


6-2017

Ethical Issues of Parental Vaccine Hesitancy and Resistance to the MMR Vaccine

Harlie Silver

Union College - Schenectady, NY

Follow this and additional works at: <https://digitalworks.union.edu/theses>

 Part of the [Community Health and Preventive Medicine Commons](#), [Public Health Education and Promotion Commons](#), and the [Virus Diseases Commons](#)

Recommended Citation

Silver, Harlie, "Ethical Issues of Parental Vaccine Hesitancy and Resistance to the MMR Vaccine" (2017). *Honors Theses*. 86.
<https://digitalworks.union.edu/theses/86>

This Open Access is brought to you for free and open access by the Student Work at Union | Digital Works. It has been accepted for inclusion in Honors Theses by an authorized administrator of Union | Digital Works. For more information, please contact digitalworks@union.edu.

Ethical Issues of Parental Vaccine Hesitancy
and Resistance to the MMR Vaccine

By

Harlie Silver

* * * * *

Submitted in partial fulfillment
of the requirements for
Honors in the Department of Philosophy

UNION COLLEGE

June, 2017

ABSTRACT

SILVER, HARLIE Ethical issues of parental vaccine hesitancy and resistance to the MMR vaccine. Department of Philosophy, June 2017.

ADVISOR: Robert Baker, PhD

In this thesis I present a brief history of vaccination, the anti-vaccine movement, the measles virus, and the associated risks to children and adults. I then discuss the factors contributing to parental vaccine hesitancy and resistance, consider issues of undervaccination, herd immunity, and the underlying ethical issues. Finally, I address exemptions to school-required immunizations and argue for the elimination of both philosophical and religious exemptions, while examining parental moral responsibility when it comes to the health and safety of one's own children and those with whom they may come in contact.

Table of Contents

Acknowledgments	v
Abbreviations and Acronyms	vi
Chapter I: Introduction	
Part I: Brief History of Vaccination and the Anti-Vaccine Movement	1
Part II: Measles – The Virus, The Disease, The Risks, and The Vaccine	8
Chapter II: Parental Safety Concerns Regarding Vaccination	16
Chapter III: Concerned Parental Groups and Challenges	
They Each Present	27
Part I: The Concerned and Their Challenges	28
Part II: The Concerned Modifiers and Their Challenges	30
Part III: The Opposed and Their Challenges	33
Chapter IV: Undervaccination, Herd Immunity, and Underlying Ethical Issues	35
Chapter V: School-Required Vaccine Exemptions and Parental Moral Responsibility	
Part I: Different Types of Vaccination Exemptions	46
Part II: Elimination of Philosophical Vaccination Exemptions	49
Part III: Elimination of Religious Vaccination Exemptions	58

Part IV: Parental Moral Responsibility and the Importance of Medical Vaccination Exemptions	65
Chapter VI: Conclusion	68
Glossary	71
Bibliography	78

Acknowledgements

I would like to recognize and thank Professor Robert Baker for his time, assistance, and feedback throughout the thesis writing process. Professor Baker's guidance as both a bioethicist and as my thesis advisor enabled me to advance as a philosophical writer and fostered my ability to ethically argue my perspective on school-required vaccine exemptions. I am grateful to Professor Baker for his continuous support.

Abbreviations and Acronyms

AAFP – American Academy of Family Physicians

AAP – American Academy of Pediatrics

AIDS – Acquired Immunodeficiency Syndrome

CDC – Center for Disease Control

CNS – Central Nervous System

CO – Conscientious Objector

CRC – United Nations Convention on the Rights of the Child

DNA – Deoxyribonucleic Acid

D.O. – Doctor of Osteopathy

DTH – Delayed-Type Hypersensitivity

EPI – Expanded Program on Immunization

FDA – Food and Drug Administration

HIV – Human Immunodeficiency Syndrome

MCV – Measles Containing Vaccine

M.D. – Medical Doctor

MIBE – Measles Inclusion Body Encephalitis

MMR – Measles, Mumps, and Rubella

NVIC – National Vaccine Information Center

RNA – Ribonucleic Acid

SSPE – Subacute Sclerosing Panencephalitis

UNICEF – United Nations Children’s Fund

WHO – World Health Organization

Chapter I: Introduction

Part I: Brief History of Vaccination and the Anti-Vaccine Movement

Before the development of vaccination, the most successful way to combat disease, specifically smallpox, was through inoculation.¹ Smallpox is believed to have first appeared around 10,000 BC, and as early as 430 BC it was common knowledge that those who survived the disease became immune to it.¹ “During medieval times, many herbal remedies, as well as cold treatment and special cloths, were used to either prevent or to treat smallpox”.¹ However, inoculation – also known as variolition – was the most successful way to fight this disease, by subcutaneously placing a smallpox virus sample into non-immune individuals.¹ This was done by an inoculator, who would take “fresh matter...from a ripe pustule of some person who suffered from smallpox”.¹ The inoculator then took the collected sample and placed it under the skin of the arms or legs of the patient.¹ This practice began to increase across several countries, due to the threat of epidemic, but it also had associated risks.¹ These risks included “that recipients might develop disseminated smallpox and spread it to others”, as well as the threat of “transmission of other diseases, such as syphilis, via the bloodborne route”¹ from the smallpox-infected individual to the inoculation receiving, non-immune individual.¹

¹ Riedel, S., MD, PhD. (2005). *Edward Jenner and the history of smallpox and vaccination*. Baylor University Medical Center. Proceedings, 18(1), 21. Retrieved from <http://search.proquest.com/docview/1032820068?accountid=14637>

It is likely that inoculation was practiced in Africa, India, and China long before it was introduced to Europe in the 18th Century.¹ The practice was introduced to the Middle East in 1670, when Circasian traders brought it to the Ottoman Empire.¹ Women from the Caucasus were inoculated as children, as they were highly sought after for the Turkish sultan's harem.¹ In the beginning of the 18th Century, travelers from Istanbul arrived in Europe, bringing inoculation practices with them.¹ Reports from travelling Europeans began to arrive in London, documenting the details of the inoculation procedure, but it did not sway the practices of the conservative English physicians.¹

It was not until Lady Mary Wortley Montague, an English aristocrat, continuously advocated for the procedure that inoculation was really introduced in England.¹ An episode of smallpox had seriously disfigured Lady Montague's face in 1715, and her brother died from the disease only 18 months later.¹ Then in 1717, when her husband was appointed as an English ambassador in Istanbul, Lady Montague was determined to prevent smallpox from detrimentally effecting her children.¹ In 1718, after studying the inoculation technique used in Istanbul, Lady Montague "ordered the embassy surgeon, Charles Maitland, to inoculate her 5-year-old son".¹ In 1721 the family returned to London, and "Lady Montague had Charles Maitland inoculate her 4-year-old daughter in the presence of physicians of the royal court".¹

The inoculations of Lady Montague's children were the first to be professionally performed, and talk of the procedure spread throughout the royal family as a result.¹ In August 1721, Charles Maitland was given a royal license to perform a trial of inoculation on six prisoners.¹ "Court physicians, members of the Royal Society, and members of the College of Physicians observed the trial", which proved to be successful, as "all prisoners survived the experiment, and those exposed to smallpox later proved to be immune".¹ Maitland followed these results by repeating the trial, but this time on orphaned children.¹ His results were, again, successful.¹ Finally, in April 1722, following the successful inoculation of the Prince of Wales' daughters, the procedure was broadly accepted.¹

The practice of inoculation quickly spread among the physicians in Europe, and due to the large demand for protection against smallpox, the procedure began being administered on a large scale basis.¹ Inoculation rapidly became extremely popular among both aristocrats and common people in Europe, even though 2% to 3% of inoculated people "died from the disease, became the source of another epidemic, or suffered from diseases (e.g., tuberculosis and syphilis) transmitted by the procedure itself".¹ The procedure would continue to be widely popular and practiced in Europe until 1800, when Edward Jenner's vaccination procedure would have spread rapidly across England and would reach most European countries.¹

As a young boy, Edward Jenner was successfully inoculated with smallpox, setting him down the path of science, nature, and the future foundations of immunology.¹ A significant moment in Jenner's life came when he was 13 years old, while working as an apprentice to a country surgeon near Bristol.¹ "The record shows that it was there that Jenner heard a dairymaid say, "I shall never have smallpox for I have had cowpox. I shall never have an ugly pockmarked face." In fact, it was a common belief that dairymaids were in some way protected from smallpox".¹ This moment would be the first of many in Jenner's life in which the tale that post-cowpox-infected dairymaids were naturally protected from smallpox.¹ Jenner went on to work with two well-respected doctors, from whom he learned valuable knowledge about science, and both surgical and general medical practices.¹ However, it was not until 1796, after 23 years of practicing medicine, that Jenner made any real progress towards eradicating smallpox.¹ After hearing smallpox-protected dairymaid stories for much of his life, Jenner believed that "cowpox not only protected against smallpox but also could be transmitted from one person to another as a deliberate mechanism of protection".¹

In May 1796, Jenner encountered Sarah Nelms, a young dairymaid infected with cowpox, who had fresh pustules on her hands and arms.¹ Jenner first attempted to test his cowpox-against-smallpox theory on May 14, 1796, when he used matter from Nelms' pustules to inoculate 8-year-old James Phipps, without any form of parental consent.¹ Following the inoculation, Phipps

presented with a mild fever and discomfort under his arms, as well as complaining of feeling cold and loss of appetite nine days after the procedure.¹ However, on the tenth day Phipps was feeling much better.¹ Jenner gave Phipps a second inoculation in July 1796, this time with matter from a fresh smallpox pustule, and again without parental consent.¹ When Phipps failed to develop smallpox, Jenner concluded that Phipps must have achieved smallpox protection and his experiment was a success.¹ Seeking publication of his findings, Jenner performed this practice a few more times and privately, in 1798, he published a small booklet.¹ Jenner cleverly used the Latin word for cow (*vacca*) and the Latin word for cowpox (*vaccinia*) as inspiration in naming his new procedure, ultimately deciding to call it *vaccination*.¹

Following publication of his booklet, Jenner traveled “to London in search of volunteers for vaccination”¹, but unfortunately found no individuals willing to undergo the procedure.¹ However, Jenner had given some inoculate to a surgeon named Henry Cline, who had success in beginning to popularize the smallpox vaccination in London.¹ Over the next few years, other physicians would also begin to support vaccinations in their practices, stimulating Jenner to conduct “a nationwide survey in search of proof of resistance to smallpox or to variolition among persons who had cowpox”.¹ Results of the survey confirmed Jenner’s cowpox-against-smallpox theory.¹ Consequently, the practice of vaccination began to spread through Europe, reaching through England and to most mainland European countries by 1800.¹ Jenner would send the “vaccine to

his medical acquaintances and to anyone else who requested it”¹, and many recipients would then send the vaccine to their acquaintances, and so on.¹

This pay-it-forward practice explains how the vaccine eventually ended up in the United States. After some time, a doctor sent the vaccine to Benjamin Waterhouse, a professor at Harvard University, who was able to introduce the practice to New England.¹ In Virginia, Waterhouse was also able to sway Thomas Jefferson into trying vaccination, which led to Waterhouse’s appointment as vaccine agent in the National Vaccine Institute, as well as to the enactment of a vaccination program in the United States.¹ Vaccines “quickly became integral to utilitarian and public health notions of societal security, productivity, and protection”.² In the 1800s, state laws in both Europe and North America were passed that made smallpox vaccination compulsory.² Then in the 1900s, a list of recommended childhood immunizations was established, managed by the government, and eventually formed the basis of the school-required immunizations for public schools.² Finally, vaccine programs went global after the establishment of UNICEF (1946) and the WHO (1948).² Global vaccine programs include those such as EPI, launched by the WHO in 1974 and operated through regional WHO offices, that aims to considerably increase childhood vaccination rates in developing countries around the world.² The WHO also lead a massive

² Stern, A. M., & Markel, H. (2005). The history of vaccines and immunization: Familiar patterns, new challenges. *Health Affairs* 24 (3):611-621.

smallpox campaign in 1960s-1970s, resulting “in the last naturally occurring case of smallpox in Somalia in 1977”.²

However, as vaccination has become a successful global practice, there has also been relatively consistent vaccine opposition. There was already an anti-vaccination movement in the 1800s opposing Jenner’s smallpox vaccine, despite obvious benefits, which ultimately resulted in continuous smallpox outbreaks and related deaths into the twentieth century.³ Interestingly,

Antivaccine thinking receded in importance between the 1940s and the early 1980s because of three trends: a boom in vaccine science, discovery, and manufacture; public awareness of widespread outbreaks of infectious diseases (measles, mumps, rubella, pertussis, polio, and others) and the desire to protect children from these highly prevalent ills; and a baby boom, accompanied by increasing levels of education and wealth. These events led to public acceptance of vaccines and their use, which resulted in significant decreases in disease outbreaks, illnesses and deaths.³

This era can be referred to as the golden age of public vaccine acceptance, but it was short-lived due to the lack of visible benefits and the increases in media circulation of faulty science and anecdotal claims about vaccine injury.³ Thus, anti-vaccine sentiment reemerged in the late 1970s.³ The modern anti-vaccine

³ Poland, G. A., & Jacobson, R. M. (2011). The Age-Old Struggle against the Antivaccinationists. *New England Journal of Medicine*, 364(2), 97-99. doi:10.1056/nejmp1010594

movement uses primarily television, social media, blogs, and other areas of the Internet to draw public attention away from scientific evidence and to influence public vaccination opinions.³ The retracted 1998 Wakefield et al. article in the *Lancet* made fraudulent claims that the MMR vaccine was causally linked to autism development, which ended up sparking a worldwide debate over the vaccine.³ The article led to countries including Britain, the United States, and Ireland decreasing use of the vaccine, ultimately resulting in measles outbreaks.³ Modern anti-vaccinationists include people ranging from those who are simply innumerate³, to those with “a radical fringe element who use deliberate mistruths, intimidation, falsified data, and threats of violence in efforts to prevent the use of vaccines and to silence critics”.³

