

Childhood Immunization: What You Need to Know



**A handbook
for health workers and parents**



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Adapting this Booklet for Your Program

This booklet originally was published as “Plain Talk About Childhood Immunizations” by Public Health - Seattle & King County¹ and the Snohomish Health District. With their permission, the Children’s Vaccine Program at PATH has revised the original “Plain Talk” to create this version for health workers and parents in Africa and Asia.

You may wish to use this booklet as it is in your program. But you may also wish to adapt it to more effectively meet your needs. We encourage you to do so!

Adaptation Ideas

- Translate the booklet into a local language. Add more pictures. Add examples from your country.
- Insert your national vaccination schedule into that section of the book.
- Delete or adapt sections that discuss diseases or vaccines not found in your country.
- Delete or adapt sections that are of lower priority for your program (for example, you might choose not to include the sections on adolescent immunization or vaccine safety even though these are high priority topics in other countries).
- If you are adapting the booklet for health workers, consider adding information on how to give the specific vaccines used in your program and how to safely dispose of used needles, syringes, and other contaminated medical waste.

To make adaptation easier, a word processor version of this booklet is available from the Children’s Vaccine Program at PATH:

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Why should we immunize our children?

Immunizations Save Lives

Immunization is one of the greatest medical success stories in human history. Worldwide, childhood immunization saves about three million lives each year. However, nearly three million additional lives could be saved if all children received all the vaccines they need (see chart below).

Many serious childhood diseases are preventable by using vaccines routinely recommended for children. In countries where most children are vaccinated, rates of diseases such as polio, measles, mumps, rubella, diphtheria, pertussis (whooping cough), and meningitis caused by *haemophilus influenzae* type B have declined by 95 to 100%.

Without immunization, there is nothing to stop these diseases from sickening and even killing many infants and children. And many of the children who survive could suffer from chronic health problems for the rest of their lives.

Deaths Which Might be Prevented Through Immunization²

Disease	Deaths in Africa (per year)	Deaths in Asia (per year)
Measles	514,000	258,000
Diphtheria	1,000	3,000
Tetanus	91,000	220,000
Pertussis (Whooping Cough)	133,000	107,000
Polio	1,000	1,000
Tuberculosis	357,000	1,082,000
Hepatitis B-related liver disease	150,000	(no estimate available)
TOTAL	1,247,000	1,671,000

² All African and Asian mortality figures are from the World Health Organization's *World Health Report 2000*.

Immunizations Prevent the Spread of Disease

Diseases spread through communities by infecting unimmunized people as well as the small percentage of people for whom immunizations do not work. Individuals who are unimmunized increase the risk that they, and others in their community, will get the diseases vaccines can prevent. For some highly contagious diseases, such as measles, even a small number of unimmunized or underimmunized people can lead to an outbreak.

The biggest cause of the 1989-1991 measles epidemic in the United States was failure to vaccinate children between 12-18 months of age on time. This measles epidemic was responsible for 55,000 cases and more than 120 deaths. Nearly half of those deaths were in children under age 5, most of whom had not been immunized.

Immunizations are Safe

Immunizations are extremely safe and getting safer and more effective all the time as a result of medical research and ongoing review by doctors, researchers, and public health officials. Immunizations are given to keep healthy people well, so they are held to the highest safety standards.

The number of recommended immunizations has increased because we are now able to safely protect children from more serious diseases than ever before.

Immunizations Are Strong Protection

Immunization is the single most important way parents can protect their children against serious diseases. Children who have not been immunized are at far greater risk of becoming infected with serious diseases. For example, a recent study showed that children who had not received the measles vaccine were 35 times more likely to get the disease.

Immunizations work by naturally using the power of the body's own immune system to battle against diseases.

There are no effective alternatives to immunization for protection against serious and sometimes deadly infectious diseases. While breastfeeding can help to prevent some diseases among babies, it is not effective in protecting against many serious, vaccine-preventable diseases.

Immunizations Save Money

Every dollar spent on vaccine saves seven dollars in medical costs and 25 dollars in overall costs related to vaccine-preventable diseases.

The estimated direct medical cost of the 1989-1991 measles outbreak in the U.S. was over \$150 million. This does not include the indirect costs to the family, such as lost days of work, school and child care. Those costs would have been saved if more children had been protected against measles.

And, Did You Know. . . .

- Even if a disease is not currently present in a community, the bacteria and viruses that cause it have not gone away. Disease outbreaks can and do occur in communities that are not protected by immunization.
- Many of the diseases that vaccines prevent cannot be effectively treated or cured.
- Infants are often more vulnerable to disease because their immune systems cannot easily fight off disease bacteria or virus. Often, the effects of disease are more serious in infants than in older children.

The Facts About Vaccine-Preventable Diseases

For information about the vaccines that prevent these diseases, see page 13.

Measles

Measles causes a high fever, rash, and cold-like symptoms. It can lead to hearing loss, pneumonia, brain damage, and even death. Measles spreads from person to person very easily, through coughing, sneezing, or just talking. It spreads so easily that a child who has not been immunized will most likely get the disease if exposed to it. In fact, the measles virus can remain in the air (and be contagious) for up to two hours after a person with the disease has left the room.

Measles kills approximately 514,000 children each year in Africa and 258,000 children each year in Asia!³

Diphtheria, Tetanus and Pertussis

Diphtheria, easily spread through coughing or sneezing, can cause paralysis, breathing and heart problems, and death.

Diphtheria kills approximately 1,000 children each year in Africa and 3,000 children each year in Asia.

Tetanus (Lockjaw) occurs when a tetanus germ enters a cut or wound, or even while cutting a baby's umbilical cord after birth. Tetanus can cause muscle spasms, breathing and heart problems, and death.

Tetanus kills approximately 91,000 children each year in Africa and 220,000 children each year in Asia.

Pertussis (Whooping Cough), spread through coughing or sneezing, causes very long spells of coughing that make it hard for a child to eat, drink, or even breathe. Pertussis can cause lung problems, seizures, brain damage, and death.

