



The Experts

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Why Vaccinate

Why do children need so many vaccines?

SAWYER: There are a lot of vaccines, and I can say as an infectious disease doctor, that's a great thing. We are eliminating diseases that I used to see all the time in my clinical practice.

KOSLAP-PETRACO: Years ago when my boys were small, all we could prevent was diphtheria, tetanus, and whooping cough and hope that those older vaccines would work. And then all of a sudden measles, mumps and rubella vaccine came along.

SAWYER: Despite the increase in the number of vaccines we're giving, there's no signal that they're causing any kind of problem or side effect. And the benefit is we're protecting young children from those diseases now.

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OFFIT: As long as there are diseases that routinely cause children to suffer or be hospitalized or die, and as long as we can make vaccines that can safely prevent them, then we should do that. We certainly know that the 14 different vaccines that children get in the first few years of life do not weaken their immune system, it doesn't alter their immune system, it doesn't overwhelm their immune system, they can easily handle it. And so as long as you can safely prevent these diseases, then prevent them.

Are my children really in danger of becoming seriously ill if I don't have them vaccinated?

KOSLAP-PETRACO: I think sometimes we lose sight of the fact how sick you can get from these vaccine-preventable diseases and because we're fortunate enough not to see them as often as we did years ago, people lose sight of the fact about how miserable you can be with these diseases.

OFFIT: Now where we've been so successful with vaccinations and we don't see many of those diseases—and not only young mothers but young doctors didn't see them either, haven't grown up with them, and don't see them now. So for them, vaccination at some level becomes a matter of faith.

SAWYER: It's only people in my line of work who can appreciate how severe some of these things are. When you get the measles, you are incredibly sick. More or less three or four out of every thousand children with the measles actually die from the measles. And so people think about these as routine childhood infections, but they actually are very, very severe.

How do you feel about chickenpox parties?

SAWYER: The problem with chickenpox parties and getting the chickenpox is although, in general, it's a relatively mild disease, some children get *very* severely ill. I actually saw a child die last year from the chickenpox in my hospital. So it's not as mild as people think it is.

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KOSLAP-PETRACO: You might be the lucky mom or dad or grandparent whose child or grandchild goes through the disease with absolutely no problems. But you also might be the unlucky parent or relative of a child who gets severely ill from chickenpox.

OFFIT: There have been chickenpox parties where children have gone to the party, acquired chickenpox, and died from the disease. That's no party. The fact of the matter is that although chickenpox is not the routine killer that, say, measles was or *Haemophilus Influenzae* Type B (Hib) was or even, arguably, pneumococcus was, I mean, chickenpox every year before the vaccine was introduced in 1995, caused 10,000 hospitalizations and caused about 70 children to die.

KOSLAP-PETRACO: One of our dear friends, their little girl developed chickenpox because the mom didn't think it was really necessary to vaccinate and this child developed a severe infection in her neck from the chickenpox and almost died because she was having difficulty breathing because there was so much swelling it moved her airway over.

OFFIT: Now most times that you go to a chickenpox party and you get chickenpox you will survive that infection and you won't be hospitalized. But why would you ever take that chance given that you can get a vaccine that can safely and easily offer you roughly the same kind of immunity that you're going to get from a natural infection without having to pay the potential price of natural infection which can be death?

Many vaccines are for diseases that don't appear to exist anymore. Why is it important to vaccinate against them?

KOSLAP-PETRACO: These germs are just sleeping giants. We've seen that in other countries, we've even seen that here in our country. When we don't vaccinate children, we see disease. When we don't give them measles vaccine, we see measles.

SAWYER: And with modern air travel, it's just one plane ride away before a disease that you think isn't around suddenly is. For example, recently we had an outbreak of measles in San Diego that started because

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somebody came back from Europe where measles is still occurring more frequently than it is here and we suddenly had an outbreak of measles on our hands.

OFFIT: There are some diseases that are much less common but still kind of bubble under the surface: measles, mumps, still occur in the United States. So when there are pockets of children who are relatively under-vaccinated, you see those outbreaks occur.

KOSLAP-PETRACO: My mom had polio when she was a little girl, my sister almost died when she had measles when we were children. And I remember sitting there watching her and watching the tears in my mother's eyes and I was very small at the time and thinking to myself, 'I don't think my sister's going to live, and what do I do if my sister doesn't live?' So I think we forget those kinds of personal experiences because we've done such a good job in controlling vaccine-preventable disease. But if we don't vaccinate, we're going to see those very same things again.