Part II: Measles – the Virus, the Disease, the Risks, and the Vaccine

Measles (Rubeola) is a highly contagious disease caused by infection with the measles virus.^{4,5} Dr. John Enders and Dr. Thomas Peebles first isolated the virus in the 1950s from the blood of someone with the disease.⁵ The virus is transmittable through the air by means of respiratory droplets released when infected individuals cough or sneeze.^{4,5} These respiratory droplets carry infectious measles virus to the respiratory tract of the vulnerable hosts.⁵ Once

⁴ Wikipedia – *Measles* – <https://en.wikipedia.org/wiki/Measles>

⁵ Moss, W. J., MD, MPH, & Scott, S., PhD. (2009). *The Immunological Basis for Immunization Series: Module 7: Measles, Update 2009*. Geneva, Switzerland: World Health Organization Department of Immunization, Vaccines and Biologicals; WHO Press.

infected, individuals will not immediately experience the onset of clinical signs and symptoms of the disease, due to a 10 to 14-day incubation period.⁵

Typically, the virus will begin replication in the upper respiratory tract, will then spread to local lymphatic tissue, and is followed by viremia.⁵ The virus will then continue to spread to various organs, including “lymph nodes, skin, kidney, gastrointestinal tract and liver, where the virus replicates in epithelial and endothelial cells as well as monocytes, macrophages and lymphocytes”.⁵

After the incubation period, clinical symptoms will begin to afflict the infected individual. These symptoms usually begin with a high fever (up to 105°F), runny nose (coryza), cough, conjunctivitis (red and watery eyes), and sore throat.⁶ Two or three days after symptoms begin, tiny white spots (Koplik spots) may also appear on the inside of the infected individual’s mouth, and a rash will usually break out around day five from when the symptoms began.⁶ Initial symptoms will commonly intensify a few days prior to rash emergence.⁵ The rash will first appear as flat, red spots along the facial hairline, and will disseminate downward towards the neck, torso, arms, legs, and feet.⁶ “Small raised bumps may also appear on top of the flat red spots. The spots may become joined together as they spread from the head to the rest of the body”.⁶ Individuals are typically contagious 2-3 days prior to onset of the rash, and will remain contagious for up to four days post-onset.⁵ After approximately three to

⁶ CDC – *Measles Signs and Symptoms* – <https://www.cdc.gov/measles/about/signs-symptoms.html>

four days, the infected individual's fever will begin to subside and the rash will fade in a manner similar to how it appeared.^{6,5} "Some children, particularly those who are malnourished, may develop a deeply pigmented rash that desquamates or peels during recovery".⁵ The measles rash occurs as a result of a cellular immune response, and therefore people with challenged cellular immunity, such as those with AIDS, may not develop the characteristic measles rash even if they are infected.⁵

Complications from the infection occur in 10-14% of cases, with the risk of complication increasing "by extremes of age, malnutrition, and other causes of impaired immunity".⁵ While measles complications have been recorded in nearly every organ system in the body, the respiratory tract is one of the most frequent complication sites.⁵ Pneumonia, which can be caused by secondary viral infection, bacterial infection, or measles virus itself, is actually the cause of most measles associate deaths.⁵ "Other respiratory complications include laryngotracheobronchitis (croup) and more commonly otitis media (ear infection)".⁵ Other measles complications may also contribute to malnutrition, such as mouth ulcers (stomatitis), by hindering children with measles from eating or drinking.⁵ Many children infected with measles will also develop diarrhea, which will add to their malnutrition.⁵ Post-infection complications, such as eye disease (keratoconjunctivitis), may also develop and ultimately lead to blindness in the infected individual.⁵ This complication occurs particularly in children with vitamin-A deficiency.⁵ One out of every four individuals who become infected with

measles virus will have to be hospitalized, clearly illustrating the seriousness of the disease.⁷ One out of every thousand individuals afflicted with measles virus will develop brain swelling due to infection (encephalitis), which may lead to brain damage.⁷ One to two out of every thousand infected individuals will ultimately die from the disease, illustrating yet another example of the seriousness of the virus.⁷

There are also some very serious, but rare, complications from the virus that involve the central nervous system.⁵ One out of every thousand infected individuals will develop post-measles encephalomyelitis, occurring primarily in older children and adults.⁵ Rare CNS complications including MIBE and SSPE may also occur months to years after the acute measles infection.⁵ Malnourished children, especially those with vitamin-A deficiencies, as well as children who are severely immunocompromised, such as those with advanced HIV infections, “are at increased risk of severe or fatal measles”.⁵ In countries that lack many resources and have common exposure to infectious diseases and malnourishment, “the case-fatality ratio for measles is usually 3% to 6%, but can be as high as 30% in refugee camps or in isolated, immunologically naïve populations”.⁵ In developed countries with ample resources, deaths due to measles are rare, with the case-fatality ratio around 0.01% to 0.1%.⁵ The

⁷ CDC – *Measles Parent Infographic* – <https://www.cdc.gov/measles/parent-infographic.html>

following data was recorded by the CDC in regards to morbidity (Table 1) and percent-vaccinated (Table 2).

Reported number of new measles (rubeola) cases	187
Reported number of new mumps cases	584
Reported number of new German measles (rubella) cases	9

Table 1: Morbidity data for new cases of measles (rubeola), mumps, and German measles (rubella), as reported by the CDC in 2013⁸

MMR vaccine – children	91.5%
MMR vaccine – adolescents	90.7%

Table 2: percent of children (age 19-35 months) and percent of adolescents (age 13-17 years; receiving 2 doses or more) vaccinated against measles, mumps, and rubella (MMR) in 2014, as reported by the CDC⁸

Soon after the initial measles virus isolation, MCVs began to be developed.⁵ This development effort was crucial to public health, because without regulation the “measles virus is one of the most infectious directly-transmitted pathogens known, and occurs naturally only in humans”.⁵ The virus itself is a single-stranded, round, negative-sense RNA virus, which typically have

⁸ CDC – *Measles Statistics* – <https://www.cdc.gov/nchs/fastats/measles.htm>

high mutation rates.⁵ However, the measles virus is regarded as being antigenically monotypic, “meaning that the surface proteins responsible for inducing protective immunity have retained their antigenic structure over decades and throughout the world”.⁵ This is largely significant for public health, because MCVs previously manufactured from a single strain of measles virus are still globally protective.⁵

In order to produce MCVs, wild-type measles virus is attenuated through serial passage in cultured cells.⁵ This is the process by which a virus is repeatedly grown in a laboratory setting, and may begin growing in one environment and then moved to grow in a new environment.⁹ Serial passage is useful in creating a strain of the initial virus with very low virulence, which can then be used in live, attenuated vaccines.⁹ The first licensed attenuated measles vaccine was the Edmonston B, which was widely used between 1963-1975 even though it was frequently associated with fever and rash.⁵ The two vaccine strains commonly used today, the Schwarz and the Moraten, were both derived from the original Edmonston B strain, and subsequently underwent further attenuation through additional serial passage.⁵ The Moraten vaccine strain is primarily used in the United States, while the Schwarz vaccine strain is used in many other developed countries all over the world.⁵ The most widely used vaccine strain in developing countries is the Edmonston-Zagreb, which is similarly derived from

⁹ Wikipedia – *Serial Passage* – https://en.wikipedia.org/wiki/Serial_passage#Use_in_vaccines

the original Edmonston B strain.⁵ Other attenuated MCVs “have been produced from locally derived wild-type strains particularly in the Russian Federation (Leningrad-16), the People’s Republic of China (Shanghai-191) and Japan (CAM-70, AIK-C)”.⁵

There are also several attenuated MCVs available in combination with other antigens, which are used to provide immunity to multiple viruses with one vaccination.⁵ Such combination vaccines include the vaccine for measles and rubella (MR) and the vaccine for measles, mumps, and rubella (MMR).⁵ MCVs must be “reconstituted in sterile diluent prior to use” and are typically “injected subcutaneously but can be administered intramuscularly” as well.⁵ The WHO recommends routine immunizations for all children, with the first dose being given age 9-12 months (6 months minimum).¹⁰ There are two doses in the primary MCV series, with a minimum interval of four weeks in between doses.¹⁰ The WHO says that the standard for all immunization programs should be reaching all children with two doses of MCV.¹⁰

The WHO also allows for governmental choice of strategy for delivering of the second dose of measles vaccine (MVC2), either through routine scheduled appointments or through mass immunization campaigns, depending upon which method will achieve the highest rate of coverage.¹⁰ For countries, such as the

¹⁰ World Health Organization. (September, 2016). *Routine Immunization Schedules – Retrieved from http://www.who.int/immunization/policy/Immunization_routine_table2.pdf?ua=1*

United States, that have achieved very low measles transmittance rates and low risk of infant infection, the WHO recommends delivering MCV1 at the age of 12 months old, in order to take advantage of the higher seroconversion rates reached at this age.¹⁰ In such countries, administration of MCV2 at age 15-18 months old is recommended, as “it ensure early protection for the child, slow the accumulation of susceptible young children, and may correspond with other routine immunizations”.¹⁰ In attempts to effectively achieve herd immunity for measles and to prevent outbreaks in schools, the WHO suggests administration of MCV2 upon school entry in countries where MCV1 coverage is greater than 90% and school enrollment is greater than 95%.¹⁰ They also note that “mild, concurrent infections are not considered a contraindication to vaccination, but it should be avoided if the patient has a high fever or other signs of serious disease”¹⁰ and recommend that those who are severely immunocompromised should not obtain a measles vaccination.¹⁰

Chapter II: Parental Safety Concerns Regarding Vaccination

Recent outbreaks of vaccine-preventable diseases highlight the problems we currently face with undervaccination. Measles and pertussis, both preventable through vaccination, have recently seen an increase in outbreaks. As of February 2015, there were 125 documented cases of measles associated with the 2014 California measles epidemic.¹¹ Of the 110 confirmed cases from California 49 individuals (45%) were unvaccinated, 47 individuals (43%) had unknown or inadequate vaccination documentation, and “among 37 vaccine-eligible patients in the confirmed cases, 28 (76%) were intentionally unvaccinated because of parental beliefs and 1 child was on an alternative vaccination schedule”.¹¹ As a result, parental vaccine refusal and hesitancy are increasingly being acknowledged as important factors impacting the increase of vaccine-preventable disease outbreaks.¹¹

While there are many causes for parental vaccine hesitancy and refusal, many can be traced back to parents wanting their concerns to be heard.¹¹ The majority of parents are seeking credible information to aid them in making an informed, rational decision about their child’s immunizations, after weighing the risks and benefits.¹¹ However, in attempting to make decisions of this kind, parents fail to take into account the emotional component that is necessarily

¹¹ Bass III, P. F., MD, MS, MPH. (2015, July). Vaccine Refusal. *Contemporary Pediatrics*, 32(7), 20-23.

involved when dealing with their children. This emotional component may cloud the judgement of the decision-making parents and they may have difficulty separating their perceived vaccine risks and benefits from the fact-based risks and benefits. This added difficulty, in conjunction with a lack of first-hand experience with vaccine-preventable diseases, increases the extent to which parents may not understand the risks of contracting such diseases.¹¹ Concerns towards succumbing to vaccine-preventable diseases has declined due to the effectiveness of vaccines, which may also increase the likelihood that parents will focus on anti-vaccine sentiment.¹¹ “Rather than seeing President Franklin Delano Roosevelt’s post-polio state, parents today see celebrity stances against vaccination from the likes of Jenny McCarthy, Alicia Silverstone, Rob Schneider, and Robert Rodriguez”.¹¹ This shifted focus lends itself to the increasing concerns about the safety of vaccines.¹¹

There are twelve common parental vaccine safety concerns and reasons for hesitancy or refusal that I will now address individually, with reference to the MMR vaccine. (1) Potential to experience a long-term complication or adverse effect from vaccines¹¹: this is unlikely to occur, as long-term complications and adverse effects of the MMR vaccine are very rare without the patient having a prior existing condition, such as HIV, that leaves them severely immunocompromised.⁵ In such cases, the WHO recommends avoiding a measles vaccination¹⁰, and the child would obtain a medical exemption. (2) Immediate short-term adverse effects such as pain or fever¹¹: while adverse

effects may occur as a result of receiving the MMR vaccine, they are very short-term and are generally mild and transient.⁵ High fever occurs in 5% of patients and a transient rash occurs in 2% of patients, but neither result in serious morbidity or mortality.⁵ While it is difficult for parents to see their child in any amount of pain or discomfort, there is only mild, short-term, pain and tenderness at the injection site associated with the MMR vaccine. This short-term discomfort seems to be a small price to pay for long-term health and immunity against a highly contagious disease like measles. (3) Development of autism¹¹: the Wakefield paper suggesting a causal relationship between the MMR vaccine and autism has been rejected and discredited, as the result of several comprehensive reviews and additional epidemiological studies.⁵ (4) Do not perceive their child will contract a vaccine-preventable illness¹¹ and (5) Do not believe the risk or severity of a vaccine-preventable illness warrants vaccination¹¹: due to the effectiveness of the MMR vaccine and other MCVs, measles is not a disease that most people have a first-hand relationship with. Vaccines are described as being “‘victims of their own success’, meaning that the diseases that vaccine prevent have become exceedingly rare in the United States”.¹² This agrees with the notion that both real and alleged risks of vaccination are visually perceptible through individuals who attribute the cause of their child’s medical condition to vaccines, while the actual benefits of vaccination to individuals and communities is much more difficult to see.¹² Many parents and younger physicians have not

¹² Schwartz, J. L., & Caplan, A. L. (2011). *Vaccination Refusal: Ethics, Individual Rights, and the Common Good*. *Primary Care: Clinics in Office Practice*, 38(4), 717-728. DOI:10.1016/j.pop.2011.07.009

experienced the danger of vaccine-preventable diseases, which until very recently were the cause of a lot of suffering and death.¹² However, just because the benefits of vaccination are difficult to see¹², does not mean that they are nonexistent. There are real and severe risks to foregoing MMR vaccination, both to the child in question and to the greater community. Moreover, foregoing MMR vaccination will also likely cause a decrease in measles herd immunity, which has a very fragile threshold and requires a very high rate of vaccination.¹³ I will discuss the concept of herd immunity in more detail in Ch. IV.

