Eli Lilly and Company and the Salk Polio Vaccine

Introduction

This lesson coordinates with the *You Are There 1955: Ending Polio* component of the *Indiana Experience* at the Eugene and Marilyn Glick Indiana History Center. In this experience, visitors are invited to become a part of the action as Eli Lilly and Company employees work to package and ship vials of Jonas Salk's polio vaccine to devastated communities nationwide. Visitors interact with assembly-line workers and learn how this Indiana company helped end America's polio panic. The curriculum is intended to provide historical context for the nationwide public health crisis of polio, the celebrated creation of the polio vaccine, and the importance of the pharmaceutical industry to Indiana's economy. The lesson may be used to prepare students for a visit to the *You Are There 1955: Ending Polio* experience or it may be used as a follow-up to a visit. In addition, the historical context and themes will be relevant to classroom instruction even if a visit is not possible. *You Are There 1955: Ending Polio* will remain open through September 14, 2013.

Overview/Description

In this lesson students will learn about the race to create a polio vaccine, the science behind the Salk polio vaccine, and Eli Lilly and Company's production of the Salk polio vaccine.

Grade Level

Elementary (grade four)

Academic Standards

Social Studies 4.1.13–Identify and describe important events and movements that changed life in Indiana from the mid-twentieth century to the present.

Social Studies 4.4.7–Identify entrepreneurs who have influenced Indiana and the local community. (Example, Eli Lilly)

Science 4.4.11 2000–Explain that there are some diseases that human beings can only catch once. Explain that there are many diseases that can be prevented by vaccinations so that people do not catch them even once.

Health and Wellness 4.1.5–Explain how to prevent illness by seeking care from medical personnel. (ex. Immunizations)

Health and Wellness 4.5.1–Explain situations that may require a thoughtful health-related decision.

Health and Wellness 4.7.3–Describe behaviors to reduce health risks.

Math 4.1.4–Order and compare whole numbers using symbols for "less than" (<), "equal to" (=), and "greater than" (>).

Math 4.6.2–Interpret data graphs to answer questions about a situation.

CCS Informational Texts 1.4.2–Determine the main idea of a text and explain how it is supported by key details; summarize the text.

CCS Informational Text 1.4.7–Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

CCS Informational Text 1.4.9–Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

CCS Informational Text 1.4.10–By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in grades 4 to 5 text complexity band proficiently, with scaffolding as needed at the high end of the range.

CCS Writing 1.4.3–Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

a. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.
b. Use dialogue and description to develop experiences and events or to show the responses of characters to situations.
c. Use a variety of transitional words and phrases to manage the sequence of events.
d. Use concrete words and phrases and sensory details to convey experiences and events precisely.
e. Provide a conclusion that follows from the narrated experiences or events.

Science and Social Studies/Historical Concepts

Scientific innovation, the polio pandemic of the 1940s and 1950s, industry in Indiana, and entrepreneurs in Indiana

Learning/Instructional Objectives

Students will be able to:

- Name Eli Lilly and Company as one of the five American companies that manufactured the Salk polio vaccine.
- Describe the role of the vaccine in eliminating polio in the United States.

- Describe the way in which a vaccine works to prevent infection.
- Recognize the sense of urgency that surrounded the race to develop a vaccine for polio.

Time Required

One class period

Materials Required

- Copies of "Case and Death Rates for Polio in United States–1915-1952" from 1954 National Foundation for Infantile Paralysis Speaker's Handbook (Courtesy, Eli Lilly and Company Archives; see page nine of this lesson)
- Copies of "Polio Age Pattern –1952" from 1954 National Foundation for Infantile Paralysis Speaker's Handbook (Courtesy, Eli Lilly and Company Archives; see page ten of this lesson)
- Copies of excerpts of the *Indianapolis Star* article, "Thrilled by Salk Success, Indiana's Doctors Act to Immunize 270,000" (Wednesday morning, April 13, 1955) (Courtesy, *Indianapolis Star*; see page 12 of this lesson)
- Copies of Student Worksheet for "Thrilled by Salk Success, Indiana's Doctors Act to Immunize 270,000" (see page 14 of this lesson)

Background/Historical Context

Refer to the "Polio and Lilly Background Essay" for more information.

Teacher's Instructional Plan

Introduction

Introduce the lesson by reviewing with students how polio outbreaks in the 1940s to 1950s constituted a public health crisis (see "What is Polio?" Lesson plan). In order to reinforce this concept, distribute copies of the "Case and Death Rates for polio in United States–1915-1952" from the 1954 National Foundation for Infantile Paralysis speaker's guide (see page nine of this lesson). Together as a class, analyze the chart.

- Ask students to identify the three years with the highest number of cases of polio (1916, 1949, and 1952).

- Ask them to determine whether or not these were also the years with the highest rate of polio cases per 100,000 people and the highest number of deaths (yes, they are).

- Do these years have the highest "case fatality rate" (meaning the number of deaths divided by the number of cases)? (No, they don't.) Ask students to speculate as to why that might be. In order to assist students with this last question, point out the general pattern of decreasing case fatality rates as time progressed (the exception occurs in the mid-to-late 1930s). Ask students if they think that advances in technology and medical knowledge might have led to lower death rates/higher recovery rates.

- Discuss with students the different types of polio and explain how the disease could be fatal if the muscles controlling breathing and swallowing were paralyzed:

    - Spinal polio is the most common form of paralytic polio. The virus produces inflammation of nerve cells, causing the muscles to no longer receive signals from the brain or spinal cord. Fever and muscle pain can quickly lead to paralysis, the severity of which depends on the region of the spinal cord affected.

