City Health Information

Volume 40 (2021) | No 2; 15-30

New York City Department of Health and Mental Hygiene

TALKING WITH PARENTS ABOUT CHILDHOOD VACCINATION: BUILDING VACCINE CONFIDENCE

- You are the most important influence on parents' decisions to have their children and adolescents vaccinated.
- Routine childhood vaccinations have declined during the COVID-19 pandemic. It is imperative to take steps to bring your patients up to date on their immunizations.
- Use every office visit as an opportunity to review your patients' vaccination status and offer recommended vaccines.
- Acknowledge and empathize with parents' concerns and respond with accurate information.
- Let parents know why you do or would vaccinate your own children at the recommended intervals.

INSIDE THIS ISSUE (click to access)

Vaccination has eliminated or controlled serious infectious illness in the United States (US) (**Box 1**[1-5]), yet outbreaks of diseases such as measles have occurred because of lower levels of immunization and increased travel from areas where vaccine-preventable diseases are endemic (**Box 2**[6-11]).[1,2,6,12-14]

While most parents believe that vaccines are important to protect their children, some have declined or delayed vaccination because of concerns about vaccine safety or effectiveness, worry about the effects of simultaneous vaccinations on their children, or the belief that their children are protected by herd immunity.[15-17]

Parent-provider interactions play a critical role in maintaining parental confidence in vaccination.[16,18-21] You are the family's most trusted source of vaccine information and your advice affects parents' decision to vaccinate—even those who had considered vaccination delay or refusal.[16,18,20-24]

Take these steps to promote childhood vaccination in your practice[18,19,24-27]:

- Place vaccination-promoting materials in the waiting room and all examination rooms (**Resources**).

- Ensure that all staff are educated about vaccines, can address parental concerns, and will deliver consistent provaccination messages.
- Recommend vaccination at every visit.
- Use a presumptive statement with parents to initiate a willingness to vaccinate their child (eg, "Your child needs to receive vaccines today.").
- Acknowledge and empathize with parents' concerns.
- Respond with accurate information, stressing the benefits of vaccination for the child.
- Repeat the recommendation at each visit if a parent still chooses not to vaccinate.

AVOID MISSED OPPORTUNITIES

Every sick- and well-child visit is an opportunity to review a child's immunization history and tell parents which vaccines can be given and when the next vaccine is due. Children can safely be vaccinated if they have a minor acute illness such as low-grade fever, upper respiratory tract infection, otitis media, or mild diarrhea. It is safe to administer vaccines in most situations, including breastfeeding, family history of an adverse event after vaccination, household contacts of pregnant or immunosuppressed persons, mild illness, nonanaphylactic allergy, pregnancy, and preterm infant (start vaccinating on schedule based on chronological age).[5] **Table 1**[5,28] includes some of the conditions in which it is safe to administer routine childhood immunizations.

BOX 1. IMPACT OF WIDESPREAD VACCINATION IN THE UNITED STATES[1-5]

- Vaccination is one of the greatest public health achievements of the last century, eliminating or controlling diseases such as polio, measles, rotavirus, diphtheria, and pertussis
- Smallpox was declared eradicated worldwide in 1980 through global vaccination efforts
- Vaccination of each US birth cohort with the current childhood immunization schedule prevents approximately 42,000 deaths and 20 million cases of disease
- Reductions in morbidity since each vaccine was introduced range from 80% to 90% for pertussis to 95% for smallpox, 97% for diphtheria, 99% to 100% for poliomyelitis, and 97% for measles
- Mortality from varicella for persons aged younger than 20 years declined by 97% from the prevaccine period (1990-1994) to 2005-2007
- Routine rotavirus vaccination now prevents an estimated 40,000 to 60,000 hospitalizations each year

ACKNOWLEDGE PARENTS' CONCERNS

If parents hesitate to vaccinate their child, open a nonconfrontational dialogue to probe their concerns. Acknowledge and empathize with those concerns and offer accurate information, emphasizing vaccination's benefit for the child (**Boxes 3**[17-19,24-27,29,30] and **4**[6,8,12,31-36], page 18).

Financial concerns should not be a barrier

The Vaccines for Children (VFC) program is a federally funded program that distributes free vaccine to NYC providers in private and public health care facilities for vaccinations

Continued on page 18

BOX 2. OUTBREAKS OF VACCINE-PREVENTABLE DISEASES[6-11]

Measles

- **2019:** From January 1 to December 31, 1,282 individual cases of measles were confirmed in 31 states. This is the greatest number of cases reported in the United States since 1992 and since measles was declared eliminated in 2000.
- **2018-2019:** As of September 3, 2019, when the measles outbreak was declared over, 649 measles outbreak-related cases were confirmed in New York City between September 2018 and July 2019, with 97% of the cases occurring in Brooklyn. During the outbreak, 49 people were hospitalized and 20 were admitted to intensive care. The first child with measles was unvaccinated and was exposed to measles during a visit to Israel, where a large outbreak of the disease was occurring. Additional unvaccinated children acquired measles while in Israel, sparking the largest measles outbreak in the United States since 1992. This outbreak was fueled by low vaccination rates in young children.
- **2015:** A multistate outbreak of 159 cases of measles occurred, of which 111 were attributed to an outbreak in an amusement park in California in December 2014. The likely source was a person who became infected while traveling abroad. More than 80% of the cases occurred among those who were not vaccinated or did not know their vaccination status. Of the 22 people who were hospitalized, 5 had pneumonia.
- **2013:** An intentionally unvaccinated adolescent returned to New York City after contracting measles in London. A total of 58 cases were identified in two densely populated neighborhoods in Brooklyn. No cases were identified in persons who had a documented measles vaccination at the time of exposure. Twelve cases were in infants aged younger than 12 months, which is before the age of routine measles, mumps, and rubella vaccination. Complications included pneumonia in one child; two pregnant women required hospitalization, including one who miscarried.

Varicella

- **2016:** A total of 257 cases of varicella were reported in Williamsburg, Brooklyn. Of the affected patients, 73% were not vaccinated against varicella and 12% had not yet received the recommended number of doses.

Back to page 15

TABLE 1. SOME CONDITIONS IN WHICH IT IS SAFE TO ADMINISTER ROUTINE CHILDHOOD IMMUNIZATIONS[5,28]

DTap and Tdap

- Local reactions (eg, erythema and induration with or without tenderness, nodule at the injection site) are usually self-limited and do not require therapy
- May be given to those with a family history of seizures or other neurologic diseases or conditions (eg, controlled idiopathic epilepsy, cerebral palsy, developmental delay)

Hib

- Administer first vaccine at 2 mos
- Give at same visit as other recommended vaccines
- PRP-OMP is preferred vaccine for American Indian/Alaskan Native people
- Vaccines are interchangeable and 3-dose schedule should be followed if more than 1 brand is used
- Children <24 mos who develop invasive Hib
  - Vaccinate as soon as possible during convalescent stage
  - Administer complete series for age
- For other special populations and older children, see Pink Book

HPV

- Do not administer during pregnancy
- Recommended for prevention in males and females aged 11 to 12 years with catch-up through age 26 yrs
  - Can be started at age 9 yrs
  - For people aged 27-45 yrs, vaccination should be based on individual clinical decision making
- Prevaccination tests (eg, HPV testing, Pap testing, pregnancy testing) are not required
- May be administered to persons with primary or secondary immunocompromising conditions in whom immune response to vaccination may be attenuated

IIV

- Administer any one of the licensed age-appropriate IIV4 vaccines at recommended doses to children aged ≥6 to 35 mos without a contraindication
- Persons with egg allergy involving only urticaria without other symptoms may receive licensed age-appropriate IIV, RIV4, or LAIV4
- May be administered on the same day or any time before or after other inactivated vaccines or live vaccines. If given on the same day as other injectable vaccines, administer at separate anatomical sites

LAIV

- For healthy nonpregnant people aged ≥2 to 49 yrs
- For persons who do **not** have contact with severely immunosuppressed persons who require hospitalization and are in isolation for severe immunosuppression
- Persons at high risk for influenza complications should be given IIV rather than LAIV

MMR and MMRV[a]

- MMR is licensed for persons aged ≥12 mos
- MMRV is licensed for persons aged 12 mos through 12 yrs
- For the first dose, separate MMR and varicella vaccines are preferred for those aged 12 to 47 mos to reduce risk of febrile seizure
- MMRV is preferred for dose 2 and dose 1 at age ≥48 mos
- Children vaccinated before age 12 mos (for travel) should be revaccinated with 2 doses of appropriately spaced MMR or MMRV vaccine according to the routinely recommended schedule
- Can be administered to children who have egg allergy
- Should be administered to healthy susceptible close contacts of severely immunocompromised persons
- May be given to those in close contact with a pregnant person
- Pregnancy is a contraindication for MMR and MMRV
- MMR vaccine is recommended for susceptible HIV-infected persons aged 12 mos or older, depending on CD4 counts[a]

Rotavirus

- May be administered to clinically stable preterm infants with chronological age ≥6 wks at discharge or after discharge from neonatal intensive care unit or nursery
- May be started as early as 6 wks with minimal interval of 4 wks between doses
- RV1 is usually dosed at 2 and 4 mos
- RV5 is usually dosed at 2, 4, and 6 mos
- Latest maximum recommended first dose is 14 wks 6 d; last dose should be given no later than 8 mos 0 d[b]
- Infants who have had documented rotavirus gastroenteritis before completing the full course should still begin or complete the full 2- or 3-dose schedule
- Given orally: The tip caps of the RV1 prefilled diluent applicators contain natural rubber latex; the RV5 dosing tube is latex-free
- May be given on same day as other live or inactivated vaccines
- May be administered to infants living in households with immunosuppressed persons or pregnant people

Varicella[a]

