



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
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## **To Vaccinate or Not?**

Curriculum Unit 14.04.01  
by John M. Adamovich

### **Introduction**

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My name is John M. Adamovich and I teach Health Education for New Haven Public Schools. Upon choosing a topic of research for my unit I wanted to choose a topic which the student have a tough time understanding the concepts. Ultimately I want the students to truly understand the concepts while creating projects, which require higher order of thinking. Ultimately I chose the topic of where diseases come from and how can a person prevent them. The information research will relate greatly with vaccines, medicines, as well as communicable and non-communicable diseases. The unit that I teach during this marking period is classified as anatomy and physiology. Within this part of the course students will discover the many facets of structure and function of the human body. Each of the body systems is a sub unit within this unit. The unit covering the immune system would be the section where most students will hear of vaccines for the first time.

### **Current Curriculum**

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Currently students read through the selected Glencoe Health textbook provided by the district of New Haven. Along with the textbook I have also created several power point explaining vaccines and their roles in the world of preventative medicines. Students are given a workbook to work out of as well. Most of the information is very basic and rudimentary for a high school student. Students also currently complete a unit on the different types of medications and how they are taken/function in the body. It is my goal by researching articles and taking the information presented weekly to create a better understanding of my own knowledge of vaccines as well as creating a more in depth unit elaborating on what students already know. This will hopefully increase student understanding of the core subject matter while also creating a more extensive and interactive unit.

## Unit Assignments and Integration

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I have been researching several topics related to vaccines, preventative medicine, and disease treatment in an attempt to collect information pertaining to the unit. Most of the information relates to several of the communicable and non-communicable diseases students will be learning throughout all of the units. Students will be able to refer back to the information on vaccines throughout multiple topics relating to diseases and illnesses. By connecting students previous knowledge of vaccines to the new information being presented in current event it is my hope that it will help assist students in being up to date with modern medicine.

Assignments throughout our units are considered, "Project Based Learning." Meaning that all units must have a culminating project, which corresponds to all information throughout the unit coming together as one. Several of the assignments will allow students to research a certain topic and self educate themselves as well as the others in their class about the given topic. Students first project will be a power point presentation on a certain disease pinpointing several of the signs symptoms, medication techniques, and any of the prevention strategies. The final project for this unit will be a persuasive essay expressing whether or not vaccines truly do a body good? Students will have to learn writing styles of APA format as well as researching information on vaccines and their validity. Ultimately students will be able to express their own views while supporting their position with factual information from outside published source.

## Student Objective/ State Standards

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1- Core Content

4.2- Analyzing internal and External influence on the body

8.1 - Self-Advocacy

Content Objective

- Students will be able to explain the function of the lymphatic system in the body.
- Students will be able to differentiate between the four different types of medicines that prevent infection, fight pathogens, relieve pain and promote health.
- Students will be able to explain the bodies' reaction to a foreign object presented to the body and how it acts to fight off infection.
- Students will be able to explain what an antigen is and its role in the illness prevention process.
- Students will be able to explain the process, which is taken for approval of pharmaceutical medicines.
- Students will be able to identify the 7 key elements of a drug facts label.
- Students will be able to create their own manifesto and sample drug facts label for a drug they have created will submit for approval to the FDA.
- Students will be able to defend whether or not vaccines work?
- Students will be able to analyze several cases where vaccines were used and which were more

successful than others.

## Teaching Strategies

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Throughout the unit students will be asked to participate in various classroom activities and partner with one another. This will allow for students to feed off of one another's skill levels and expertise. Much of the instructional information will be presented to the students by using a projector in whole group discussion forum. However during the skills application portion of class students will be in groups of no more than 3 per group. For the activities these students will be doing, there will be multiple parts, so it will allow for all students to keep busy throughout the application process.

Implementation of writing skills will also be instructed in regards to persuasive writing. Students will be given a rubric to follow for all written assignments done in class. The rubric will include the structural integrity of the essay as well as the content within the written assignment as well.

Computer skills will also be implemented in order to allow students to present their information found on specific medications. These skills will also be used to generate their presentations to the class on a medication of their choice. Close reading protocol will also be implemented throughout the unit to give students a better overall understanding of the subject matter.