Pertussis kills approximately 133,000 children each year in Africa and 107,000 children each year in Asia.

³ All African and Asian mortality figures are from the World Health Organization's *World Health Report 2000*.

Polio

Polio causes fever and may progress to meningitis (inflammation of the lining of the brain) and/or lifelong paralysis. Polio can be fatal. Persons infected with the polio virus can infect others.

Polio kills approximately 1,000 children each year in Africa and 1,000 children each year in Asia.

Tuberculosis (TB)

Tuberculosis (TB) spreads through the air. When someone's immune system is weakened, the chances of getting sick are greater. It usually attacks the lungs, but other parts of the body, including the bones, joints, and brain, also can be affected.

Tuberculosis kills approximately 357,000 children each year in Africa and 1,082,000 children each year in Asia.

Hepatitis B

Hepatitis B is an infection of the liver. It can be passed from an infected mother to her newborn during childbirth and from one person to another through blood or body fluids or by intimate contact. The hepatitis B virus can cause liver damage, liver cancer, and death. It is second only to tobacco in causing human cancer.

It is difficult to determine how many people in Africa and Asia die from liver disease caused by hepatitis B, though the World Health Organization estimates that about 900,000 people die from the disease each year worldwide, with approximately 150,000 deaths in Africa.

Haemophilus Influenzae Type B (Hib)

Hib disease can cause pneumonia; meningitis (inflammation of the lining of the brain); infections of the joints, skin, and blood; brain damage, and death. It is most serious in infants under one year of age.

It is difficult to determine how many children in Africa and Asia die from Hib disease. The World Health Organization estimates that about 400,000 children die from the disease each year worldwide.

Meningococcal Meningitis

Meningococcal meningitis, spread through coughing or sneezing, causes intense headache, fever, nausea, vomiting, sensitivity to light, stiff neck, lethargy, delirium, coma and/or convulsions. Meningitis is an inflammation of the lining of the brain.

Meningococcal meningitis kills approximately 50,000 people worldwide each year, most of them in Africa.

Japanese Encephalitis

Japanese encephalitis (JE) is spread by mosquitoes. JE causes a flu-like illness with sudden onset of fever, chills, headache, tiredness, nausea, and vomiting. It then progresses to encephalitis (infection of the brain), frequently resulting in death or disability.

JE kills approximately 10,000 children each year in Asia.

Yellow Fever

Yellow fever is transmitted by mosquitoes and can cause jaundice; high fever; general muscle pain; backache; shivers; headache; loss of appetite; nausea; vomiting; shock; bleeding from the mouth, nose, eyes, and/or stomach; and kidney and liver failure.

Yellow fever kills approximately 30,000 people worldwide each year, most of them in Africa.

Mumps

Mumps can cause headache, fever, swelling of the glands of the jaw and neck, and swelling of the testicles in adolescents and adults. It can lead to hearing loss, male sterility, meningitis, (inflammation of the lining of the brain) and brain damage. Mumps spreads from person to person very easily, through coughing, sneezing, or just talking.

Rubella

Rubella (German Measles) causes a slight fever and a rash on the face and neck. Pregnant women who get rubella can lose their babies, or have babies with severe birth defects (known as congenital rubella syndrome). Like measles and mumps, rubella spreads from person to person very easily, through coughing, sneezing, or just talking.

Chickenpox (Varicella)

Chickenpox is a very contagious disease causing rash and fever. It is spread by coughing and sneezing or direct contact with drainage from the rash. Among children, a common complication is bacterial infection of the skin lesions. Varicella can lead to serious complications such as inflammation of the brain and pneumonia, and rarely, “flesh-eating” bacterial infection or death. Varicella is more serious in adults and persons with impaired immune systems. If a woman has this disease while pregnant, it can cause birth defects and infant death.

Hepatitis A

Hepatitis A is an infection of the liver, but is different than hepatitis B. Hepatitis A usually is spread by close personal contact and sometimes by eating food or drinking water containing the virus. A person with hepatitis A can easily pass the disease to others within the same household.

Influenza (Flu)

Influenza is a contagious viral disease that may cause a sudden onset of fever, chills, muscle aches, cough, sore throat, and headache, and may lead to severe pneumonia. Flu is spread through sneezing, coughing, or direct contact with the infected individual. Children and family members with certain long-term health problems, such as asthma or diabetes, are especially at risk for serious complications from the flu. Such complications include pneumonia, dehydration, meningitis, and even death. Influenza is a major cause of death among elderly persons.

Pneumococcal Disease

Pneumococcal disease can lead to serious infections of the lungs (pneumonia), the blood, and the lining of the brain (meningitis). The disease is spread through sneezing, coughing, or direct oral contact with an infected individual.

Vaccination Schedules

Vaccination schedules differ from country to country. Ask your health care provider about the recommended schedule in your country.

The Immune System and How Vaccines Work

The immune system is the defense mechanism in each person that helps the body fight disease. Medical science has found an effective way to help the immune system fight disease through the use of vaccines.

- When you get an infection, your body reacts by producing substances called antibodies. These antibodies fight the invading germ (antigen) or disease and help you get over the illness. The antibodies usually stay in your system, even after the disease is gone, and protect you from getting the same disease again. This is called immunity.
- Newborn babies often have immunity to some diseases because they have antibodies from their mothers (known as maternal antibodies). But this immunity is only temporary.
- We can keep children immune to many diseases, even after they lose their mothers' antibodies, by immunizing them. The germs (virus, bacteria) that cause disease are weakened and then used to make the vaccines. These vaccines can be given to children as shots or as drops to be swallowed.
- Vaccines make the body think it is being invaded by a specific disease, and the body reacts by producing antibodies. Then, the child is protected if exposed to the disease in the future.
- Some vaccines consist of weakened disease virus. These vaccines (measles vaccine, for example) are extremely effective. Some vaccines are inactivated (killed) and require multiple doses to build up the immune response - for example, IPV (inactivated polio vaccine). Some inactivated vaccines require booster doses throughout life.

