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Vaccinate

“Vaccines are the most cost-effective health-care interventions there are. A dollar spent on a childhood vaccination not only helps save a life but greatly reduces spending on future health care.”

Ezekiel Emanuel

THE TOPIC OF vaccinating our children has become very delicate and difficult in the past few years. With parents exposed to so much conflicting information on this subject, it is understandably very hard to know what to believe. When you hear claims that vaccinations have the potential to irreversibly harm your infant child—the most precious being you could imagine—it is reasonable to be concerned and feel apprehensive.

The responsibility one feels as a new parent adds weight to every little decision: what kind of crib to get, to co-sleep or not, what kind of car seat to buy, what kind of stroller to use, to breastfeed or use formula, and which kind of formula to choose? It is endless and can feel overwhelming, when all you want to do is keep your little one safe and healthy. When it's

time for vaccination, you likely need more information to feel confident in your decision. The challenge is getting good information from someone you trust and feeling content enough with that information to take action.

The majority of people vaccinate themselves and their children, and a few people will never change their minds about the topic. This chapter is mainly directed at those who feel scared, confused, or want to feel confident in their decision. I hope that no matter where you land on this spectrum you will be open-minded enough to read this chapter in its entirety. I provide reliable information about one of the most successful health interventions humanity has ever developed, while clarifying some common myths about vaccination. I hope to convince you that vaccinations are a key aspect of healthy living for your family and yourself.

Any level of uncertainty around a difficult choice or a change typically leads to inaction. When it comes to vaccinating our children, it can be easier to delay indefinitely or avoid thinking about it, rather than commit to getting the immunizations done. But delaying or avoiding vaccinations puts your child—as well as the health of other children and people in your community—at risk. My goal is to help you feel confident enough in the recommendations of the global medical community to overcome any hesitancy and keep you and your loved ones up-to-date on your vaccinations.

I have joked that vaccination has become one of those subjects—like politics and religion—that are taboo to bring up in polite dinner conversation. The discussion of vaccination usually boils down to two views that cannot be reconciled. On social media, a post on anything related to vaccination programs seems to yield angry and visceral responses on both sides.

For this reason, I have been nervous to bring up this topic but I reassure myself by knowing I am in good company. I am

thankful that prominent physicians, health writers, and community members—from Dr. David Gorski to Tara Haelle to Timothy Caulfield—have publicly expressed their support for vaccinations.

I truly am grateful for all those who have been vocal in this area, and they have helped me to be clear with my patients and friends about why I stand firmly on the side of vaccination. They have also motivated me to join the discussion and add my voice in support.

Why Vaccinate?

To begin, let's define the terms: *vaccination* refers to the use of a substance to induce an immune response that leads to immunization. *Immunization* is the process of becoming resistant to an infection, be it by surviving the illness *or* by vaccination. (I use both terms interchangeably in this chapter.) When we vaccinate someone, we are not giving them a “medicine” but tricking the body into producing its own antibodies, via a natural process, against the disease—without having to endure the symptoms, risks, and complications of the illness itself. It is a phenomenal process to prevent illness.

The bottom line when it comes to vaccines is that they are incredibly effective and safe. Medical practitioners, medical associations, public health departments, scientists, researchers, governments, and health organizations around the world all agree that vaccines are a good thing and should be provided to everyone *to protect and save as many lives as possible*. A debate implies that there is an ongoing discussion between opposing viewpoints; as far as the science is concerned, there is no “other side” on this subject. Some people, even physicians, disagree and believe there is a large conspiracy to try to harm

our children; this group is a tiny minority. There are also tiny minorities who believe that the Earth is flat and only 6,000 years old, and that we didn't land on the moon.

Vaccines, and scientific findings in general, do not care if you believe in them or not. They help protect you no matter your stance.

In addition to the consensus among governments, health organizations, scientists, and physicians, it is important to note that the vast majority of people understand the benefit of vaccines. Despite the impression some patients have that there is true debate and controversy around vaccines, the reality is that worldwide about 85 percent of infants are vaccinated against polio, diphtheria, pertussis (whooping cough), and tetanus. In Canada, the results of a survey done in 2013 showed only 2.7 percent of children under age two had not received any vaccinations, while 89 percent had been vaccinated for measles, mumps, and rubella. In the United States, 2016 data from the Centers for Disease Control and Prevention show vaccination rates to be similarly high—92 percent of infants aged nineteen to thirty-five months were vaccinated for measles, mumps, rubella, and chicken pox.