## Classroom Activities

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Multiple activities will be constructed in an attempt to further expand upon the information presented to the students in regards to disease and illness prevention. Students will be able to apply their vocabulary and skills learned in order to generate several critical thinking projects.

### **KWL Worksheet**

At the start of the unit I felt it would be in my best interest to grasp what the students already know about the subject matter prior to implementing the background knowledge into each class lesson. A KWL worksheet allows the student to tell the teacher what he/she already *knows* (K) about the subject, *What* (W) they would

like to know, and more importantly at the end what's new that they have *learned* (L). The worksheets are typically set up in the simple three-chart system and students are able to fill out each column when asked. My worksheet will allow students to use this worksheet throughout the unit as check in's with the instructor. The section on what they know and what they want to know is actually a detachable piece at the bottom of the worksheet allowing the students to rip them off and hand them into the teacher. This allows the teacher to know in what direction to start while also gaining topics of interest from each of the students.

## IE

What I <b>KNOW</b> about _____ :
What I <b>WANT</b> to know about _____ :
What I have <b>LEARNED</b> about _____ : Or a variation could be, What I expect to <b>LEARN</b> about _____ :

## Video

ESPN 30 for 30 Video, "The Announcement" This video goes into the physical and mental toll a severe illness has effected Magic Irving Johnson, who had become contracted with HIV as well as it has effected the others around them. Open-ended questions can be those, which make the viewers think outside of the box. (Video can either be found on youtube, ordered online through Amazon/Ebay, or downloadable through: [http://espn.go.com/espn/espnfilms/story/\\_/page/theannouncement/announcement](http://espn.go.com/espn/espnfilms/story/_/page/theannouncement/announcement))

Questions such as these may be used to draw students :

What lifestyle risk factors led to Magic (Irving) Johnson to contracting such a deadly disease?

How did the other athletes react when they heard that Magic Johnson had contracted the disease? Do you feel that this was a fair reaction? Why or why not?

How did the players react when they heard that he was going to still play in the NBA? What would your reaction be if you knew that the person you played against have a deadly and highly contagious disease?

What issues did Magic Johnson face throughout his NBA career? Home life? Social/Media?

## **Close reading**

This activity will allow them to become more familiar with the basic information of what is a vaccine and what it does. Students will conduct a close read on the history of the first vaccine and how it was used. Students will have had a basic understanding of the anatomy and physiology behind how the body systems work prior to this reading. Close reading is a process of breaking down a text that's above the students reading level. The entire process allows students to take a paragraph, or several paragraphs, and analyze only a sentence or two at a time.

Sections of the book entitled: "Surviving the Extremes: What Happens to The Body and Mind at The Limits of Human endurance" written by, Kenneth Kamler M.D., can be used for close reading exercises on the body systems.

## **Manifesto Activity**

Students will create their own medication, which would need to be written up as a manifesto. Student's criteria for this activity will be composed of several parts. Creation of the manifesto is one of the steps in creating their medication. Students will need to research what ingredients in medications interact with the body and will use those in their ingredients list for their future medication (this is will minimize outlandish medications being presented). Students will then create their medications packaging using Microsoft publisher or Photo Shop a current medication packaging to give a close to real appearance for the made up medication.

## **Final Persuasive Essay**

Students are always being told that they must be vaccinated against multiple illnesses and diseases prior to attending college. However, what if one decides not to become vaccinated? Can one opt out of becoming vaccinated? This next activity/ written assignment allow the students to act on behalf of the parent of a student going to attend the school or the president of the university. In their writing they must defend their decision with facts identifying whether or not vaccinations should be given/allowed in order to attend the university.

After reading multiple articles on vaccines and the controversies between whether or not to use them students will be asked to generate a five paragraph essay on whether or not vaccines should be used? Students will then be given time in class to research debatable websites. A few of the websites I currently use with my students for this activity are, [www.vaccinationdebate.net](http://www.vaccinationdebate.net), [www.vaccines.procon.org](http://www.vaccines.procon.org), and <http://www.scholastic.com/parents/resources/article/parent-child/vaccine-debate>.

Students are given a rubric to follow for the paper. This rubric has been formatted across curriculums with two other sophomore teachers. This allows students to stay consistent throughout their classes writing processes.