QUESTION: Do vaccines decrease the immune system's natural ability to fight disease?

ANSWER: No. A vaccine produces an immune response that is very specific to the organism or antigen which produced it. For example, the antibodies produced in response to measles virus have no effect on the body's ability to respond to another illness, such as pertussis.

The immune system is constantly working to protect us from bacteria and viruses in our environment. Immunizations strengthen our immune defenses against a specific infection. Immunizations do not interfere with our ability to fight off other infections that we are not immunized against.

QUESTION: I heard that the less you “bombard” the immune system at one time, the better, so you would not give several vaccines on the same day. Is this true?

ANSWER: No. A child's body is not harmed by receiving more than one childhood immunization at the same time. While there is clearly much more to learn about the immune system, some things we do know. Scientific data show that giving a child several vaccines at the same time has no adverse effect on a normal immune system.

The immune system is an extremely capable system. It can manage and respond to literally millions of antigens (foreign substances) at the same time. Take for example, walking outside on a spring day with flowers and trees in bloom. Through your mouth, nose, and lungs, your immune system will constantly respond to multiple antigens (like pollen and dust) as it does its work in your bloodstream. In the same way, in daily interactions, you may be exposed to multiple cold viruses and your body will respond successfully. But some infections can cause severe illness and death even in persons with healthy immune systems. We can help the immune system ward off the serious infectious diseases that immunizations can prevent.

QUESTION: Is the method of injecting vaccines harmful for the body?

ANSWER: No. Injecting the vaccines is a safe method that has been used for decades. Just as injecting infection-fighting antibiotics for illness is safe, so is injecting vaccines. Vaccines are not injected directly into the bloodstream. As long as the syringe and needle used for an immunization are sterile and are only used once and then thrown away, there is no possibility for the spread of infection by getting immunized.

Some vaccines are given by mouth, while others, which may soon be available, are given in other ways (such as by being sprayed into the nose). The method used to administer vaccine, whether it be by injection or another route, is thoroughly tested for safety and effectiveness before it is used in the general population.

It is very important that each needle and syringe only be used one time, then either thrown away or carefully sterilized before the next injection.

QUESTION: I have heard that some people get diseases that they have been vaccinated against. How could this be true?

ANSWER: Modern vaccines are extremely effective, but are not perfect. For example, when we say that a vaccine is 90% effective, it means that one in every ten people who is vaccinated is not protected from the disease. Should disease affect a community, those that are unprotected are likely to be infected - which includes those who were not vaccinated and the 10% of people who were vaccinated but in whom the vaccine didn't work. Because most diseases that vaccines prevent are transmitted from person to person, the more people in a community who are immunized, the less the likelihood that disease will be transmitted and "find" the few who are unprotected.

Most vaccines require more than one dose to reach maximum immunity. Some, like tetanus and diphtheria, require booster doses throughout life to continue the immunity.

QUESTION: I heard that because of better hygiene and sanitation, vaccine-preventable diseases began to disappear before vaccines were introduced. Is this true?

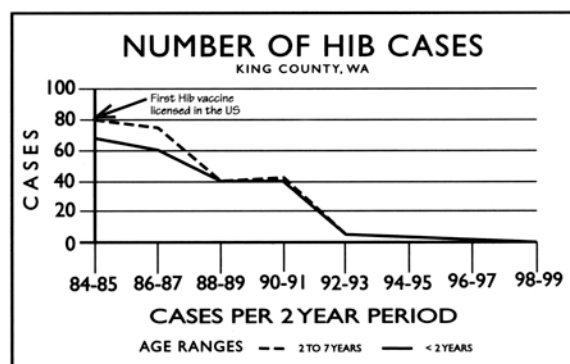
ANSWER: Yes. Many infectious diseases became less common as living conditions and hygiene improved; however, they remained serious threats due to periodic outbreaks in vulnerable populations. Combating diseases often takes a combined approach. Several factors have helped the work of vaccines, including:

- Better nutrition
- Less crowded living conditions and better sanitation
- More effective antibiotics and other treatments

In spite of these advances, vaccine-preventable disease outbreaks still occur because of lack of immunization or incomplete immunization. Diseases like measles and pertussis are highly contagious, regardless of hygiene and living conditions.

Immunizations have led to a dramatic decrease in serious childhood infections, such as Hib disease, that could not have been accomplished through improvement in sanitary conditions alone.

The chart below shows what happened after Hib vaccine became available in the United States.



As you can see, the Hib vaccine was directly responsible for decreasing the incidence of Hib disease and Hib meningitis. Once the leading cause of death among young children, Hib disease has dropped more than 95% in the last five years in the U.S. Since sanitation has not improved that much in the United States since the early 1990s, sanitation alone cannot account for the dramatic drop in Hib disease.

To Wait or Not to Wait

Parents frequently ask why immunizations are given so early in life. You may wonder if you can wait until your child enters school to get the required immunizations. You may also wonder about the risk if your child does not receive all recommended immunizations.

QUESTION: Is it okay to wait until my child is getting ready to start school to get all his or her immunizations?

ANSWER: No. Waiting to immunize until the child begins school, or even until after his or her first birthday, can put the child at unnecessary risk of getting serious diseases. Maternal antibodies fade during the first year, when the child is also more frequently exposed to other children and adults who may be infected with these diseases.

Many vaccine-preventable diseases are more severe and pose the greatest risk for complications in infants and very young children.

QUESTION: Can my child catch up if he or she is behind in immunizations?

ANSWER: Yes, but it is best to stay as close as possible to the recommended schedule.

An interruption in the schedule **does not** require a child to start the series over for any vaccines. However, until the entire vaccine series is received, the individual will not have the maximum protection against the disease. If a child is behind on the immunization schedule, a catch-up schedule can be determined by the child's doctor, nurse, or clinic.