- Do not give to pregnant people
- For persons ≥12 mos
- Given as 2 doses that may be administered 3 mos apart for people aged 12 mos-12 yrs and 4 wks apart for those aged ≥13 yrs
- May be administered simultaneously with other childhood vaccines
- May be given the same day as MMR; if not given the same day, separate the vaccines by 4 wks
- Recommended for susceptible HIV-infected persons aged 12 mos or older, depending on CD4 counts[a]

DTaP, diphtheria, tetanus toxoids, acellular pertussis; Hib, *Haemophilus influenza* type b; HPV, human papillomavirus vaccine; IIV, inactivated influenza vaccine; IIV4, quadrivalent inactivated influenza vaccine; LAIV, live attenuated influenza vaccine; LAIV4, quadrivalent live attenuated influenza vaccine; MMR, measles, mumps, rubella; MMRV, measles, mumps, rubella, varicella; RIV4, quadrivalent recombinant influenza vaccine; RV1, rotavirus vaccine, live, oral; RV5, rotavirus vaccine, live, oral, pentavalent; Tdap, tetanus toxoid, reduced diphtheria toxoid, acellular pertussis

[a]MMRV is contraindicated in people with HIV. Persons with HIV may receive MMR and varicella vaccine depending on CD4 counts (for persons aged 12 mos through 5 yrs: CD4 percentage ≥15% for at least 6 mos; for persons older than 5 yrs, CD4 count ≥200 cells/mm^3 for at least 6 mos). See Pink Book

[b]Age recommendations from the Advisory Committee on Immunization Practices vary from those in the package insert

Back to page 15

Continued from page 16

recommended by the Advisory Committee on Immunization Practices (ACIP) for eligible children

- from birth through 18 years,
- who receive Medicaid or are uninsured,
- who are Native-American or Alaskan Native.

Enroll in the VFC program, if not already enrolled. The NYC Health Department also distributes vaccine through VFC for children who are enrolled in Child Health Plus B and for children who are underinsured (ie, their insurance does not cover immunizations). See Vaccines for Children Program for more information.

GIVE ACCURATE INFORMATION

Vaccine safety

- Vaccines are thoroughly tested before they are licensed, and, once in use, they are continually monitored by the US Food and Drug Administration (FDA), Centers for

BOX 3. TALKING WITH PARENTS ABOUT VACCINATION[17-19,24-27,29,30]

- Ask open-ended questions to elicit concerns about vaccination
- Acknowledge concerns and empathize with parents
- Emphasize the personal benefits of vaccination for the child rather than the public health benefits
- Acknowledge that the vaccine may have adverse events, usually minor, as detailed in the Vaccine Information Statement (**Resources**)
- Describe the experience you have had in your practice with vaccine-adverse events
- Answer questions authoritatively and accurately
- If you do not have an immediate answer, take a moment to do research
- Do not overwhelm parents with too much detail
- Explain why you vaccinate (or would vaccinate) your own children at the recommended intervals

BOX 4. COMMON QUESTIONS ABOUT CHILDHOOD VACCINATION[6,8,12,31-36]

Q: Are these infections so serious that vaccination is necessary?

A: Yes. Vaccine-preventable diseases are serious and can lead to major complications in younger children. Before the measles vaccine, 500 people died, 48,000 were hospitalized, and 1,000 developed encephalitis each year in the United States. Every influenza season brings hospitalizations and deaths. In the 2017-2018 season, an estimated 61,000 people died from influenza, including 600 children, of whom only 188 were reported. In the 2018-2019 measles outbreak in New York City, vaccination status was known for 555 cases; of these, 477 (86%) were unvaccinated.

Q: Isn't it better for my child to get sick and develop lifelong immunity than to have the vaccine?

A: No. Vaccination is the best way to protect your child. We don't know which children will develop complications and be more seriously affected by an infection. When we vaccinate according to the recommended schedule, we protect your child because they may be exposed to the infection and we give your child just enough of the antigen from the virus or bacteria to produce a robust immune response and provide protection from serious illness.

Q: Does vaccination really work? Isn't it true that when there's an outbreak, vaccinated children get sick anyway?

A: Yes, vaccines work. With any vaccine, there may be a small percentage of people who do not develop immunity. However, children who are not fully vaccinated are much more likely to be infected in an outbreak. If exposed to measles, about 3% of fully vaccinated children will get the disease compared with almost 100% of unvaccinated children. Vaccinated children who do get sick are much more likely to have mild illness.

Q: Isn't my child protected because so many other children are vaccinated?

A: No. While it's true that in a highly vaccinated community there are fewer people available to spread viruses and bacteria (herd immunity), unvaccinated children who are exposed to an organism are far more likely to get sick than children who've been fully vaccinated. Also, unvaccinated children may be clustered in a geographic area so there may not be protection from herd immunity in some communities.

Q: Are vaccines the reason that these diseases declined? Or is it better sanitation?

A: Yes, vaccines are the reason for the steep decline in measles and some other diseases that are vaccine-preventable. Better sanitation has reduced some infectious diseases, such as diarrheal diseases, but sanitation does not protect against most of the illnesses that have a vaccine. Measles outbreaks have occurred in countries, such as France, Israel, and Italy, that have good sanitation but lower vaccination rates than are recommended.

Q: Isn't vaccination all about profits for drug companies?

A: No. Most vaccines are not high-profit products. Drug companies make far more money on medicines to treat diseases than on vaccines to prevent them.

Back to page 15

Disease Control and Prevention (CDC), and other public and private organizations (**Box 5**[37-40]).

- The vast majority of reactions, such as low-grade fever and injection site tenderness, are minor and self-limited.[26] Serious adverse events can occur, but they are rare.[26,41]
- Vaccines are made from safe ingredients (**Table 2**[42-44]).
- Health experts monitor vaccines that are in use to detect any possible adverse event[37]
- From 2006 through 2019, more than 1.8 billion doses of flu vaccine were administered and 5,000 injury claims were filed.[45,46] Many of those claims related to shoulder injuries, usually in adults, that occurred because a health care provider injected a vaccine in the wrong location.

BOX 5. HOW VACCINE SAFETY IS MONITORED[37-40]

The United States has the safest, most effective vaccine supply in its history. Before a vaccine is approved by the FDA for use by the public, it is thoroughly tested in the laboratory and then in animals; only after testing in animals is it tested in healthy human volunteers.

1. Laboratory tests: Vaccines are first tested in a laboratory. Those vaccines that are found to have the potential to be safe and effective in humans are then tested in animals.

2. Animal testing: If a vaccine is safe in animals, and studies suggest that it will be safe in people, it will be tested in clinical trials.

3. Clinical trials: Clinical trials' results assess specific predetermined safety and efficacy endpoints that are FDA-approved and consistent across trials. Vaccine manufacturers must report on all of the trials' endpoints as they are defined in the study protocol. All clinical investigations are required to have a data and safety monitoring plan to ensure the safety and welfare of the research subjects.

- **Phase I:** The vaccine is tested in 20-100 healthy volunteers to assess safety, immunogenicity, whether there are serious adverse events, and how the size of the dose is related to side effects and immune response.
- **Phase II:** Vaccines are further tested in several hundred volunteers to assess the most common short-term side effects and the vaccine's immunogenicity.
- **Phase III:** Randomized, controlled trials are done with hundreds or thousands of volunteers. The trial is continuously monitored by an independent data and safety monitoring board (DSMB) that typically includes physicians from relevant medical specialties, statisticians, bioethicists, and scientists. The DSMB follows the approved data and safety monitoring plan to review all study data to ensure the continuing safety of current participants and those yet to be enrolled. The DSMB assesses safety, study conduct and progress, and, if necessary, efficacy, and it has the authority to stop a trial if the vaccine is thought to be unsafe.
- **Phase IV:** Many vaccines undergo formal, ongoing studies after the vaccine is approved and licensed or as part of post-marketing surveillance.

4. Licensing: When a vaccine is shown to be safe and effective, the developer applies for an FDA license to manufacture the vaccine. The FDA reviews all information gathered during drug development and testing and grants a license only if they determine that the vaccine is safe and effective. During public health emergencies, such as the COVID-19 pandemic, the FDA may issue an emergency use authorization (EUA) to allow for the use of medical products that have not undergone full licensure review, or unapproved uses of approved medical products to diagnose, treat, or prevent serious or life-threatening diseases or conditions.

5. Adding the vaccine to the recommended schedule: After the vaccine is licensed, all available data are reviewed by the Advisory Committee on Immunization Practices (ACIP), a group of medical and public health experts. ACIP makes recommendations for use of the vaccine for the civilian population in the United States, for example, whether the vaccine should be given routinely, at what ages, and if the vaccine should be added to the recommended schedule.

6. Manufacturing: The manufacturer must test all lots to be sure they are safe, pure, and have the right amount of active ingredients. The FDA reviews safety and quality of the lots before they can be released and inspects manufacturing facilities to ensure quality and safety.

7. Monitoring vaccine safety: Once a vaccine is in use, health officials monitor closely to ensure that the benefits continue to outweigh the risks for people who receive the vaccine. Monitoring is conducted by several entities:

- **Vaccine Adverse Event Reporting System (VAERS):** a national surveillance program run by the Centers for Disease Control and Prevention (CDC) and the FDA that collects information about the vaccine's adverse events. VAERS serves as an early warning system to detect possible safety issues.
- **Vaccine Safety Datalink (VSD):** a collaboration between the CDC's Immunization Safety Office and health care organizations. VSD uses electronic health data from participating sites to study possible adverse events, which are then reported to VAERS.
- **Clinical Immunization Safety Assessment (CISA) Project:** a national network of vaccine safety experts from the CDC's Immunization Safety Office, medical research centers, and other partners who consult on clinical vaccine safety issues and assist with immunization decision-making.