Before addressing concerns 6-12, it is important to first explain the CASE method of communication¹¹ and the CDC recommended strategies for effective communication.¹⁴ The CASE method can be used by physicians to form a more time-sensitive, but still effective, dialogue with parents.¹¹ CASE stands for Corroborate, About me, Science, Explain/advise, and can be used to provide parents with enough information to know they should ask questions, but without overwhelming them.¹¹ In corroborating with the parent, the physician is able to acknowledge the parent's concerns and empathize that they are not alone in their concern for the health and well-being of their child.¹¹ It is helpful for the physician to bring an emotional connection into the conversation, with statements

¹³ Hendrix, K. S., Sturm, L. A., Zimet, G. D., & Meslin, E. M. (2016, February). Ethics and Childhood Vaccination Policy in the United States. *American Journal of Public Health*, 106(2), 273-278. DOI:10.2105/ajph.2015.302952

¹⁴ Center for Disease Control. (2012, March). *Talking with Parents about Vaccines for Infants: Strategies for Health Care Professionals*. Retrieved January 24, 2017, from <https://www.cdc.gov/vaccines/hcp/patient-ed/conversations/downloads/talk-infants-color-office.pdf>

such as “we both want your child to be healthy and disease free”, which aid in setting the stage for a respectful discussion.¹¹ It is also important that the physician fully grasps the parent’s concerns in the corroboration step, and they should press the parents if the reasons given for delay or refusal are particularly vague.¹¹

In the About me step, the physician should transition into describing how they became an expert on the issue of vaccination.¹¹ The physician could discuss their research and/or explain the foundation of their knowledge on vaccination risks and benefits.¹¹ This step in the CASE method serves to reassure the parent that the physician has substantial knowledge and expertise in regards to vaccination, and that they are a trustworthy source of information. In the Science step, the physician should discuss scientific data points that support vaccination and address the parent’s specific concerns with fact-based evidence.¹¹ Often, the parent may not want to hear the scientific data or may feel overwhelmed with data if it is the first thing discussed.¹¹ Thus, after having the physician really understand their concerns and after learning they can trust the physician’s expertise, only then might the parent be more inclined to hear and try to understand the scientific data.¹¹ Finally, in the Explain/advise step, the physician must explain to the parent why they feel strongly about their recommendation to vaccinate or to not use an alternative vaccination schedule.¹¹ As noted by the CDC, personal statements and anecdotes resonate particularly well with parents

in these discussions, and may be influential in the decision-making process in terms of their child's vaccinations.¹⁴

Along with personal statements and anecdotes, the CDC reports that physicians have found that giving their personal experiences with vaccine safety, discussing what they would do with their own child, and giving their personal beliefs on the safety of vaccines, are all "effective when talking with parents who are skeptical of vaccination or who want to delay immunization".¹¹ The CDC also discusses ways to develop a dialogue with parents, and makes suggestions on how to ensure that the parent feels understood.¹⁴ These suggestions include taking the time to listen to the parent's concerns, maintaining eye contact, giving them full attention, and restating their concerns back to them.¹⁴ This is important because "the extent to which a parent feels heard will impact the parent's decision to choose vaccination or not".¹¹ Recommendations also include asking open-ended questions to indicate the physician's desire to address all parental questions and concerns, despite their full schedule; physicians should also be mindful of non-verbal communication and body language.¹⁴ If a parent feels as though they cannot freely ask questions or is self-conscious about their questions as a result of non-verbal communication, then they will stop communicating with the physician and the necessary trusting relationship will have been lost.¹⁴ The CDC also recommends including less science in the discussion, because while scientific information is important in educating the parents, sometimes the

parents might simply seek a personal, anecdotal story or some thoughtful advice from the physician, after listening to their concerns.¹⁴

Concerns (6) Inadequate research¹¹ and (7) General worry¹¹ present good opportunities for physicians to educate parents, prior to the formation of any beliefs about vaccines that are not factually based or that are emotionally driven. In such situations, the CASE method of communicating with parents is useful, as are CDC recommended strategies for establishing effective communication.^{11,14} The CASE method should also be implemented for concerns (8) Do not believe vaccine to be effective¹¹ and (9) Concern that vaccines weaken the immune system¹¹, in order to avoid bombarding the parent with scientific information, and so the parent feels as though they have been heard by the physician.¹¹ For parents with concern (10) Are aware of published alternative schedules or have friends using an alternative vaccination schedule¹¹, the CASE method can again be used to explain that even though there are published alternative schedules, that does not mean that those alternative schedules follow WHO guidelines or accepted vaccination schedules.¹⁰ Friends with have children that use alternative schedules may have particular medical reasons to do so, as decided upon with their physician, or they may be using a physician that is willing to go against the accepted vaccination schedules. Using the CASE method should provide adequate information to the parents with concern (10), and should include that unless there is a pre-existing medical condition that deters the immunization, it is still in the child's best interest to get vaccinated. (11) Current illness¹¹: this is the

only concern or reason that I would argue has any validity in the argument to delay or refuse vaccination. As discussed in Ch. I, Part II, there are guidelines laid out by the WHO for when it is and is not permissible to vaccinate a child following the standard schedule, depending on the child's current medical condition.¹⁰ For example, a child with a high fever or other signs of a serious disease should avoid getting the MMR vaccine, but a child with mild, simultaneous infections should not deter from receiving the vaccination.¹⁰

Concern (12) Perceived lack of control over their child's health decisions¹¹, can occur in situations where there is still a vaccination conversation going on, and where there has not yet been vaccine refusal. In these situations, it is important that the physician implement the CASE method once again, in order to educate the parent effectively. If done properly, the parent will feel heard and informed and will likely no longer feel that lack of control.¹¹ This will then plausibly guide the parents towards choosing to vaccinate their child for the sake of the child's well-being.¹¹ Concern (12) may also occur in situations where there has already been outright vaccine refusal. In such cases, if the child does not qualify for a medical exemption, then I believe the parent may actually be right to feel as though they have lack of control over their child's health decision. In this type of situation, I believe it is permissible for the state to encourage vaccination along school-required immunization guidelines, if the child and the child's parents wish for them to attend school, rather than being homeschooled. In regards to homeschooling, there are different rules for vaccinations on a state-by-state

basis. There are four states that require parents to submit proof of immunization (MN, ND, PA, TN), eleven states that require immunization but do not require submission of proof of immunization (CO, IL, IN, KS, KY, MT, NM, NC, TX, VA, WY), and nine states that have multiple homeschooling options with conflicting immunization requirements (AK, FL, IA, LA, ME, MD, MI, NE, WA).¹⁵ As I will discuss in Ch. V, I believe it is within the state's power to take away the parent's right to choose whether or not to vaccinate their child, in the interest of public health and safety.

Although these twelve common parental safety concerns are largely based on misinformation or lack of understanding, and can be addressed in the suggested ways, there are still many anti-vaccine celebrities who indirectly influence parental opinions as a result of their status. Just as celebrities use their fame platform to determine what is 'trendy' in society, some also use this platform to voice their beliefs about vaccination. Celebrities such as Jenny McCarthy, Aidan Quinn, and Holly Robinson Peete each believe that their child's autism was caused by the MMR vaccine, and are very vocal in the anti-vaccination movement. There are also celebrities that still believe in the discredited theory that vaccines can cause autism, like Robert F. Kennedy Jr., who recently met with President Donald Trump about chairing a potential

¹⁵ Coalition for Responsible Home Education. (2016, June 07). Homeschool Immunization Requirements. Retrieved January 24, 2017, from <https://www.responsiblehomeschooling.org/policy-issues/current-policy/homeschool-immunization-requirements/>

commission on vaccine safety.¹⁶ President Trump also believes in the disproven vaccine-autism theory, and “met with several vaccine skeptics during his campaign and since his election, including discredited British ex-physician Andrew Wakefield – who...launched the modern anti-vaccine movement after publishing a study, now fully discredited as fraudulent, that connected autism to the MMR vaccine”.¹⁶ In response to his views and his intent to create a commission on vaccine safety, more than 350 United States medical, vaccine-advocacy, and professional organizations sent a letter to President Trump on February 7, 2017.¹⁷

The letter, organized by the AAP, expresses the unequivocal support of the participating organizations for the safety of vaccines, and advises Trump that “as a nation we should redouble our efforts to make needed investments in patient and family education about the importance of vaccines in order to increase the rate of vaccination among all populations”.¹⁸ The letter also explains that there is a large collection of medical and scientific literature that disproves claims of vaccines being unsafe when administered according to recommended

¹⁶ Sun, L. H. (2017, February 06). Trump’s vaccine views are at odds with those of most Americans, study says. Retrieved February 12, 2017, from https://www.washingtonpost.com/news/to-your-health/wp/2017/02/02/trumps-vaccine-views-at-odds-with-those-of-most-americans-study-says/?tid=a_inl&utm_term=.d03587167e93

¹⁷ Sun, L. H. (2017, February 08). More than 350 organizations write Trump to endorse current vaccines’ safety. Retrieved February 12, 2017, from https://www.washingtonpost.com/news/to-your-health/wp/2017/02/08/more-than-350-organizations-write-trump-to-endorse-current-vaccines-safety/?utm_term=.a3f5690513a6

¹⁸ American Academy of Pediatrics, et al. (2017, February 07). [Letter to President Donald Trump]

schedules.¹⁸ The text of the letter concludes by welcoming a meeting with Trump, where the organizations offer to share their “robust, extensive scientific evidence supporting vaccine safety and effectiveness”.¹⁸ It then continues for another 26 pages to list all of the organizations that signed, and to include over 40 studies on vaccine reliability.^{17,18} This letter is a clear example of the overwhelming national and state-based organizational endorsement of the safety of vaccines.

While surveys have found that the majority of parents tend to follow and trust advice from their primary care physician and their child’s pediatrician, these parents still maintain a lack of trust in the information those same physicians provided about vaccines.¹⁹ Yet again, this highlights the importance of effective communication, because the greatest impact can be made by the physician by simply talking to parents with an appropriate communication strategy.¹¹ In order to achieve this type of communication, it is important that physicians educate themselves on current vaccine policy and information, thus ensuring the relay of appropriate care and education to the child and parents through the CASE method and per CDC recommendations.¹¹

¹⁹ Glanz, J. M., Wagner, N. M., Narwaney, K. J., Shoup, J. A., McClure, D. L., McCormick, E. V., & Daley, M. F. (2013). A Mixed Methods Study of Parental Vaccine Decision Making and Parent–Provider Trust. *Academic Pediatrics*, 13(5), 481-488. doi:10.1016/j.acap.2013.05.030

Chapter III: Concerned Parental Groups and Challenges They Each Present

It is likely that physicians and other healthcare providers will encounter three different kinds of parents who are hesitant or have concerns regarding vaccination.¹² I will discuss these groups as ‘the concerned’, ‘the concerned modifiers’, and ‘the opposed’. Generally, the concerned have no specific objections, but they are concerned as a result of “the emotional, fervent rhetoric that they have encountered in the media and elsewhere”.¹² The concerned modifiers have concerns about specific vaccines or recommended vaccine schedules, and prefer a modified vaccination procedure.¹² The opposed have objections to all vaccines, and include individuals “with religious or philosophical reasons for this position”.¹² Physicians and other health care providers will have particular challenges to address with each of these groups, and will have to take into account the ethical considerations each group raises.¹² Due to the actual discussion and administration of the vaccine occurring within the doctor-patient/parent relationship, the success of this relationship depends on shared trust, respect, complete disclosure of information, and an open line of communication between physicians and their patients, as well as between physicians and their patient’s parents (in regards to children).¹²

Part I: The Concerned and Their Challenges

Of the three types of patients and parents that physicians may encounter, the concerned are the most numerous.¹² The concerned are historically supportive of vaccination but have questions regarding specific vaccines or theories that may have been discussed in the media, among friends, or among family.¹² This may present difficulties for physicians and healthcare providers, but it can also open the door to educate and build doctor-patient/parent trust.¹²

Responding to patient or parental concern about empirical or safety-related vaccination topics presents two distinct types of challenges for doctors and healthcare professionals.¹² The first challenge is to remain up to date on the most current information regarding vaccine safety and vaccinations in general.¹² In recent years the public has gained interest in vaccines, which brings with it the rapid spread of information about vaccine research and the rapid release and dissemination of claims of adverse events.¹² It is also important for physicians to remain informed about information that may not be subject to peer review, such as information presented in the media or on the Internet, as that is often where much of the most controversial claims appear and are seen by the public.¹² Physicians and healthcare providers should be aware and “familiar with the best available information regarding vaccine safety and related topics as well as those theories and allegations receiving significant attention among the public”.¹² Being familiar with this information will help physicians in implementing the CASE

method and in effectively communicating with parents.^{11,14} This will allow physicians to answer questions, clarify any worries, and soothe uncertainty regarding the risks and benefits of vaccines.¹²

Remaining fully informed about both the latest verified information as well as about any unverified claims against vaccines is a difficulty even for vaccine specialists.¹² For primary care physicians, the challenge to maintain fluency in vaccine-related topics may seem overwhelming, as they are also required to remain up to date on a wide range of current topics in prevention, diagnosis, and treatment.¹² In order to help with this burden, many nonprofit institutions “produce regularly updated resources highlighting developments in vaccine science and clinical practice”¹², and attempt to affectively synthesize all key information on vaccines.¹²