QUESTION: Are immunizations okay even if my child has a minor illness?

ANSWER: Yes. Immunizations can be given and should be requested during any visit to your doctor or nurse, even if your child has a minor illness, such as mild fever, a cold, or diarrhea, or is taking antibiotics. The vaccine will still be effective and it will not make your child sicker. Receiving all immunizations when they are due is an important way to complete each vaccine series on time and avoid extra visits.

QUESTION: Are there times that vaccines should NOT be given?

ANSWER: Yes, sometimes there are medical reasons for not giving a vaccine or for delaying it. These are referred to as “contraindications” and “precautions.” In general, a child should not receive an immunization if he or she:

- Has a medical condition that could be made more severe or even life threatening if the vaccine were given. Example: A child has a severe allergy to a vaccine component (e.g., neomycin, gelatin) that would cause a serious reaction, such as difficulty breathing, low blood pressure, or shock, if the vaccine were given.
- Has a medical condition, which could reduce the ability of the vaccine to produce the desired immunity (such as severe illness). Example: A child has recently received blood products (such as immune globulin, or a blood transfusion), and the antibodies in the blood could damage a live vaccine, such as a measles vaccine.

In most instances, vaccines may be given if a child is breastfed, has an ear infection, is taking antibiotics, has mild diarrhea, or has milk allergy.

Check with your health care provider if you have specific questions regarding these or other circumstances.

Questions and Answers about Specific Vaccines

(see also *Compare the Risks* section)

Measles Vaccine

Measles vaccine is given alone in many countries, but sometimes it is combined with vaccines protecting against mumps and rubella (German measles). The combined vaccines are called MR (measles + rubella) or MMR (measles + mumps + rubella) vaccine (see page 20).

QUESTION: Is measles really a dangerous disease?

ANSWER: Yes! The World Health Organization estimates that approximately 900,000 people die from measles every year worldwide.⁴

Diphtheria, Tetanus, and Pertussis (DTP) Vaccine

QUESTION: What are the side effects of the DTP vaccine?

ANSWER: Some children who receive the DTP vaccine may experience soreness, swelling, and redness at the site of the injection, low fever, fussiness, drowsiness, or loss of appetite. Usually these reactions last from one to two days. Serious side effects are rare.

QUESTION: How effective is the DTP vaccine and is it worth getting?

ANSWER: Approximately 95 out of 100 children will be protected from diphtheria and virtually all children will be protected from tetanus after the full DTP series is given. A full series of vaccinations protects approximately 80 children out of 100 from getting severe pertussis. Even children vaccinated with DTP who do become ill with pertussis almost always have a milder illness than if they had not been vaccinated.

It is important to protect children with DTP vaccine because:

- Children, especially young infants, who catch pertussis, often become critically ill.
- Because it is so contagious, the possibility of a child getting severe pertussis when exposed is far greater than the chances of experiencing a severe adverse reaction from the vaccine.
- Insufficiently immunized children contribute to higher rates of pertussis disease in some communities.

⁴ All African and Asian mortality figures are from the World Health Organization's *World Health Report 2000*.

- Most individuals who have had a full series of DTP vaccine are protected from diphtheria, tetanus, and severe pertussis for many years.

QUESTION: What is the difference between “whole-cell” DTP vaccine and acellular DTaP vaccine?

ANSWER: Whole-cell pertussis vaccine has been used for decades and is still recommended by WHO. A new vaccine, acellular pertussis, has been available since 1997. It is called DTaP instead of DTP and contains only the specific parts of the pertussis bacteria thought to be important for immunity. It differs from “whole-cell” vaccines that contain whole, killed pertussis organisms. The acellular vaccine has a lower incidence of redness and swelling after immunization, but whole cell vaccines provide higher levels of protection against the disease.

Polio Vaccine

QUESTION: Is it still worth being immunized against polio?

ANSWER: Yes! Although wild polio disease has been eliminated from many countries, it still exists in others, and unprotected children could be infected. When the virus is eradicated worldwide, we will be able to stop using polio vaccine. However, as long as polio exists in the world, our children need protection.

QUESTION: Are there different types of polio vaccines?

ANSWER: Yes. They are the live, oral polio vaccine (OPV) and the inactivated polio vaccine (IPV). OPV is the vaccine of choice of routine immunization in most countries. Some countries, like the United States, use the newer IPV.

Hepatitis B Vaccine

QUESTION: I know that hepatitis B causes liver disease, which mainly kills adults. Why do we give hepatitis B vaccine to infants?

ANSWER: Even though hepatitis B mainly kills teenagers and adults, usually those people were infected as infants. That is why the World Health Organization and many national governments recommend immunizing **all infants** against hepatitis B. The earlier in life a child is exposed to hepatitis B, the more likely he or she will become a chronic (lifelong) carrier able to infect other people. Chronic carriers also are more likely to develop serious liver problems, such as liver cancer, later in life. Because it helps prevent liver cancer, hepatitis B is the world’s first anti-cancer vaccine.

There is no specific treatment for acute hepatitis B.

QUESTION: Can hepatitis B vaccine be given along with other vaccines?

ANSWER: Yes. Hepatitis B vaccine is often given at the same time as other vaccines, either by a separate injection or in special combinations, such as hepatitis B + DTP vaccine or hepatitis B + DTP + Hib vaccine.

QUESTION: Does hepatitis B vaccine cause multiple sclerosis (MS) or SIDS (Sudden Infant Death Syndrome)?