My point is that despite the vocal presence online, in the media, and at rallies, only a very small group is pushing an anti-vaccination agenda forward. Many of us in the medical community are frustrated when television “debates” present one person discussing the value of vaccination and another presenting the anti-vaccine point of view, in an attempt to fairly show both sides of the issue. This is a misrepresentation—to be accurate you would have to have dozens of people speaking to the value of immunization and one person trying to shout down the science.

Myth #1: There is controversy and debate around the safety and effectiveness of vaccinations.

Fact: Scientists, doctors, governments, and health organizations agree in the value of vaccination programs and their safety. The belief that they are unsafe or dangerous is held by only a very small group of people, as demonstrated by the high worldwide vaccination rates.

I do not mean to imply that we can be complacent. While vaccination rates are generally high, and the incidence of vaccine-preventable diseases has plummeted (polio and rubella are gone from the United States; diphtheria—which used to kill up to 15,000 Americans each year—is exceedingly rare), the rates of vaccination are dropping. They are also dangerously low in certain pockets of North America—for example, one school in California had 40 percent of students on some sort of exemption from vaccination, and another had only a third of students fully vaccinated—which can allow the reemergence of diseases that we have not seen for years.

This has already happened with outbreaks of measles. The outbreak in Disneyland in 2015 saw 159 people from eighteen states be infected and more than 80 percent of them were unvaccinated or did not know their status. In 2017, more than 20,000 people in Europe had measles, with thirty-five deaths. While there are multiple factors involved—low coverage in marginalized groups, challenges in vaccine supply or disease surveillance—the decreased uptake of vaccinations in traditionally safer countries has resulted in overall increased episodes throughout Europe.

In order to have an effective population vaccination program and protect our most vulnerable, we need to have an 85 percent vaccination rate for most diseases (like mumps and rubella); for the most contagious—like pertussis and measles—probably closer to 95 percent. We also have to be aware that even if diseases aren't common in North America, they are just a short plane ride away as seen with the measles cases

in Europe. Even polio, which is almost eradicated around the world with a 99 percent drop in cases since 1988, still has cases reported in Pakistan, Afghanistan, and Nigeria. Travelers to and from these regions could still be exposed to the illness and bring it back to North America.

A common refrain from those against vaccination is that if your children are vaccinated and protected, then what do you care if others choose not to vaccinate. Well, beyond the fact that I think that all children should be protected and safe, the reality is that no vaccine is 100 percent effective—it depends on the immune system of the person as well. The most vulnerable of our population may not be able to get vaccinated with live vaccines and would not generate immunity with others, due to a weakened immune system from cancer, chemotherapy, medication, or another underlying disease.

It can be hard to think of that bigger vague picture of protecting others, so think of a real person. My mother-in-law had leukemia, chemotherapy, and an autologous bone marrow transplant: her immune system was weak and no vaccination would be useful to her. Instead, it was the responsibility of everyone around her to protect her—to reduce the risk of infection as much as humanly possible. Or think of the family of a child who is immune-compromised. How much fear must they have in sending their child to school, the park, or the mall knowing that any infection, let alone one of these vaccine-preventable ones, could send him to the hospital or even kill him.

Preventing outbreaks of these illnesses, even for those already vaccinated, comes down to the numbers. Vaccinated children are certainly better protected than unvaccinated ones during an outbreak, but again it is not 100 percent effective. When you look at the higher *proportion* of children who have been vaccinated, the *absolute numbers* who get infected may

end up being larger among the vaccinated group. I know this is confusing, so let me use an example.

Let's say during an outbreak of a disease that the risk of infection in vaccinated children is only 4 percent and in unvaccinated children it is 40 percent. If 1,000 children are exposed and only twenty are unvaccinated, then eight unvaccinated children will get sick (40 percent of twenty). Thirty-nine children of the vaccinated group will get the illness (4 percent of 980). Some may use those absolute numbers to argue that vaccinations don't work, but clearly it is the opposite. We need high vaccination rates to stop the spread of the disease among all of our population—those vaccinated as well as those who can't be.