    - Bulbar polio accounts for nearly 2 percent of polio cases. It occurs when the poliovirus invades and destroys nerves within the bulbar region of the brain stem, leading to a host of symptoms including difficulty breathing, speaking, and swallowing; muscle weakness; facial weakness; and respiratory arrest. This type of polio can be fatal.

    - Bulbospinal polio makes up approximately 19 percent of cases and results from a combination of symptoms from both spinal and bulbar infections. Here, the virus affects the upper part of the cervical spinal cord and causes paralysis of the diaphragm, which interferes with the ability to breathe. It can lead to paralysis of the arms and legs and also affects the heart.

- Now that students have examined the "Case and Death Rates for Polio in United States–1915-1952" chart, ask them if they would qualify the polio outbreaks in the twentieth century as a public health crisis (see glossary for definition of "public health"). Students should justify their answers.

Also, distribute to students the "Polio Age Pattern–1952" chart from the 1954 NFIP speaker's guide (see page ten of this lesson). Again, analyze the chart together as a class, or have the students work together in small groups to analyze it.

- Ask students to identify the four ages that had the highest admission rate per 100,000 population in 1952. (Ages three, four, five, and six)

- In addition, ask students to look at the very bottom of the chart. There, percentages of all admissions are listed for age ranges. Ask students to identify what percentage of all admissions was accounted for by admissions of children ages zero to nine? Ask students if

that information would make them more likely to classify the polio outbreaks in the twentieth century as a public health crisis. Why or why not?

Tell students that these facts and figures represent the reasons why the NFIP, which was founded in 1938 by President Franklin D. Roosevelt, battled polio by raising money to support research into a vaccine that could prevent polio.

Even before the NFIP was founded, scientists had been working to develop a polio vaccine that would prevent this dreaded illness. However, the early vaccines all had problems–one was believed to have caused several cases of polio and another caused severe allergic reactions.

The work of scientists in the 1940s paved the way for the development of a safe and effective vaccine in several ways. Scientists John Enders and Thomas Weller, for example, figured out how to grow the poliovirus outside of the human body in non nervous system tissue. This meant that a lot of poliovirus could be made and used to create a vaccine.

By the early 1950s several researchers were experimenting with polio vaccines. Jonas Salk from the University of Pittsburgh was one of them. His work was funded by the NFIP. Salk used his experience in creating an influenza vaccine to help him develop the polio vaccine. His vaccine was made with killed poliovirus. When injected, the killed virus caused the body to create antibodies that attacked the killed poliovirus. In the future if the subject contracted polio the body would recognize the poliovirus and have antibodies to fight it off.

Salk began testing his vaccine in a huge field trial in 1954. Millions of school children in the second through fourth grades either received doses of the vaccine or a placebo shot that was a saline (salt and water) solution. The children receiving the saline shots were the "control group" and provided data against which to compare the results of what happened to the children who received the actual vaccine. Eli Lilly and Company produced Salk vaccine to supply the field trials, but also to stockpile so that it could be ready if and when the government approved the vaccine for use by the general public.

On April 12, 1955, Salk announced the results of the field trials. The vaccine had been successful in preventing at least 68 percent of paralytic polio cases.[1]

Salk was not the only researcher working on a polio vaccine. Another scientist, Albert Sabin, was developing a polio vaccine at the same time. However, Sabin's vaccine was an "attenuated" vaccine that used a weakened form of the live poliovirus to produce antibodies in the subject. Eight years after Salk's success, Sabin finished work on his vaccine. Although the Salk vaccine

[1] Harry M. Marks. "The 1954 Salk Poliomyelitis Vaccine Field Trial." Institute of the History of Medicine, Johns Hopkins University, Baltimore, MD, 2008, p. 20.

hit the market first, the Sabin vaccine was commonly used beginning in the 1960s until fairly recently. Today, doctors use a version of Salk's original product.

Procedure

- Distribute copies of excerpts of the *Indianapolis Star* article titled, "Thrilled by Salk Success, Indiana's Doctors Act to Immunize 270,000," from the morning of April 13, 1955. Also distribute the accompanying student worksheet (see page 12 of this lesson). A copy of the complete article is also included for your reference (see pages 13-14 of this lesson).

- Allow twenty minutes for students to work in small groups to complete the student worksheet in which they analyze the newspaper article.

- After analyzing the newspaper article, have students write a letter from the perspective of an employee of Eli Lilly and Company. Have the students address the news about the vaccine's approval–is this a historic moment or not? Do they feel that their work producing the vaccine at the company is important work? Why or why not? Do they have any worries about working with a vaccine that contains the poliovirus, even though it has been killed? If they have children, will they vaccinate their children with this new vaccine? Do they feel hopeful that the vaccine will help eliminate the yearly polio epidemics?

Glossary

Public Health–The science and practice of improving the health of a community through preventive practices such as immunizations, health education, sanitation, disease control, etc. A crisis of public health happens when a disease is not controlled for one reason or another.

Antibodies–Antibodies are proteins in the blood that our body produces in response to the presence of antigens (toxins, bacteria, or diseases such as the poliovirus). They are part of our immune system's response to disease and help to fight off the disease.

Killed virus vaccine–A vaccine made from killed, or inactivated, virus that still has the ability to cause the production of antibodies in the blood, leading to immunity against a disease. The virus is usually killed by heating it or adding a chemical called formaldehyde.

Attenuated vaccine–A vaccine made from a weakened form of virus that causes the body to produce antibodies in the blood, leading to immunity against a particular disease.