Each of the five sections will be designed to focus on the several areas in which they would need to improve to stay on track for the following school year. There will be five sections each scored on a descending scale starting at four. Section one focuses on the student's thesis statements and introductions. Section two will be based on basic essay structure. Section three will be supporting paragraphs being used throughout the body of their papers to determine if each body paragraph has its own idea/purpose. Section four will be used to determine supportive reasoning, allowing students to cite other researchers work. Section five focused on their concluding paragraph. This allowed me to see if the student were able to restate the thesis statement while also giving a summative conclusion to the paper

## Background Knowledge

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Students must have a deeper understanding of the immune system prior to venturing into thoughts of having to vaccinate or not. Our immune system is a complex machine, which is constantly fighting every second of every day to keep us at a state of homeostasis. Our body has many complex systems. The cardiovascular system works together with the lymphatic system to kill off any pathogen, a microorganism that may cause disease, allowing us to live a healthy balanced lifestyle.

### Blood

The cardiovascular system is responsible for blood transport throughout the body. One may ask the question why do we need blood? A student's typical answer is to say, "to stay alive." This is a general response and in fact is more complex in nature. Blood has several jobs throughout the body. "Blood carries oxygen to body cells, delivers nutrients to body cells, carries carbon dioxide to the lungs to be exhaled, delivers waste product to the kidneys, and helps white blood cells fight diseases." (Bronson M., 2011).

Blood is made up of plasma, red blood cells, white blood cells, and platelets. Plasma is a fluid made up of mainly water but also consists of nutrients, proteins, salts and hormones. Plasma, however, is only 55% of the make up of blood. Another 40% is found in the red blood cells, better known as "hemoglobin." Hemoglobin is a iron rich protein which is able to bind to oxygen to carry it throughout the body. It is also able to bind to carbon dioxide, which helps in the ability to bring this waste gas back to the lungs to be exhaled and eliminate. The other 5% of blood is the combination of white blood cells and platelets. White blood cells surround and ingest the organisms that cause disease. This allows white blood cells to form antibodies and react quicker in a second attack. Platelets on the other hand allow the blood to clot. Allowing our bodies not to continuously bleed when cut.

### Cardiovascular system

The main component of the cardiovascular system are the heart, arteries, veins, and capillaries. The heart works as a pump to allow blood to circulate into the heart and out of the heart. The heart works together with the lungs to bring deoxygenated blood to the lungs to become oxygenated. The deoxygenated blood travels throughout pulmonary **arteries**, which are blood vessels that send blood away from the heart. Pulmonary **veins**, allow the now oxygenated blood to flow back towards the heart, and then be pumped to the rest of the body. (Bronson M., 2011).

### The Heart

The heart is broken down into multiple parts working together as one to deliver oxygenated blood throughout the body. The heart receives blood via the inferior and superior vena cava. These veins are both connected to the right atrium and are the first stop for deoxygenated blood. The blood is then pumped into the right ventricle where it is then sent via pulmonary arteries to the lungs to bind with oxygen. Once the blood binds with the oxygen it is now oxygenated and is ready to be sent back to the heart by the pulmonary veins. These pulmonary veins are connected to the left atrium, which is responsible for receiving oxygen rich blood (hemoglobin) from these veins. The blood is then pumped into the left ventricle. Blood is then pumped into the aorta. The aorta is responsible for distributing all of the blood throughout our body via a network of capillaries that pervade the entire body. Without this complex connection of vessels, arteries, veins, and capillaries we

would not be able to function at a normal rate of homeostasis.

## **The Lymphatic System**

The lymphatic system is very different from the cardiovascular system and works together with it to protect our bodies from infections and illnesses. It is different in the sense that there is no central "pumping station" like the heart. This system is under positive pressure and a certain portion of blood is thus leaked into a complex network of vessels and tissues that move and filter this blood into what is called, "Lymph," a clear fluid devoid of red blood cells that fills pervades the entire body. Lymph is similar to plasma and is found all throughout the body. Along with the many properties in lymph (water and proteins) it also contains fat and white blood cells called, lymphocytes. These lymphocytes help to fight off pathogens. "A pathogen is identified as any microorganism that may cause disease." (Bronson M., 2011).