SAWYER: In fact, the young doctors of the current generation are totally inexperienced to deal with some of the infections that I learned about when I was in medical school and in my residency and that's all the more reason why we need children to be protected against them because doctors who recognize these diseases are beginning to retire and they're not as familiar as they used to be.

OFFIT: You know, you don't want to have to relive history. We certainly know that if you let your guard down, if immunization rates drop, those diseases will come back. And one can only hope that we don't have to resort to human sacrifice as a way to get some people to pay attention to vaccines.

Why Follow the Recommended Immunization Schedule

Why is it necessary to vaccinate infants who are so young?

SAWYER: We give a lot of vaccines now to young babies and, for me, that's a great thing because we're protecting them against diseases. We give vaccines as early as we can because young babies are the most susceptible to severe consequences from the infections that we can now prevent.

KOSLAP-PETRACO: We do very rigorous testing to make sure that when we're giving the vaccines, it's the right vaccine, at the right age, at the right time.

OFFIT: I mean, whooping cough traditionally killed young infants, as does rotavirus, as does pneumococcus, as does *Haemophilus Influenzae* Type B (Hib). So you need to try and get children to a position where they're as immune as they can be at the time when they're most likely to face these diseases.

SAWYER: In addition to that, for some vaccines we need two or even three doses before babies are protected. So we want to start as early as possible so we can protect them as soon as possible.

Is it safe for a child to receive multiple vaccinations during a single office visit?

KOSLAP-PETRACO: Multiple vaccines are given in a single visit because we want to make sure that we protect the children as early as possible and as safely as possible.

SAWYER: There's no reason *not* to give vaccines together in a single visit. There's no problem with doing so, there's no increased risk of side effects, and the reason we do that is to make sure that babies get protected as soon as possible; otherwise parents would have to come back over and over and over again just to get the vaccines that we can now give starting at two months of age.

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KOSLAP-PETRACO: The immune system is really amazing and can sort out all of those different antigens or ingredients that are in the vaccines so the body appropriately builds the immunity to each one of those different diseases that each one of those separate vaccines is designed to protect against.

Are we overwhelming the immune system by giving too many vaccines?

SAWYER: You sometimes hear that maybe we give too many vaccines and that they actually overwhelm the immune system and there's no reason to think that that's really the case. For me, the best evidence for that is that after we give all those vaccines, children aren't more susceptible to getting infection. When your immune system is overwhelmed, you then get other infections because you can't fight them off. That doesn't happen in children after they've been vaccinated. Your immune system can handle many, many more vaccines than we actually give at one time.

OFFIT: When a child is in the womb, they're in a sterile environment. When they enter the birth canal and the world, they're not. And very quickly they have living on the surface of their body trillions and trillions of bacteria to which they make an immune response. I mean, babies will make grams of immunoglobulins every day to try and meet the challenges in their environment. The food they eat isn't sterile; the dust they inhale isn't sterile. Let me put it to you this way: if the 14 different vaccines that we gave to children in the first few years of life were overwhelming their immune system, the species wouldn't survive given that, frankly, those vaccines are a drop in the ocean, a literal drop in the ocean, of what children typically encounter and manage every day.

How do they determine the ages when children should receive each vaccine? Is it okay to delay vaccines?

SAWYER: The ages at which people get vaccinated are determined by two things: it's when they're most at risk for disease and when their immune system is able to respond to the vaccine.

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OFFIT: For example, you want to make sure that you're protected against *Haemophilus Influenzae* Type B (Hib) and pneumococcus and rotavirus and whooping cough when you're a young child because that's when those diseases typically occur. You want to make sure that you're immunized very early against hepatitis B virus because if you get that disease as a young child, you're destined—90% of the time—to go on to develop liver cancer and chronic liver disease.

OFFIT: I think people who choose their own schedules, I think, don't really appreciate just how much goes into the current schedule.

SINGER: The CDC created the vaccine schedule for a reason. Children are given vaccines at the time when they are most susceptible to harm done from the disease itself.

OFFIT: This is a very well tested schedule and there's no benefit in spreading things out because when you start to spread things out, you're only increasing the period of time during which children are susceptible to those diseases without benefit.

What if I elect not to vaccinate my children?

SAWYER: Parents who choose not to vaccinate their children are not only making that decision for their children, but they're actually making that decision for other children as well. In order for our whole society to be protected we need almost everybody to be immunized; otherwise outbreaks of disease can occur.

KOSLAP-PETRACO: When I hear parents say, 'Well, I'm not going to vaccinate and it's because it'll protect my child,' and my question to them is, 'Well, what about someone else's child who can't be vaccinated or who's too young to be vaccinated?' You're putting that child at risk. Do you really want to do that to your neighbor? Is that what we really want to have for our society? What kind of a lesson is that teaching our children?