In addition to lack of information or misinformation that may hinder the doctor-patient/parent line of communication regarding vaccines, the second challenge for physicians and healthcare providers results from various “practical and logistical considerations that may”¹² complicate the doctor-patient/parent conversation. As vaccination has become a regular procedure in the United States, the process of informed consent has been reduced to little more than a few brief questions and answers, followed by distribution of government-produced and federally required Vaccination Information Statements.¹² The time pressures felt by physicians also seems to be a factor influencing the reduction in

vaccine discussions.¹² If a parent seeks out an extensive discussion about the risks and benefits of vaccination, physician scheduling conflicts may limit the conversation.¹² These scheduling pressures are quite common to primary care physicians and other healthcare providers, and restrict the time available for a respectful doctor-patient/parent dialog.¹² There are also pressures from physician billing programs that only compensate for actual administration of the vaccine, which leads to further disincentive towards discussion.¹² Nevertheless, none of these challenges present acceptable “justifications for the omission of a fully informed consent prior to vaccination”¹², and physicians should aim to effectively implement the suggested methods of time-sensitive communication.^{11,14}

Part II: The Concerned Modifiers and Their Challenges

Instead of looking for reassurance and validation of their vaccine support, the concerned modifiers explore issues relating to vaccine safety and believe that changes are necessary and warranted.¹² Physicians face a particular challenge with parents who prefer an alternate or customized approach to the recommended vaccination schedule.¹² For example, “Dr. Bob” Sears wrote a book in which he proposed vaccine schedules known as ‘compromises’.¹² Sears’ compromises, as well as alternate schedules from many others, prioritize vaccines that are deemed as more important and “space out the full vaccination schedule over a longer period of time than recommended by the CDC, AAP, and AAFP”.¹²

The intent of these compromises and alternative schedules is to spread out the vaccination schedule and therefore reduce the number of vaccine doses administered to a patient in any one visit.¹² Theoretically, this would reduce both the risk of harmful interaction and the risk of burdening the patient's immune system.¹² However, after extensive study of these concerns, there is no evidence that suggests that the timing and spacing of the current recommended vaccination schedule presents risks for healthy patients.¹² But there are, in fact, risks in delaying vaccinations, including an increase in the likelihood that "a multidose vaccination series will not be completed".¹² These risks arise from additional office visits required by alternative schedules, as well as from the longer time frame in which children may lack full protection.¹² Parents insisting on delays in their child's vaccinations also "increase the risk of vaccine-preventable diseases in their communities, particularly among those too young or otherwise unable to receive recommended vaccines".¹² This is a large concern for the pediatric community, specifically for infants and young children in day-care facilities.¹²

The concerned modifier presents another opportunity for physicians to use the CASE method¹¹ and to understand the parental motivations that lead to the preference towards compromised schedules.¹² The concerned modifier's requests also "allow physicians to discuss two related and misleading views of contemporary vaccination policy in the United States".¹² The first misconception

is that some of the diseases prevented by the recommended routine vaccinations are “trivial maladies incapable of causing serious disease”.¹² For example, varicella is a disease mistakenly represented in this way.¹² It is likely that parents who discount the varicella vaccination based on memories of “the once-common childhood experience of chickenpox are...unaware of the significant varicella-related mortality prior to the introduction of the vaccine in the 1990’s”.¹²

The second misconception among the concerned modifiers is that the current recommended vaccine schedules take a general approach, rather than an individual approach to each patient.¹² The CDC vaccination schedule provides an outline for timely vaccination of healthy individuals, but the CDC and medical societies, including the WHO, also provide supplementary guidelines for groups of individuals that warrant alternative approaches.^{10,12} Some of the groups that warrant these supplementary guidelines are patients with autoimmune diseases, pregnant women, and transplant recipients, as well as many others.¹² The recommended schedules endorsed by the CDC and other medical societies are evidence-based, and provide “more guidance for patients with special health conditions than the most popular alternative schedules”.¹² Parents and patients that prefer alternate approaches to vaccinations present difficulties for physicians and other healthcare providers, but the risks raised by ‘compromises’ are usually limited to the extra time that is necessary to complete all of the recommended vaccinations.¹²

Part III: The Opposed and Their Challenges

In a 2011 survey, 85% of pediatricians reported encountering at least one family in their practices that completely refused vaccines.¹² Parents that want to refuse “one or more vaccines present far more significant ethical, clinical, and public health challenges”.¹² The actual number of parents refusing vaccines nationwide is “small in absolute terms”¹², but there is an upward trend of increasing non-medical exemptions from school vaccine requirements.¹²

Vaccination refusal can also put a lot of strain the doctor-patient/parent relationship, “particularly for physicians committed to vaccination as an essential means of disease prevention”.¹² As a result, there are networks of parents concerned with vaccine policy that circulate lists of physicians who are not opposed to delaying vaccinations and who are accepting of vaccine refusal.¹² The physicians on these lists are described as ‘vaccine-friendly’.¹² But a parent declining vaccines for their child presents a similar opportunity for education that occurs when alternative schedules are requested.¹² Physicians and healthcare providers should engage in respectful dialog with parents, in order to try and understand the reasons why they are declining vaccines for their child.¹² If the cause of refusal is “inaccurate or imprecise information about vaccine safety, effectiveness, or necessity”¹², an informed physician will be able to provide the correct information using the communication methods discussed in Ch. II.

Another potential source of resistance for the opposed may arise from the cost of the vaccination.¹² Parents may not be aware of the programs (both state and federal) that are available to help subsidize the cost of vaccinations for uninsured or underinsured children.¹² This can lead to perceived cost adversely affecting the willingness of parents in allowing their children to receive vaccinations.¹² Programs such as the Vaccine for Children program and state programs supported by Section 317 grants are available to significantly help parents reduce financial disadvantages acting as barriers to childhood vaccinations in the United States.¹² While there are no comparable programs in the public sector for adult vaccinations, there are many vaccine manufacturers that “have established patient assistance programs designed to reduce the cost of vaccines for uninsured or underinsured individuals”.¹²

A third possible challenge from the opposed may result from concerns over the temporary pain or discomfort that is associated with vaccination, a very similar concern to the #2 parental vaccine safety concern that I discussed in Ch. II.^{11,12} This concern arises particularly with parents of infants and children receiving vaccines by injection.¹² In situations where this is the primary concern, physicians can remind parents that short-term discomfort is greatly outweighed by long-term protection against illness and possible death.¹² Nonetheless, parents may still be troubled and anxious about seeing their child in apparent distress, even if only for a moment.¹²

Chapter IV: Undervaccination, Herd Immunity, and Underlying Ethical Issues

Within the debate between public health and person choice, there is the belief that having a handful of non-vaccinating parents will not have a significant impact on the likelihood of outbreaks or outbreak management.¹³ For eliminated, almost eliminated, or low level transmissible diseases, this belief may seem to be somewhat justified.¹³ However, for highly contagious diseases like measles, this belief is completely invalid. Herd immunity requires a large percentage of the population to be vaccinated for the given disease, with the rate of vaccination generally around 85-90%.¹² For measles, the rate of vaccination must be around 96-99% to provide maximum protection from herd immunity, yielding a very fragile threshold.¹³ Thus, the few unvaccinated children of some non-vaccinating parents will potentially have a very significant impact on the likelihood of measles outbreaks. As I previously mentioned, such an outbreak was seen in California at a popular amusement park in December 2014, and studies have attributed the cause of the outbreak to be underimmunization.¹³ A recent NPR article discussed a 6-year-old boy in remission from leukemia, who is unable to be vaccinated due to his immune system still being compromised.²⁰ The article features a plea from the boy's father asking the school to prevent unvaccinated students from

²⁰ Aliferis, L. (2015, January 27). To Protect His Son, A Father Asks School To Bar Unvaccinated Children. NPR. Retrieved January 24, 2017, from <http://www.npr.org/sections/health-shots/2015/01/27/381888697/to-protect-his-son-a-father-asks-school-to-bar-unvaccinated-children>

attending.²⁰ The father is quoted as saying “it’s very emotional for me. If you choose not to immunize your own child and your own child dies because they get measles, OK, that’s your responsibility, that’s your choice. But if your child gets sick and gets my child sick and my child dies, then...your action has harmed my child”.²⁰ This case clearly illustrates the importance of herd immunity for those unable to obtain vaccinations, as the continued health of the community against vaccine-preventable diseases is in the hands of those who choose to or choose not to vaccinate.¹³

Many scholars discuss populations that are appropriately vaccinated against highly infectious diseases, such as measles, as contributing to the common good of the society in which they live.¹³ This is a very utilitarian viewpoint and the good is strengthened when a community maintains their immunity, as it ensures the societies overall health and well-being.¹³ It follows that in order to maintain that health and well-being, any vaccine-eligible individual should be vaccinated.¹³ However, sometimes individuals refuse to vaccinate their children or request delay of vaccination for non-medical reasons.¹³ This type of decision seems to indicate lack of consideration for the common good or belief that their child’s perceived good is of greater importance. Thus, “as more individuals behave in a manner that fails to consider the common good, there is a detrimental effect on the overall well-being of the group and, therefore, on the well-being of each individual, including those individuals who chose to forgo vaccination”.¹³

It is also noted that individual parental interest is at stake in considering vaccinations for their child, and refusal or delay of vaccination is often the result of belief in “inaccurate information or lack of understanding of the safety and efficacy of vaccines”.¹³ Occasionally, parents will use herd immunity as a reason that their child should be allowed to forgo school-required immunizations.¹³ This type of free-rider argument implies that these parents should not have to “expose their child to the risk of side-effects from vaccination if everyone else is vaccinated to a level that prevents the spread of illness”.¹³ A recent article in *Bioethics* briefly outlines the threat of free-riding to society as

an ongoing temptation for individuals to accept benefits that spring from being part of a society without contributing to the upkeep and preservation of that society...if the number of free-riders becomes too high, the future of that society itself is undermined ...if non-free riders are aware that there are significantly many free-riders in their society, then their own commitment to contribute to that society can be undermined by resentment towards free-riders, which makes it more likely that they themselves will become free-riders.²¹

This description of how the free-rider mentality in society can quickly spiral into undermining that society is analogous to the free-rider mentality towards school-

²¹ Clarke, S., Giubilini, A., & Walker, M. J. (2016). Conscientious Objection to Vaccination. *Bioethics*, 31(3), 155-161. doi:10.1111/bioe.12326

required vaccinations. I will discuss this concept and the article in further detail in Ch. V, Part II.

At the heart of issues surrounding vaccination are three underlying ethical issues: distributive justice, beneficence and nonmaleficence, and respect for personal autonomy through informed consent.¹³ Vaccination is an issue of distributive justice “insofar as benefits and burdens are allocated to those who vaccinate and those who do not”.¹³ Issues involving distributive justice therefore include understanding who should benefit from herd immunity, who should bear the burden of getting vaccinated, and if it is permissible to allow individuals to benefit without assuming any risk from vaccinations, while those who obtain vaccinations do take on some risk. I believe that anyone who is eligible to receive vaccinations against highly contagious diseases, such as measles, should bear the burden of vaccination. In doing so, they will be increasing the common good of the community and protection for those who are unable to get vaccinated, making vaccination also a matter of beneficence.¹³ Vaccination “invokes beneficence and nonmaleficence precisely because the benefits and harms to individuals and communities are seen to be in dispute”.¹³

There is also a clear ethical issue surrounding herd immunity, due to the importance of both honoring the informed decisions that parents want to make in regards to their child’s vaccinations, and in protecting individuals who are unable to obtain vaccinations themselves. In order to achieve herd immunity, the

government must implement directives that place “citizens in the position of supporting actions or policies judged to be for the overall benefit of society but that might contradict individual beliefs about what is in the best interests of a particular person”.¹³ School-required immunizations are supported by the themes of utilitarianism, as they promote prevention of harm to individuals and communities that can be caused as the result of unvaccinated children.²² Parental perspective is of extreme importance as well, as parents are the ultimate decision-makers for their child’s vaccinations.¹³ However, parents do not always take into account their social responsibilities or how their choices may affect the health and well-being of their community.¹³ Ethically, we can consider the question of whether or not it is a parent’s responsibility to incorporate the effect that vaccinating or refusing to vaccinate their child will have on others.¹³ This question raises the issues involving vaccination exemptions that I will discuss in Ch. V, including whether or not there is a line to be drawn between maximizing the greater good through herd immunity and respecting the choice of parents who refuse vaccines for their child.¹³

Parents who refuse or resist their child’s recommended vaccinations defend their decisions with the belief that their choice is in the best interest of their child.¹³ As I discussed in Ch. II and Ch. III, there are a wide variety of reasons that parents may refuse or resist their child’s recommended

²² Field, R. I., & Caplan, A. L. (2008). A Proposed Ethical Framework for Vaccine Mandates: Competing Values and the Case of HPV. *Kennedy Institute of Ethics Journal*, 18(2), 111-124. doi:10.1353/ken.0.0011

vaccinations, as well as a range of different methods that physicians use regarding the appropriate response to these parents. There are many arguments for holding these non-vaccinators as both legally and financially liable for their decisions, when those decisions expose not only their child, but also other individuals, to harm.¹³ A recent study found that increasing financial responsibility for non-vaccinators holds promise for increasing vaccination rates.²³ In the study review, it was noted that financial incentives were effective in promoting short-term, private, preventative health behaviors, such as vaccination.²³ While it has been mentioned that this tactic is a type of coercion that infringes upon personal autonomy and decision-making, in regards to the health of the child and to overall public health, I believe it is permissible to limit this parental autonomy in decision-making. This type of argument brings up the notion of retributive justice, in order to understand the appropriate way to punish those who make decisions or perform actions that increase the risk of harm to others.¹³ Retributive justice raises questions of whether or not unvaccinated children should be subject to exclusion policies, such as being prevented from participating in after-school sports or prevented from going to school?¹³

As John Stuart Mill wrote in 1859, "The only purpose for which power can be rightfully exercised over any member of a civilized community, against his will,

²³ Constable, C., Blank, N. R., & Caplan, A. L. (2014). Rising rates of vaccine exemptions: Problems with current policy and more promising remedies. *Vaccine*, 32(16), 1793-1797. doi:10.1016/j.vaccine.2014.01.085

is to prevent harm to others”.²⁴ Unvaccinated children clearly pose a threat of harm to others when they attend schools and other school and community related activities. Thus, exclusion policies that prevent their attendance seems justified, because they have the potential to expose the other children in the community to the risk of highly communicable diseases. In the case of a child who received the school-required immunizations, but perhaps had an allergy to one on the list, then I believe it would qualify for a medical exemption and the child would not be subject to such exclusion policies. This may seem like a harsh stance to take on the matter, but “there are corollary examples of adults who refuse to vaccinate themselves. In some instances, there are punitive measures for failure to vaccinate oneself – for example, health care workers face employment termination for refusing influenza vaccination”.¹³ In this example, health care workers are required to obtain a flu vaccine, without opposition, because it is part of the protocol aimed at protecting public health.