Myth #2: If you or your child is vaccinated, there is no reason to worry about whether other people are vaccinated.

Fact: The purpose of getting vaccinated is to protect you, your family, and your community at large. We need extremely high vaccination rates to prevent outbreaks of these diseases and protect everyone in our community, especially the most vulnerable who can't receive vaccines or for whom they are ineffective.

As vaccination rates drop below the threshold, we will likely continue to see outbreaks of these illnesses, and the potential is there for these diseases to once again become part of our medical landscape. We have been spoiled by the success of worldwide vaccination programs and forget about the potentially devastating consequences of these now vaccine-preventable diseases.

But we cannot allow complacency to put our children in harm's way again. Just because we don't remember these illnesses doesn't mean they don't exist. We need to be concerned

with the reemergence of these illnesses because, at some point, children will start to die or have significant consequences from diseases like pertussis and measles—again as seen in Europe. It is a numbers game—as more people are infected, eventually someone will experience significant consequences. We even still minimize the risk of things like influenza—even though the flu vaccine isn't 100 percent effective, it is still one additional measure of defense against an illness that kills adults and children every year.

I don't want to use fear to push for vaccinations; I just want to emphasize how fortunate we are that vaccines have been so effective. We can't let this success blind us to how life used to be. It may be worthwhile to talk to seniors who have had more experience with these illnesses than most current physicians have had. Even polio is just a generation removed and celebrities like Alan Alda, Joni Mitchell, Neil Young, and Jack Nicklaus were all fortunate to have survived it.

Myth #3: These illnesses are rare, so I don't need to be worried about vaccinating for them.

Fact: Although rare, these vaccine-preventable illnesses are still around and have the potential to reemerge, particularly in our global community. It is up to all of us to ensure they don't.

I understand that it is very hard to change minds, but that doesn't mean it's not worth the effort. The anti-vaccination movement's narrative really appeals to the See-Feel-Change model we talked about previously. Seeing a parent express their belief that a vaccine caused irreparable damage to their lovely child, and seeing that same child in some state of distress really sticks in your mind. It causes all of us to *feel* something. Regardless of whether that anecdote is scientifically valid or not, the story is powerful.

The medical response tends to lean toward the Analyze-Think-Change model: a lot of data is presented that demonstrates that vaccines have been proven to be safe and effective, but that approach does little to overcome that narrative. The medical community's challenge has been to find a way to counter these strong emotional stories with compelling facts. It used to be that the numerous cases of children in hospital, quarantined, or otherwise affected by these illnesses was fresh in our minds and emphasized the importance of vaccination, but thankfully those incidents are few and far between. But I do wonder what the uptake would be for vaccines for more modern disease scares like the Zika virus or SARS—incredibly high, I suspect. I hope we can find other ways to demonstrate the value of immunization without going back to being fearful of illnesses killing or disabling our children.

Since the image of a healthy child with the absence of a disease is not that compelling, I will try to show you the common cognitive errors, logical fallacies, and biases involved in this issue. I'll return to the critical thinking concepts we discussed in the "Think" chapter. Realistically, the recommended *behavior* for this particular focus on healthy living—vaccination—is easy: book an appointment at your public health unit or with your primary care provider to update your children's and your own vaccinations. The true challenge is in the thinking: How can we feel confident in the information we have in order to move forward on that action?

Step 1: Focus on the Claim Itself

The first step in analyzing the issues around vaccination is to focus on the specific concern. Oftentimes, there is a general fear of "the shots" and it helps to clarify that. If the belief is

that all vaccines are bad, then there is not much wiggle room. If there are absolutely no vaccines you would ever consider, under any circumstances, then it is unlikely that any information anyone could provide would ever change your mind. But hopefully there are specific concerns you have that I can help alleviate.

In focusing on the individual claims, it is again important to note that the *source* is not the target of the discussion. Any discussion descending to name-calling or personal attacks is not helpful. I will keep focused on the particular and common fears in an effort to reduce them.