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OFFIT: Hundreds of thousands of people every year can't be vaccinated. They can't be vaccinated because they're getting steroids for their asthma or because they're getting chemotherapy for their cancer or because they're getting immunosuppressive therapy for their transplants.

They depend on the herd to protect them. They depend on living among a group of people who are highly vaccinated so they won't be exposed to those viruses or bacteria and it's frankly hard for them to watch herd immunity break down. I got a call from a woman this morning who said to me, 'My child has leukemia. I now am going to be sending her into a classroom where half the classroom isn't vaccinated. That scares me to death,' and it should.

SAWYER: So for example in our recent outbreak of measles that we had in San Diego, some of the children who got the measles got it not because they weren't immunized because their parents chose not to have them immunized, they just were too young to be immunized. And they showed up in a doctor's office where the child with measles happened to be that same day and they were exposed to the measles.

OFFIT: We had a measles epidemic in 2008 that was bigger than anything in more than a decade. We're seeing children now whose parents have chosen not to vaccinate them who now die from bacterial meningitis. That's a critical break in herd immunity.

Vaccine Testing, Ingredients & Safety

Are vaccines safe?

SAWYER: The thing that you need to think about when you're making a decision about a vaccine is you have to weigh the risk of a vaccine against the risk of acquiring the disease that the vaccine is there to prevent. And I think when people get full information about that decision; they're going to decide every time in favor of the vaccine. The risk of acquiring diseases is much, much higher than any risk associated with vaccines.

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KOSLAP-PETRACO: My mom had polio when she was a little girl and she's one of the first people who'll say to you, 'You need to vaccinate your babies,' because the vaccines that they're giving your babies have just gotten safer and safer as the years have gone on because we have better science and better technology.

OFFIT: I would argue that vaccines are the safest, best tested things we put into our bodies because they would have to be. They're given to healthy young children so they should be held to a very high standard of safety.

KOSLAP-PETRACO: The worst thing that I've ever seen in my entire career following a vaccine is a fever and redness and swelling. And I vaccinated an awful lot of children over my career.

SAWYER: The bottom line for me is vaccines are extremely effective and they're extremely safe. And when given the right information, I think every parent is going to make the decision to immunize their children.

What sort of testing goes on before and after a vaccine is given to a child?

SAWYER: Vaccines are tested very extensively before they even reach the marketplace. Clinical trials are done in the population for which the vaccine is intended to be used and usually hundreds, if not thousands, of people are studied.

OFFIT: So for example, the rotavirus vaccines—and there are two currently that are being distributed—were tested in more than 60,000 children for each of the vaccines. It took 20 years to develop those vaccines. So those vaccines have been in children for a long time, and the safety testing is quite extensive. A typical development program for a vaccine costs about a billion dollars.

There is a vaccine to prevent a common cause of cervical cancer, called the human papilloma virus vaccine that was tested in 30,000 women for seven years before it was ever licensed. I think drugs never undergo that kind of scrutiny. Vaccines really are held to a very high standard of safety.

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That's why they cost so much to develop. But again, they're given to healthy people so they should be held to that high level.

SAWYER: But perhaps even more important than that, and something I think a lot of people don't know, is *after* a vaccine is already on the market, it continues to be studied. And that way we can find very rare side effects from a vaccine because we only see those after millions and millions of people get the vaccine.

OFFIT: There are a couple ways in which we monitor safety. One is something called the Vaccine Adverse Events Reporting System, or VAERS, whereby people who get a vaccine—the doctors or nurses or the person themselves or the parent—can report any possible side effect. And that raises the question of whether or not the vaccine could have actually caused it. And then to *test* that question, to answer that question, there's something called the Vaccine Safety Data Link, which is this computerized network of people who receive vaccines or don't receive vaccines, so you can really very quickly test whether or not there's a problem.

The H1N1 flu vaccine (swine flu vaccine) is new. How do I know it's safe?

SAWYER: People talk about the H1N1 being rushed or being hurried or in some way being experimental. Actually, H1N1 vaccine for influenza is being made in the exact same way that every other influenza vaccine is made.

OFFIT: Influenza is a tough virus to pin down. I mean, every year it changes so much so that immunization or natural infection the previous year really doesn't protect against disease the following year. So every year, essentially, we make a new influenza vaccine. We call it the seasonal flu vaccine—and that seasonal flu vaccine typically contains new strains every year. No different this year.

SAWYER: If H1N1, the infection, had been identified just three months earlier, it would've just been put in the regular vaccine like we change them every year and you never would've known.