Similarly, school-required immunizations are in place to protect the health of the school community, including the faculty, the children, and the families of the children. Imagine a situation where an unvaccinated child contracted measles, and went to school because they were still asymptomatic. The unvaccinated child might then infect their classmates and teachers, even if they have all received the MMR vaccination. If there happened to be a child or teacher

²⁴ Mill, John Stuart. (1859) 1975. *On Liberty: John Stuart Mill*, New York: Norton Critical Edition.

in the school with a medical exemption, they would initially be at a greater risk of contracting the virus, and the unvaccinated child would further increase that risk. Imagine a vaccinated child had an infant sibling at home (too young to be vaccinated), and accidentally brought the virus home with them? What if the unvaccinated child went to after-school soccer practice and the coach was never vaccinated (born before the creation of the vaccine) and picked up the virus from the unvaccinated child? Each person that the unvaccinated child is near throughout the day has the risk of contracting measles, even if they have been vaccinated. Each of those people will then go home to their families, and their family members will each go out the next day to their school/work/etc., and then suddenly the risk has increased from one child to an entire community. This example illustrates a spiraling public health epidemic, and the obvious threat that unvaccinated individuals may have on the community. This example, supported by Mill's harm principle, clearly demonstrates the permissibility of subjecting unvaccinated children to exclusion policies.

There is also an ethical conversation surrounding refusing to treat or discharging families from healthcare practices for refusing to vaccinate based on non-medical reasons.¹³ In a survey of pediatrician attitudes towards this issue, "39% of pediatricians said they would dismiss families who refused all vaccines, with 28% reporting they would dismiss families who refused some vaccines".¹³ In a recent 2011 study, 25% of the surveyed pediatricians said they would dismiss families from their practice due to refusal of any of the primary childhood

immunization series vaccines.¹³ Unvaccinated individuals can be dangerous and increase the risks for others in the waiting room of healthcare offices, such as children who are too young to receive vaccinations or immunocompromised individuals.¹³ This type of dismissal goes against AAP Committee on Bioethics' recommendations, and thus raises an ethical conversation on the matter.¹³ As discussed in Ch. II and Ch. III, each interaction with an anti-vaccine family is an opportunity for education and discussion using communication strategies presented by the CDC and using the CASE method.^{14,11} The AAP stresses the importance of trying to find a middle ground with parents in order to maintain a relationship with the family, rather than severing communication through familial dismissal.¹³ Only in situations where a significant amount of distrust develops, or where poor communication continues, does the AAP suggest that the pediatrician encourage the family to find another doctor or healthcare practice.²⁵ In such cases, the pediatrician must give advanced notice to the family, prior to their dismissal from the practice, so that the family has enough time to find another healthcare provider.²⁵

There are also ethical issues surrounding current research on the best approaches to communicating with vaccine-hesitant and vaccine-resistant families. There are three current arguments for the best approach.¹³ The first is the presumptive approach, which suggests that the physician should assume that

²⁵ Diekema, D. S., & The AAP Committee on Bioethics. (2005). Responding to Parental Refusals of Immunization of Children. *Pediatrics*, 115(5), 1428-1431. doi:10.1542/peds.2005-0316

the family is going to agree to the recommended immunizations⁸³. The belief in this approach is that it will lead to higher rates of vaccination and decrease vaccine resistance.¹³ However, it is also thought that families may feel that the provider does not care about their perspective when there is reduction or complete lack of shared decision-making.¹³ This perspective, along with the thought that families will feel as though their autonomy is being limited, are potential drawbacks of the presumptive approach.¹³ The second approach is the participatory approach, where the physician should make no assumptions in the outcome of the immunization discussion, and should solicit the family's input on whether or not they should vaccinate their child.¹³ The third approach is the guiding approach, where the physician should address the specific concerns presented, and should ultimately help the family end up at the decision to vaccinate their child.¹³ Both the participatory approach and the guiding approach are more likely to "foster the therapeutic relationship between patients and their providers"¹³ and to implement the CASE method of communication¹¹, but they both also increase the likelihood that families will "leave the provider's office unvaccinated for a period of time, perhaps putting children at risk for exposure to illness".¹³ Physicians and other healthcare providers may also succumb to moral distress when attempting to determine the degree to which they should encourage or nudge vaccine-hesitant or vaccine-resistant families to vaccinate their children.¹³ "This moral distress would likely result from an ethical conflict between doing what the provider sees as best for the child and for society (i.e.,

vaccinating) and what is best for fostering the therapeutic relationship with the patient and the patient's family".¹³

Chapter V: School-Required Vaccine Exemptions and Parental Moral Responsibility

Part I: Different Types of Vaccination Exemptions

The National Vaccine Information Center clearly lays out the legislation in the United States on a state-by-state basis, showing that all 50 states require at least 1 dose of MMR vaccine or MCV before a child is able to enter pre-kindergarten or daycare.²⁶ The wellbeing of children and of the larger community is potentially put at risk if parental power leads to refusal of vaccines for preventable diseases. That is not to say that medical exemptions should not be permitted. There are three main types of vaccination exemptions, each with specific state-by-state regulations, with the granting of these exemptions not taken lightly.

Following the United States Constitution, the religious beliefs of Americans are respected and the government will not pass laws that obstruct the religious freedoms of the people. If a parent wishes for their child to be exempt from school-required vaccinations on the grounds of religion, the parent must be willing, able, and prepared to defend their beliefs in their own words.²⁷ This

²⁶ The National Vaccine Information Center – *State Law and Vaccine Requirements* – <http://www.nvic.org/Vaccine-Laws/state-vaccine-requirements.aspx>

²⁷ Vaccine Exemptions FAQs – NVIC. (n.d.). Retrieved from <http://www.nvic.org/faqs/vaccine-exemptions.aspx>

exemption is only intended for individuals that hold genuine religious beliefs against vaccination, such that if the state forced the vaccination it would be violating the individual's right to exercise their religious beliefs.²⁷ This becomes more complicated when in reference to children's school-required immunizations, as I will discuss in Part III. Religious exemption to vaccinations are allowed in all U.S. states except California, Mississippi, and West Virginia.²⁷

The second type of vaccine exemption is the medical exemption. As I have discussed, there are certain medical conditions that actually make it dangerous or more harmful for a child to receive some vaccines, such as the MMR vaccine. In most states, either an M.D. or a D.O. must write and sign a medical exemption to school-required immunizations.²⁷ There are also some states that allow other state-designated healthcare professionals to certify that one or many vaccines on the required list would be damaging to the health of the child, as well as damaging to the child's overall wellbeing.²⁷ These medical exemptions are extremely difficult to obtain, due to most physicians and healthcare professionals following federal vaccination recommendations from the CDC, as well as recommendations from the WHO, which both outline the conditions that are considered medical contraindications to vaccination.^{5,10,27}

The third type of vaccine exemption is the philosophical, conscientious, or personal belief exemption. This exemption is for individuals who conscientiously object to one or more vaccines, and is only legal in 15 U.S. states.²⁶ Each state

that does allow philosophical exemptions has different eligibility requirements depending on the state.²⁷ Some states require that parents, or children old enough to give consent (usually around 12yrs or older), must object to all vaccines and not just one vaccine or specific vaccines.²⁷ Parents in Washington and Oregon must obtain a signature from a physician or from another state-designated healthcare professional before they are able to file for philosophical exemption.²⁷ Parents in Oregon may also be required to complete a state vaccine education program.²⁷

There are also some state laws that allow for vaccine exemption or re-vaccination exemption with proof of immunity.²⁷ Using a blood titer test, medical laboratories are able to test levels of naturally acquired or vaccine acquired antibodies, which are used to indicate proof of immunity to specific diseases.²⁷ If an individual's antibody levels are high enough and follow the accepted standards of antibody concentration for each disease they are testing for, individuals are then able to submit their bloodwork report with a request for exemption.²⁷ I do not consider this a true exemption, as the individual looking to avoid re-vaccination or the child who still needs their school-required immunizations would already have immunity to the vaccine-preventable disease. The individual or the child would not pose a threat to their own health or the greater health of the community, and therefore does not need a true exemption; they are already immune.

Following this understanding of the different types of vaccination exemptions, I argue for the elimination of both philosophical and religious vaccination exemptions, and that it is only permissible to allow medical vaccination exemptions. In Part II I will discuss philosophical exemptions and why they should be eliminated. In Part III I will examine religious exemptions and the reasons that they too should be eliminated. Finally, in Part IV I will explain the importance of medical exemptions and will use thought experiments to explain potential consequences.

Part II: Elimination of Philosophical Vaccination Exemptions

The NVIC is one of the strongest advocates for philosophical exemptions. They use the ethical principle of informed consent as a basis for their argument, stating that “implicit in the concept of informed consent is the right to refuse consent or, in the case of vaccination laws, the right to exercise conscientious, personal belief, or philosophical exemption to mandatory use of one or more vaccines”.²⁸ While there is no question about the importance of informed consent and that it is a clear overarching ethical principle in medicine that should always be upheld, I disagree with the NVIC when they claim that “vaccination is a medical procedure that could reasonably be termed as experimental each time it is performed on a healthy individual”.²⁸ An experiment is by definition “a test

²⁸ Informed Consent – NVIC. (n.d.). Retrieved from <http://www.nvic.org/informed-consent.aspx>

under controlled conditions that is made to demonstrate a known truth, examine the validity of a hypothesis, or determine the efficacy of something previously untried".²⁹ It is true that the FDA, the CDC, and those that actually produce vaccinations often do not have a large enough number of human subjects in the pre-licensing studies conducted to detect rare adverse effects.²⁸ However, this fact does not designate vaccination to be a type of scientific experiment.

There are experiments conducted in order to develop vaccines, but to classify vaccination as a type of experiment is absurd. In administering a vaccine, the physician is not trying to test a hypothesis or determine the efficacy of something previously untried. The purpose of vaccination is to produce immunity within the body of a healthy individual so that they will remain a healthy individual. This is known of each vaccine administered, as is the immunological process by which it produces immunity. When Edward Jenner first attempted to prove his cowpox-against-smallpox theory, he did so with an experiment that tested his hypothesis. His experiment on James Phipps was without consent, and the effectiveness of the procedure was not proven at the time of administration. Today, administered vaccines have been tested and cleared by the FDA, the CDC, and the scientists who actually that manufacture the vaccines, and the vaccine effectiveness has been proven prior to public distribution and use.

²⁹ Experiment. (n.d.) *The American Heritage® Medical Dictionary*. (2007). Retrieved January 11 2017 from <http://medical-dictionary.thefreedictionary.com/experiment>

While there are occasionally newer vaccines that have not existed for enough time to be aware of any potential long-term adverse effects, there are many vaccines that have been around for decades and are proven to prevent highly contagious diseases from afflicting public health. For example, before the worldwide use of measles vaccines, incidence of the virus was so high that becoming infected was “as inevitable as death and taxes”.³⁰ When measles vaccine was first introduced in 1963, there was no data on the long-term effects of the vaccine on the human body. Yet, people began to receive the vaccine because the disease was endemic to the entire world. Between 1997 and 2013, fewer than 200 cases of measles were reported each year, and measles is currently no longer endemic in the United States as a result of vaccinations.⁴ To say that, in general, each time a vaccine is administered to a healthy individual that it is an experiment is an invalid claim. Receiving the vaccination, combined with the herd immunity provided by high rates of vaccination in each community, will maintain and promote not only the health of that healthy individual, but also the health of the larger population. In regard to the MMR vaccine, the occasional adverse reactions are rarely serious and are well known and documented by the FDA, and therefore, receiving the vaccine is not an experiment.

³⁰ Babbott FL Jr; Gordon JE (1954). “Modern measles”. *Am J Med Sci.* 228(3): 334-61. PMID 13197385

The ethical principle of informed consent is extremely important in all areas of medicine, and when discussing vaccination, we can refer to John Locke's *Second Treatise of Government*, in which he discusses parental power and the need for parents to understand for their children.³¹ Locke describes parents as having "a sort of rule and jurisdiction over them when they come into the world, and for some time after, but it is a temporary one".³¹ He explains that parents have the right to govern over and take care of their children, until the children achieve reason and understanding.³¹ At such a time, the children will be able to make decisions for themselves and direct their will and actions in the right direction, without the governing of their parents.³¹ Locke compares this concept to the law and the freedom an individual may have to "dispose of his actions and possessions, according to his own will, within the permission of that law".³¹ He describes what allows for this ability as a capacity for knowing that law, and if it permits the parents to be free then it will permit the children to be free as well⁵⁴. However, until the child has achieved reasoning and understanding, under the law the child will have no will and is "guided by the will of his father or guardian, who is to understand for him".³¹ Thus, it is vital for parents to be fully informed about all of their child's potential procedures, as the child is not yet able to achieve the necessary reasoning and understanding. In regards to vaccination, reaching the parents with the relevant information requires a respectful, open, and trusting doctor-patient/parent relationship, in order to achieve effective communication and promote the child's health and future. Lack of such a

³¹ Locke, J. (1689). *Two Treatises of Government*. England, Awnsham Churchill. Print.

relationship may lead to detrimental health outcomes for both the child and for the public, due to increased risk of vaccine-preventable diseases, such as measles. If a parent does not fully understand the risks and benefits of such vaccinations, they will be unable to make an informed decision about what is in the best interest of their child, increasing the aforementioned risks. Thus, this parental power is not absolute, and is only permissible insofar as it helps the child grow to be strong, healthy, intelligent, and skillful.³¹ If a parent is governing over their child in a way that does not benefit their health or their future, then it is not permissible for parents to maintain this parental power.³¹

The NVIC states that those in authority positions of public health in the federal and state government should not “crush all dissent to mandatory vaccination laws and force individuals to violate their deeply held conscientious beliefs”.²⁸ I agree that opposition to mandatory vaccination laws should not be crushed, however, I believe such dissent would be better dealt with through effective communication within the doctor-patient/parent relationship. I also agree that people should not be forced to violate their deeply held conscientious beliefs, unless there is strong state interest, as was the case in *Jacobson v. Massachusetts* (1905)³². In this case, the United States Supreme Court ruled to uphold the state authority to enforce compulsory vaccination laws for smallpox against Pastor Henning Jacobson.³² The court ruling supports Locke’s view, and

³² *Jacobson v. Massachusetts*. (n.d.). Retrieved from https://en.wikipedia.org/wiki/Jacobson_v._Massachusetts

my own, asserting that “the freedom of the individual must sometimes be subordinated to the common welfare and is subject to the police power of the state”.³² Jacobson had argued that mandatory vaccination was an “invasion of his liberty”³² and was against the Fourteenth Amendment of the Constitution.³²

The first rationale used to uphold the court’s decision was that “the state may be justified in restricting individual liberty...under the pressure of great danger”³². At the time, the smallpox epidemic was a danger to the public health of the United States. As a result, personal liberties and rights were held as secondary priorities when compared to the state’s responsibility to eradicate the disease and the responsibility to the health and safety of the public.³² The second rationale used by the Supreme Court was actually adopted from Jacobson’s own argument that mandatory vaccination laws were “arbitrary and oppressive”.³² The court explained that mandatory vaccinations in the face of epidemic are neither arbitrary nor oppressive, and they maintained that vaccination would bring the country closer to the total eradication of smallpox.³² The outcome of this case set the precedent that it is permissible to suspend personal liberties given specific external circumstances. The decision in this case supports both governmental power and limits on power, such that the state is able to intervene if there is an extreme threat to public health.