One common worry is that vaccine programs begin at such a young age. Some parents are concerned that vaccinations can be harmful to their baby. The reason to vaccinate so early comes down to the basic philosophy of any vaccination program: *to ensure immunization occurs before the child has the chance to be exposed to the disease*. It does no good to give a vaccine at age two if the child is infected and suffers with it at age one. Vaccinations are given as soon as feasible to protect the child. In some cases, children are immunized shortly after birth to minimize the risk of transmission of an illness from mother to child (hepatitis B, for example). All of these vaccinations have been given for decades; after millions of doses being tracked and watched, the safety of this schedule is clear. For this reason, I do not advocate for any delayed immunization schedules—the concern is not founded and delaying makes children vulnerable.

Myth #4: Vaccines are given at too young of an age.

Fact: Vaccines are given as soon as possible to protect the child before any possible exposure to the disease.

Another concern parents have is that the immune system might become overloaded with all the shots that infants get as part

of the vaccination program. Certainly, there have been more vaccinations added to the routine immunization schedule, and it can seem like a lot, but this is a good thing. The more illness and disease we can prevent, the safer our children are.

The reality is that our immune systems can handle it. Our immune system does not work based on the number of diseases it's exposed to but rather by the number of antigens—molecules that can induce an immune response. When exposed to a pathogen, like a virus or bacteria, the body creates antibodies to the wide variety and large number of antigens on it. With today's vaccinations, we are able to limit the number of antigens in the shots and thus the actual burden on our system is much smaller than if it was exposed to the whole virus. In fact, even with the increased number of vaccinations, our body is exposed to much fewer antigens than in earlier vaccination schedules. For this reason, I do not recommend an altered vaccination schedule that attempts to spread them out to decrease a risk that does not exist.

Myth #5: Our kids are given too many vaccines and it is too much of a burden on their immune systems.

Fact: Our immune system can handle it. In fact, the current vaccine schedule exposes the body to fewer antigens than used in the 1980s.

The next area of anxiety for many parents is that there are dangerous toxins in the vaccinations. With any substance, it is the dose that makes it dangerous or not; any substance will be toxic at high enough doses and anything given in a small enough amount will do us no harm. For example, you can die from drinking too much water and yet you will experience no appreciable effect from the small amount of opium in a poppy seed muffin. Typically, there are tiny doses of ingredients in a vaccine that serve to dissolve the antigen, stabilize it, or to

create a more potent response to make it more effective, and these ingredients tend to be targeted by those in the anti-vaccine movement.

The initial concern raised was around mercury. This claim was focused on thimerosal, which is used as a preservative in some vaccines. Thimerosal is used presently only in the multi-dose flu vaccine and in one multidose version of the meningitis vaccine. It contains the mercury atom but breaks down to ethylmercury, which is vastly different from the methylmercury found in fish, which you have likely heard concerns about. Ethylmercury has been extensively studied since the initial concerns: it has been found to be quickly metabolized, much less dangerous than methylmercury, and harmless in the tiny doses used in vaccines.

Formaldehyde is another common toxin of concern. Formaldehyde is used to inactivate live viruses prior to vaccine production. There may still be tiny amounts remaining in the vaccine, but your body produces much more of it on its own. You are also exposed to it in many household items (nail polish, plywood, grocery bags), and you consume it regularly in fruits and vegetables.

Aluminum is also used in some vaccines to help make the immune response to the vaccine stronger. Again, it is in tiny amounts, and babies are exposed to much more through breast milk, formula, and their environment. Some vaccines may also contain tiny doses of antibiotics to prevent bacterial growth, and some vaccines may have trace amounts of egg protein remaining after the use of eggs to grow the viruses—neither of which is a concern.

And to dispel one other unfounded claim, there is no anti-freeze in vaccines.

Myth #6: There are dangerous toxins in vaccines.

Fact: There are tiny amounts of additives in vaccines to help make, store, and preserve the vaccine. Some components are there to help them work better. They are in tiny doses and have been repeatedly shown to be safe.

One of the most common and discussed fears around vaccinations is that they cause brain damage, autism, or other neurological issues. This impression has typically resulted from the spread of information, as follows: an initial report linking vaccination to brain injury is very publicly and vocally discussed in the media and online. Almost immediately vaccination rates decline. After the issue is analyzed and investigated by researchers, it is revealed to be unfounded, misleading, or totally false. However, this information is only quietly spread and never completely undoes the mistrust created by the initial report.