Assessment

Use a teacher-developed rubric to assess student analysis of primary sources, participation in class discussions, and journaling activity

Suggested Modifications

- Distribute copies of the image of a doctor giving a girl the polio vaccine (see page X of this lesson). Tell students that this image shows a doctor giving a young girl the Salk polio vaccine. Hold a think-aloud discussion about vaccines. Ask students if they have ever received a vaccine before? How did they feel about getting a shot? What are the benefits of vaccines? How can they keep you and others around you healthy? Some people do not like to use vaccines because they fear the vaccine can give them the very disease it is meant to prevent. Why do you think people would have this fear? (Hint: some people feared that the killed poliovirus in the polio vaccine might still have the power to give them or their children polio.) Others fear that vaccines can leave them at risk for other diseases. This has generally been proven to be false.

Additional Resources

Publications

Bankston, John. *Jonas Salk and the Polio Vaccine.* Unlocking the Secrets of Science Series. Hockessin, DE: Mitchell Lane Publishers, 2001.

For grades 6-10; this book covers Salk's early years and the struggles he faced as he developed the polio vaccine. It also discusses other scientists whose work contributed to discovering pieces of the puzzle necessary to produce the polio vaccine. Finally, the author addresses Franklin D. Roosevelt's struggle with polio and his creation of the National Foundation for Infantile Paralysis.

Breedson, Carmen. *Jonas Salk: Discoverer of the Polio Vaccine*. People to Know Series. Berkeley Heights, NJ: Enslow Publishers, 1993.

Breedson's book describes the polio epidemics and explains the concepts of virus, bacteria, vaccine, and antibody to students with little science background. It also discusses Salk's discovery of the polio vaccine and devotes text to his research projects since the 1950s, particularly his work on an AIDS vaccine. For grades 5-9.

De la Bédoyère, Guy. *The First Polio Vaccine*. Milestones in Modern Science Series. Lanham, MD: M. Evans and Company, 2008.

De la Bédoyère's book explains what vaccinations are and how they work, discusses how Salk created the polio vaccine and how his work was received by the public and fellow scientists, and investigates other scientists that worked on developing a polio vaccine. It also looks at what the discovery of the polio vaccine has meant for medical science up until the present day.

Krohn, Katherine E. Illustrated by Al Milgrom. *Jonas Salk and the Polio Vaccine.* Inventions and Discovery Series. North Mankato, MN: Capstone Press, 2007.

Written in comic-book style, this book's dialogue is nevertheless fairly sophisticated and includes quotes or other primary source materials. The book also offers summary fact pages, further reading suggestions, recommended Internet sites, a bibliography, and a glossary.

Sammartino McPherson, Stephanie. *Jonas Salk: Conquering Polio.* Lerner Biographies Series. Minneapolis: Lerner Publishing Group, 2001.

This book addresses both Salk's personal biography and his scientific achievement. It includes an extensive bibliography, a list of recommended Web sites, and an afterword that provides detailed information about polio. For grades 5-8.

Tocci, Salvatore. *Jonas Salk: Creator of the Polio Vaccine.* Great Minds of Science Series. Berkeley Heights, NJ: Enslow Publishers, 2003.

Tocci addresses Salk's scientific achievement in creating the polio vaccine and the public acclaim it brought him. He also touches on the criticism Salk received from other scientists. According to a *Booklist* review, "Tocci does a good job of showing how the fear of polio affected the public during the 1950s, an aspect of social history that sets the stage for Salk's story." Furthermore, the author touches upon the science of creating a vaccine and challenges particular to creating a polio vaccine. Includes a foreword by Salk's son, a chronology, a glossary, chapter notes, and a list of recommended books and Web sites.

True Peters, Stephanie. *The Battle against Polio.* (Epidemic! Series. New York: Benchmark Press, 2005.

For grades 5-9, this book discusses the causes of polio and the infection process. Subsequent chapters use primary sources to address the history of the disease and the search for a cure, focusing on the United States from 1900 to the 1960s.

Web sites

Smithsonian Institution. National Museum of American History. "Whatever Happened to Polio," online exhibit. http://americanhistory.si.edu/polio/ (accessed June 15, 2012).

This Web site was created in conjunction with a temporary gallery exhibition, installed at the Smithsonian's National Museum of American History from April 2005 to April 2006. The online

exhibit highlights the science and history of polio, its legacy, Salk's development of a vaccine, and its subsequent field trials. It also looks at the state of polio today.

Center for Disease Control. "Vaccines and Preventable Diseases: Polio Vaccination." http://www.cdc.gov/VACCINes/vpd-vac/polio/default.htm (accessed July 2, 2012).

This Web site gives a brief description of polio and offers information about the polio vaccine. It also offers links to other Web sites with more in-depth information about the history of the disease, development of the vaccine, and modern-day efforts to eradicate polio.

Chemical Heritage Foundation. "Jonas Salk and Albert Bruce Sabin." http://www.chemheritage.org/discover/online-resources/chemistry-in-history/themes/pharmaceuticals/preventing-and-treating-infectious-diseases/salk-and-sabin.aspx (accessed July 2, 2012).

This Web site offers biographical information about Jonas Salk and Albert Bruce Sabin, an overview of their work, and a synopsis of the race to be the first to create a polio vaccine.

POLIO AFTERMATH

NOTE: A partial impression of polio's long-lasting effects—and its consequent impact on March of Dimes expenditures—can be gained from this table, which shows the results of a survey of 5,164 polio patients who returned for assistance early in 1953—in relation to the years in which they contracted infantile paralysis. These figures are based on re-admissions for hospitalization or other services during the first four months of 1953 only. They do not include thousands of cases requiring extended out-patient treatment nor patients still in hospitals when 1953 began.