Back to page 15

Vaccine effectiveness

- Most routine childhood vaccines protect 85% to 97% of those who are vaccinated. With any vaccination, there will be a few people who do not develop immunity.[6,47,48]
- Widespread vaccination also protects people who cannot be vaccinated, including newborns and people who are immunocompromised who may not respond well to vaccines.[47,48]

Vaccination schedule

- Vaccination schedules are based on:
  - age when the person is likely to be susceptible or acquire the infection, after immunity from any transplacental antibodies from the mother may have waned,[33] and
  - ages of the participants in the clinical trial.
- It is safe to give several vaccines at one time:
  - Babies can generate immune responses at birth and are exposed to many foreign antigens, bacteria, and viruses in their environment every day.[49]
  - Researchers estimate that a child's immune system could handle up to 10,000 vaccines at one time.[49]
  - Although we now give children more vaccines than we did 60 years ago, the number of antigens they receive is smaller than ever. The smallpox vaccine alone contained about 200 antigens. Now, the routinely recommended vaccines together contain fewer than 130 antigens.[49]
- Most vaccines require more than one dose, so grouping vaccinations together at each visit means fewer office visits, which can be less traumatic for the child.[33,50] Using

TABLE 2. FACTS ABOUT VACCINE INGREDIENTS[42-44]

Aluminum salts: help stimulate the immune response, reducing the number of shots a patient needs
- Aluminum is found in air, food, water, breast milk, and baby formula
- In the first 6 months of life, infants receive about 4.4 mg of aluminum from vaccines, compared with about 7 mg, 38 mg, and 117 mg from breast milk, infant formula, and soy-based formula, respectively
- Half of the aluminum in vaccines is eliminated from the body within a day
- When aluminum is an ingredient in a vaccine, it is more likely to enter the body's circulation than when it is consumed; however, the total amount that enters the circulation is still much smaller than the amount consumed from food and drink
- Aluminum-containing vaccines have been used for decades and have been given to more than 1 billion people without problems
- People who have medical conditions that affect aluminum levels (eg, kidney problems, taking large amount of antacids, getting intravenous fluids that contain aluminum) can still be vaccinated

Gelatin: prevents the active ingredients from breaking down during manufacture, transportation, and storage
- A highly purified, watered-down form of gelatin is used in vaccines
- In rare cases, larger quantities than are found in vaccines may induce severe anaphylactic reactions, but only in severely allergic individuals
- Gelatin-specific allergies to MMR vaccine are very rare (1 in 2 million)
- There are no religious dietary restrictions on the use of gelatin-containing vaccines (**Box 6**)

Formaldehyde: kills viruses or inactivates toxins during manufacturing
- Formaldehyde is largely removed before packaging
- Formaldehyde is a natural byproduct of our metabolism; it is needed by the body to make protein and DNA
- The amount of formaldehyde from vaccination is <1% of the amount found naturally in the body
- Based on laboratory data, it is estimated that a child aged 2 mos would almost completely clear formaldehyde from the injection site within 30 min

Thimerosal: prevents contamination by bacteria
- Thimerosal is only used in multidose vials of flu vaccine; it is not used in any other recommended childhood vaccine
- Thimerosal was never in MMR, varicella, inactivated polio, or pneumococcal conjugate vaccines
- The mercury used in thimerosal is called ethylmercury; it is rapidly cleared from the body and has not been shown to cause harm

Latex: used in packaging for some vaccines
- Latex is not in vaccines themselves
- Latex-free products are available for children with latex allergy. See Latex in Vaccine Packaging for guidance

Residual antibiotics: prevent bacterial contamination during manufacturing
- The types of antibiotics used in vaccines are usually nonallergenic
- There is no evidence of hypersensitivity to antibiotics

Regularly check Vaccine Ingredients for up-to-date information on ingredients in individual vaccines

MMR, measles, mumps, rubella

Back to page 15

combination vaccines can reduce the number of injections a child needs.[33,50]
- The American Academy of Pediatrics and the American Academy of Family Physicians endorse the recommended schedule because it is known to be safe and effective.[51]
- There is no acceptable alternative schedule. A delay in vaccination leaves the child unprotected for a longer time.[52]
- Widespread vaccination according to the recommended schedule protects infants younger than 12 months, who are too young to be vaccinated against measles, varicella, and hepatitis A.[52] Infants younger than 6 months are too young to be vaccinated against influenza.[53]
- Widespread vaccination protects people who are immunocompromised and cannot be vaccinated.[52]

Religious concerns

- Assure families that there are no religious proscriptions against vaccinations (**Box 6**[43,54-58]).
- State law requires that students be vaccinated in accordance with ACIP.[59]
- Religious exemptions from vaccination requirements are no longer allowed in New York State (NYS).[60] Personal belief exemptions were never allowed.
- The NYS Department of Health Office of Professional Medical Conduct may be notified if a provider is identified as having a pattern of submitting requests for improper exemptions from the recommended vaccinations.
- Children must receive the first dose of all required school immunizations no later than 14 days after the first day of school and must complete the vaccine series according to the ACIP catch-up vaccination schedule. The parent must submit documentation indicating the dates of catch-up vaccinations that are within 14 days of when the next vaccine dose is due.[61]

PROVIDE VACCINE-SPECIFIC FACTS

Parents may have concerns about the necessity for and safety of certain vaccines. Offer accurate information to address common concerns.

Measles, mumps, rubella (MMR) vaccine

- Measles is one of the most contagious of all infectious diseases. Approximately 9 in 10 susceptible persons will develop measles after close contact with an infected person.[6] The virus can remain infectious in the air for up to 2 hours after an infected person leaves a room.[6]
- Measles causes high fever and can lead to serious complications. About 1 in 5 unvaccinated people in the US who get measles will be hospitalized; 1 out of 1,000 children will develop brain swelling; and 1 to 3 in 1,000 children will die.[6]
- Measles is still common in many parts of the world. Unvaccinated children who travel to these areas are at risk of infection. In addition, travelers with measles bring the disease into the US every year.[6]
- Globally, measles cases increased to 869,770 in 2019, the highest number reported since 1996, with increases in all World Health Organization regions.[62,63] Deaths from measles were estimated to reach 207,500, nearly 50% higher since 2016.[62,63]

BOX 6. ADDRESSING RELIGIOUS CONCERNS ABOUT VACCINE INGREDIENTS[43,54-58]

Give accurate information to parents who have concerns about religious prohibitions on vaccines

Human cells

- The Roman Catholic Church allows for MMR and varicella vaccinations made with human cells because there is no available alternative. These vaccines prevent serious risk for the child and the community, including pregnant women
- Two human cell lines provide these cultures; they were developed from two legally aborted fetuses in the early 1960s
- The donor fetuses were not aborted for the purpose of obtaining these cells
- The same cell lines have been grown in the laboratory for more than 50 years. The cells are now their own cell line and are not the cells of the fetus

Porcine products

- The Orthodox Union and the Rabbinical Council of America strongly urge all parents to vaccinate their healthy children on the timetable recommended by their pediatrician
  - There is an obligation to care for one's own health and prevent harm to others
  - Nonoral products made from pigs are acceptable
- According to the Islamic Organization for Medical Sciences, the gelatin formed as a result of the transformation of the bones, skin, and tendons of a judicially impure animal is pure, and it is permissible to receive gelatin-containing vaccinations

MMR, measles, mumps, rubella

Back to page 15

- In 2019, approximately 1,300 cases of measles were reported in 31 states in the US—the greatest number since 1992.[64] All of these outbreaks were linked to travel-related cases that reached at-risk populations (unvaccinated or undervaccinated against measles) in the US.[64]
- MMR vaccine is safe and definitively does not cause autism (**Box 7**[65-71]).

Human papillomavirus (HPV) vaccine

- HPV vaccine protects against the human papillomavirus, which causes cervical, anal, oropharyngeal, other cancers, and precursor lesions. The American Academy of Pediatrics, American Academy of Family Physicians, American College of Obstetricians and Gynecologists, and American Society of Clinical Oncology[72] all strongly recommend the HPV vaccine.
- HPV is so common that nearly all sexually active men and women get the virus at some point in their lives.[73]
- In a cohort study, the cumulative incidence of new genital HPV infection among male college students who have sex with women was 62% at 24 months.[74]
- The prevalence of HPV-related anal intraepithelial neoplasia was 57% among HIV-positive men who have sex with men (MSM) and 35% among HIV-negative MSM in a cross-sectional study conducted in San Francisco, CA.[75]
- In clinical trials, HPV vaccine had 89% efficacy in preventing HPV4-related genital warts in men and 75% efficacy in preventing high-grade anal abnormalities in MSM.[76]
- Each year in the US, approximately 45,300 new cancer cases (25,405 in women and 19,925 in men) are attributable to HPV.[77]
- HPV vaccination is safe (**Box 8**[78-84]) and has decreased HPV infection, genital warts, and cervical precancers in young people in the years it has been available.[85-88]
- Vaccination reduced the prevalence of HPV strains 16/18 from 8.2% to 1.6% (80% reduction) in women aged 16 through 18 years and from 14.0% to 1.6% (89% reduction) in women aged 19 through 21 years.[89]
- Among women aged 15 through 26 years, vaccination reduced the risk of precancer from 113/10,000 to 6/10,000 (94% reduction)

BOX 7. THE AUTISM MYTH[65-71]

- In 1998, Andrew Wakefield and his colleagues published an article in *The Lancet* suggesting that the measles vaccine virus in MMR caused inflammatory bowel disease, which allowed harmful proteins to enter the bloodstream and damage the brain.
- Wakefield's findings could not be reproduced by other investigators, raising concerns about the validity of the original paper.
- Wakefield's findings were further discredited when an investigation found that Wakefield did not disclose that his research was funded by lawyers seeking evidence to use against vaccine manufacturers.
- Parents of children included in the study stated that the case information was not correct. One child was falsely described as developing behavioral symptoms after vaccination with MMR, when the symptoms actually appeared 1 month before vaccination. The article also mischaracterized the child's early behavioral symptoms as a chest infection.
- Wakefield was permanently barred from practicing medicine in the United Kingdom. Ten of the 12 authors withdrew their names from the article and *The Lancet* later retracted it.
- Numerous large, well-designed population-based studies around the world show no association between MMR and autism.
- Although the causes of autism are not completely understood, we know it is not caused by vaccines. At least 65 genes have been identified as contributors. While children display signs of autism between 1 and 2 years, we know from magnetic resonance imaging studies that brain changes may have been present even before a child is born.