Jacobson v. Massachusetts supports Locke’s view that parental power is not absolute, and in situations where the child’s health or the health of the

greater community is at risk, the government or state is able to step in for protection of those involved.³¹ I agree with Locke and the outcome of *Jacobson v. Massachusetts*, that in the face of extreme threats to public health the state should be able to intervene. In regard to philosophical exemptions to school-required immunizations, there is a sizeable threat to public health if they are permitted. It follows that the state should intervene on behalf of the rights of the child and encourage vaccination for children of parents who may hold a personal belief objection, even after they have been educated on the matter. The CRC, a human rights treaty laying out the rights of children, states that adults should hold the best interest of the child as their primary concern in all matters concerning children.^{33,34} The idea that the government has a responsibility to ensure the child's protection, care, and well-being is very similar to Locke's limited permissibility of parental power, occurring only when the child and the child's well-being are benefited.^{34,31} These two ideas are complementary, because if the parent is benefiting the child and promoting the child's well-being, then the state is technically fulfilling its responsibility.

As I briefly mentioned in Ch. IV, a recent article in *Bioethics* interestingly compared conscientious objection to vaccination to conscientious objection to military service.²¹ Clarke et al. were able to make this comparison because both

³³ Convention on the Rights of the Child. (n.d.). Retrieved from https://en.wikipedia.org/wiki/Convention_on_the_Rights_of_the_Child

³⁴ The United Nations. (November 20, 1989). Convention on the Rights of the Child. *Treaty Series*, 1577, 3.

an invading military force and the outbreak of a vaccine-preventable disease threaten political stability, national security, and public health and safety.²¹ The article addressed two important questions pertaining to conscientious objection to vaccinations. The first question was generally if individuals should be permitted to philosophical vaccination exemptions, either for themselves or for their children.²¹ The second question was if philosophical exemptions are permitted, then what restrictions or obligations should these conscientious objectors (CO) be subject to?²¹ Their argument was that

conscientious objectors to vaccination should make an appropriate contribution to society in lieu of being vaccinated. The contribution to be made will depend on the likelihood that vaccine refusal will lead to harm. In particular, the contribution required will depend on whether the rate of CO in a given population threatens herd immunity to the disease in question: for severe or highly contagious diseases, if the population rate of CO becomes high enough to threaten herd immunity, the requirements for CO could become so onerous that CO, though in principle permissible, would be de facto impermissible.²¹

I agree with their argument, as school-required vaccinations are required due to the highly contagious nature of the viruses they prevent. For example, as an incredibly infectious, directly-transmitted pathogen, measles virus can yield many detrimental secondary complications after the initial infection. The herd immunity produced from a high MMR vaccination rate can provide additional protection to

all members of the community¹², but if philosophical exemptions are permitted, then there is a substantial threat to herd immunity. It follows that there should be restrictions and/or obligations that individuals would have to submit to in order to obtain such exemptions, as a direct result of the severity of the disease and the sizeable threat to measles herd immunity.

Clarke et al. discuss two implications from their CO comparison: (1) “it is legitimate to expect those conscientiously objecting to vaccination to supply evidence of their sincerity” and (2) “those who conscientiously object have an obligation to contribute to the upkeep of their society”.²¹ They note that it may be difficult to directly test the sincerity of a philosophical objection, and instead suggest that sincerity is tested indirectly, through increasing the effort required to actually obtain such an exemption.²¹ In doing so, it would effectively push free-riders to feel as though the burdens of conscientiously objecting are more demanding than those of vaccinating.²¹ This would result in the decrease of free-riding, and the consequent increase in herd immunity and thus public health and safety. In contributing to the upkeep of society, Clarke et al. suggest that COs may be subject to “financial penalties” or “denied access to financial benefits”.²¹ The monetary value of these restrictions would depend on the disease, the compromising of herd immunity, the severity of possible harms, the probability of such harms occurring, and conditions of the specific disease such as the morbidity, the communicability, and the mortality once an individual is infected.²¹ Following these guidelines would produce proportional retribution, because “as

vaccination rates decrease, penalties increase, with the effect of not only preventing free riding, but putting pressure on objectors to examine their beliefs".²¹

While I agree that the methods suggested by Clarke et al. would be useful in decreasing the number of philosophical exemptions, I still believe that such exemptions should not be permitted. As illustrated by the ruling in *Jacobson v. Massachusetts*, John Locke's notion of limited parental power, and the CRC, the government has a responsibility to intervene and protect the rights, health, and safety of children.^{32,31,34} In situations where there is strong state interest to maintain childhood and greater public health and safety, as is the case with school-required immunizations, strongly felt personal beliefs may be held as secondary to the administration of the vaccine to any eligible individual, thus eliminating the necessity of philosophical vaccination exemptions.

Part III: Elimination of Religious Vaccination Exemptions

In regards to religious vaccination exemptions, States may be concerned that not allowing such exemptions would be unconstitutional, violating the First Amendment of the U.S. Constitution, which states that no laws can be passed by congress that prohibit the free exercise of religion.³⁵ In reality, there are no

³⁵ United States Constitution. Amendment I. Retrieved from https://www.law.cornell.edu/constitution/first_amendment

federal or state courts that are constitutionally required to allow religious or personal belief exemptions. In many cases, the courts actually end up at the opposite conclusion, deciding that it is more important for the state to protect public health and the health of children. In *Prince v. Massachusetts* (1944), the Supreme Court addressed this issue stating that parents “cannot claim freedom from compulsory vaccination for the child more than for himself on religious grounds. The right to practice religion freely does not include liberty to expose the community or the child to communicable disease or the latter to ill health or death”.³⁶ The Supreme Court held that the government has broad authority to regulate the actions and treatment of children, which, again, is in agreement with Locke’s notion of limited permissibility of parental power – the idea that parental authority is not absolute and can be permissibly restricted if doing so is in the best interest of the child’s wellbeing.^{31,37,36}

In some cases, such as *Brown v. Stone* (1979), the court has ruled that allowing religious exemptions would violate the equal protection guarantee of the Fourteenth Amendment of the U.S. Constitution.³⁸ Section 1 of the Fourteenth Amendment says that no state will pass any laws that deny equal protection of

³⁶ *Prince v. Massachusetts*. (n.d.). Retrieved from

https://en.wikipedia.org/wiki/Prince_v._Massachusetts

³⁷ *Prince v. Com. Of Mass.* (January 31, 1944) (FindLaw, Dist. file).

<http://caselaw.findlaw.com/us-supreme-court/321/158.html>

³⁸ *Brown v. Stone*, 378 So. 2d 218 (December 19, 1979). Retrieved from

<http://www.publichealthlaw.net/Reader/docs/Brown.pdf>

the laws to any person within its jurisdiction.³⁹ In *Brown v. Stone* (1979), the Supreme Court of Mississippi explained that allowing vaccination exemption for children of parents whose religious beliefs conflict with school-required immunizations would actually discriminate against the majority of children, whose parents do not hold those religious beliefs⁷³. This violates the equal protection guarantee because “it would require that the great body of school children be vaccinated and at the same time expose them to the hazard of associating in school with children exempted under the religious exemption who had not been immunized as required by the statute”.³⁸

Prince v. Massachusetts (1944) and *Brown v. Stone* (1979) are just two of the many Supreme Court cases that clearly set legal precedent for elimination of religious exemptions to school-required immunizations.^{37,38} However, this legal precedent ethically brings up the potential slippery-slope problem in regards to religious freedom in the United States. The nature of this problem is that if we follow the constitution and accept that children should not be treated differently on religious grounds, then how far does that doctrine go and what will remain of freedom of religion in the family? I address this issue using Article 14 of the CRC, as well as Locke’s notion of raising a child as an individual with their own beliefs.^{34,31}

³⁹ United States Constitution. Amendment XVI. Section 1. Retrieved from <https://www.law.cornell.edu/constitution/amendmentxiv>

Article 14 of the CRC explains that children have the right to freedom of thought, conscience, and religion.³⁴ Parents and/or legal guardians have the right and duty to provide direction to the child in terms of what is right and wrong, while maintaining respect for the child's right to choose their own religion, their own beliefs, and to think for themselves.³⁴ This is comparable to Locke, who explains that the duty of a parent is to raise the child as an individual.³¹ In doing so, the child will mature with their own thoughts, beliefs, and religion, rather than just becoming a projection of the parental beliefs, attitudes, and religion. The third point made in Article 14 states that "freedom to manifest one's religion or beliefs may be subject only to such limitations as are prescribed by law and are necessary to protect public safety, order, health or morals, or the fundamental rights and freedoms of others".³⁴ This means that the limiting of religious and personal freedoms is permissible under such conditions that threaten both the child's and the public's health and safety, or that threaten the fundamental rights and freedoms of others³⁴, but this does not entail that parental first amendment rights are suddenly lost. This limitation simply means that while parents may exercise their freedom of religion as they please, they may no longer abuse the system and put their child and the public at increased health and safety risks. By abuse the system, I am referring to parents lying to get religious exemptions and how the U.S. legal system makes it difficult to prevent.⁴⁰ Professor Dorit

⁴⁰ Reiss, D. R., PhD. (2014). Thou Shalt Not Take the Name of The Lord Thy God in Vain: Use and Abuse of Religious Exemptions from School Immunization Requirements. University of California Hastings College of the Law: Legal Studies Research Paper Series, 1-70. Retrieved January, 2017, from https://papers.ssrn.com/sol3/papers2.cfm?abstract_id=2396903

Rubenstein Reiss argues for the existence of this abuse, using survey data of reasons that people do not vaccinate as evidence for lying.⁴⁰ She found that the reasons people give are generally safety concerns, not religious concerns, but are recorded as religious exemptions.⁴⁰ Dr. Reiss also surveyed the positions of established religions on vaccination, finding that “most religions either fail to prohibit vaccinations or explicitly support them”.⁴⁰ If a state wants to provide religious exemptions then “they must apply them to anyone who has a sincere religious belief opposed to vaccination”.⁴⁰

The current legal landscape in the United States makes preventing exemption abuses difficult, due to the understandable reluctance of courts to police religious beliefs.⁴⁰ If the state were to determine which religious beliefs were valid and which were invalid, it would be in clear violation of the First Amendment. However, this does not mitigate concerns regarding the legitimacy of individual’s religious beliefs. Much of the abuse comes from religions that are created with the intention of obtaining religious vaccination exemption to school-required immunizations. For example, the Congregation of Universal Wisdom was created by Dr. Walter T. Schilling, a chiropractor in New Jersey⁴¹, with the tenet that it is “sacrilege to depart from the precepts of the Congregation by the injection into the body of medication or other matter of substances that defy

⁴¹ McNeil, D.G. (2003, January 13). Worship Optional: Joining a Church to Avoid Vaccines. Retrieved January 16, 2017, from <http://www.nytimes.com/2003/01/14/science/worship-optional-joining-a-church-to-avoid-vaccines.html>

natural law”.⁴² Once an individual applies for membership and receives their membership certificate, they are guaranteed a waiver of religious exemption from school-immunization requirements.⁴¹ In a New York Times article, Dr. Schilling explained that his church was founded to defend ‘straight chiropractors’ like himself, who regard Western medicine as a form of satanism.⁴¹ In 2003, he claimed that there were “5,520 members, mostly families wanting to avoid vaccination, in 28 states”.⁴¹ The Congregation of Universal Wisdom is just one example of the system abuse, and how difficult it is for the United States legal system to prevent such abuse from occurring.