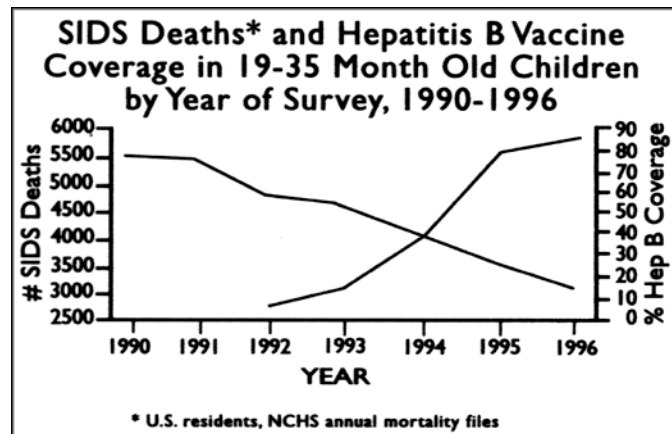
ANSWER: No. Analyses by the World Health Organization, the U.S. Institute of Medicine, and the Medical Advisory Board of the U.S. National Multiple Sclerosis Society conclude that there is no evidence that the hepatitis B vaccine causes MS or other neurological diseases.

MS is an autoimmune disorder in which a person's antibodies attack the body's own myelin (a covering on the nerves). MS is a life-long illness which fluctuates through periods of exacerbation (symptoms worsen) and remission (symptoms subside). The cause of MS is unknown, but the most widely held belief among medical experts is that patients are genetically at risk for the disease and some environmental factors can “trigger” disease exacerbation.

There is no evidence that hepatitis B vaccine increases the rate of MS in otherwise healthy individuals. In addition, a study by the French National Drug Surveillance Committee revealed that recipients of over 60 million doses of hepatitis B vaccine given between 1989 and 1997 were less likely to have neurological disease, including MS, than the general population. Hundreds of millions of persons worldwide have been immunized with the hepatitis B vaccine without developing MS or any other autoimmune disease. The National Multiple Sclerosis Society supports the wide and general use of hepatitis B vaccine.

There have been reports of exacerbation of MS following immunization in persons who already have MS. Although these cases may be purely coincidental, carefully controlled studies are currently underway to determine the nature of these reports.

Since 1991, infants in the United States have been receiving hepatitis B vaccine starting as early as the first day of life. If SIDS were somehow related to hepatitis B vaccination, we would expect to see an increase in SIDS deaths since 1991. However, this is not the case. In fact, there has been a steady decrease in the numbers of newborn deaths as the number of hepatitis B vaccinations has increased (see graph below).



Almost all infants are vaccinated during the first year of life. Because vaccines are usually given at the age of 2, 4, and 6 months, there is always a chance that ill health or death could occur within 24 hours of vaccination by coincidence alone. But to say that the vaccine causes all those health problems would be like saying that eating bread causes car crashes because most car drivers who are in accidents have eaten bread within the past 24 hours.

The U.S. Institute of Medicine reports: “All controlled studies that have compared immunized versus non-immunized children have found either no association . . . or a decreased risk . . . of SIDS among immunized children.”

Measles, Mumps and Rubella (MMR) Vaccine

The combination measles, mumps, and rubella vaccine is called MMR.

QUESTION: Is there any evidence to indicate an association between the MMR vaccine and autism?

ANSWER: No. There is no evidence to suggest that the MMR vaccine increases the risk of developing autism or any other behavioral disorder. Experts agree that autism is most likely a genetic disorder that occurs before birth.⁵ A working group organized by the National Institutes of Health in 1995 reached a consensus that autism is genetic condition.

Typically, in the natural history of autism, symptoms of autism first appear in children from 18-30 months of age. MMR vaccine is usually given to children 12 to 15 months of age - around the time these symptoms usually develop in a child with this genetic disorder. Although autism may be detected during the weeks or months following MMR vaccination, this does not mean that the disorder was caused by the vaccine. According to the published results of a large study (*Lancet*, June 1999), there is no association between MMR vaccine and autism.

⁵ Priven J. The biological basis of autism, *Current Opinion in Neurobiology* 1997; 7:708-12. Rodier PM, Hyman SL. Early environmental factors in autism. *MRDD Research Reviews* 1998; 4:121-128.

Chicken Pox (Varicella)

QUESTION: Chickenpox isn't a very serious disease. Why vaccinate?

ANSWER: Although chicken pox is generally not a very severe disease, complications from varicella disease, such as pneumonia, encephalitis, “flesh-eating” bacterial infection, and death can occur in children and adults. Vaccinating against the illness during childhood will help reduce the incidence of the disease (and related complications) in later years. Varicella vaccine also reduces the risk of “shingles,” a painful nerve and skin disease caused by reactivation of the varicella virus later in life.

Varicella vaccine is recommended for:

- Children 12 months of age and older who have not had chickenpox
- Individuals over one year old (who have not had chickenpox) who will have close contact with persons at high risk for serious complications from the disease (such as those with weakened immune systems)
- Adolescents 11 to 12 years of age who have not been previously vaccinated and have not had the disease
- Adults at high risk of exposure to chickenpox (who have no prior history of having the disease), such as health care workers and teachers

QUESTION: Does immunity from the varicella vaccine last?

ANSWER: Data indicate that protection from varicella vaccine should last for at least 20 years. Experience with other live viral vaccines (like measles, mumps, and rubella vaccine) has shown that post-vaccination immunity remains high throughout life. Studies are ongoing to determine how long protection from varicella vaccine lasts and whether booster doses may be needed in the future. Even if an immunized individual develops chickenpox after being exposed to the disease, the illness will likely be much milder than if the person had never been vaccinated.

Pneumococcal Vaccine

QUESTION: What is pneumococcus? Is there a pneumococcal vaccine for infants?

ANSWER: Pneumococcus is a bacteria that can cause disease in any age group, but it most commonly affects children and the elderly. In children under two years of age, pneumococcus is the most common cause of pneumonia, meningitis, sepsis (bloodstream infection causing shock), sinusitis, and ear infection.

A new pneumococcal vaccine which can be used in children under two years of age is currently on the market.