About thimerosal

Some people have heard that MMR contains a preservative called thimerosal that is linked to autism.

- MMR, varicella, inactivated polio, and pneumococcal conjugate vaccines never contained thimerosal. It is only used in multidose vials of flu vaccine and in some vaccines for adults.
- Well-designed studies have not demonstrated a link between thimerosal-containing vaccines and autism, and the pharmacokinetics of the kind of mercury (ethylmercury) in thimerosal makes such an association unlikely.
- Data from many studies show no evidence of harm caused by the low doses of thimerosal in vaccines.
- Thimerosal was removed from childhood vaccines in 2001, yet autism rates continue to rise.

MMR, measles, mumps, rubella

Back to page 15

in HPV-naïve women and from 341/10,000 to 157/10,000 (54% reduction) overall.[90]

- Three international randomized, double-blind studies showed that nonavalent HPV vaccination reduced high-grade cervical disease and cervical surgery related to 9 HPV types by 98.2% and 97.8%, respectively, among women who were negative for 14 HPV types prior to vaccination.[91]
- Quadrivalent HPV vaccination substantially reduced the incidence of high-grade cervical abnormalities among women eligible for vaccination based on age.[92] In Australia, the greatest and earliest decline was among the youngest age group (aged <20 years), whose 2014 rate of 5 per 1,000 women was less than half the rate in 2007.[92] Nonavalent HPV vaccine is expected to prevent up to 90% of cervical cancers.[92]
- After the introduction of HPV vaccine, rates of cervical intraneoplasia grades 2/3 and adenocarcinoma in situ declined in women aged 21 through 26 years, with the greatest effect among younger women. Declines ranged from 74% among women aged 21 years to 30% among women aged 26 years.[87]

Recommend HPV vaccine with other adolescent vaccines[93-95] using a presumptive approach.[96] Explain which vaccines will be administered and why: "Today your child needs three vaccines: HPV to prevent cancer, MCV4 to prevent meningococcal disease, and Tdap to prevent tetanus, diphtheria, and pertussis."

Influenza vaccine

- Influenza is highly contagious and causes debilitating illness, hospitalizations, and deaths each year.

BOX 8. HUMAN PAPILLOMAVIRUS (HPV) VACCINE SAFETY[78-84]

- HPV vaccine has been extensively studied and found to be safe
- Several studies have shown that HPV vaccination at recommended ages is not associated with increased sexual activity
- There are no data available to suggest that getting HPV vaccine will affect future fertility; in contrast, women who develop cervical cancer may need treatment that could affect their fertility
- HPV vaccine has been in use since 2006, with more than 120 million doses of HPV distributed in the United States and, to date, there is no evidence that immunity wanes over time

- Young children are at particularly high risk for influenza complications.[28]
- While vaccine effectiveness varies from year to year, vaccination is still the best means of preventing influenza and its serious complications, such as pneumonia.
- Vaccination prevented more than 40,000 deaths annually in the US during the 2005-2006 through 2013-2014 influenza seasons.[97]
- During the 2010-2014 influenza seasons in the US, influenza vaccination was associated with reduced risk of pediatric death associated with laboratory-confirmed influenza. Vaccine effectiveness against death was 65% overall and 51% in children with high-risk underlying conditions.[98]
- During the 2019-2020 influenza season, vaccination prevented an estimated 7.52 million influenza illnesses, 3.69 million influenza-associated medical visits, and 105,000 influenza-associated hospitalizations.[99]
- In seasons when the vaccine viruses matched circulating strains, flu vaccine has been shown to reduce the risk of influenza-related doctor visits in the US by 40% to 60%.[100]
- The 2017-2018 influenza season in the US was severe, with the highest overall hospitalization rates recorded since the current surveillance system began in 2003.[101,102] There were an estimated 810,000 hospitalizations and 61,000 deaths, including 188 influenza-related pediatric deaths, 5 of which were in NYC.[31,32,103]
- The 2018-2019 influenza season in the US was a moderate severity season with two waves of influenza A activity of similar magnitude.[104] Preliminary nationwide estimates for the 2018-2019 influenza season show that influenza caused 37.4 to 42.9 million illnesses, 531,000 to 647,000 hospitalizations, and 36,400 to 61,200 deaths.[104]
- The 2019-2020 influenza season in the US was atypical in that it was severe for children aged 0 to 4 years and adults aged 18 to 49 years.[105] Preliminary nationwide estimates for the 2019-2020 influenza season show that influenza caused 38 million illnesses, 400,000 hospitalizations, and 22,000 deaths.[105]
- The 2020-2021 influenza season in the US had low laboratory-affirmed activity.[106] One influenza-associated pediatric death was reported to the CDC.[107] Precautions

Back to page 15

for COVID-19 (social distancing, masks, handwashing, and staying home) contributed to the low number of influenza cases.

CONTINUE THE DIALOGUE

If parents decline some or all vaccines for their children[21,24]

- Consider asking them to sign a Refusal to Vaccinate form (**Resources**).
- Explain any restriction your practice has on appointments for unvaccinated children.
- Offer educational materials and refer them to trustworthy online sources (**Resources for Parents**).
- If you choose to retain the child in your practice, continue the dialogue at the next visit.

COVID-19 PANDEMIC

During the peak of the COVID-19 pandemic, childhood vaccine administration rates declined. Although vaccine administration rates have been increasing, children who missed immunization appointments must be brought up to date (**Box 9**[108-111]). Use the Citywide Immunization Registry (CIR) to identify children who are behind in their vaccinations.

COVID-19 vaccines

As of September 22, 2021, more than 677,000 COVID-19-related deaths and 42,363,900 COVID-19 cases have been reported in the US,[112] and there have been more than 877,900 confirmed cases and 28,900 confirmed deaths in NYC.[113]

COVID-19 can be severe in children and adolescents. With increased circulation of variants, COVID-19–associated hospitalization rates among children and adolescents increased nearly five-fold during the summer of 2021; 1 in 4 of those hospitalized require intensive care.[114] Among fully vaccinated adolescents aged 12 to 17 years, hospitalization rates were 10 times lower than those among unvaccinated adolescents.[114]

At this time, the 2-dose Pfizer-BioNTech COVID-19 vaccine is FDA-approved for all people aged 16 years and older; it is still available for children aged 12 to 15 years under emergency use authorization (EUA).[115] The FDA has also granted EUAs to the 2-dose Moderna COVID-19 vaccine and the 1-dose Johnson & Johnson/Jansen COVID-19 vaccine for people aged 18 years and older.[115]

BOX 9. THE COVID-19 PANDEMIC AND BRINGING VACCINATIONS UP TO DATE[108-111]

Vaccinations lagging

- Administration of childhood vaccines dropped during the peak of the COVID-19 pandemic in 2020, compared with the same period in 2019
  - The largest decrease in doses occurred the week of April 5-11, 2020
    - 62% decrease among children aged <24 months
    - 96% decrease among children aged 2-18 years
- Vaccine administration is rebounding, but many children remain behind
- Children must have required immunizations to attend in-person school and childcare programs

Bring children's vaccinations up to date

- Use the Citywide Immunization Registry (CIR) to identify children behind on their vaccinations
- Recall children behind on their vaccinations (eg, by telephoning or texting parents/guardians)
- Prioritize children who need to be brought up to date
  - Start with newborns and children up to 24 months
  - Follow with young children and adolescents

COVID-19 vaccinations

- See the Centers for Disease Control's (CDC's) COVID-19 Vaccination for current information
- Updated CDC guidance now allows for administration of COVID-19 vaccines with other routinely recommended vaccinations. See Interim Clinical Considerations for Use of COVID-19 Vaccines Currently Authorized in the United States
- Report adverse effects to the Vaccine Adverse Event Reporting System

Vaccine supply

- If you are enrolled in the Vaccines for Children Program, order vaccine online through the CIR

See Vaccine Storage and Handling Resources; Interim Guidance for Routine and Influenza Immunization Services During the COVID-19 Pandemic; and Guidance for Planning Vaccination Clinics Held at Satellite, Temporary, or Off-Site Locations

Back to page 15

An additional dose of the Pfizer-BioNTech COVID-19 vaccine may be used in certain immunocompromised individuals, specifically, solid organ transplant recipients or those who are diagnosed with conditions that are considered to have an equivalent level of immunocompromise.[115] See Interim Clinical Considerations for Use of COVID-19 Vaccines Currently Approved or Authorized in the United States for detailed guidance.

The situation is changing quickly. Refer to COVID-19 Vaccination and COVID-19 Vaccine Information for Providers for current information; see COVID-19 Vaccine Communication Resources for Providers for guidance on talking with your patients about vaccination.

Be sure to give a vaccine-specific COVID-19 Fact Sheet for Recipients and Caregivers to each person (or their caregiver) you vaccinate. Report adverse effects to the Vaccine Adverse Event Reporting System.

SUMMARY

Vaccination is the most effective tool we have to protect children and adolescents against serious infectious diseases. Use every office visit as an opportunity to review your patients' vaccination status, communicate the importance of recommended vaccines, and empathetically respond to parents' concerns. If parents choose not to vaccinate and you retain the child in your practice, continue the dialogue at the next visit. Use tools available in your electronic medical record or the CIR to identify children who are not up to date on recommended vaccines, contact the parent or guardian, and schedule an immunization appointment (**Boxes 10**[5,18,116,117] and **11**[26,116,118-121]).