B cells and T cells are the two types of lymphocytes circulating in the body. After coming into contact with a pathogen B-cells multiply. These B-cells produce antibodies that fight the foreign pathogen and inform other cells in the immune system of the illness so that a subsequent response is quicker and vigorous. In that sense, the immune system develops a memory of an invading pathogen. T cells act in a similar manner to B cells. Unlike B cells, T cells do not produce antibodies, but rely on B cells for information regarding the nature of the invading pathogen. There are two types of T cells, killer T cells and helper T cells. The killer T cells enlarge and kill off the infection preventing it from spreading while the helper T cells job is to help activate B cells and killer T cells. In this way, there is a reciprocating and cooperative function between the various cells of the immune system. It is in a sense a conversation regarding the nature of the invading pathogen and how the body should respond to it. "Lymph is filtered by lymph nodes, small bean-shaped organs found in lymph vessels." (Bronson M., 2011). The white blood cells in these lymph nodes trap and destroy pathogens.

The lymphatic system works with the circulatory system to circulate information throughout the body while also allowing the body to communicate between systems. The immune system must work cooperatively to maintain homeostasis and create a quicker response to an illness and therefore minimize the severity of a future reaction.

## **Vaccines**

Vaccines are a dead version of the pathogen you are looking to defend against. These communicable diseases can leave you severely ill or even dead. The vaccine works in two ways; it introduces your immune system to the dead pathogens and allows your body to build up a defense system boosting the immune response when a person is presented with the diseases.

Most vaccines contain either a small version of the disease that is very weakened or a dead version of it. Vaccines do not contain the germ that makes you sick, but it allows the immune system to recognize the pathogen ahead of time and build up antibodies against the diseases being presented to the body. Most vaccines are delivered by injections, but some recently have been delivered via nasal spray or orally (by mouth).

Your body can create antibodies in two ways: by getting the disease, or by receiving the vaccine for the disease. Getting the vaccine is a much safer way to building the vaccines than having to suffer the disease itself first hand. Vaccines and antibodies for these diseases can be stored in your body for a long time, however, diseases can change and morph into different versions of the disease. In these cases the individual may need to have a "booster shot." A booster shot sends the same vaccine back into the body to regenerate

and increase the antibodies as well as the immune response to the diseases.

### **History of the first vaccine**

In 1791 Small pox raged through Boston leaving 844 people dead. "During this epidemic, physician Zabdiel Boylston, at Cotton Mather urging, variolated 248 people, thereby introducing variolation to the Americans." (HofV.org, 2014) Variolations were first used prior to vaccinations to immunize an individual against smallpox. The fatalities, which came about from these variolations was about 3%, and the disease case was 14% fatal. This led to at least 900 people leaving the town in fear of contracting the disease.

Edward Jenner did the world's first true vaccination in 1796. He did so by extracting pus from a cowpox lesion from a milkmaid's hand and then inoculating an eight-year-old boy, James Phipps. Six weeks later Jenner then injected James with the smallpox disease and was unharmed. James's immune system had built up immunity to the cowpox, which allowed his body to have the pathogen presented to his body, but not feel the side effects to the disease.

In 1901 an outbreak of small pox hit Boston, MA. The illness lingered until 1903. "From 1901 to 1903, there were 1596 cases of smallpox with 270 deaths., in a city with the population of approximately 560,900. The attack rate was 3 cases per 1000 persons, with a case fatality rate of 17 percent." (Albert, Ostheimer, Breman, 2001). At this rate the city of Boston needed to do something to control this epidemic from wiping the cities population out completely.

In 1901 Dr. Samuel Holmes Durgin, chairman on the board of faculty at Harvard Medical Group, served as a front man in the race to stopping this deadly illness. By December 1901 over 400,000 Bostonians were vaccinated. People were even forced to take the vaccinations even though they may not have wanted to become vaccinated. "People who refused vaccinations were subjected to a \$5 fine or 15-day jail sentence." (Albert, O., B., 2001). Since majorities of the people with the illness were homeless, the Boston Board of Health mandated it, in November of 1901, to send out "virus squads." These squads would serve to vaccinate any men living in inexpensive houses.