There are a couple of main examples of this. First, in the 1980s, a big concern was raised that the pertussis vaccine caused seizures and brain injury. As a result, congressional hearings were held and expensive investigations were ordered to determine the validity of the claim. An initial study did suggest a link and this terrified families and physicians alike. Unsurprisingly, the rates of vaccinations for pertussis declined dramatically. However, numerous repeat studies all over the world were never able to duplicate the findings of the initial review and consistently found no link between the vaccine and brain injury or seizures.

Finally, after detailed analysis, it was concluded that the *initial study was wrong*. Due to political pressure and to be sure that no one could accuse it of being biased toward proving the vaccine was safe, many cases were included in the investigation as potential examples of vaccine injury that were later found to be false—either due to other causes or the fact that

the children were actually normal prior to and after the vaccine. Even more profound was the fact that Dr. Samuel Berkovic, a neurologist from Australia, was able to determine that many of these cases of supposed vaccine injury were due to Dravet syndrome, a genetic disorder characterized by seizures in the first year of life and subsequent developmental challenges. Unfortunately, all of this robust and detailed science that has ruled out the link between pertussis and brain injury has never quite removed that erroneous impression of risk around vaccines and brain development.

Considering vaccine risk, it is also worth noting that just a few reported cases of potential issues are enough to raise concern—when giving out millions of doses of vaccines, even a tiny serious risk is enough to warrant caution. This is a valuable approach to ensure a safe vaccine for the population. On the downside, a few errors in reporting can lead to unwanted anxiety.

Case in point is the issue around the measles, mumps, and rubella (MMR) vaccine and its purported link to autism. The initial paper by Andrew Wakefield, a British surgeon, was published in the respected medical journal *The Lancet* in 1998. It involved the report of only *eight* cases of autism that he linked to the MMR vaccine; again, this led to an immediate reduction in vaccination rates from which we are still trying to recover. We've experienced a drop in vaccination rates despite the fact that all subsequent trials have shown no link between vaccines and autism; that Dr. Wakefield's initial paper was retracted by *The Lancet*; that Dr. Wakefield was reprimanded by England's General Medical Council for not having his study approved by an ethics review board; and that Dr. Wakefield is now unable to practice medicine in England after being struck from the country's medical register.

The fact that one small study raising concern can galvanize the research community to determine the truth is encouraging;

the fact that one small erroneous paper can continue to create confusion and harm, despite the abundance of good evidence disputing it, is disappointing and worrisome.

Myth #7: vaccines can cause autism, seizures, or brain damage.

Fact: Vaccines have been thoroughly investigated for safety against all of these claims and have been repeatedly found to be safe.

Step 2: Determine the Pre-test Probability

The next step in considering the safety and effectiveness of vaccines is the pre-test probability. In terms of vaccinations, that would be the likelihood that the entire medical community, pharmaceutical industry, governments, and health organizations the world over are all conspiring to give children vaccinations they don't need as a way to poison them and cause developmental problems.

I struggle with this one and try to not take it personally when this claim is made by patients or acquaintances. But it is a hard one to let go. As a family physician, I encourage my patients to be vaccinated and perform the vaccination; it's one of the core roles I have as a primary care provider. The idea that I would do this just for the money (and, for the record, vaccinating infants is not a high-paying endeavor) regardless of some significant potential harm it could cause patients is a bit insulting.

Setting aside my personal feelings, any conspiracy of this size would require the involvement of too many people to count, all keeping the truth a secret. How do we manage that? Where would the leadership meet? How does one benefit from this conspiracy to vaccinate children?

I don't want to belabor this point, as anyone who believes there is a conspiracy will likely believe that I am part of it as well. I just request that you honestly ask yourself: What is the likelihood of all of these parties—who in general don't work well together—being able to coordinate such a vast global conspiracy?

Myth #8: There is a complex conspiracy by government, health-care workers, and Big Pharma to poison our children with vaccines.

Fact: There isn't.

Step 3: Check for Biases

When looking at vaccine safety claims, even though the focus should be on the actual issue at hand, it is still worthwhile to consider where information is coming from and any potential biases or conflicts of interest. I understand that many people might think that, as a physician, I am unreliable to talk about vaccines because I'm part of the "system." I can somewhat see where that comes from but, again, I only get paid a few dollars for each vaccine given, and no amount of money would be enough to justify me putting children at risk. And in defense of the medical profession, and science in general, we are not held to a strict "belief" in vaccinations but rather to the evidence behind them; if that evidence changes, so do our practice and standards of care.

