PROJECT TO SUPPORT AND PROMOTE
THE PREVENTION OF SEXUALLY TRANSMITTED INFECTIONS

Looking Back to Look Ahead - The History of Disease Prevention Teacher Resource 5: Group Work Evaluation Rubric

Directions: Explain the rubric to the class before the activity begins. First, have students complete a self-evaluation using the first Group Work Rubric on the sheet. Second, give the rubric to a group member to complete the second rubric. Finally, based on anecdotal observations, the teacher completes the third rubric on the page.

STUDENT NAME _____

SELF EVALUATION

Interactive Time Line Project	Point Total ____/20				Total
	1	2	3	4	
Interacted, discussed, and posed questions	never	rarely	often	always	
Contributed to the small group research effort	never	rarely	often	always	
Listened to others, offered ideas and shared information	never	rarely	often	always	
Participated in creating the time line	never	rarely	often	always	
Encouraged and supported teammates	never	rarely	often	always	

PEER EVALUATION

Interactive Time Line Project	Point Total ____/20				Total
	1	2	3	4	
Interacted, discussed, and posed questions	never	rarely	often	always	
Contributed to the small group research effort	never	rarely	often	always	
Listened to others, offered ideas and shared information	never	rarely	often	always	
Participated in creating the time line	never	rarely	often	always	
Encouraged and supported teammates	never	rarely	often	always	

TEACHER EVALUATION

Interactive Time Line Project	Point Total ____/20				Total
	1	2	3	4	
Interacted, discussed, and posed questions	never	rarely	often	always	
Contributed to the small group research effort	never	rarely	often	always	
Listened to others, offered ideas and shared information	never	rarely	often	always	
Participated in creating the time line	never	rarely	often	always	
Encouraged and supported teammates	never	rarely	often	always	

Evaluation Point Total ____/60

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Teacher Resource 6: Reference List

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Say Something <<http://www.say-something.org/>>

The Yellow Umbrella <<http://www.theyellowumbrella.org/>>

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U.S. Department of Health and Human Services <<http://www.hhs.gov/diseases/>>

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