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OFFIT: It wasn't rushed to market anymore than we rush any flu vaccine to market. Remembering that we do need to generate new flu vaccines every year, it just happens to be that this year that virus, the novel H1N1, is spreading across the country like wildfire and is causing a fair amount of hospitalization and death.

I've heard there are ingredients in vaccines that can harm children. Is this true?

OFFIT: You inject the child with this fluid and you don't quite know what's in it. It's very easy to appeal to the notion that that vaccine contains harmful additives or preservatives or manufacturing residuals. But in fact the quantities of all the sort of trace chemicals that can be in vaccines are at such a low amount that they cause no problem and frankly are no different than what one is typically exposed to in the day, assuming that you eat food on this planet and drink its water.

Is there mercury (thimerosal) in vaccines? Is that dangerous?

OFFIT: Mercury is something that's in our earth's crust, it's something that we are exposed to every day in the water that we drink or the breast milk that we give our children or the infant formula that we give our children.

SAWYER: Thimerosal is a preservative that's been in vaccines for decades and it's a mercury derivative and it's used in vaccines to keep them sterile.

KOSLAP-PETRACO: The reason that thimerosal was essentially removed from the vaccines was just to increase parents' confidence in the vaccine supply because they had concerns.

OFFIT: And frankly, even *before* we took thimerosal out routine childhood vaccines, the amount of mercury that children would be exposed to by breastfeeding or infant formula feeding alone was much greater than children were exposed to in vaccines. And the kind of mercury in

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vaccines, so-called ethyl mercury, is eliminated much more quickly from the body than environmental mercury.

SINGER: There are studies that look at children who were exposed to no thimerosal and multiple levels of thimerosal, and it really doesn't matter if you're exposed to zero or to some, the thimerosal has nothing to do with whether a child is more or less likely to be diagnosed with autism.

Can you explain why adjuvants, like aluminum, are in some vaccines?

OFFIT: An adjuvant is something added to a vaccine to enhance the immune response so that one can give either lesser quantities of the vaccine or fewer doses of the vaccine. The only adjuvant that we're currently using in the United States is aluminum salts.

SAWYER: But what you need to know is that aluminum is in our environment everywhere in the world: aluminum cans, formula that we feed babies has aluminum in it; even breast milk has aluminum in it. So the amount of aluminum that you're exposed to through vaccines is extremely small compared to the amount that we face every day in our daily life.

Should I be concerned about combination vaccines?

OFFIT: We've been using combination vaccines really since the 1940s. The first combination vaccine was diphtheria/pertussis/tetanus. Now we have combinations with measles, mumps, rubella (MMR) and other larger combinations. Frankly we've worked very hard to try and put those vaccines together so that one can have fewer and fewer shots. It's not easy. I mean sometimes the buffering and stabilizing agents in those vaccines conflict and so it hasn't been an easy task. But there's certainly no reason *not* to get combination vaccines. Often it means fewer shots and there's certainly no benefit really to separating those vaccines out.

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What does it mean to “green” a vaccine?

SAWYER: I don't know what it means to “green” a vaccine. You hear that expression out there and I think the intent is to suggest that there are things in vaccines that we don't need. But actually, every ingredient that's in a vaccine is in there for a reason and they've all been tested, they're all safe, and if we didn't have the ingredients in there, the vaccines wouldn't work.

OFFIT: I think what it refers to is the false notion that vaccines contain harmful preservatives or chemicals or additives or something that's doing harm and that we want to get away from all that. But the fact of the matter is that vaccines contain elements that we typically encounter and manage every day and they *are* green, because they are made from nature. The fact of the matter is that when you take a viral vaccine or a bacterial vaccine they are made from the natural product that is weakened or inactivated in such a way that it *can't* cause harm, but that it can induce an immune response that's protective. It's all natural. That's why it works.

KOSLAP-PETRACO: When vaccines are manufactured, they're manufactured under the strictest of standards so that we make sure that there's not contamination, that there's nothing going into the vaccines that are not expected to be in there. We clearly know what's in our vaccines. I think our vaccines are green right now.

Vaccines and Autism

Do vaccines cause autism?

OFFIT: There has never been a study that has shown that vaccines cause autism. There was a paper that appeared in *The Lancet* in the late 1990s that raised the question of whether or not vaccines *could* cause autism, but that was not a study.

SAWYER: Many studies have been done to look at that question and there's no evidence at all that vaccines are related to autism.

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OFFIT: I think, from a parent's standpoint, you know, 'My child is fine, they got a vaccine, then they weren't fine, they developed autism. Could the vaccine have done it?' A perfectly reasonable question. The good news is it's an answerable question.