Changes in standards of care have already happened in numerous ways when it comes to vaccination. For example, a vaccine against rotavirus, a common virus that can hospitalize thousands of children each year in North America and kills thousands daily in the developing world, was released in 1998.

After ten months, some concerns were raised after reports of fifteen children apparently developing intussusception (a rare telescoping of the bowel, which is a medical emergency). Without any media pressure or scandalous revelation, the vaccine recommendation was removed and the product was pulled off the market until further studies were done. Eventually, a risk was found of one case in approximately 10,000 vaccine recipients, and it took seven years before a safer version was made and released for use.

That example shows science working to further our understanding and to ensure a safe vaccine program. If evidence is presented to change our body of knowledge, the medical community responds to it. In contrast, many in the anti-vaccine movement are held to a certainty bias that vaccines are harmful—they are sure they are right and nothing can be said or done to change that mindset. This makes any discussion on this topic very challenging.

Currently, the anti-vaccine campaign seems to be promoting the idea that they are all about access to information to allow parents to make their own choices. The name of the most powerful anti-vaccine organization in America, the National Vaccine Information Center (NVIC), makes this stance clear. Unfortunately, the name doesn't change what it does: provide misleading, inaccurate, and frightening information to parents in an attempt to discourage vaccination. The NVIC has consistently opposed any and all vaccinations—no vaccination appears to be safe enough or good enough for them to recommend. They are even against a vaccine that has been proven to prevent cancer—the HPV vaccine, which prevents cervical cancer.

I have struggled with this mindset, as I don't really understand how an intervention whose sole purpose is to prevent illness, complications, and death from disease could generate

such mistrust and fury. I don't believe it comes down to financial motivation (although I'm sure there are many lawyers who make a good living representing these cases and that some doctors have done well as professional witnesses on the subject).

I wonder if this response stems from the incredibly intense feelings that must come with having a child diagnosed with a developmental issue, like autism. Believing that the vaccine they allowed to be injected into their child caused irreparable harm—which is *wrong and unfair to think*—could cause overwhelming guilt. If that is what they truly believe, then I suppose it is understandable to be consumed by such anger and blame. I am sorry for that because it is unnecessary to add that immense guilt to what must already be a very difficult situation.

Myth #9: The goal of those opposed to vaccination is to provide accurate information to families in order to allow them to make their own informed decisions.

Fact: The continued spread of false information despite accurate science is a danger to an effective vaccination program. These organizations have a bias against vaccinations and are working to undermine confidence in them. No vaccine will likely ever be safe enough or effective enough to warrant their approval.

We have already discussed one bias that is common amongst anti-vaccination advocates, the *certainty bias*, but the biggest one around this issue is that of *confirmation bias*—the tendency to look for, interpret, evaluate, and remember information in such a way as to confirm what we already believe. We may, for example, only read articles supporting our view of vaccinations' safety or danger, which unfortunately often also ridicules the opposing view. If you are fighting that urge and have continued reading this chapter despite feeling the discomfort that comes

from being presented with an opposing view, I truly thank you—I appreciate the extra effort that takes.

As a family physician, I have the opportunity to try to see both sides regularly. Obviously, I want to ensure my patients and their children are vaccinated, so I look to the evidence behind that view. But I also care for those few patients I have who are against vaccinations or have serious misgivings. I don't dislike them; I want to genuinely help them and understand where they are coming from. For this reason, I look at what's on these anti-vaccination sites. At times, they can sound convincing and I feel anxious as they work to insert a bit of uncertainty about vaccinations. I can only imagine how hard it must be for parents trying to navigate this maze who don't know about the background, the typical tricks and subjects used, and the weight of evidence on the other side in support of vaccinations.

Some physicians have taken a strict line on this debate and elect to not take on any patients who will not vaccinate their children. I don't believe in that stance. My role is to be a trustworthy source to help clear up the confusion. I do not offer, recommend, or support any type of delayed or alternative schedules of vaccination, but I will give vaccinations to families whenever they are ready to receive them—and I make sure they know that I will bring up the subject every single visit.