Year of Polio Onset	Number of Polio Patient Re-admissions Jan. 1-May 2, 1953
1952	2,539
1951	327
1950	364
1949	425
1948	204
1947	84
1946	131
1945	73
1944	89
1943	50
1942	37
1941	53
1940	17
1939	27
1938	9
1937	27
1936	9
1935	17
1934	5
1933	2
1932	5
1931	16
1930	8
1929	1
1928	5
1927	4
1926	4
1925	1
1923	3
1922	2
1921	3
1920	2
1919	1
1918	2
1916	11
1915	2
1914	1
1912	6
1911	3
1910	4
1909	1
1908	1
1907	2
1906	1
1905	2
1904	1
1903	1
1901	1
1899	1
1893	1
1892	1
1891	1
Unspecified	577
Total	5,164

CASE AND DEATH RATES

for Polio in United States—1915-1952

Year	Cases Reported: Number	Cases Reported: Rate° Per 100,000 Population†	Deaths Reported: Number	Deaths Reported: Case Fatality Rate
1915	1,639	3.1	661	40.3
1916	27,363	41.4	7,179	26.2
1917	4,174	5.0	1,451	34.8
1918	2,543	2.9	1,079	42.4
1919	1,967	2.3	813	41.3
1920	2,338	2.4	855	36.6
1921	6,301	6.1	1,862	29.6
1922	2,255	2.0	847	37.6
1923	3,489	2.9	1,013	29.0
1924	5,262	4.6	1,145	21.8
1925	6,104	5.2	1,632	26.7
1926	2,750	2.2	911	33.1
1927	10,533	8.8	2,176	20.6
1928	5,169	4.2	1,436	27.8
1929	2,882	2.3	854	29.6
1930	9,220	7.5	1,427	15.5
1931	15,872	12.8	2,139	13.5
1932	3,820	3.0	882	23.1
1933	5,043	4.0	797	15.8
1934	7,510	5.9	852	11.3
1935	10,839	8.5	1,040	9.6
1936	4,523	3.5	780	17.2
1937	9,514	7.4	1,461	15.4
1938	1,705	1.3	487	28.6
1939	7,343	5.6	773	10.5
1940	9,804	7.4	1,026	10.5
1941	9,086	6.8	807	8.9
1942	4,167	3.0	561	13.5
1943	12,450	9.3	1,151	9.2
1944	19,029	14.3	1,361	7.2
1945	13,624	10.3	1,186	8.7
1946	25,698	18.4	1,845	7.2
1947	10,827	7.5	580	5.4
1948	27,726	19.1	1,895	6.8
1949	42,033	28.4	2,720	6.5
1950	33,300	22.0	1,904	5.7
1951	28,386	18.6	1,320*	4.6
1952	57,628	36.9	3,300*	5.7

Note: Data on cases for earlier years should be interpreted with caution because of probable under-reporting of less serious cases.

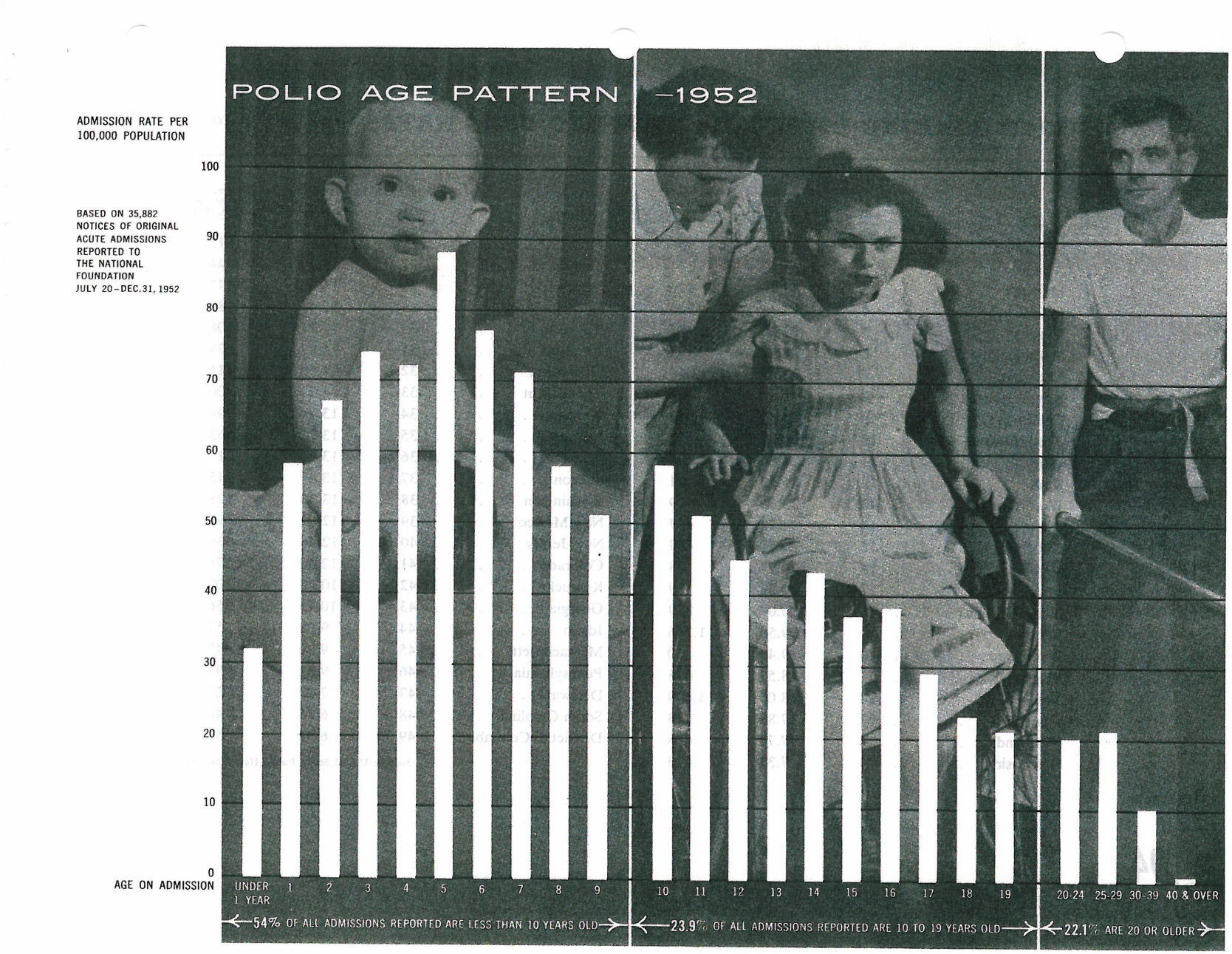
°Health authorities usually consider a rate of 20 to be epidemic in the case of polio.