Compare the Risks: Disease vs. Immunization

RISK OF <u>SERIOUS</u> COMPLICATIONS FROM THE DISEASE	RISK OF <u>SERIOUS</u> REACTION FROM IMMUNIZATION
<p style="text-align: center;">Measles:</p> <p>Measles kills approximately 514,000 children each year in Africa and 258,000 children each year in Asia.⁶</p> <p><i>Pneumonia:</i> 1 in 20</p> <p><i>Encephalitis</i> (brain fever): 1 in 2,000</p> <p><i>Thrombocytopenia:</i> 1 in 6,000</p> <p><i>Death:</i> 1 in 3,000</p>	<p style="text-align: center;">Measles Vaccine:</p> <p>Severe allergic reaction: less than 1 in 1,000,000</p>
<p style="text-align: center;">Diphtheria:</p> <p>Diphtheria kills approximately 1,000 children each year in Africa and 3,000 children each year in Asia.</p> <p><i>Death:</i> 1 in 10</p>	<p style="text-align: center;">DTP Vaccine – Diphtheria:</p> <p>No known association between diphtheria vaccine and serious adverse events.</p>
<p style="text-align: center;">Tetanus:</p> <p>Tetanus kills approximately 91,000 children each year in Africa and 220,000 children each year in Asia.</p> <p><i>Death:</i> 1 in 3</p>	<p style="text-align: center;">DTP Vaccine – Tetanus:</p> <p>Severe neuritis (inflammation of the nerves): 1 in 100,000</p> <p>Severe allergic reaction: 1 in 1 million</p>

⁶ All African and Asian mortality figures are from the World Health Organization's *World Health Report 2000*.

<p style="text-align: center;">Pertussis:</p> <p>Pertussis kills approximately 133,000 children each year in Africa and 107,000 children each year in Asia.</p> <p><i>Pneumonia:</i> 1 in 8</p> <p><i>Convulsions/seizures:</i> 1 in 100</p> <p><i>Death:</i> 1 in 500</p>	<p style="text-align: center;">DTP Vaccine – Pertussis:</p> <p>Fever greater than 104° F: fewer than 3 cases in 1,000 doses</p> <p>Prolonged crying for 3 hours or more: 2 or fewer cases in 100,000 doses</p> <p>Seizure within 48 hours of vaccinations: 4 or fewer cases in 10,000 doses</p> <p>NOTE: The Institute of Medicine concluded that there is no evidence that pertussis vaccine causes SIDS (Sudden Infant Death Syndrome)</p>
<p style="text-align: center;">Polio:</p> <p>Polio kills approximately 1,000 children each year in Africa and 1,000 children each year in Asia.</p> <p><i>Permanent paralysis:</i> 1 in 100</p> <p><i>Death:</i> 1 in 20 children and 1 in 4 adults with paralytic polio.</p>	<p style="text-align: center;">Oral Polio Vaccine:</p> <p>Permanent paralysis: 1 in 2.5 million doses</p> <p style="text-align: center;">Inactivated Polio Vaccine:</p> <p>No known associations between IPV and serious adverse events.</p>
<p style="text-align: center;">Hepatitis B:</p> <p>The World Health Organization estimates that about 900,000 people die from the disease each year worldwide.</p>	<p style="text-align: center;">Hepatitis B Vaccine:</p> <p>Severe allergic reaction: 1 in 600,000</p>
<p style="text-align: center;"><i>Haemophilus influenzae</i> type B (Hib):</p> <p>The World Health Organization estimates that about 400,000 children die from the disease each year worldwide.</p> <p>Before Hib vaccine, 1 in 200 children developed meningitis or other invasive Hib disease by the age of five.</p> <p>Before vaccine, Hib was the leading cause of bacterial meningitis.</p> <p>Sixty percent of cases occur in children younger than one year</p> <p>Death: 1 in 20 children with invasive Hib disease; many more due to Hib pneumonia</p> <p>Neurologic damage: up to 45 in 100 children with invasive Hib disease</p>	<p style="text-align: center;">Hib Vaccine:</p> <p>No known association between Hib vaccine and serious adverse events.</p>

RISK OF <u>SERIOUS</u> COMPLICATIONS FROM THE DISEASE	RISK OF <u>SERIOUS</u> REACTION FROM IMMUNIZATION
<p style="text-align: center;">Mumps:</p> <p>Cases: 200,000 per year before vaccine became available, currently 3,000-5,000 per year</p> <p><i>Encephalitis:</i> 1 in 300</p> <p><i>Testicular swelling:</i> 1 in 5 adults</p> <p><i>Deafness:</i> 1 in 20,000</p> <p><i>Death:</i> 1 in 3,000 to 1 in 10,000</p>	<p style="text-align: center;">MMR Vaccine – Mumps:</p> <p>Severe allergic reaction: less than 1 in 1,000,000</p>
<p style="text-align: center;">Rubella:</p> <p>1.2 million cases in 1964-65, including 2,100 infant deaths, 11,250 abortions, and 20,000 cases of nervous system disorders</p> <p><i>Arthritis</i> (usually temporary): 7 in 10 adults</p> <p><i>Thrombocytopenia:</i> 1 in 3,000</p> <p><i>Congenital Rubella Syndrome</i> (deafness, cataracts, mental retardation) in 1 in 4 infants if women infected in early pregnancy</p>	<p style="text-align: center;">MMR Vaccine – Rubella:</p> <p>Arthritis (usually temporary): Up to 1 in 4, usually teenage or adult women</p> <p>Severe allergic reactions: less than 1 in 1,000,000</p>
<p style="text-align: center;">Varicella (Chickenpox):</p> <p>50-100 deaths per year in the U.S., mostly in healthy children and adults</p> <p>Hospitalization: 3 in 1,000 cases</p> <p>Nine out of 10 people in a household who have not had chickenpox already will catch the virus if exposed to an infected household member.</p> <p>Disease is more severe and complications more frequent in adolescents and adults, and in those with weakened immune systems. Complications include:</p> <p>Bacterial infection of skin lesions and scarring</p> <p>Pneumonia</p> <p>Reactivation of varicella virus as herpes zoster (shingles) in later life</p>	<p style="text-align: center;">Varicella Vaccine:</p> <p>Seizure caused by fever: less than 1 in 1,000</p> <p>Pneumonia very rare.</p>

Vaccines for Adolescents: Shots Aren't Just Kids' Stuff

Although infant and child immunization programs have greatly decreased the occurrence of many childhood infections, vaccine-preventable diseases such as hepatitis A and B, measles and rubella continue to affect adolescents and young adults.