### **The Pfeiffer Affair**

In 1902 Dr. Immanuel Pfeiffer visited the smallpox hospital while also refusing a vaccination to the disease. Pfeiffer felt strongly that healthy non-vaccinated individuals were not at a risk of contracting the disease. He went as far as to pass a bill called the "Pfeiffer Bill." This bill would make the medical staff obtain consent prior to injecting a poisonous substance into the body of any person. (Albert, O., B., 2001).

In an unexpected move, Durgin lifted the strict requirements for recent vaccinations. Even though Pfeiffer fell severely ill short after tests showed it was not in relation to the smallpox disease. The media took it upon themselves to use this to their advantage to promote vaccinations and printed a statement saying, "it is a salutary lesson to the anti-vaccinationists, and it is destined to live in the annals of preventive medicine." (Albert, O., B., 2001).

### **The Vaccination Controversy**

Throughout the last few decades' parents, schools and doctors have expressed strong beliefs that vaccinations are a big step in keeping your child healthy. Are they right? Are vaccinations the real way to keep children safe from pathogens outside the body? As we can see above from past to present people everywhere



have opinions as to whether or not one should be routinely vaccinated. Today, students must be vaccinated in order to step foot on school grounds. If a student is not vaccinated he or she are sometimes not allowed to legally have access to an education.

In 2008 a survey was taken and ranked several risk behavior to show parents what type of behaviors were in fact "high risk" behaviors. Parents who send their child to school and then back home are under the assumption that a school is of low risk. Within the survey it was shown that both school and playing sports are labeled as "high risk" behaviors. (Bronfin D., 2008).

All 50 states require vaccinations for children entering into public schools even though no mandatory federal law exists. 48 states (excluding Mississippi and West Virginia) allow religious exemptions and the prevalence of non-medical exemptions have increased in states that make them easily available to parents. Children with a non-medical exemption have been shown to have an increased risk of acquiring and transmitting diseases.

A statement was made in the Journal of the American Academy of Pediatrics in reference to this legal issue. These doctors are working in areas of legislation, vaccinations, and adolescent health:

"Federal law does not explicitly require parental consent for vaccinations. However, federal law does require the provision of information about particular vaccines when they are administered. This requirement is based on the National Childhood Vaccine Injury Act of 1986 (NCVIA), which requires the provision of a vaccine information statement (VIS) whenever any specified vaccine is administered to either a child or an adult. A VIS is a 1-page (2-sided) information sheet produced by the Centers for Disease Control and Prevention (CDC). VISs inform vaccine recipients, or their parents or legal representatives, about the benefits and risks of vaccines.<sup>8</sup> The CDC's VIS fact-sheet Web page: ([www.cdc.gov/vaccines/pubs/vis/vis-facts.htm](http://www.cdc.gov/vaccines/pubs/vis/vis-facts.htm))." (English, Shaw, McCauley, Fishbein, 2008)

The two charts below show ways a minor may give consent to a vaccine.

Table 1: on the basis of their legal status, Table 2: specific health services.

**TABLE 1 Minor Consent Based on Legal Status: Categories of Legal Status That Permit Minors to Consent for Their Own Health Care in 1 or More States**

Emancipated minor  
Married minor  
Minor in the armed services  
Mature minor  
Minor over a certain age  
Minor living apart from parents  
High school graduate  
Pregnant minor  
Minor parent  
Incarcerated minor

Sources: English A, Kenney KE. *State Minor Consent Laws: A Summary*. 2nd ed. Chapel Hill, NC: Center for Adolescent Health and the Law; 2003 and English A. *Minor Consent for Health Care in the States: A Table*. Chapel Hill, NC: Center for Adolescent Health and the Law; 2007 (both

**TABLE 2**

**Minor Consent Based on Services: Categories of Health Care Services for Which Minors Are Allowed to Give Consent in 1 or More States**

Pregnancy-related care  
Contraceptive or family planning services  
Prevention, diagnosis, and treatment of sexually transmitted or venereal disease  
Prevention, diagnosis, and treatment of reportable disease  
HIV/AIDS testing and treatment  
Drug or alcohol counseling and treatment  
Outpatient mental health services  
Examination, diagnosis, and treatment for sexual assault

Sources: English A, Kenney KE. *State Minor Consent Laws: A Summary*. 2nd ed. Chapel Hill, NC: Center for Adolescent Health and the Law; 2003 and English A. *Minor Consent for Health Care in the States: A Table*. Chapel Hill, NC: Center for Adolescent Health and the Law; 2007 (both available at [www.cahl.org](http://www.cahl.org)).