†Based on population of states reporting. Some did not report in early years.

*Based on 10 percent sample of death certificates.

Source: United States Public Health Service.

"Case and Death Rates for Polio in United States–1915-1952" from 1954 National Foundation for Infantile Paralysis Speaker's Handbook (Courtesy, Eli Lilly and Company Archives)



"Polio Age Pattern –1952" from 1954 National Foundation for Infantile Paralysis Speaker's Handbook (Courtesy, Eli Lilly and Company Archives)

Thrilled By Salk Success, Indiana's Doctors Act To Immunize 270,000

THE SOARING, historic news that the Salk vaccine works was announced, after long months of secret research, by Dr. Thomas Francis Jr., University of Michigan epidermologist, who headed the task of determining its effectiveness.

Children, kept living and well, tell the full import of his story:

Only 71 children were paralyzed by polio last summer, out of the 440,000 vaccinated.

But 445 children were paralyzed among the 1,400,000 surveyed who didn't receive vaccine.

A total of only 113 youngsters were stricken by polio—paralytic and non-paralytic types—among all those vaccinated.

But a total of 750 were felled by polio among the non-vaccinated.

None died among the children who took the full series of shots.

But 15 died among those not vaccinated.

There was one death from polio in a child—not named—who had taken only two shots and had a tonsillectomy during an epidemic of polio in his community.

BROTHERS AND sisters were spared when polio virus insidiously struck down one member of a family. Only one of 233 vaccinated children developed polio from contact within the family. But eight out of 244 getting the dummy shots, picked up the nerve destroying virus this way.

The vaccine reportedly is incredibly safe and amazingly free from the kick of reactions which always affect some people no matter what the drug is.

Q. Exactly what is the Salk vaccine?

A. The Salk vaccine contains viruses of all three types of paralytic polio. This virus has been "killed" by chemical treatment to render its polio causing qualities inactive. The vaccine was named for its director, 40-year-old Dr. Jonas E. Salk, of the University of Pittsburgh.

Q. How is it made?

A. The viruses are grown in monkey kidney tissue cultures and "fed" with a nutrient mixture. Using this method sufficient quantities are produced to manufacture a vaccine. The vaccine is then treated with the chemical formalin to insure safety. It is pre-tested on monkeys before any children are given shots.

Q. How does the vaccine work?

A. It works on the principle of giving a mild infection in order to stimulate the cells to produce disease-fighting antibodies. A high level of antibodies should insure immunity in most people.

"Thrilled by Salk Success, Indiana's Doctors Act to Immunize 270,000" (*Indianapolis Star*, Wednesday morning, April 13, 1955) (Courtesy, *Indianapolis Star*)

Full text of "Thrilled by Salk Success, Indiana's Doctors Act to Immunize 270,000" (page one; *Indianapolis Star*, Wednesday morning, April 13, 1955)
(Courtesy, *Indianapolis Star*)

Thrilled By Salk Success, Indiana's Doctors Act To Immunize 270,000

Two Pitman-Moore Company workers begin loading packages of Salk vaccine vials into a delivery truck for delivery to Weir Cook Municipal Airport. Part of the "vast" amount of vaccine manufactured since the field tests last spring will be made available immediately for commercial use. But the biggest part will be turned over to the National Foundation for Infantile Paralysis for its mass inoculation program. The two workers are Thomas Baker (left) and Chester McDermet. (Star Photo)

By BERNARD W. WYNN

Elated by the unqualified success of the Salk vaccine tests, Indiana physicians last night began preparations for the mass immunization of 270,000 Hoosier schoolchildren against the crippling disease.

A stock of 81,000 vials of the precious serum will be stockpiled at the State Health Board Building here for distribution to 92 counties as soon as the National Foundation for Infantile Paralysis sets its machinery into motion.

Both Marion and Lake Counties will lead off what is hoped to be the final battle against the deadly germ of poliomyelitis at 9:30 a.m. Monday. It took 33 lives in Indiana last year.

In Marion County, 35 inoculation centers have been prepared to handle 30,000 children. The first shot is scheduled to be given in Public School 2, 700 North Delaware Street.

LAKE COUNTY will immunize more than 22,000 first and second-graders with the first of a series of three shots. Each shot will contain one cubic centimeter of Salk vaccine.

Physicians from throughout Indiana traveled to Indianapolis last night to get first-hand instructions on the miracle vaccine from the developer, Dr. Jonas E. Salk.

The technical details of the development of the drug, the 1954 field tests and the future of the immunization program were disclosed to nearly 3,000 persons in a closed circuit telecast in the Indiana Theater.

The private hearing before members of the medical fraternity and technicians was sponsored by Eli Lilly & Co., one of the six pharmaceutical firms licensed last night to manufacture the vaccine.

DR. SALK CALMLY vaccinated an unidentified young boy with the 1955 model serum for the benefit of some 56,000 physicians scheduled to watch the live telecast from all over the nation. The broadcast originated in Ann Arbor, Mich.

"It didn't hurt, did it!" Dr. Salk remarked to the youth, smilingly. This familiar query drew a roar of laughter from the Indianapolis audience.