Accordingly, Article 14 yields the right to choose religion to the child (with only directional rights to the parents)³⁴, and complements Locke and the court decisions in *Jacobson v. Massachusetts* (1905) and *Prince v. Massachusetts* (1944). Religious freedoms and personal liberties are thus able to be restricted by the state if a parent is governing over their child in a way that does not benefit the child’s future, if there is proof of legitimate danger to the state, or if there are specific external circumstances, such as the threat of an outbreak to a vaccine-preventable disease.^{31,32,37} Allowing religious exemptions increases the likelihood of such outbreaks, which then increases the risk of threats to the child’s health, to public health and safety, and to the fundamental rights and freedoms of others.³⁴ Eliminating religious vaccination exemptions would reduce the risk of vaccine-

⁴² Congregation of Universal Wisdom. (2017). Retrieved January 16, 2017, from <http://www.cuwisdom.org/index.php>

preventable disease outbreaks, and would thereby reduce the associated risks. In eliminating religious exemptions, the risk of threat to the child's health would be reduced because they would not only have immunity to vaccine-preventable diseases, but they would also be contributing to herd immunity for those diseases. The risk of threat to public health and safety would then be reduced, because when the child and all other vaccine-eligible members of the community are vaccinated, the overall herd immunity for those diseases is increased. This increase in herd immunity is very important because no vaccine is 100% effective, and achieving high percentages of vaccination rates will provide protection for those who are too young to be vaccinated or who have medical exemptions. Furthermore, human beings, including children³⁴, have the fundamental right to life, and it stands to reason that a subset of this right is the fundamental right to good health. Limiting vaccination exemptions solely to those granted for medical reasons, allows for the protection of these fundamental rights, and thus increases the health of the child, overall herd immunity, and protection to those who are unable to get vaccinated. Consequently, it is clear that elimination of religious vaccination exemption has no pathway to infringe upon the familial right to freedom of religion and therefore mollifies the potential slippery-slope problem of religious freedom in the United States.

**Part IV: Parental Moral Responsibility and the Importance of
Medical Vaccination Exemptions**

In contrast to philosophical and religious exemptions, medical vaccination exemptions to school-required immunizations are based on scientific evidence that the vaccine in question is contraindicated with the medical condition of the child. Children who obtain medical exemptions have biological reasons for why they cannot be given the school-required immunizations, and therefore rely on herd immunity to stay protected from vaccine-preventable diseases. As discussed in Part III, limitation of vaccination exemptions increases protection of fundamental rights, and increases the child's health, the public's health, and the overall herd immunity. Parents therefore have a moral responsibility to make sure their children receive all school-required immunizations, unless the child has an underlying medical condition that prevents them from doing so. This moral responsibility is clearly illustrated in the NPR article I mentioned in Ch. IV, in which the father of a 6-year-old recovering from leukemia says "if your child gets sick and gets my child sick and my child dies, then...your action has harmed my child".²⁰

To be morally responsible for an action or an event is to be worthy of a particular reaction, such as praise or blame, for having performed the action or

having directly caused a subsequent event as the result of one's actions.⁴³ If the 6-year-old in recovery dies from coming into contact with a sick unvaccinated child, then the parent of the unvaccinated child is blameworthy for that death. That parent has directly caused the recovering 6-year-old's death as a direct result of their choice to not vaccinate their own child. The parent is therefore morally responsible for not only the death, but also for any other consequences that may result from their child's lack of vaccination. Furthermore, depending on the medical reason for exemption, a child may be highly susceptible to contracting the disease for which they are not vaccinated. Additionally, permitting non-medical exemptions would put these children at a much greater risk of becoming infected, as well as increase the risk to everyone with whom they come in contact. For example, the WHO recommends that children who are severely immunocompromised, such as the recovering 6-year-old, should not receive a measles vaccination.¹⁰ Such children would likely obtain a medical vaccination exemption, and would rely thus on the herd immunity provided by the greater vaccinated population to stay safe against vaccine-preventable diseases.¹⁰ If non-medical exemptions are permitted, then there is a greater likelihood that the rate of vaccination will not reach the level that is required to obtain herd immunity, especially for diseases like measles with required vaccination rates of 96-99% .¹³ Thus, allowing these non-medical exemptions results in an increased risk to medically exempt children and to public health, as well as an increase in

⁴³ Eshleman, Andrew, "Moral Responsibility", *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition), Edward N. Zalta (ed.).
<https://plato.stanford.edu/archives/win2016/entries/moral-responsibility/>

the number of parents who will be failing their moral responsibility to the health and safety of their child and their community.

Chapter VI: Conclusion

So, how should physicians respond to the parent who fully understands the risks and benefits of vaccinating their child, yet believes that it would be putting toxins into the child's body and therefore refuses the vaccine? What is the state to do in such situations? Should the state take away the parental right to decide what is best for their child? Or should the state allow the parent to make the decision and maintain their personal liberties? When presented with this situation, I believe physicians should not only use the CASE method¹¹ and CDC effective communication strategies¹⁴ to ensure that the parent truly comprehends the choice they are making, but should also explain the moral responsibility that the parent has to their child and to their community. In response to what the state should do in such situations, I agree with Locke, who explains parental power as only permissible insofar as it helps the child grow to be strong, healthy, intelligent, and skillful, and that the duty of the parent is to raise their child to be an individual with their own beliefs.³¹ The parent who believes that vaccines are toxins and refuses to vaccinate their child is projecting their beliefs onto the health and well-being of the child, and doesn't allow the child to exercise their rights under Article 14 of the CRC.³⁴ As a result, not only is the child susceptible to vaccine-preventable diseases, but it also puts the larger community at risk even if a large percentage of that community has been vaccinated.

The parent is therefore not fulfilling their duty to raise their child an individual, nor is the parent governing over the child in a way that benefits the child's health or future. Parents may truly believe that they are doing what is best for their child and that their child's health will benefit more without vaccination than if 'toxins' were injected into the child's body. However, this belief would not even exist if the prevalence of vaccine-preventable diseases was not so low, as a direct result of vaccination. If a disease such as measles was not preventable by vaccination and continued to have a high mortality rate, I do not believe the view that a child's health has a better future without a disease-preventing injection would exist. Furthermore, while the parent has the right to govern over their child, the child also has the fundamental right to life and to good health. Thus, it is not permissible for the parent to maintain parental power over their child, and it is permissible for the state to take away that personal freedom.

As I clearly illustrated in Ch. V, there is a significant difference between medical vaccinations exemptions and both philosophical and religious vaccination exemptions to school-required immunizations. Allowing for philosophical and religious exemptions to these vaccination requirements increases the risks to the child's health, to the public health, to the fundamental rights to life and good health, and to the freedoms of others. Under these increased risks, there is a substantial threat of vaccine-preventable disease outbreaks, which poses a threat to political stability, national security, and public health and safety.²¹. As a result, it is obvious that parents have a moral

responsibility to vaccinate their children following the CDC and the WHO recommended schedules, unless the child has a contraindicating medical condition.^{5,10,27} Fulfilling this responsibility will consequently promote the health and safety of their own children and all individuals with whom those children may come in contact. Therefore, it is permissible to eliminate both philosophical and religious vaccine exemptions, leaving only medical vaccine exemptions. This elimination would directly promote the health and well-being of all adults and children in the United States, through use of vaccines such as MMR, to protect against vaccine-preventable diseases.

Glossary

- Antigen – any substance that, as a result of coming in contact with appropriate cells, induces a state of sensitivity or immune responsiveness and that reacts in a demonstrable way with antibodies or immune cells of the sensitized subject in vivo or in vitro.⁴⁴
- Antigenic – having the properties of an antigen.⁴⁵
- Attenuate (attenuation, attenuated) – to dilute, thin, reduce, weaken, diminish.⁴⁶
- Contraindicate – to avoid a protocol or treatment based on specific prevailing circumstances.⁴⁷
- 'Dr. Bob' Sears – American pediatrician noted for his unorthodox views on childhood vaccination; proposes two alternative vaccination schedules that stray from accepted medical recommendations; his alternative schedules are not supported by medical evidence and have contributed to dangerous

⁴⁴ Antigen. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/Antigen>

⁴⁵ Antigenic. (n.d.) *Medical Dictionary for the Health Professions and Nursing*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/antigenic>

⁴⁶ Attenuate. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/attenuate>

⁴⁷ Contraindicate. (n.d.) *Medical Dictionary for the Health Professions and Nursing*. (2012). Retrieved November 11 2016 from <http://medical-dictionary.thefreedictionary.com/contraindicate>

under-vaccination in the national child population; he is characterized as an anti-vaccine doctor and a vaccine delayer.⁴⁸

- Encephalomyelitis – general term for inflammation of the brain and spinal cord.⁴⁹
- Endothelial Cells – the cells lining the inner walls of blood vessels.⁵⁰
- Epithelial Cells – cells that form a thin surface coating on the outside of a body structure.⁵¹
- Intramuscular – within the substance of a muscle.⁵²
- Keratoconjunctivitis – inflammation of the eye that involves both the cornea and conjunctiva. Keratoconjunctivitis can occur due to abrasion trauma, infection, and underlying diseases.⁵³
- Laryngotracheobronchitis (croup) – viral infection of the upper respiratory tract that causes varying degrees of airway obstruction but that, with aggressive emergent management, only infrequently requires hospitalization. Although the disease is most often self-limited, it

⁴⁸ Robert Sears (physician). (n.d.). Retrieved from

[https://en.wikipedia.org/wiki/Robert_Sears_\(physician\)](https://en.wikipedia.org/wiki/Robert_Sears_(physician))

⁴⁹ Wikipedia – *Encephalomyelitis* – <https://en.wikipedia.org/wiki/Encephalomyelitis>

⁵⁰ Endothelial cells. (n.d.) *Gale Encyclopedia of Medicine*. (2008). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/Endothelial+cells>

⁵¹ Epithelial cells. (n.d.) *Gale Encyclopedia of Medicine*. (2008). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/Epithelial+cells>

⁵² Intramuscular. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/intramuscular>

⁵³ MedicineNet – *Keratoconjunctivitis* –

<http://www.medicinenet.com/script/main/art.asp?articlekey=4094>

occasionally is severe and can in rare cases be fatal. Common symptoms include a barking cough, stridor, and fever.⁵⁴

- Lymphocytes – population of 22-28% of circulating white blood cells (leukocytes).⁵⁵
- Macrophages – white blood cells (activated monocytes) that protect the body against infection and foreign substances by breaking them down into antigenic peptides recognized by circulating T-cells.⁵⁶
- Measles inclusion body encephalitis (MIBE) – severe brain swelling caused by the measles virus as a complication of getting infected with wild-type measles virus. While rare, this disorder almost always happens in patients with weakened immune systems. The illness usually develops within one year after initial measles infection and has a high death rate. There have been three published reports of this complication happening to vaccinated people. In these cases, encephalitis developed between 4 and 9 months after MMR vaccination. In one case, the measles vaccine strain was identified as the cause.⁵⁷

⁵⁴ Medscape – *Laryngotracheobronchitis* – <http://reference.medscape.com/article/800866-overview>

⁵⁵ Lymphocytes. (n.d.) *Illustrated Dictionary of Podiatry and Foot Science* by Jean Mooney. (2009). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/lymphocytes>

⁵⁶ Macrophages. (n.d.) *Jonas: Mosby's Dictionary of Complementary and Alternative Medicine*. (2005). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/macrophages>

⁵⁷ CDC – Vaccine Safety – *A Closer Look at the Safety Data* – <http://www.cdc.gov/vaccinesafety/vaccines/mmr-vaccine.html>

- Monocytes – the largest of the white blood cells; mononucleated; develop into macrophages and both consume foreign material and alert T-cells to its presence.⁵⁸
- Morbidity – the prevalence of a disease in a particular percentage of the population; the number of cases of a particular disease per unit of population; any departure, subjective or objective, from a state of physiological or psychological well-being.⁵⁹
- Otitis media (ear infection) – inflammation of the middle ear without reference to etiology or pathogenesis.⁶⁰
- Reconstitute (reconstitution) – to restore a dried substance to a fluid form that can be used for injection (in pharmacology); to rebuild a substance or reservoir within the body (such as bone marrow) to a natural or functionally healthy state.⁶¹
- Section 317 – part of the Public Health Service Act authorizing the federal purchase of vaccines to vaccinate children, adolescents, and adults; Section 317 discretionary funding also supports immunization program operations at the local, state, and national levels.⁶²

⁵⁸ Monocytes. (n.d.) *Jonas: Mosby's Dictionary of Complementary and Alternative Medicine*. (2005). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/monocytes>

⁵⁹ Morbidity. (n.d.) *Segen's Medical Dictionary*. (2011). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/morbidity>

⁶⁰ Medscape – *Otitis Media* – <http://emedicine.medscape.com/article/994656-overview>

⁶¹ Reconstitute. (n.d.) *Medical Dictionary*. (2009). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/reconstitute>

⁶² Questions Answered on Vaccines Purchased with 317 Funds. (2013, July 19). Retrieved from <https://www.cdc.gov/vaccines/imz-managers/guides-pubs/qa-317-funds.html>. Content source: National Center for Immunization and Respiratory Diseases

- Seroconversion – the process by which, after exposure to the etiologic agent of a disease, the blood changes from a negative to a positive serum marker for that specific disease.⁶³
- Stomatitis – general term for an inflamed and sore mouth; can disrupt a person’s ability to eat, talk, and sleep. Stomatitis can occur anywhere in the mouth, including the inside of the cheeks, gums, tongue, lips, and palate.⁶⁴
- Subacute sclerosing panencephalitis (SSPE) – a progressive, debilitating, and deadly brain disorder related to measles (rubeola) infection. SSPE is caused by an abnormal immune response to measles or, possible, certain mutant forms of the virus may cause severe illness and death. This response leads to brain inflammation (swelling and irritation) that may last for years. Considered a rare disease in western countries, but has been documented all over the world. Fewer than 10 cases per year are reported in the United States, showing dramatic decrease following the nationwide measles immunization program. Tends to occur several years after an individual has measles. Disease generally occurs in children and adolescents, and tends to affect males more often than females.⁶⁵

⁶³ Seroconversion. (n.d.) *Medical Dictionary for the Health Professions and Nursing*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/seroconversion>

⁶⁴ WebMD – *Stomatitis* – <http://www.webmd.com/oral-health/guide/stomatitis-causes-treatment#1>

⁶⁵ MedlinePlus – *Subacute Sclerosing Panencephalitis* – <https://medlineplus.gov/ency/article/001419.htm>