BOX 10. ENSURE A POSITIVE VACCINATION EXPERIENCE FOR THE FAMILY[5,18,116,117]

A positive experience with vaccines promotes acceptance of later vaccinations

- Reduce waiting time
- Be sure your staff is welcoming to families
- Make every effort to minimize the child's pain and emotional stress for the family
- Administer topical anesthetic before the injection
- Rub or stroke the child's skin near the injection site
- Administer vaccine without aspirating
- Give the most painful injection last
- Recommend breastfeeding during vaccination for children aged 2 years and younger; for those not breastfeeding during vaccination, offer sweet-tasting solutions before the vaccination
- Tell the parent/caregiver to give a comforting hold during the vaccination (**Resources for Parents**)

BOX 11. INCREASE VACCINATION IN YOUR PRACTICE[26,116,118-121]

- Place vaccine-promoting posters and brochures in waiting areas or exam rooms (**Resources**)
- Use the Citywide Immunization Registry's (CIR's) texting function for recall messages
- Follow up on missed appointments with phone, postcard, e-mail, and text reminders
- Have ancillary staff and/or providers check the CIR every time a patient comes in for either a routine or sick visit
- Have ancillary staff print out CIR records for all patients who are currently due for vaccines and/or document on that visit's encounter form that vaccines are due
- Run monthly coverage reports in the CIR and implement a recall system for patients who are not up to date with their immunizations

Back to page 15

RESOURCES FOR PROVIDERS

Immunization schedules

- Centers for Disease Control and Prevention (CDC)
  - Catch-up schedule for persons aged 4 months to 18 years: https://www.cdc.gov/vaccines/schedules/hcp/imz/catchup.html
  - Recommended child and adolescent immunization schedule for ages 18 years or younger: https://www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html
  - Advisory Committee on Immunization Practices (ACIP) immunization schedules: https://www.cdc.gov/vaccines/schedules/hcp/index.html

School immunization requirements

- NYC Health Department. September 2021 Medical Requirements for Childcare and New School Entrants: https://www.schools.nyc.gov/docs/default-source/default-document-library/sh65-medical-immunization-requirements

Practice tools

- CDC
  - Contraindications and precautions: https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html

    Charts for contraindications, precautions, and misconceptions for commonly used childhood vaccines
  - ACIP vaccine recommendations and guidelines: https://www.cdc.gov/vaccines/hcp/acip-recs/index.html
  - Childhood immunization resources. Flyers and posters: https://www.cdc.gov/vaccines/partners/childhood/print-ads-posters.html
  - Print materials for preteens and teens: https://www.cdc.gov/vaccines/partners/teens/print-materials.html
  - Provider resources for vaccine conversations with parents: https://www.cdc.gov/vaccines/hcp/conversations/index.html
  - Talking to parents about infant and HPV vaccines: https://www.cdc.gov/hpv/hcp/for-hcp-tipsheet-hpv.pdf
- Immunization Action Coalition
  - Screening checklist for contraindications to vaccines for children and teens: https://www.immunize.org/catg.d/p4060.pdf

    For parents to fill out, available in 10 languages
  - Skills checklist for staff who immunize patients: https://www.immunize.org/catg.d/p7010.pdf
  - Checklist for safe vaccine storage and handling: https://www.immunize.org/catg.d/p3035.pdf

Forms

- CDC. Vaccine Information Statements (VIS): https://www.cdc.gov/vaccines/hcp/vis/index.html

  Available in more than 40 languages
- American Academy of Pediatrics. Refusal to vaccinate: https://downloads.aap.org/DOPCSP/SOID_RTV_form_01-2019_English.pdf

Vaccine access

- NYC Health Department
  - Vaccines for Children Program (VFC): https://www1.nyc.gov/site/doh/providers/nyc-med-cir/vaccines-for-children-program.page
  - Citywide Immunization Registry (CIR): https://www1.nyc.gov/site/doh/providers/reporting-and-services/citywide-immunization-registry-cir.page

Vaccine ingredients

- CDC. Vaccine excipient summary: https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/b/excipient-table-2.pdf
- CDC. Latex in vaccine packaging: https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/b/latex-table.pdf

Vaccine adverse event reporting

- Vaccine Adverse Event Reporting System: https://vaers.hhs.gov

Guidance for planning immunization clinics

- CDC. Guidance for planning vaccination clinics held at satellite, temporary, or off-site locations: https://www.cdc.gov/vaccines/hcp/admin/mass-clinic-activities/index.html
  - Planning activities: https://www.cdc.gov/vaccines/hcp/admin/mass-clinic-activities/planning-activities.html
  - Pre-clinic activities: https://www.cdc.gov/vaccines/hcp/admin/mass-clinic-activities/pre-clinic-activities.html
  - During the clinic activities: https://www.cdc.gov/vaccines/hcp/admin/mass-clinic-activities/during-clinic-activities.html
  - Post-clinic activities: https://www.cdc.gov/vaccines/hcp/admin/mass-clinic-activities/post-clinic-activities.html
- CDC. Vaccine storage and handling resources: https://www.cdc.gov/vaccines/hcp/admin/storage/index.html

COVID-19

- NYC Health Department
  - Vaccine information for providers: https://www1.nyc.gov/site/doh/covid/covid-19-providers-vaccines.page
  - Vaccine communication resources for providers: https://www1.nyc.gov/site/doh/covid/covid-19-providers-vaccines-communication.page
- CDC
  - Interim guidance for routine and influenza immunization during the COVID-19 pandemic: https://www.cdc.gov/vaccines/pandemic-guidance/index.html
  - COVID-19 vaccination: https://www.cdc.gov/vaccines/covid-19/index.html
  - Interim clinical considerations for use of COVID-19 vaccines currently authorized in the United States: https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html
  - COVID-19 vaccine emergency use authorization (EUA) fact sheets for recipients and caregivers: https://www.cdc.gov/vaccines/covid-19/eua/index.html

Call the NYC Provider Access Line at 866-692-3641 for immunization information

Back to page 15

RESOURCES FOR PARENTS

General information

- CDC
  - Vaccines for your children: https://www.cdc.gov/vaccines/parents/index.html
  - Vaccines.gov: https://www.vaccines.gov
- American Academy of Pediatrics. Vaccines your child needs: https://www.healthychildren.org/English/safety-prevention/immunizations/Pages/Vaccines-Your-Child-Needs.aspx
- The Children's Hospital of Philadelphia Vaccine Education Center: https://www.chop.edu/centers-programs/vaccine-education-center
- Immunization Action Coalition: https://www.immunize.org

Vaccine access

- Child Health Plus B: https://www.health.ny.gov/health_care/child_health_plus
- NYC HealthMap: https://a816-healthpsi.nyc.gov/NYCHealthMap
- Call 311 to find a location

Educational resources

- CDC
  - Your child's vaccine visit: https://www.cdc.gov/vaccines/parents/visit/index.html
  - How to hold your child during vaccination: https://www.cdc.gov/vaccines/parents/visit/holds-factsheet.html
  - The journey of your child's vaccine: https://www.cdc.gov/vaccines/parents/infographics/journey-of-child-vaccine-h.pdf
- NYC Health Department
  - Human Papillomavirus (HPV): https://www1.nyc.gov/site/doh/health/health-topics/human-papillomavirus-hpv.page
  - Health Bulletins: https://www1.nyc.gov/site/doh/data/publications.page

  Available in multiple languages
    - Health Bulletin #93: Start Smart: Vaccinate
    - Health Bulletin #107: Influenza/Flu
    - Health Bulletin #119: Vaccinations and Pregnancy
- Immunization Action Coalition
  - MMR Vaccine Does Not Cause Autism. Examine the Evidence!: https://www.immunize.org/catg.d/p4026.pdf
  - Religious concerns: https://www.immunize.org/talking-about-vaccines/religious-concerns.asp