It's also never too late to get vaccinated, so children can be caught up on their shots at any age. Even teenagers or young adults who have been unvaccinated as children have to get fully updated in order to apply for certain jobs (in health care, for example) or to travel to certain areas. It is also worth noting that adults are recommended to remain up-to-date with annual flu shots, the shingles vaccine, tetanus boosters, and other age-appropriate vaccinations.

Another bias that often comes up on the topic of vaccines is the idea that the government or doctors “can't tell me what

to do.” This subject is challenging; getting a needle does seem invasive, and is it really ethical to force people to get a vaccination if they don’t want it? I struggle with this myself and certainly hope we don’t ever get to the point that we have to force individual families to vaccinate in order to help protect the larger population. I just ask that you be aware of the internal resistance you may be feeling due to this issue and not make it a primary reason you are rejecting a vaccination.

Step 4: Assess the Basis of the Claim

Now we get to more specifics on the nature of the claims themselves. What is behind the idea that vaccines are unsafe, beyond what we have already discussed? There are a number of logical fallacies, or errors in thinking, that tend to drive this point of view, many of which we discussed in the first chapter, “Think.”

The first to consider is the use of anecdotes as data. Many people have a specific story or incident that supports their belief that vaccines can harm children. But one story or even lots of anecdotes do not replace a scientific study. Numerous case reports have been used to suggest that vaccines are dangerous, but subsequent high-quality studies have proven them to be false. Certainly, those anecdotal incidents are likely more memorable, but we need to be strong enough to resist that aspect and focus on the accuracy of the science.

Myth #10: Recounting a story about vaccinations causing harm is equivalent to research.

Fact: The plural of anecdote is not data. Stories can be inaccurate in multiple ways and scientific research is required to truly assess the safety and risk of vaccinations.

Next is the idea that because one thing happened after another, the earlier event caused the latter. This issue is huge when discussing vaccinations because many developmental delays, seizures, autism, and other conditions of childhood start to show themselves and are diagnosed in the first year of life—just when children are getting most of their vaccinations. It is inevitable that some will start demonstrating symptoms close to the occasion of an immunization just due to timing. It can feel incredibly powerful and definitive to a family that one caused the other, but that is why we need to look at the evidence and the studies—to offset that emotional, and completely natural, assumption.

Myth #11: Because symptoms showed up after a vaccination, the vaccination caused the problem.

Fact: Many conditions are first noticed in early childhood and vaccination also occurs during that time. Correlation does not equal causation. Scientific research is required to clarify if one action truly leads to a particular event; its place on a timeline is not sufficient evidence.

The idea that anything natural is good and anything unnatural is bad is another common logical fallacy that shows up in regards to vaccinations. Some people seem to feel that it is better to get the measles or chicken pox, as we would develop stronger immunity that way. In some ways that may be true; if you endure and survive the infection, your body will have had a very robust immune response to every antigen on that virus or bacteria and will be well protected as a result. However, what also follows from this idea is that if you are unvaccinated against all of these diseases, and you don't get infected either, you will have weaker immunity than someone who is vaccinated. The vaccination triggers your immune system to go

through its *natural* process of producing antibodies so it is already prepared to fend off future infections from that bug. And there is the added benefit of not having to get sick, not having to deal with a rash or other symptoms, and not taking the risk of getting complications or even dying from the infection.

Myth #12: It is better to get the infection itself than to get vaccinated.

Fact: It is best to be immunized and protected without getting infected at all, and thus avoid the risks of the disease.

If people believe that it is better to get infected rather than getting vaccinated to avoid the illness, they must on some level feel that it is no big deal to get sick in the first place. “We all used to just get the measles or chicken pox, and we all are fine.” Many people did recover with no issues at all from measles, mumps, chicken pox, polio, and any of the vaccine-preventable diseases, but those who died from them or suffered significant consequences are not available to make their voices heard. We also tend to downplay the illness itself, the symptoms and discomfort caused by it, and the possibility of hospitalization even if there are no long-term consequences.

Myth #13: With some of these vaccine-preventable illnesses, the disease itself is no big deal, so why even worry about it?

Fact: We tend to underestimate the illness itself, and even a low risk of death or serious complications is something worth preventing.