Pitman-Moore Company officials said they are ready to begin shipment of the vaccine immediately. The first commercial shipment of Salk was flown to the West Coast at 5:30 p.m.

"You can bet that we'll get it out as fast as possible—in Indiana and over the country," a spokesman said.

LILLY WORKERS, too, reportedly had a large quantity of the vaccine at the loading docks, ready for immediate distribution.

Pitman-Moore plans a 30 per cent step-up in Salk production

Turn to Page 4, Column 8

(Here are authoritative answers to your key questions about the Salk polio vaccine, just pronounced safe and effective in a report by Dr. Thomas Francis Jr. at Ann Arbor, Mich. When, where and how soon it may be obtained, who will get it and how much it costs are explained in this article by Dr. Hart E. Van Riper, medical director of the National Foundation for Infantile Paralysis.)

By DR. HART E. VAN RIPER
Medical Director, National Foundation for Infantile Paralysis

Ann Arbor, Mich. (INS)—

Q—How good is the Salk vaccine?

A—It would appear to be as effective as other comparable biologicals—those against smallpox, tetanus, diphtheria, pertussis (whooping cough) and so on.

Q—What does Dr. Francis' report really mean?

A—That a vaccine properly produced and efficiently administered can be expected to protect up to 90 per cent of those who avail themselves of this product.

Q—Does use of the Salk vaccine mean there will be no polio from now on?

A—No. It is impossible to achieve absolute effectiveness with any vaccine. Also there is not enough vaccine on hand now to protect everyone at once.

Q—How many will get the vaccine this year?

A—There is enough on hand right now for at least 18,000,000 children based on a series of three shots. Youngsters who participated in the 1954 field trial and first and second-graders will get initial priority.

Q—How soon can I get it for my children?

A—If they are in the first or second grades of school, they will receive shots from the National Foundation for Infantile Paralysis supply sometime between April 27 and June (the vaccine first must be licensed by the Federal government; target date for beginning the shots is April 27).

Q—Where can I get the vaccine?

A—If your children are not covered in the above first and second grade categories see your family physician who will receive his vaccine supplies from commercial producers.

Some physicians may be getting their first vaccine supplies within a week.

Q—How much will it cost?

A—The foundation's supplies are free of charge. Best guess is that the series of vaccinations would cost approximately $2 each plus the administering doctor's fee.

Q—Will there be a shortage, and if so, for how long?

A—Yes, there will be, at first. There will not be enough vaccine on hand this year to inoculate every one of the 60,000,000 in the polio-susceptible age

Turn to Page 4, Column 4

Editorial on Page 14

Ann Arbor, Mich. (AP)—A potent new 1955-model Salk polio vaccine began rolling last night to doctors' offices to end polio's long reign of terror.

The vaccine was licensed officially for public use by the National Institutes of Health only hours after it had been found safe, effective and powerful in preventing paralytic polio.

The vaccine in mass tests last year proved its ability to prevent up to 90 per cent of cases of paralytic polio.

But since then it has been improved, and this new 1955 model vaccine is the one which the public will begin to get very soon, perhaps within a few days' time.

THIS VACCINE is far better than the vaccine tested last year, and it theoretically can prevent paralytic polio 100 per cent, declared Dr. Jonas Salk, brilliant young Pittsburgh scientist who developed it.

Children would get only two shots of this newer vaccine—spaced two to four weeks apart—if Dr. Salk's recommendations are followed. They would get a third shot no earlier than seven months after that.

Dr. Salk finds this spacing best pulls the trigger of the body's gun mechanism, flooding billions of protective antibodies into the bloodstream. It is these antibodies which build a wall between children and paralytic polio.

"Grave consideration will be given" to Dr. Salk's two-shot recommendation, said Dr. Hart E. Van Riper, medical director of the National Foundation for Infantile Paralysis. The present plan is three shots, given within five weeks time.

THE SOARING, historic news that the Salk vaccine works was announced, after long months of secret research, by Dr. Thomas Francis Jr., University of Michigan epidermologist, who headed the task of determining its effectiveness.

Children, kept living and well, tell the full import of his story:

Only 71 children were paralyzed by polio last summer, out of the 440,000 vaccinated.

But 445 children were paralyzed among the 1,400,000 surveyed who didn't receive vaccine.

A total of only 113 youngsters were stricken by polio—paralytic and non-paralytic types—among all those vaccinated.

But a total of 730 were felled by polio among the non-vaccinated.

None died among the children who took the full series of shots.

But 15 died among those not vaccinated.

There was one death from polio in a child—not named—who had taken only two shots and had a tonsillectomy during

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Full text of "Thrilled by Salk Success, Indiana's Doctors Act to Immunize 270,000" (page two; *Indianapolis Star*, Wednesday morning, April 13, 1955)

(Courtesy, *Indianapolis Star*)

Salk Report Dooms Polio

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an epidemic of polio in his community.

BROTHERS AND SISTERS were spared when polio virus indiddiscriminately struck down one member of a family. Only one of 233 vaccinated children developed polio from contact within the family. But eight out of 244 getting the dummy shots, picked up the nerve destroying virus this way.

The vaccine reportedly is incredibly safe and amazingly free from the kick of reactions which always affect some people no matter what the drug is.

These items in the report bore that out:

Just 931 slight reactions among the vaccinated children.

Only 939 slight reactions among some 210,000 who received the dummy shots of a completely inert watery material which was harmless.

Just nine major reactions—a "not clearly attributed to the inoculations"—among the vaccinated ones.

But 13 major reactions among those getting the dummy shots.

Absolutely no evidence that the vaccine itself caused any infection.

ABSOLUTELY NO evidence that paralysis—in the few cases when it did come—tended to localize in the left arm which received the inoculations.