Parents can call 800-CDC-INFO (800-232-4636) with questions about vaccines

REFERENCES

1. Centers for Disease Control and Prevention (CDC). Ten great public health achievements—United States, 1900-1999. *MMWR Morb Mortal Wkly Rep*. 1999;48(12):241-243. Accessed August 20, 2021. https://www.cdc.gov/mmwr/preview/mmwrhtml/00056796.htm
2. CDC. Ten great public health achievements—United States, 2001-2010. *MMWR Morb Mortal Wkly Rep*. 2011;60(19):619-623. Accessed August 20, 2021. https://www.cdc.gov/mmwr/pdf/wk/mm6019.pdf
3. CDC. History of smallpox. Updated February 20, 2021. Accessed August 20, 2021. https://www.cdc.gov/smallpox/history/history.html
4. Zhou F, Shefer A, Wenger J, et al. Economic evaluation of the routine childhood immunization program in the United States, 2009. *Pediatrics*. 2014;133(4):577-585. doi:10.1542/peds.2013-0698
5. CDC. Epidemiology and prevention of vaccine-preventable diseases: the Pink Book course textbook 14th ed. Updated August 18, 2021. Accessed August 20, 2021. https://www.cdc.gov/vaccines/pubs/pinkbook/index.html
6. CDC. Measles for healthcare professionals. Updated November 5, 2020. Accessed August 20, 2021. https://www.cdc.gov/measles/hcp/index.html
7. Zucker JR, Rosen JB, Iwamoto M, et al. Consequences of undervaccination—measles outbreak, New York City, 2018-2019. *N Engl J Med*. 2020;382(11):1009-1017. doi:10.1056/NEJMoa1912514
8. New York City Department of Health and Mental Hygiene (NYC DOHMH). Measles: cases by neighborhood. Accessed August 20, 2021. https://www1.nyc.gov/site/doh/health/health-topics/measles.page#cases
9. Clemmons NS, Gastanaduy PA, Fiebelkorn AP, Redd SB, Wallace GS. Measles—United States, January 4-April 2, 2015. *MMWR Morb Mortal Wkly Rep*. 2015;64(14);373-376. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6414a1.htm
10. CDC. Notes from the field: measles outbreak among members of a religious community—Brooklyn, New York, March-June 2013. *MMWR Morb Mortal Wkly Rep*. 2013;62(36):752-753. Erratum in: *MMWR Morb Mortal Wkly Rep*. 2013;62(45):906. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6236a5.htm
11. Isaac BM, Garnes P, Arciulo RJ, et al. Varicella outbreak in Williamsburg Orthodox Jewish community, 2016. Paper presented at: 2017 Council of State and Territorial Epidemiologists (CSTE) Annual Conference; June 5, 2017; Boise, ID. Abstract 8153. https://cste.confex.com/cste/2017/webprogram/Paper8153.html
12. Phadke VK, Bednarczyk RA, Salmon DA, Omer SB. Association between vaccine refusal and vaccine-preventable diseases in the United States: a review of measles and pertussis. *JAMA*. 2016;315(11):1149-1158. Erratum in: *JAMA*. 2016;315(19):2125. doi:10.1001/jama.2016.1353
13. Sugerman DE, Barskey AE, Delea MG, et al. Measles outbreak in a highly vaccinated population, San Diego, 2008: role of the intentionally undervaccinated. *Pediatrics*. 2010;125(4):747-755. doi:10.1542/peds.2009-1653
14. Gahr P, DeVries AS, Wallace G, et al. An outbreak of measles in an undervaccinated community. *Pediatrics*. 2014;134(1):e220-e228. doi:10.1542/peds.2013-4260
15. Freed GL, Clark SJ, Butchart AT, Singer DC, Davis MM. Parental vaccine safety concerns in 2009. *Pediatrics*. 2010;125(4):654-659. doi:10.1542/peds.2009-1962
16. Kennedy A, Basket M, Sheedy K. Vaccine attitudes, concerns, and information sources reported by parents of young children: results from the 2009 HealthStyles Survey. *Pediatrics*. 2011;127(Suppl 1):S92-S99. doi:10.1542/peds.2010-1722N
17. Kempe A, O'Leary ST, Kennedy A, et al. Physician response to parental requests to spread out the recommended vaccine schedule. *Pediatrics*. 2015;135(4):666-677. doi:10.1542/peds.2014-3474
18. Benin AL, Wisler-Scher DJ, Colson E, Shapiro ED, Holmboe ES. Qualitative analysis of mothers' decision-making about vaccines for infants: the importance of trust. *Pediatrics*. 2006;117(5):1532-1541. doi:10.1542/peds.2005-1728
19. Leask J, Kinnersley P, Jackson C, Cheater F, Bedford H, Rowles G. Communicating with parents about vaccination: a framework for health professionals. *BMC Pediatr*. 2012;12:154. doi:10.1186/1471-2431-12-154

Back to page 15

REFERENCES *(continued)*

20. Shay LA, Baldwin AS, Betts AC, et al. Parent-provider communication of HPV vaccine hesitancy. *Pediatrics*. 2018;141(6):e20172312. doi:10.1542/peds.2017-2312
21. Edwards KM, Hackell JM; Committee on Infectious Diseases, Committee on Practice and Ambulatory Medicine. Countering vaccine hesitancy. *Pediatrics*. 2016;138(3):e20162146. Accessed August 20, 2021. doi:10.1542/peds.2016-2146
22. Chung Y, Schamel J, Fisher A, Frew PM. Influences on immunization decision-making among US parents of young children. *Matern Child Health J*. 2017;21(12):2178-2187. doi:10.1007/s10995-017-2336-6
23. Freed GL, Clark SJ, Butchart AT, Singer DC, Davis MM. Sources and perceived credibility of vaccine safety information for parents. *Pediatrics*. 2011;127(Suppl 1):S107-S112. doi:10.1542/peds.2010-1722P
24. CDC. Provider resources for vaccine conversations with parents. Talking with parents about vaccines for infants. Updated April 11, 2018. Accessed August 20, 2021. https://www.cdc.gov/vaccines/hcp/conversations/talking-with-parents.html
25. Domachowske JB, Suryadevara M. Practical approaches to vaccine hesitancy issues in the United States: 2013. *Hum Vaccin Immunother*. 2013;9(12):2654-2657. doi:10.4161/hv.26783
26. Healy CM, Pickering LK. How to communicate with vaccine-hesitant parents. *Pediatrics*. 2011;127(Suppl 1):S127-S133. doi:10.1542/peds.2010-1722S
27. Hendrix KS, Finnell SME, Zimet GD, Sturm LA, Lane KA, Downs SM. Vaccine message framing and parents' intent to immunize their infants for MMR. *Pediatrics*. 2014;134(3):e675-e683. doi:10.1542/peds.2013-4077
28. Grohskopf LA, Alyanak E, Broder KR, et al. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices—United States, 2020-21 influenza season. *MMWR Recomm Rep.* 2020;69(8):1-24. doi:10.15585/mmwr.rr6908a1
29. Glanz JM, Wagner NM, Narwaney KJ, et al. A mixed methods study of parental vaccine decision making and parent-provider trust. *Acad Pediatr*. 2013;13(5):481-488. doi:10.1016/j.acap.2013.05.030
30. Kempe A, Daley MF, McCauley MM, et al. Prevalence of parental concerns about childhood vaccines: the experience of primary care physicians. *Am J Prev Med*. 2011;40(5):548-555. doi:10.1016/j.amepre.2010.12.025
31. CDC. 2017-2018 Estimated influenza illnesses, medical visits, hospitalizations, and deaths and estimated influenza illnesses, medical visits, hospitalizations, and deaths averted by vaccination in the United States. Updated November 22, 2019. Accessed August 20, 2021. https://www.cdc.gov/flu/about/burden-averted/2017-2018.htm
32. CDC. 2019-20 season's pediatric flu deaths tie high mark set during 2017-18 season. Published August 21, 2020. Accessed August 20, 2021. https://www.cdc.gov/flu/spotlights/2019-2020/2019-20-pediatric-flu-deaths.htm
33. Children's Hospital of Philadelphia (CHoP). Vaccine schedule: altering the schedule. Updated March 18, 2019. Accessed August 20, 2021. https://www.chop.edu/centers-programs/vaccine-education-center/vaccine-schedule/altering-the-schedule
34. Immunization Action Coalition (IAC). Quick answers to tough questions. Vaccine talking points for healthcare professionals. Published October 2018. Accessed August 20, 2021. https://www.immunize.org/catg.d/s8030.pdf
35. CDC. Measles, mumps, and rubella (MMR) vaccination: what everyone should know. Updated January 26, 2021. Accessed August 20, 2021. https://www.cdc.gov/vaccines/vpd/mmr/public/index.html
36. Feikin DR, Lezotte DC, Hamman RF, Salmon DA, Chen RT, Hoffman RE. Individual and community risks of measles and pertussis associated with personal exemptions to immunization. *JAMA*. 2000;284(24):3145-3150. doi:10.1001/jama.284.24.3145
37. CDC. Ensuring vaccine safety. Updated July 1, 2020. Accessed August 20, 2021. https://www.cdc.gov/vaccinesafety/ensuringsafety/index.html
38. CDC. The journey of your child's vaccine. Published July 30, 2018. Accessed August 20, 2021. https://www.cdc.gov/vaccines/parents/infographics/journey-of-child-vaccine-h.pdf
39. US Food and Drug Administration (FDA). Emergency use authorization for vaccines explained. Updated November 20, 2020. Accessed August 20, 2021. https://www.fda.gov/vaccines-blood-biologics/vaccines/emergency-use-authorization-vaccines-explained
40. Yao B, Zhu L, Jiang Q, Xia HA. Safety monitoring in clinical trials. *Pharmaceutics*. 2013;5(1):94-106. doi:10.3390/pharmaceutics5010094
41. Maglione MA, Das L, Raaen L, et al. Safety of vaccines used for routine immunization of US children: a systematic review. *Pediatrics*. 2014;134(2):325-337. doi:10.1542/peds.2014-1079
42. CHoP. Vaccine ingredients. Updated March 8, 2021. Accessed August 20, 2021. https://www.chop.edu/centers-programs/vaccine-education-center/vaccine-ingredients
43. IAC. Religious concerns. Updated January 10, 2021. Accessed August 20, 2021. https://www.immunize.org/talking-about-vaccines/religious-concerns.asp
44. Mitkus RJ, Hess MA, Schwartz SL. Pharmacokinetic modeling as an approach to assessing the safety of residual formaldehyde in infant vaccines. *Vaccine*. 2013;31(25):2738-2743. doi:10.1016/j.vaccine.2013.03.071
45. Belluck P, Abelson R. By the numbers: vaccines are safe. *New York Times*. Published June 18, 2019. Accessed August 20, 2021. https://www.nytimes.com/2019/06/18/health/you-should-get-vaccinated.html
46. US Health Resources and Services Administration. National Vaccine Injury Compensation Program Monthly Statistics Report: Data and statistics. Updated August 1, 2021. Accessed August 20, 2021. https://www.hrsa.gov/sites/default/files/hrsa/vaccine-compensation/data/data-statistics-report.pdf
47. World Health Organization (WHO). Vaccines and immunization: myths and misperceptions. Published October 19, 2020. Accessed August 20, 2021. https://www.who.int/news-room/q-a-detail/vaccines-and-immunization-myths-and-misconceptions
48. US FDA. Vaccine safety questions and answers. Updated March 23, 2018. Accessed August 20, 2021. https://www.fda.gov/biologicsbloodvaccines/safetyavailability/vaccinesafety/ucm133806.htm
49. Offit PA, Quarles J, Gerber MA, et al. Addressing parents' concerns: do multiple vaccines overwhelm or weaken the infant's immune system? *Pediatrics*. 2002;109(1):124-129. doi:10.1542/peds.109.1.124
50. CDC. Vaccine safety. Multiple vaccinations at once. Updated August 14, 2020. Accessed August 20, 2021. https://www.cdc.gov/vaccinesafety/concerns/multiple-vaccines-immunity.html
51. CDC. Recommended child and adolescent immunization schedule for ages 18 years or younger, United States, 2021. Published February 11, 2021. Accessed August 20, 2021. https://www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf
52. American Academy of Pediatrics (AAP). Child immunization schedule: why is it like that? Updated February 15, 2018. Accessed August 20, 2021. https://www.healthychildren.org/English/safety-prevention/immunizations/Pages/Child-Immunization-Schedule-Why-Is-It-Like-That.aspx
53. CDC. Vaccine for flu (influenza). Updated August 2, 2019. Accessed August 20, 2021. https://www.cdc.gov/vaccines/parents/diseases/flu.html
54. Congregation for the Doctrine of the Faith. Dignitas personae: instruction on certain bioethical questions. Published December 31, 2008. Accessed August 20, 2021. https://www.catholicbishops.ie/2008/12/31/feature-dignitas-personae
55. Pontificia Academia Pro Vita. Moral reflections on vaccines prepared from cells derived from aborted human foetuses. Published June 9, 2005. Accessed August 20, 2021. https://www.immunize.org/talking-about-vaccines/vaticandocument.htm
56. Grabenstein JD. What the world's religions teach, applied to vaccines and immune globulins. *Vaccine*. 2013;31(16):2011-2023. doi:10.1016/j.vaccine.2013.02.026
57. Adler A. For observant Jews: porcine and other animal-derived ingredients in nonoral medication. Published July 31, 2003. Accessed August 20, 2021. https://www.immunize.org/talking-about-vaccines/concerns_observant_Jews.pdf
58. WHO Regional Office for the Eastern Mediterranean. Letter concerning use of animal products that have undergone chemical transformation. Published July 17, 2001. Accessed August 20, 2021. https://www.immunize.org/talking-about-vaccines/porcine.pdf
59. New York State Department of Health (NYS DOH). Immunization laws and regulations. Updated July 2020. Accessed August 20, 2021. https://www.health.ny.gov/prevention/immunization/laws_regs.htm
60. NYS DOH. The New York State Department of Health notification of legislation removing nonmedical exemptions to required vaccinations. Published July 16, 2019. Accessed August 20, 2021. https://www.health.ny.gov/professionals/doctors/conduct/docs/non_med_exemp.pdf
61. NYC DOHMH, Department of Education. September 2021 Medical requirements for child care and new school entrants. Published July 2, 2021. Accessed August 20, 2021. https://www.schools.nyc.gov/docs/default-source/default-document-library/sh65-medical-immunization-requirements
62. WHO. Worldwide measles deaths climb 50% from 2016 to 2019 claiming over 207,500 lives in 2019. Published November 12, 2020. Accessed August