In order to protect adolescents and young adults from these serious vaccine-preventable diseases, many national health authorities recommend an **adolescent health visit** at 11 to 12 years of age. This visit will enable parents and their health care providers to discuss the recommended vaccines and decide which immunizations their child needs. An adolescent health visit, of which immunizations are a part, also helps to affirm that child's lifelong commitment to good health.

QUESTION: Which vaccines are recommended for my adolescent?

ANSWER: The recommended vaccines for adolescents are hepatitis B, MMR, tetanus/diphtheria, and possibly varicella (chickenpox). Contact your doctor, nurse, or clinic for information about scheduling your adolescent for these vaccinations.

Immunizations Recommended for Adolescents

- **Hepatitis B**
- **MMR** (measles/mumps/rubella) 2nd dose (if not previously given)
- **Td** (Tetanus/diphtheria) booster
- **Varicella** (if no prior immunization or history of the disease)
- **Hepatitis A** (for certain adolescents at high risk)

Vaccine Safety

Sometimes parents have concerns about vaccine safety. In licensing vaccines, national health and licensing authorities have developed scientific criteria for approving vaccines and for monitoring side effects once approval has been given.

Approval of Vaccines

The approval process for a biological product such as a vaccine is based on legal regulations and involves clinical trials in three phases.

- **Phase One:** Studies concerned primarily with learning more about the safety of the product with a few study volunteers.
- **Phase Two:** Studies are usually longer and involve more study volunteers, designed to demonstrate the ability of a vaccine to induce the production of antibodies, as well as to further evaluate side effects and risks.
- **Phase Three:** Studies involving a very large number of study volunteers for a longer time. They provide verification that a vaccine is effective in preventing a particular disease, as well as information on risks vs. benefits. Clinical trials have been ongoing for years before a vaccine is ever licensed.

After completing the three phases, the manufacturer submits the safety and effectiveness data to national authorities in an application for licensure to sell the product. The national licensing authority has the responsibility to review the clinical studies data, the facilities to be used, and the methods to be used in the manufacture of the product for safety and effectiveness.

Monitoring Vaccine Safety

After a product is approved for sale, the World Health Organization and many national authorities continue to monitor vaccine safety and effectiveness by various means, including on-site inspection of the manufacturing facility. For example, the U.S. Food and Drug Administration staff review manufacturers' testing of vaccines for their safety, potency, and purity.

QUESTION: Are there certain vaccine lots that have been associated with more adverse events than other lots?

ANSWER: To date, no vaccine lot in the modern era has been found to be unsafe.

QUESTION: Do vaccines cause chronic disease, such as diabetes, Crohn's disease, and cancer?

ANSWER: After decades of vaccine use around the world, available research shows no reliable evidence proving that vaccines cause chronic illness. Vaccine safety research, including research into theories linking vaccines to chronic diseases, is being conducted on a regular basis in many countries to ensure that the public is receiving the safest possible vaccines.

Occasionally, researchers have published articles about their studies supporting theories about vaccine and chronic illness; however, when other researchers attempt to duplicate their results (the test of good research), they often cannot. Medical conclusions about vaccine safety and the causes of disease must be judged on the quality of the scientific research and evidence.

Because no vaccine is without risk, when medical and public health professionals recommend vaccines for infants and children, they must balance the scientific evidence of benefits, costs, and risks. This balance changes as diseases are controlled or eliminated. For example, thanks to the smallpox vaccine, smallpox has been eliminated worldwide. Thus, the risk of adverse reactions from the vaccine now outweighs the risk of getting smallpox. Therefore, smallpox vaccine is no longer recommended for use in the general population.

Injection Safety

Worldwide, approximately **12 billion injections are given each year**. The World Health Organization estimates that, in the developing world, **15 to 50 percent are unsafe**—performed without proper sterilization. Each unsafe injection can pose serious health risks to patients, health workers, and the general public.

Unsafe injections can kill.

The most visible negative consequences of unsafe injections are abscesses at the site of skin penetration. But the invisible, quiet transmission of serious infectious disease is a much more common problem. Each year unsafe injections are responsible for:

- **8 to 16 million hepatitis B infections,**
- **2.3 to 4.5 million hepatitis C infections,** and
- **75,000 to 150,000 HIV/AIDS infections.**

Experts estimate that the current burden of infection will cause **1.3 million premature deaths a year**.

Between 60 and 80 percent of all injections are unnecessary.

Studies have shown that 60 to 80 percent of all injections are used to treat health problems that could have been more effectively and safely treated with oral medications or other therapies. Cultural and economic reasons contribute to the prevalence of unnecessary injections. Sometimes doctors anticipate that patients want injections, even when they do not. And sometimes patients demand injections, even against the advice of their doctors. In many cases providers profit by selling useless injections of vitamins or other medicaments. Such unnecessary and irrational injections further raise the risk of infection. **The more injections a patient receives, the more likely it is that one of them will be unsafe.**

Immunizations make up less than 10 percent of all injections.

Most immunization injections ARE necessary; they prevent disease from infecting people in the first place. WHO predicts the number of immunization injections carried out annually in developing countries will triple by the year 2005, to 3.5 billion immunizations each year. In light of these increases, the global health community must be diligent in its efforts to keep these injections safe.

Most immunization injections are safe.