Clearly there are a lot of arguments being promoted out there against the value and safety of vaccinations. It can be overwhelming and frustrating to try to defeat them all, as often it becomes a game of Whack-a-mole—once you refute one

claim, another one pops its head up. Hopefully, through critical thinking, you can understand the limitations of many of the statements against vaccinations and feel confident in addressing any other ideas you are presented with.

Facts about the Flu Vaccine

Every year there is concern and confusion around the vaccine for the flu. In addition to the myths discussed in this chapter, there are a few specific concerns around this particular vaccine that need to be addressed.

- We have to admit that the flu vaccine is not our best vaccine. Due to the changes in the influenza virus every year, the vaccine has to be developed each and every year to try to match the virus and be most effective. Each year, three (or four) strains are picked as the most likely to circulate that winter. Some years, the match is very close; other years, it is not as close as we'd like. This results in the flu vaccine being able to reduce your risk of getting sick by approximately 50 percent (somewhere between 30 to 70 percent depending on the year). This is still significant; I'm sure people would be open to interventions that reduce the risk of car accidents by that amount.
- We have to admit that most people do not get the flu. You are far more likely to get colds and other viruses than the flu. But if you do get the flu, it is no fun and you will be laid up for seven to ten days with fever, muscles aches and pains, and generally feeling lousy. And there is a small chance of you getting seriously ill, being hospitalized or even dying.
- This risk of complications from the flu is much higher for those who are elderly, very young, or otherwise immune-compromised. Unfortunately, the flu shot is the least effective for these

groups due to their weaker immune system. If you want to help protect your grandparents, it is probably better that you and those around them get vaccinated (although your grandparents should also get the shot to at least get some protection).

- It is still possible to develop complications from the flu if you are otherwise healthy. It is a serious illness that results in hundreds of thousands of hospital admissions each year (an estimated 310,000 Americans in 2015–16) and the deaths of about 23,600 people in the United States each year. In children, 80 percent of the deaths are in the unvaccinated.
- You should get the flu vaccine every year, as each year the vaccine is a little different and protects against different strains.
- You cannot get sick from the flu vaccine. There is nothing living in it (or it's a highly weakened form of the flu—depending on the vaccine). People tend to get sick around that time because the shot is given out during the fall when common colds start making an appearance, or you were exposed to the flu before receiving your shot.
- The flu vaccine is safe for pregnant women and for children older than six months.
- The stomach flu is not the same as influenza. The flu shot does nothing to prevent diarrhea. It also does not protect against the common cold.
- Just because you've never had the flu, that does not mean you can't get it in the future. If you got the flu shot in the past and got the flu anyway, it doesn't mean the shot can't help you the next time. The flu vaccination reduces your risk of getting sick but doesn't guarantee you won't get the flu, though it likely would make your illness less severe.
- The flu shot is extremely safe. The risk of any significant complication has been shown to be miniscule with millions of doses

given each year, and that tiny risk is far less than the risk of complications from influenza itself.

Overall, the flu shot is effective, safe, and can help protect the most vulnerable in our population each year. Please consider it.

Summary

Vaccination programs around the world have saved millions of lives and led to the eradication of smallpox globally, as well as polio in all but three countries. Previously common diseases that used to infect, hospitalize, harm, and kill our children are now so rare that it is hard for us to feel any sort of concern surrounding them. However, as vaccination rates decrease, the likelihood of these diseases reemerging and hurting our children is increasing, as seen by recent outbreaks of measles, mumps, and pertussis in North America and Europe.

Vaccines have been repeatedly shown to be safe and effective. Worldwide, millions upon millions of doses have been given, studied, and shown to be safe. There is no debate between scientists, physicians, researchers, or governments on this issue. The idea of there being uncertainty around vaccinations has been promoted by a small minority who are, simply put, in the wrong.

It is absolutely understandable that some families are uncertain or hesitant given this environment. While there are likely complicated reasons why there is so much anger and animosity toward the vaccination and protection of our children, the myths and reasons given for the hesitancy are able to be refuted both by evidence and by critical thinking. I hope that with some careful consideration, thought, and discussion with

your trusted primary care provider, you can come to the same realization that the vast majority of citizens have reached—that vaccines are safe and that they work to protect the health of ourselves, our families, and the most vulnerable in our communities.