Back to page 15

REFERENCES *(continued)*

20, 2021. https://www.who.int/news/item/12-11-2020-worldwide-measles-deaths-climb-50-from-2016-to-2019-claiming-over-207-500-lives-in-2019

63. Patel MK, Goodson JL, Alexander JP Jr, et al. Progress toward regional measles elimination—worldwide, 2000-2019, *MMWR Morb Mortal Wkly Rep*. 2020;69(45):1700-1705. doi:10.15585/mmwr.mm6945a6
64. CDC. Global measles outbreaks. Updated August 12, 2021. Accessed August 20, 2021. https://www.cdc.gov/globalhealth/measles/data/global-measles-outbreaks.html
65. IAC. Evidence shows vaccines unrelated to autism. Accessed August 20, 2021. https://www.immunize.org/catg.d/p4028.pdf
66. Institute of Medicine. *Immunization Safety Review: Vaccines and Autism*. Washington, DC: National Academies Press; 2004. doi:10.17226/10997
67. Deer B. How the case against the MMR vaccine was fixed. *BMJ*. 2011;342:c5347. doi:10.1136/bmj.c5347
68. Murch SH, Anthony A, Casson DH, et al. Retraction of an interpretation. *Lancet*. 2004;363(9411):750. doi:10.1016/S0140-6736(04)15715-2
69. Hotez P. Autism spectrum disorder: if not vaccines, then what? Published February 24, 2017. Accessed August 20, 2021. https://blogs.bcm.edu/2017/02/24/autism-spectrum-disorder-if-not-vaccines-then-what
70. CDC. Thimerosal and vaccines. Updated August 25, 2020. Accessed August 20, 2021. https://www.cdc.gov/vaccinesafety/concerns/thimerosal/index.html
71. Parker SK, Schwartz B, Todd J, Pickering LK. Thimerosal-containing vaccines and autistic spectrum disorder: a critical review of published original data. *Pediatrics*. 2004;114(3):793-804. doi:10.1542/peds.2004-0434
72. Bailey HH, Chuang LT, duPont NC, et al. American Society of Clinical Oncology statement: human papillomavirus vaccination for cancer prevention. *J Clin Oncol*. 2016;34(15):1803-1812. doi:10.1200/JCO.2016.67.2014
73. CDC. Human papillomavirus (HPV) statistics. Updated April 5, 2021. Accessed August 20, 2021. https://www.cdc.gov/std/hpv/stats.htm
74. Partridge JM, Hughes JP, Feng Q, et al. Genital human papillomavirus infection in men: incidence and risk factors in a cohort of university students. *J Infect Dis*. 2007;196(8):1128-1136. doi:10.1086/521192
75. Chin-Hong PV, Berry JM, Cheng S-C, et al. Comparison of patient- and clinician-collected anal cytology samples to screen for human papillomavirus-associated anal intraepithelial neoplasia in men who have sex with men. *Ann Intern Med*. 2008;149(5):300-306. doi:10.7326/0003-4819-149-5-200809020-00004
76. Gardasil. Highlights of prescribing information. Updated August 2020. Accessed August 20, 2021. https://www.fda.gov/media/90064/download
77. CDC. Cancers associated with human papillomavirus, United States—2013-2017. United States Cancer Statistics Data Brief, No 18. Published September 2020. Accessed August 20, 2021. https://www.cdc.gov/cancer/uscs/about/data-briefs/no18-hpv-assoc-cancers-UnitedStates-2013-2017.htm
78. Naleway AL, Crane B, Smith N, et al; Vaccine Safety Datalink. Absence of venous thromboembolism risk following quadrivalent human papillomavirus vaccination, Vaccine Safety Datalink, 2008-2011. *Vaccine*. 2016;34(1):167-171. doi:10.1016/j.vaccine.2015.10.006
79. Gee J, Naleway A, Shui I, et al. Monitoring the safety of quadrivalent human papillomavirus vaccine: findings from the Vaccine Safety Datalink. *Vaccine*. 2011;29(46):8279-8284. doi:10.1016/j.vaccine.2011.08.106
80. Smith LM, Kaufman JS, Strumpf EC, Lévesque LE. Effect of human papillomavirus (HPV) vaccination on clinical indicators of sexual behaviour among adolescent girls: the Ontario Grade 8 HPV Vaccine Cohort Study. *CMAJ*. 2015;187(2):E74-E81. doi:10.1503/cmaj.140900
81. Donken R, Ogilvie GS, Bettinger JA, Sadarangani M, Goldman RD. Effect of human papillomavirus vaccination on sexual behaviour among young females. *Can Fam Phys*. 2018;64:509-513. https://www.cfp.ca/content/64/7/509.long
82. CDC. Talking to parents about HPV vaccine. Updated July 2019. Accessed August 20, 2021. https://www.cdc.gov/hpv/hcp/for-hcp-tipsheet-hpv.pdf
83. IAC. Ask the experts: human papillomavirus (HPV). Updated October 22, 2020. Accessed August 20, 2021. https://www.immunize.org/askexperts/experts_hpv.asp
84. Kjaer SK, Nygård M, Sundström K, et al. Final analysis of a 14-year long-term follow-up study of the effectiveness and immunogenicity of the quadrivalent human papillomavirus vaccine in women from four Nordic countries. *EClinicalMedicine*. 2020;23:100401. doi:10.1016/j.eclinm.2020.100401
85. Perkins RB, Lin M, Wallington SF, Hanchate A. Impact of number of human papillomavirus vaccine doses on genital warts diagnoses among a national cohort of US adolescents. *Sex Transm Dis*. 2017;44(6):365-370. doi:10.1097/OLQ.0000000000000615
86. Benard VB, Castle PE, Jenison SA, et al. Population-based incidence rates of cervical intraepithelial neoplasia in the human papillomavirus vaccine era. *JAMA Oncol*. 2017;3(6):833-837. doi:10.1001/jamaoncol.2016.3609
87. Niccolai LM, Meek JI, Brackney M, Hadler JL, Sosa LE, Weinberger DM. Declines in human papillomavirus (HPV)–associated high-grade cervical lesions after introduction of HPV vaccines in Connecticut, United States, 2008-2015. *Clin Infect Dis*. 2017;65(6):884-889. doi:10.1093/cid/cix455
88. CDC. Vaccine information statement: HPV (human papillomavirus) vaccine. Updated August 6, 2021. Accessed August 20, 2021. https://www.cdc.gov/vaccines/hcp/vis/vis-statements/hpv.pdf
89. Mesher D, Panwar K, Thomas SL, et al. The impact of the National HPV Vaccination Program in England using the bivalent HPV vaccine: surveillance of type-specific HPV in young females, 2010-2016. *J Infect Dis*. 2018;218(6):911-921. doi:10.1093/infdis/jiy249
90. Arbyn M, Xu L, Simoens C, Martin-Hirsch PPL. Prophylactic vaccination against human papillomaviruses to prevent cervical cancer and its precursors. *Cochrane Database Syst Rev*. 2018;5(5):CD009069. doi:10.1002/14651858.CD009069.pub3
91. Giuliano AR, Joura EA, Garland SM, et al. Nine-valent HPV vaccine efficacy against related diseases and definitive therapy: comparison with historic placebo population. *Gynecol Oncol*. 2019;154(1):110-117. doi:10.1016/j.ygyno.2019.03.253
92. Patel C, Brotherton JM, Pillsbury A, et al. The impact of 10 years of human papillomavirus (HPV) vaccination in Australia: what additional disease burden will a nonavalent vaccine prevent? *Euro Surveill*. 2018;23(41):1700737. doi:10.2807/1560-7917.ES.2018.23.41.1700737
93. Bratic JS, Seyferth ER, Bocchini JA Jr. Update on barriers to human papillomavirus vaccination and effective strategies to promote vaccine acceptance. *Curr Opin Pediatr*. 2016;28(3):407-412. doi:10.1097/MOP.0000000000000353
94. Stokley S, Jeyarajah J, Yankey D, et al; CDC. Human papillomavirus vaccination coverage among adolescents, 2007-2013, and postlicensure vaccine safety monitoring, 2006-2014—United States. *MMWR Morb Mortal Wkly Rep*. 2014;63(29):620-624. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6329a3.htm
95. Ylitalo KR, Lee H, Mehta NK. Health care provider recommendation, human papillomavirus vaccination, and race/ethnicity in the US National Immunization Survey. *Am J Public Health*. 2013;103(1):164-169. doi:10.2105/AJPH.2011.300600
96. Opel DJ, Heritage J, Taylor JA, et al. The architecture of provider-parent vaccine discussions at health supervision visits. *Pediatrics*. 2013;132(6):1037-1046. doi:10.1542/peds.2013-2037
97. Foppa IM, Cheng PY, Reynolds SB, et al. Deaths averted by influenza vaccination in the US during the seasons 2005/06 through 2013/14. *Vaccine*. 2015;33(26):3003-3009. doi:10.1016/j.vaccine.2015.02.042
98. Flannery B, Reynolds SB, Blanton L, et al. Influenza vaccine effectiveness against pediatric deaths: 2010-2014. *Pediatrics*. 2017;139(5):e20164244. doi:10.1542/peds.2016-4244
99. CDC. Estimated influenza illnesses, medical visits, and hospitalizations averted by vaccination in the United States—2019-2020 influenza season. Updated October 6, 2020. Accessed August 20, 2021. https://www.cdc.gov/flu/about/burden-averted/2019-2020.htm
100. CDC. Vaccine effectiveness: how well do the flu vaccines work? Updated May 6, 2021. Accessed August 20, 2021. https://www.cdc.gov/flu/vaccines-work/vaccineeffect.htm
101. Garten R, Blanton L, Elal AIA, et al. Update: Influenza activity in the United States during the 2017-18 season and composition of the 2018-19 influenza vaccine. *MMWR Morb Mortal Wkly Rep*. 2018;67(22):634-642. doi:10.15585/mmwr.mm6722a4
102. CDC. US Influenza Surveillance System: purpose and methods. Updated October 6, 2020. Accessed August 20, 2021. https://www.cdc.gov/flu/weekly/overview.htm
103. NYC DOHMH. Statements from health commissioner Dr. Mary T. Bassett and Corporation Counsel Chief of Appeals Richard Dearing on NY Court of Appeals upholding mandated flu vaccines for daycare and preschool children. Published June 28, 2018. Accessed August 20, 2021. https://www1.nyc.gov/assets/doh/downloads/pdf/press/2018/20180628-statement-flu-vaccines-children.pdf