The most striking protection came against bulbar type polio, one of the very worst.

Definite evidence was found that the vaccination often made the disease less severe, with less residual or remaining paralysis.

And evidence also was found that antibodies created by the vaccine persisted for at least four to five months after the three shots had been given. The vaccinated children might still be immune.

On this point, Dr. Salk believes that the longer spacing between shots will extend the immunity indefinitely, perhaps for years.

Indeed, he thinks, the triggering set up by the vaccine shots can make a child so "sensitive" he will begin pouring out antibodies whenever the virus invades his body.

DR. SALK ALSO recommended that children vaccinated in the 1954 tests get another shot as a "booster" to shoot up their protection.

Only time will tell how long the immunity actually lasts.

The quiet-mannered, self-possessed, young scientist—whose three sons were among the first children ever to get the vaccine—was accorded a standing ovation by 500 distinguished scientists and physicians, gathered in the floodlighted auditorium of a University of Michigan building.

Even as the dramatic "it works" news of the Francis report was flashed out—from a bedlam of a press room—preparations had been made to start vaccinations quickly, broadly.

Enough vaccine is expected for 30,000,000 children this year.

If Dr. Salk's two-shot plan is followed, this amount could cover nearly 45,000,000 youngsters.

The national foundation will supply, free of charge, enough to give a three-shot series to 9,000,000 first and second-grade school youngsters, plus some in the third grade who participated in the tests last year.

Doctors probably will have enough for 21,000,000 children and for pregnant women who are especially susceptible to polio.

It would be up to medical societies, or individual doctors, to decide whether to give the two-spaced shots or three bunched together. No word was available whether this would be done.

VACCINE SOLD commercially is expected to cost from $4.20 to $6 for the three-shot course. Doctors' fees for giving it would be additional.

A plea for adults not to storm doctors' offices to get the vaccine for themselves came from Dr. Dwight H. Murray, Napa, Cal., chairman of the American Medical Association's board of trustees.

"Give the children priority," he declared. While private physicians have to buy vaccine, "there is no reason why any patient has to be denied the vaccine for financial reasons," he said.

Dr. Salk told a news conference that vaccinations could be given during the summer when polio usually is raging. Giving the shots "would do more good" than not doing it if the vaccine is available, and if a child does not have any fever at the time.

Results of the great voluntary mass testing last year might have been even more heartening except for a few facts, he said.

One was that different batches of the vaccine varied in potency due to differences in the way they were prepared. This can be avoided now by better standardization of the vaccine.

FURTHERMORE, in some lots the virus, already killed for safety, was practically "fried" by a preservative and lost ability to stimulate as many antibodies.

Another, he thinks, was the six-weeks spacing of all three shots, which gave less chance for development of antibodies.

Dr. Francis' careful detailed report showed the vaccine varied in the percentage of protection afforded among different groups or in different areas.

Overall, the degree of protection was about 80 to 90 per cent, he said.

This was the degree of protection in areas where some children received the vaccine, while others received dummy shots, with only a secret code to show later, which was which. Evaluation center officials said the code was kept secret in order to prevent anyone from becoming prejudiced or biased so as to affect the judgement or accuracy of the results.

IN OTHER AREAS, only children in second grades got the vaccine, while first and third graders were simply checked for comparison.

In that kind of test, effectiveness of the vaccine ranged from 60 to 80 per cent, Dr. Francis said. But he said the tests where dummy shots were used was a better gauge, because the children in that phase of the test were more identical in age and other chargeteristics.

The vaccine varied in its power to protect against the three different types of polio virus which can cause human paralysis.

In the vaccine-plus-dummy shot areas, it was 68 per cent effective against Type I virus. It was 100 per cent effective against Type II virus and 92 per cent effective against Type III.

The Type 1 virus usually is much more prevalent than either of the other two. Despite this, Dr. Francis gave the overall 80 to 90 per cent figure for protection against paralytic polio.

OPTIMISM that the vaccine can eradicate polio was voiced by Dr. David Bodian, well-known polio researcher of the Johns Hopkins University. He said the answer cannot be absolutely that it will, but that laboratory experiments indicate that eradication may occur even before universal vaccination of the population. This would be true if the vaccine tends to eliminate virus carriers as well as paralytic cases.

The tests included some children in Canada and Finland, and the vaccine also showed some significant effect in reducing polio there, Dr. Francis said.

The National Foundation reported that the test areas chosen turned out to be fortunate from the viewpoint that there was a higher attack rate from polio in those states and counties generally this year than in the average of previous years.

The announcement of impending victory does not mean that research will stop. It will continue, to find the most perfect vaccine.

And research must continue to aid the thousands of past victims, crippled by the destroyer.

"They," said Dr. Alan Gregg, vice-president of the Rockefeller Foundation of New York, "will understand more deeply than any of us the privilege of all those who in the future will be protected from paralysis in the future. . . . Such selfless rejoicing by the afflicted gives the rest of us something to think over."

A newsman asked a question and Dr. Jonas E. Salk smiled after Dr. Thomas Francis Jr. (right), University of Michigan scientist, read The Salk vaccine report to a group of scientists at the University of Michigan at Ann Arbor yesterday. Between the doctors is Basil O'Connor, president of the National Foundation for Infantile Paralysis. (AP Wirephoto).

Indiana Acts

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ax of Monday when a new shipment of laboratory monkeys is due to arrive, an official said.

Dr. Wendell C. Anderson, director of the State Health Department's division of chronic illness, said that distributies of the Salk vaccine to various county medical societies will begin as soon as shipments are received.

All but two counties in Indiana have indicated they are set up for the mass inoculations. Jackson County is expected to report readiness soon.

NO OFFICIAL word had been received from physicians in Shelby County early last night.