SINGER: Because these myths continue to circulate, a lot of families are taking great risks by not vaccinating their children. When you don't vaccinate your child, you're doing absolutely nothing to reduce the risk that they'll be diagnosed with autism, but you're absolutely increasing the risk that they'll contract a vaccine-preventable disease.

KOSLAP-PETRACO: It is clearly not the vaccines. We've proven it's not the vaccines. It's really time to look elsewhere for the causes of autism.

SINGER: We know that autism is highly genetic. It's probably the most genetically linked of the developmental disabilities. We know this from twin studies. We know that in identical twins, if one is diagnosed with autism, the likelihood that the other twin will also be diagnosed with autism is around 90%; whereas with fraternal twins, who don't share all of their DNA, the likelihood if one is diagnosed with autism that the other will also be diagnosed with autism is one in 15, which is the same for all siblings. So we know that there's a highly, a strong genetic component to autism.

What sort of research has been done to ensure that vaccines and autism are not related?

OFFIT: When the question was raised in the late 1990s that the MMR vaccine might cause autism, very quickly the academic and public health community responded by doing studies—frankly 12 studies—in hundreds of thousands of children that did or didn't receive vaccines to see whether vaccines were a risk—because they took those parents' concerns seriously—and found that vaccines really didn't increase the risk, which is consistent with everything we know about autism, which is that it's something probably that occurs when the child is still in the mother's womb.

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SAWYER: Thimerosal, which was a product in vaccines which was implicated as a cause of autism, has been taken out of all the vaccines that we give in pediatrics now. And despite that, the rates of autism have continued to go up. So, we've taken away the purported agent in vaccines and autism continues.

SINGER: Vaccines are probably the best studied environmental trigger with regard to autism. We really need to move on and start to fund other types of studies looking at other potential environmental triggers for autism.

If we keep asking the same questions, we're not going to find new answers. We need to ask new questions so that we can finally understand what does cause autism and develop new treatments that will actually help our family members.

We're seeing more vaccines being given and more children are being diagnosed with autism. What's going on?

SAWYER: Certainly we've seen an increase in autism and that's really driving the need to understand what causes autism and, at the same time, we're giving more vaccines. So naturally, people ask the question, 'Are those two things related to each other?'

OFFIT: Whenever we've looked at vaccines as a cause of autism, we haven't found it. And that's consistent with the fact that when you look at all the research for autism, it really drives you to events that occur in the first or second trimester. It really appears that if you're autistic at age five, you're autistic at age two, and frankly, you're born with autism, which, again, would exonerate vaccines.

KOSLAP-PETRACO: What I think is happening with autism is we are doing a far better job of diagnosing autism than we ever did before. We've changed the children who qualify for that diagnosis.

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SINGER: It's natural when your child is diagnosed with a developmental disability to want to blame someone or something, because we know that our children are going to face such tremendous challenges in their lives. Believe me, I understand that. But I always tell parents not to let their hurt and their anger get in the way of the data. I always encourage them to look at the science and to focus on the facts. And the facts are clear in this case.

If I already have a child who is autistic, should I play it safe and not vaccinate my younger child?

SAWYER: Autism is a difficult disease to deal with and I sympathize with parents who have children with autism. But I think it's a big mistake for them to then conclude that they shouldn't immunize their other children. For one thing, there's no evidence at all that vaccines are related to autism. And if their other children are left unprotected, then they're just going to bring disease home and the child with autism is going to have additional problems related to those infections.

KOSLAP-PETRACO: Why would I want to expose a child who has a developmental disorder to a vaccine-preventable disease and possibly give them more problems because of the after effects from the vaccine-preventable disease? We know that there is no connection between the vaccines and autism, so we need to vaccinate the autistic child as well as the siblings.

SINGER: We know from twin studies and genetic studies that the younger siblings of children with autism are at a much higher risk for being diagnosed with autism than the general population. In general, there's a one in 100 chance that a child will be diagnosed with autism. But for siblings of children with autism, it's around one in 15. So we know that those children are at much higher risk.

But they're not at higher risk because of vaccines. In fact, one thing I'm very much concerned about is because so many parents have been frightened about vaccines; they're not vaccinating their younger children. And in fact, the younger siblings of children with autism are

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probably one of the most at-risk populations for infectious disease because they're not being vaccinated.

OFFIT: So, if a mother has a child with autism, she can be reassured then that vaccines were not the cause and she can safely immunize her younger child because if she doesn't, then all she's done is expose that child to the risk of potentially fatal infectious diseases without, in any sense, lessening the risk of autism.