Back to page 15

City Health Information

NYC Health
nyc.gov/health

42-09 28th Street, Long Island City, NY 11101

Bill de Blasio
Mayor

Dave A. Chokshi, MD, MSc
Commissioner of Health and Mental Hygiene

Division of Disease Control
Celia Quinn, MD, MPH, Deputy Commissioner

Bureau of Immunization
Jane R. Zucker, MD, MSc, Assistant Commissioner
Denise H. Benkel, MD, MPH, Medical Specialist

Division of Epidemiology
R. Charon Gwynn, PhD, Deputy Commissioner

Bureau of Public Health Training and Information Dissemination
Calaine Hemans-Henry, MPH, CHES, Assistant Commissioner
Joanna Osolnik, MPH, CHES, Senior Director, Office of Information Dissemination
Sandhya George, Director, Scientific Education Unit
Peggy Millstone, Former Director, Scientific Education Unit
Liz Selkowe, Medical Editor
Melissa Donze, MPH, Program Manager

ASK CHI

Have questions or comments about childhood vaccination?

Email

AskCHI@health.nyc.gov

Copyright ©2021 The New York City Department of Health and Mental Hygiene

E-mail *City Health Information* at AskCHI@health.nyc.gov
New York City Department of Health and Mental Hygiene. Talking with parents about childhood vaccination: building vaccine confidence. *City Health Information*. 2021;40(2):15-30.

REFERENCES *(continued)*

104. Xu X, Blanton L, Elal AIA, et al. Update: influenza activity in the United States during the 2018-2019 season and composition of the 2019-20 influenza vaccine. *MMWR Morb Mortal Wkly Rep*. 2019;68(24):544-551. doi:10.15585/mmwr.mm6824a3

105. CDC. Estimated influenza illnesses, medical visits, hospitalizations, and deaths in the United States—2019-2020 influenza season. Updated June 2, 2021. Accessed August 20, 2021. https://www.cdc.gov/flu/about/burden/2019-2020.html

106. CDC. Flu season. Updated July 23, 2021. Accessed August 20, 2021. https://www.cdc.gov/flu/season/index.html

107. CDC. Weekly US Influenza Surveillance Report: FluView. Updated August 20, 2021. Accessed August 20, 2021. https://www.cdc.gov/flu/weekly/index.htm

108. Langdon-Embry M, Papadouka V, Cheng I, Almashhadani M, Ternier A, Zucker JR. Notes from the field: rebound in routine childhood vaccine administration following decline during the COVID-19 pandemic—New York City, March 1-June 27, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(30):999-1001. doi:10.15585/mmwr.mm6930a3

109. CDC. Childhood vaccination toolkit for clinicians. Updated July 26, 2021. Accessed August 20, 2021. https://www.cdc.gov/vaccines/hcp/childhood-vaccination-toolkit.html

110. CDC. Coronavirus disease 2019 (COVID-19): information for pediatric healthcare providers. Updated December 30, 2020. Accessed August 20, 2021. https://www.cdc.gov/coronavirus/2019-ncov/hcp/pediatric-hcp.html

111. AAP. Guidance on providing pediatric ambulatory services via telehealth during COVID-19. Published April 15, 2020. Accessed August 20, 2021. https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections2/guidance-on-providing-pediatric-ambulatory-services-via-telehealth-during-covid-19

112. CDC. COVID Data Tracker: United States COVID-19 cases, deaths, and laboratory testing (NAATs) by state, territory, and jurisdiction. Updated September 22, 2021. Accessed September 22, 2021. https://covid.cdc.gov/covid-data-tracker/#cases_totalcases

113. NYC DOHMH. COVID-19: data. Updated September 22, 2021. Accessed September 22, 2021. https://www1.nyc.gov/site/doh/covid/covid-19-data-totals.page

114. Delahoy MJ, Ujamaa D, Whitaker M, et al. Hospitalizations associated with COVID-19 among children and adolescents - COVID-NET, 14 States, March 1, 2020-August 14, 2021. *MMWR Morb Mortal Wkly Rep*. 2021;70(36):1255-1260. doi:10.15585/mmwr.mm7036e2

115. US FDA. Learn more about COVID-19 vaccines from the FDA. Updated August 18, 2021. Accessed August 20, 2021. https://www.fda.gov/consumers/consumer-updates/learn-more-about-covid-19-vaccines-fda

116. Stockwell MS, Irigoyen M, Martinez RA, Findley S. How parents' negative experiences at immunization visits affect child immunization status in a community in New York City. *Public Health Rep*. 2011;126(Suppl 2):24-32. doi:10.1177/00333549111260S204

117. Taddio A, McMurtry CM, Shah V, et al; HELPinKids&Adults. Reducing pain during vaccine injections: clinical practice guideline. *CMAJ*. 2015;187(13):975-982. doi:10.1503/cmaj.150391

118. Stockwell MS, Kharbanda EO, Martinez RA, Vargas CY, Vawdrey DK, Camargo S. Effect of a text messaging intervention on influenza vaccination in an urban, low-income pediatric and adolescent population: a randomized controlled trial. *JAMA*. 2012;307(16):1702-1708. doi:10.1001/jama.2012.502

119. Stockwell MS, Kharbanda EO, Martinez RA, et al. Text4Health: impact of text message reminder-recalls for pediatric and adolescent immunizations. *Am J Public Health*. 2012;102(2):e15-e21. doi:10.2105/AJPH.2011.300331

120. Stockwell MS, Irigoyen M, Martinez RA, Findley SE. Failure to return: parental, practice, and social factors affecting missed immunization visits for urban children. *Clin Pediatr (Phila)*. 2014;53(5):420-427. doi:10.1177/0009922814527497

121. Jacobson Vann JC, Szilagyi P. Patient reminder and recall systems to improve immunization rates. *Cochrane Database Syst Rev*. 2005;2005(3):CD003941. doi:10.1002/14651858.CD003941.pub2. Update in: *Cochrane Database Syst Rev*. 2018;1(1):CD003941. doi:10.1002/14651858.CD003941.pub3

Back to page 15