But it is important for parents to make sure that their children are vaccinated safely:

- A sterile needle and a sterile syringe should be used for each injection and for each child. It is not safe to change the needle but reuse the syringe.
- If the health worker cannot provide a sterile needle and a sterile syringe, it may be possible to buy them in the market to bring to the immunization session.

True Stories

A Mother and Child with Pertussis

Maria has three sons. Maria got pertussis (whooping cough) a week before the birth of her second child. She caught it from her oldest son's friend, who visited one day with a racking cough.

After recognizing the telltale whoop in the cough, Maria discussed the issue with the friend's mother, who indicated she did not believe in immunizations.

Maria was seriously ill for six months and passed the disease on to her newborn son, who was hospitalized with pertussis at one week of age.

“My baby would cough 40 to 50 times in a row until he turned blue and threw up,” Maria said. “I quite literally did not let go of him for the first six to nine months because I was afraid he was going to die.”

The first five years of his life have been full of bouts of infections and an uncontrollable cough. Many people who had been exposed to Maria and her son had to be treated with antibiotics, because of their increased susceptibility to pertussis – especially young children and those over 60.

The out-of-pocket cost to the family was extraordinary and the community cost included many hours of investigation of contacts and the cost of the needed antibiotics – and this was a healthy pregnancy.

A Cancer That Could Have Been Prevented

When little Mohammad was born babies his age in wealthier countries routinely were vaccinated against hepatitis B. But in Mohammad's village only the rich could afford to buy the vaccine, and Mohammad's family was not rich.

So, like most children in his country, Mohammad was exposed to the hepatitis B virus at an early age. Unfortunately for him, he was one of those who became chronic carriers of the virus—able to pass it to others and at high risk of liver disease later in life. Once infected, there is no way to treat the disease.

At the age of 17, Mohammad developed liver cancer. He died the following year.

But there will be fewer stories like this one in Mohammad's village from now on because the health authorities have begun vaccinating all children against this killer disease.

Miss America's Hearing Loss

Heather Whitestone McCallum, Miss America 1995, is deaf. Ms. McCallum had an infection with high fever in 1974, when she was 18 months old. A media item reported that an immunization had caused the fever and subsequent deafness, but this was a false report.

The real cause of her illness, according to her pediatrician, was *Haemophilus influenzae* b (Hib) infection. She was treated with Gentamicin, one of the powerful antibiotic drugs used for this life-threatening infection. Unfortunately, hearing loss is one of the possible side effects of Gentamicin, particularly in infants. Deafness is also a common result of Hib meningitis infection.

Had Ms. McCallum been born after 1985, she could have been immunized against the Hib infection and her disability prevented. Hib infections have been reduced by 90% since the vaccine was made available in 1985.

Resource List

Websites

Allied Vaccine Group

A partnership of independent websites providing science-based, reliable information about immunization.

www.vaccine.org/

Children’s Vaccine Program at PATH

The Resource Center contains an extensive library of immunization materials.

www.childredivaccine.org/html/resources.htm

Global Alliance for Vaccines and Immunization (GAVI)

GAVI is a global movement to improve immunization services and introduce new and underutilized vaccines.

www.vaccinealliance.org/

Immunization Action Coalition

The Immunization Action Coalition promotes physician, community, and family awareness of, and responsibility for, appropriate immunization of all children and adults against all vaccine-preventable diseases. This U.S.-based site has a wealth of education materials, including English and Spanish vaccination information sheets.

www.immunize.org/

Immunization Materials from the American Academy of Pediatrics

This American Academy of Pediatrics section contains video and text resources for parents, including “Immunizations: What You Need To Know.”

www.aap.org/new/immpublic.htm

PKIDs (Parents of Kids with Infectious Diseases)

This national parent advocacy organization is committed to protecting children against diseases that have life-long effects on their health and development.

www.pkids.org

Polio Eradication Initiative

Information about polio, and global efforts to eradicate it.

www.PolioEradication.org

Public Health - Seattle & King County

Authors of the original “Plain Talk About Childhood Immunizations.”

www.metrokc.gov/health/immunization/childimmunity.htm

UNICEF

UNICEF advocates and works for the protection of children’s rights, to help the young meet their basic needs, and to expand their opportunities to reach their full potential. Search on “immunization” to find UNICEF statistics and immunization programs.

www.unicef.org/

The Vaccine Page

The Vaccine Page features the latest vaccine-related news from Reuters, as well as links to information organized for adults, parents, practitioners, researchers, and journalists. A scan of the country section yields journals, institutes, or immunization recommendations from 16 countries.

www.vaccines.org/

World Health Organization (WHO)

The WHO site has a wealth of information on vaccines and immunization.

www.who.int/vaccines/

Books and Papers on Vaccines and Immunization

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- Sanford, Jay P., “Tetanus—Forgotten But Not Gone,” *The New England Journal of Medicine*, vol. 332, no.12, p. 812-813.
- “Six Common Misconceptions about Vaccination (and how to respond to them),” U.S. Centers for Disease Control and Prevention, January 1996.
- “Standards for Pediatric Immunization Practices,” *Journal of American Medical Association*, April 14, 1993.
- “What Parents Need to Know About Vaccination and Childhood Disease: Guidelines For Parents,” American Academy of Pediatrics, 1994.

More Training Resources from the Children's Vaccine Program at PATH

Visit the “**Training Materials and Clinical Information**” section of our website to download any of these materials:

www.ChildrensVaccine.org

- Immunizing Children Against Hepatitis B—A Training Module
- Proper Handling and Disposal of Auto-Disable Syringes and Safety Boxes—A Training Module
- Giving Safe Injections: Using Auto-Disable Syringes for Immunization
- GAVI Training for Stronger Immunization Programs
- Hepatitis B Vaccine Introduction: Lessons Learned in Advocacy, Communication, and Training
- Training Vaccinators in a Time of Change
- Immunization and Child Health Materials Development Guide
- The Case for Childhood Immunization
- Advocacy for Immunization
- Helping Young People Become Youth Advocates for Immunization



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