- Subcutaneous – beneath the skin.⁶⁶
- Vaccine for Children (VFC) Program – a federally funded program that provides vaccines at no cost to children who might not otherwise be vaccinated because of inability to pay. Vaccines are bought at a discount by the CDC and then distributed to state health departments and other local/territorial public health agencies, who then distribute them at no charge to private physicians' offices and public health clinics registered as VFC providers.⁶⁷
- Varicella – synonym: chickenpox; an acute contagious disease, usually occurring in children.⁶⁸
- Viremia – the presence of a virus in the bloodstream.⁶⁹
- Virulence – the disease-evoking severity of a pathogen; numerically expressed as the ratio of the number of cases of overt infection to the total number infected, as determined by immunoassay.⁷⁰
- Vitamin-A deficiency – found among malnourished, elderly, and chronically sick populations in the United States, but is more prevalent in developing countries. The first signs of vitamin-A deficiency include:

⁶⁶ Subcutaneous. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/subcutaneous>

⁶⁷ Vaccines for Children Program (VFC). (2014, April 24). Retrieved from <https://www.cdc.gov/vaccines/programs/vfc/index.html>. Content source: National Center for Immunization and Respiratory Diseases

⁶⁸ Varicella. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved January 4 2017 from <http://medical-dictionary.thefreedictionary.com/varicella>

⁶⁹ Viremia. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/viremia>

⁷⁰ Virulence. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/virulence>

abnormal visual adaptation to darkness, dry skin, dry hair, broken fingernails, and decreased resistance to infections.⁷¹

- Wild-Type – referring to an organism or gene locus that predominates in natural or normal populations.⁷²

⁷¹ Medscape – *Vitamin-A Deficiency* – <http://emedicine.medscape.com/article/126004-overview>

⁷² Wild-Type. (n.d.) *Segen's Medical Dictionary*. (2011). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/wild-type>

Bibliography

1. Riedel, S., MD, PhD. (2005). *Edward Jenner and the history of smallpox and vaccination*. Baylor University Medical Center. Proceedings, 18(1), 21. Retrieved from <http://search.proquest.com/docview/1032820068?accountid=14637>
2. Stern, A. M., & Markel, H. (2005). The history of vaccines and immunization: Familiar patterns, new challenges. *Health Affairs* 24 (3):611-621.
3. Poland, G. A., & Jacobson, R. M. (2011). The Age-Old Struggle against the Antivaccinationists. *New England Journal of Medicine*, 364(2), 97-99. doi:10.1056/nejmp1010594
4. Measles. (n.d.) Retrieved from <https://en.wikipedia.org/wiki/Measles>
5. Moss, W. J., MD, MPH, & Scott, S., PhD. (2009). *The Immunological Basis for Immunization Series: Module 7: Measles, Update 2009*. Geneva, Switzerland: World Health Organization Department of Immunization, Vaccines and Biologicals; WHO Press.
6. Measles Signs and Symptoms. *Center for Disease Control and Prevention*. Retrieved from <https://www.cdc.gov/measles/about/signs-symptoms.html>
7. Measles Parent Infographic. *Center for Disease Control and Prevention*. Retrieved from <https://www.cdc.gov/measles/parent-infographic.html>
8. Measles Statistics. *Center for Disease Control and Prevention*. Retrieved from <https://www.cdc.gov/nchs/fastats/measles.htm>
9. Serial Passage. (n.d.). Retrieved from https://en.wikipedia.org/wiki/Serial_passage#Use_in_vaccines
10. Routine Immunization Schedules. *World Health Organization*. (September, 2016). Retrieved from http://www.who.int/immunization/policy/Immunization_routine_table2.pdf?ua=1

11. Bass III, P. F., MD, MS, MPH. (2015, July). Vaccine Refusal. *Contemporary Pediatrics*, 32(7), 20-23.
12. Schwartz, J. L., & Caplan, A. L. (2011). *Vaccination Refusal: Ethics, Individual Rights, and the Common Good*. *Primary Care: Clinics in Office Practice*, 38(4), 717-728. DOI:10.1016/j.pop.2011.07.009
13. Hendrix, K. S., Sturm, L. A., Zimet, G. D., & Meslin, E. M. (2016, February). Ethics and Childhood Vaccination Policy in the United States. *American Journal of Public Health*, 106(2), 273-278. DOI:10.2105/ajph.2015.302952
14. Center for Disease Control. (2012, March). *Talking with Parents about Vaccines for Infants: Strategies for Health Care Professionals*. Retrieved January 24, 2017, from <https://www.cdc.gov/vaccines/hcp/patient-ed/conversations/downloads/talk-infants-color-office.pdf>
15. Coalition for Responsible Home Education. (2016, June 07). Homeschool Immunization Requirements. Retrieved January 24, 2017, from <https://www.responsiblehomeschooling.org/policy-issues/current-policy/homeschool-immunization-requirements/>
16. Sun, L. H. (2017, February 06). Trump's vaccine views are at odds with those of most Americans, study says. Retrieved February 12, 2017, from https://www.washingtonpost.com/news/to-your-health/wp/2017/02/02/trumps-vaccine-views-at-odds-with-those-of-most-americans-study-says/?tid=a_inl&utm_term=.d03587167e93
17. Sun, L. H. (2017, February 08). More than 350 organizations write Trump to endorse current vaccines' safety. Retrieved February 12, 2017, from https://www.washingtonpost.com/news/to-your-health/wp/2017/02/08/more-than-350-organizations-write-trump-to-endorse-current-vaccines-safety/?utm_term=.a3f5690513a6
18. American Academy of Pediatrics, et al. (2017, February 07). [Letter to President Donald Trump]
19. Glanz, J. M., Wagner, N. M., Narwaney, K. J., Shoup, J. A., McClure, D. L., McCormick, E. V., & Daley, M. F. (2013). A Mixed Methods Study of

Parental Vaccine Decision Making and Parent–Provider Trust. *Academic Pediatrics*, 13(5), 481-488. doi:10.1016/j.acap.2013.05.030

20. Aliferis, L. (2015, January 27). To Protect His Son, A Father Asks School To Bar Unvaccinated Children. NPR. Retrieved January 24, 2017, from <http://www.npr.org/sections/health-shots/2015/01/27/381888697/to-protect-his-son-a-father-asks-school-to-bar-unvaccinated-children>
21. Clarke, S., Giubilini, A., & Walker, M. J. (2016). Conscientious Objection to Vaccination. *Bioethics*, 31(3), 155-161. doi:10.1111/bioe.12326
22. Field, R. I., & Caplan, A. L. (2008). A Proposed Ethical Framework for Vaccine Mandates: Competing Values and the Case of HPV. *Kennedy Institute of Ethics Journal*, 18(2), 111-124. doi:10.1353/ken.0.0011
23. Constable, C., Blank, N. R., & Caplan, A. L. (2014). Rising rates of vaccine exemptions: Problems with current policy and more promising remedies. *Vaccine*, 32(16), 1793-1797. doi:10.1016/j.vaccine.2014.01.085
24. Mill, John Stuart. (1859) 1975. *On Liberty: John Stuart Mill*, New York: Norton Critical Edition.
25. Diekema, D. S., & The AAP Committee on Bioethics. (2005). Responding to Parental Refusals of Immunization of Children. *Pediatrics*, 115(5), 1428-1431. doi:10.1542/peds.2005-0316
26. State Law and Vaccine Requirements. *The National Vaccine Information Center*. Retrieved from <http://www.nvic.org/Vaccine-Laws/state-vaccine-requirements.aspx>
27. Vaccine Exemptions FAQs – NVIC. (n.d.). *The National Vaccine Information Center*. Retrieved from <http://www.nvic.org/faqs/vaccine-exemptions.aspx>
28. Informed Consent – NVIC. (n.d.). *The National Vaccine Information Center*. Retrieved from <http://www.nvic.org/informed-consent.aspx>

29. Experiment. (n.d.) *The American Heritage® Medical Dictionary*. (2007). Retrieved January 11 2017 from <http://medical-dictionary.thefreedictionary.com/experiment>
30. Babbott FL Jr; Gordon JE (1954). "Modern measles". *Am J Med Sci*. 228(3): 334-61. PMID 13197385
31. Locke, J. (1689). *Two Treatises of Government*. England, Awnsham Churchill. Print.
32. Jacobson v. Massachusetts. (n.d.). Retrieved from https://en.wikipedia.org/wiki/Jacobson_v._Massachusetts
33. Convention on the Rights of the Child. (n.d.). Retrieved from https://en.wikipedia.org/wiki/Convention_on_the_Rights_of_the_Child
34. The United Nations. (November 20, 1989). Convention on the Rights of the Child. *Treaty Series, 1577, 3*.
35. United States Constitution. Amendment I. Retrieved from https://www.law.cornell.edu/constitution/first_amendment
36. Prince v. Massachusetts. (n.d.). Retrieved from https://en.wikipedia.org/wiki/Prince_v._Massachusetts
37. Prince v. Com. Of Mass. (January 31, 1944) (FindLaw, Dist. file). <http://caselaw.findlaw.com/us-supreme-court/321/158.html>
38. Brown v. Stone, 378 So. 2d 218 (December 19, 1979). Retrieved from <http://www.publichealthlaw.net/Reader/docs/Brown.pdf>
39. United States Constitution. Amendment XVI. Section 1. Retrieved from <https://www.law.cornell.edu/constitution/amendmentxiv>
40. Reiss, D. R., PhD. (2014). Thou Shalt Not Take the Name of The Lord Thy God in Vain: Use and Abuse of Religious Exemptions from School Immunization Requirements. University of California Hastings College of the Law: Legal Studies Research Paper Series, 1-70. Retrieved January, 2017, from https://papers.ssrn.com/sol3/papers2.cfm?abstract_id=2396903

41. McNeil, D.G. (2003, January 13). *Worship Optional: Joining a Church to Avoid Vaccines*. Retrieved January 16, 2017, from <http://www.nytimes.com/2003/01/14/science/worship-optional-joining-a-church-to-avoid-vaccines.html>
42. Congregation of Universal Wisdom. (2017). Retrieved January 16, 2017, from <http://www.cuwisdom.org/index.php>
43. Eshleman, Andrew, "Moral Responsibility", *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition), Edward N. Zalta (ed.). <https://plato.stanford.edu/archives/win2016/entries/moral-responsibility/>
44. Antigen. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/Antigen>
45. Antigenic. (n.d.) *Medical Dictionary for the Health Professions and Nursing*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/antigenic>
46. Attenuate. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/attenuate>
47. Contraindicate. (n.d.) *Medical Dictionary for the Health Professions and Nursing*. (2012). Retrieved November 11 2016 from <http://medical-dictionary.thefreedictionary.com/contraindicate>
48. Robert Sears (physician). (n.d.). Retrieved from [https://en.wikipedia.org/wiki/Robert_Sears_\(physician\)](https://en.wikipedia.org/wiki/Robert_Sears_(physician))
49. Encephalomyelitis. (n.d.) Retrieved from <https://en.wikipedia.org/wiki/Encephalomyelitis>
50. Endothelial cells. (n.d.) *Gale Encyclopedia of Medicine*. (2008). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/Endothelial+cells>
51. Epithelial cells. (n.d.) *Gale Encyclopedia of Medicine*. (2008). Retrieved November 9 2016 from <http://medical->

dictionary.thefreedictionary.com/Epithelial+cells

52. Intramuscular. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/intramuscular>
53. Keratoconjunctivitis. (n.d.) *MedicineNet*. Retrieved from <http://www.medicinenet.com/script/main/art.asp?articlekey=4094>
54. Laryngotracheobronchitis. (n.d.) *Medscape*. Retrieved from <http://reference.medscape.com/article/800866-overview>
55. Lymphocytes. (n.d.) *Illustrated Dictionary of Podiatry and Foot Science by Jean Mooney*. (2009). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/lymphocytes>
56. Macrophages. (n.d.) *Jonas: Mosby's Dictionary of Complementary and Alternative Medicine*. (2005). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/macrophages>
57. Vaccine Safety – A Closer Look at the Safety Data. *Center for Disease Control and Prevention*. (2015). Retrieved from <http://www.cdc.gov/vaccinesafety/vaccines/mmr-vaccine.html>
58. Monocytes. (n.d.) *Jonas: Mosby's Dictionary of Complementary and Alternative Medicine*. (2005). Retrieved November 9 2016 from <http://medical-dictionary.thefreedictionary.com/monocytes>
59. Morbidity. (n.d.) *Segen's Medical Dictionary*. (2011). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/morbidity>
60. Otitis Media. (n.d.) *Medscape*. Retrieved from <http://emedicine.medscape.com/article/994656-overview>
61. Reconstitute. (n.d.) *Medical Dictionary*. (2009). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/reconstitute>
62. Questions Answered on Vaccines Purchased with 317 Funds. *Center for*

- Disease Control and Prevention*. (2013, July 19). Retrieved from <https://www.cdc.gov/vaccines/imz-managers/guides-pubs/qa-317-funds.html>. Content source: National Center for Immunization and Respiratory Diseases
63. Seroconversion. (n.d.) *Medical Dictionary for the Health Professions and Nursing*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/seroconversion>
64. Stomatitis. (n.d.) *WebMD*. Retrieved from <http://www.webmd.com/oral-health/guide/stomatitis-causes-treatment#1>
65. Subacute Sclerosing Panencephalitis. (n.d.) *MedlinePlus*. Retrieved from <https://medlineplus.gov/ency/article/001419.htm>
66. Subcutaneous. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/subcutaneous>
67. Vaccines for Children Program (VFC). *Center for Disease Control and Prevention*. (2014, April 24). Retrieved from <https://www.cdc.gov/vaccines/programs/vfc/index.html>. Content source: National Center for Immunization and Respiratory Diseases
68. Varicella. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved January 4 2017 from <http://medical-dictionary.thefreedictionary.com/varicella>
69. Viremia. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved October 26 2016 from <http://medical-dictionary.thefreedictionary.com/viremia>
70. Virulence. (n.d.) *Farlex Partner Medical Dictionary*. (2012). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/virulence>
71. Vitamin-A Deficiency. (n.d.) *Medscape*. Retrieved from <http://emedicine.medscape.com/article/126004-overview>

72. Wild-Type. (n.d.) Segen's Medical Dictionary. (2011). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/wild-type>