Madison County doctors, who earlier balked at administering the vaccine free, last night reconsidered their action and decided to participate in the mass immunization program.

Their decision came after they were informed there would be no polio vaccine available to private physicians for an indefinite period because of foundation requirements.

THE CLAY COUNTY Medical Society announced it will give the shots to every Clay County resident who wants them. All profits will go to the Clay County Hospital Building Fund.

Getting under way April 23, Clay County medical volunteers will immunize families at a cost of $10 for two persons for each of three shots; $9 for three persons; $8 for four persons, and $7 for a family of five or more.

However, other counties participating in the program will furnish the service free of charge, using vaccine furnished free by the national polio foundation.

Timing of the shot, it appeared likely last night, will be changed so that the third shot will be given after a period of seven months. This was recommended last night by Dr. Salk.

ORIGINALLY, it was intended to wait one week after the first shot and four weeks after the third inoculation. But Dr. Salk said the third shot would be much more effective as a "booster" by waiting for seven months to a year.

Dr. Henry G. Nester, chairman of the Marion County Polio Immunization Committee, said everything is in readiness for launching the program next Monday.

Letters will go out to the 250 volunteer physicians, giving them their assignments at the various 35 inoculation centers.

Dr. William H. Norman, president of the Indianapolis Medical Society, is scheduled to administer the first Salk vaccination at Public School 2.

Polio Questions, Answers

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group (birth to 19). By next year there should be enough for everyone.

Q. How many people can be vaccinated with the supply on hand now?

A. At least 18,000,000, with the possibility that new improvements in the vaccine "sparing" will permit many more millions to receive the shots.

Q. What are the chances of a black market?

A. It can be prevented by your local health society—if you co-operate by approaching only reputable physicians. Supplies will be ample for normal, orderly distribution.

Q. Will anyone get special consideration?

A. Those children who participated in last year's field trial. It also is planned to give special consideration to pregnant women and infants between 6 and 18 months of age.

Q. Will the Salk vaccine give lifetime immunity?

A. No one knows for sure but as new knowledge of its action becomes known improvements in its length of effectiveness can be made.

Q. What are the most susceptible polio age groups?

A. Between infancy and 19 years of age. It should be noted, however, that the "age incidence" has been increasing rapidly in the last 50 years, that is, the age of persons afflicted has gone up. Infantile paralysis is now a misnomer.

Q. Will there be any vaccine for adults other than pregnant women?

A. At first, no. In time there will be enough for everyone who wants or needs shots.

Q. Exactly what is the Salk vaccine?

A. The Salk vaccine contains viruses of all three types of paralytic polio. This virus has been "killed" by chemical treatment to render its polio causing qualities inactive. The vaccine was named for its director, 40-year-old Dr. Jonas E. Salk, of the University of Pittsburgh.

Q. How is it made?

A. The viruses are grown in monkey kidney tissue cultures and "feed" with a nutrient mixture. Using this method sufficient quantities are produced to manufacture a vaccine. The vaccine is then treated with the chemical formalin to insure safety. It is pre-tested on monkeys before any children are given shots.

Q. How does the vaccine work?

A. It works on the principle of giving a mild infection in order to stimulate the cells to produce disease-fighting antibodies. A high level of antibodies should insure immunity in most people.

Q. What are polio's effects? Is it always paralyzing?

A. All of us are exposed to it. Most of us get the non-paralytic kind without ever knowing it. In a very few cases polio virus overruns the outnumbered antibodies and reaches the central nervous system. The brain is attacked by these paralytical viruses and crippling almost always results.

Q. Whom should I consult for further information?

A. Your family doctor.

Q. What should I do if polio hits my family this year?

A. Notify your family doctor, the local chapter of the National Foundation for Infantile Paralysis or your local public health authorities.

Graham Calls Glasgow 'Most Prayed For City'

Glasgow, Scotland (INS)—Evangelist Billy Graham told a huge audience in Kelvin Hall last night that Glasgow is "the most prayed for city in the world."

"You are the most prayed for people in the history of the Christian Church," he added.

"If a revival doesn't take place now," Graham said, "I don't know whether it will ever take place or not."

Last night's meeting brought total attendance during Graham's tour of Scotland to 367,490 persons. The total answering the evangelist's call to God rose to 8,835 last night with 423 persons making the "decision."

Student Worksheet: "Thrilled by Salk Success, Indiana's Doctors Act to Immunize 270,000"

***Indianapolis Star*, Wednesday Morning, April 13, 1955**

1) According to the article, how many children, out of all those vaccinated in the field trials, "were stricken by polio" (both paralytic and non paralytic)?

2) According to the article, how many children, out of all those *not* vaccinated in the field trials, contracted polio (both paralytic and non paralytic)?

3) Is the answer for question one greater than, less than or equal to the answer for question two? Write this relationship using one of the following symbols: >, <, or =.

4) If 440,000 children were vaccinated in the field trials, what is the percentage of those vaccinated who were stricken by polio (both paralytic and non paralytic)? (Hint: The answer will be your answer to question number one divided by 440,000).

5) Do you think that the evidence given in the newspaper article shows that the vaccine works? Why or why not?

6) A section of this article is devoted to "Polio Questions, Answers." In this section, one question is devoted to describing how the Salk vaccine is made. According to the answer to this question, the poliovirus is grown in what kind of tissue cultures?

7) The viruses grown in the lab are then used to create the vaccine. What tests or steps are used to make sure the vaccine is safe before giving it to children?

8) Another question addresses how the vaccine works. Summarize the answer given in the article to describe in your own words how the vaccine works to prevent people from contracting polio.

9) If you were a child in 1955, would you have any worries about being vaccinated with a vaccine that contained poliovirus, even if it had been killed? Why or why not?