What if a student chooses not to be vaccinated? Is this possible? In Wisconsin in 2009 a case study was done to show reasons why parents were allowing their children to be exempt from receiving vaccinations. With 166 people surveyed, at least 95 of them stated that, "the vaccines may cause harm." 51 stated, "Vaccines can bring on other disorders, such as autism." (Salmon D., 2009) 22 other individuals also stated that it went against their religious morals and/or ethical values to receive vaccinations. Each state carries different laws upon vaccinating. However, all states in the US must provide a parent and/or child with the information about the diseases and how the vaccine can potentially prevent the illness or disease from becoming contracted.

Many parents hear horror stories of what vaccines can do to an infant's body. Questions such as, "Will it weaken my baby's immune system? Will it give my baby another illness? Will this cause growth complications throughout my child's life?" The National Childhood Vaccine Injury Act of 1986 mandates a detailed database of all reported adverse events associated with vaccines and also to serve to protect providers who administer immunizations. (Bronfin D., 2008). "Since 2001 there have been over 5,000 cases alleging a relationship between vaccinations and autism." (Vaccines.procon.org, 2014). Aside from a relationship between vaccines and autism, in between 1988 and 2009, the United States Court of Federal Claims Office of Special Masters also awarded compensation to 1,322 families whose children suffered brain damage from vaccines. (Kennedy R., 2009).

In a positive light vaccinations have eradicated severe illness and disease, which in the past had wiped out thousands of individuals. Along with killing off the illnesses it prevents people from getting them before they are even introduced to the illness/disease. "According to researchers at the Pediatric Academic Society, childhood vaccinations in the US prevent about 10.5 million cases of infectious illness and 33,000 deaths per year." (vaccines.procon.org, 2014).

## Appendix

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Our school is a Magnet school based out of New Haven, CT. Our school's primary focus is on the health science sports medicine theme. We offer a diverse set of skills to our students that they will not be able to possess upon attending a public school within the district. All of the classes within our school follow the standards set for by the district as well as the magnet standards we created as a school. These magnet standards include:

1. **Critical thinking, problem solving and decision-making** – using critical thinking to analyze and solve problems.
2. **Communication skills** – develop college and career ready skills in reading, writing, speaking, listening and language.
3. **Collaboration skills** – understand the roles and responsibility of individual members of a team.
4. **Technical skills** – develop technical skills required for careers in health science and sport medicine.
5. **Content area knowledge** – develop core knowledge in the areas of health science and sports medicine.
6. **Health Maintenance skills** – understanding the fundamentals of wellness and disease prevention.

This unit is currently being taught to students at the high school level. Ninth graders have already taken courses in anatomy and physiology as well as medical interventions. This unit is intended to be taught to students within their tenth grade year. This unit will be presented to them in conjunction with other units teaching them about various forms of medications and communicable/preventative diseases.

Students, who attend our school, are selected on a lottery system. Students are chosen at random from multiple school districts. These towns currently include, but are not limited to: Bridgeport, North Haven, East Haven, Ansonia, Hamden and West Haven. These skills learned are taught to these students in the hope of preparing these individuals for a successful career in health science or sports medicine.

## Resources

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### Websites

- [www.Teachengineering.org](http://www.Teachengineering.org)
- [Http://www.huffingtonpost.com/2014/03/31/vaccination-rates-nyc--schools\\_n\\_5062316.html#](http://www.huffingtonpost.com/2014/03/31/vaccination-rates-nyc--schools_n_5062316.html#)
- [www.vaccines.procon.org](http://www.vaccines.procon.org)
- <http://www.phac-aspc.gc.ca/im/vs-sv/vs-faq01-eng.php>

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## Textbooks

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Mary H. Bronson, Ph. D., (2011). *Glencoe Health*. Columbus, OH: The McGraw-Hill Company Inc.

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