

# You and Others ~ Vaccines Doing More Good Than Harm

Kaylie-Anna Vallee

Science, Technology, and Society, Colby College, Waterville, ME

<https://www.urgentway.com/our-services/vaccines>

## HOW DO VACCINES WORK?

Vaccines reduce the risk of infection by working with the body's natural defenses to safely develop immunity to disease.

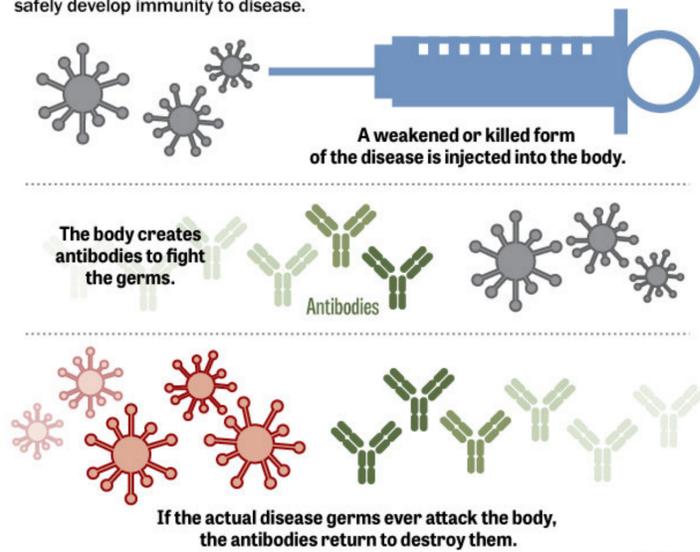


Figure 3: A very brief overview of how vaccines work in the body

[http://www.mlive.com/news/index.ssf/2014/12/how\\_do\\_vaccinations\\_work\\_the\\_s.html](http://www.mlive.com/news/index.ssf/2014/12/how_do_vaccinations_work_the_s.html)

## Vaccines

"A vaccine is made from very small amounts of weak or dead germs that can cause diseases — for example, viruses, bacteria, or toxins. It prepares your body to fight the disease faster and more effectively so you won't get sick." (U.S. Department of Health and Human 2017)

### Are vaccines safe to get, or do they create a risk of health that was not present beforehand?

Reasons people think vaccines are harmful:

- Cause of diseases and disorders like autism
- Loaded with heavy chemicals that are bad for the body
- More people are getting sick
- Side effects

Reasons vaccines are beneficial:

- Cheaper to prevent a disease than to treat it
- Decreases likelihood of developing certain types of cancer
- Boosts immune system to fight off disease
- Safe and effective
- Protects you, your family, and the future

## History

- 1<sup>st</sup> Vaccine: 1796 Edward Jenner variolation → used strain of cowpox to inject into people to develop immunity to small pox
- 1885 Louis Pasteur → rabies vaccine
- 1930s → vaccines against diphtheria, tetanus, anthrax, cholera, plague, typhoid, tuberculosis, and more began being created
- 1970s → no longer highly recommended to get smallpox vaccine because it was successfully eradicated

Centers for Disease Control and Prevention, Food and Drug Administration, and U.S. Department of Health and Human Services. (n.d.). Vaccine Adverse Event Reporting System (VAERS). <https://www.fda.gov/oc/nvri/>  
 National Vaccine Injury Compensation Program | Official web site of the U.S. Health Resources & Services Administration. 2018. <https://www.hrsa.gov/nvri/>  
 U.S. Department of Health and Human. 2017. Vaccines.gov. U.S. Department of Health and Human Services. <https://www.vaccines.gov/about-us/>  
 Vaccine Benefits | NIH National Institute of Allergy and Infectious Diseases. 2014. <https://www.niaid.nih.gov/research/vaccine-benefits>  
 Vaccine Education Center. 2014. Vaccine History: Developments by Year | Children's Hospital of Philadelphia. <http://www.chop.edu/education-program/vaccine-education-center/vaccine-history/developments-by-year>

## Why Should People Get Vaccinated?

- Data proves that over time there has been a significant decrease in the attack rate and occurrence of diseases
- Not everyone can get vaccinated, putting them at more of a risk if those around them aren't and increases their risk of developing a disease which could then be spread to the unwillingly unvaccinated individuals like pregnant mothers, the elderly, and people with immune systems too weak to handle the vaccination
- Possibility of protecting future generations → diseases could become eradicated if everyone is vaccinated and they have no body to reproduce in
- Outbreaks of diseases that are vaccine-preventable are very likely due to the increase in people's refusal to get vaccinated

## WHY DOES MY CHOICE MATTER TO OTHERS?

It matters because of the concept of "herd immunity." Here's how it works:

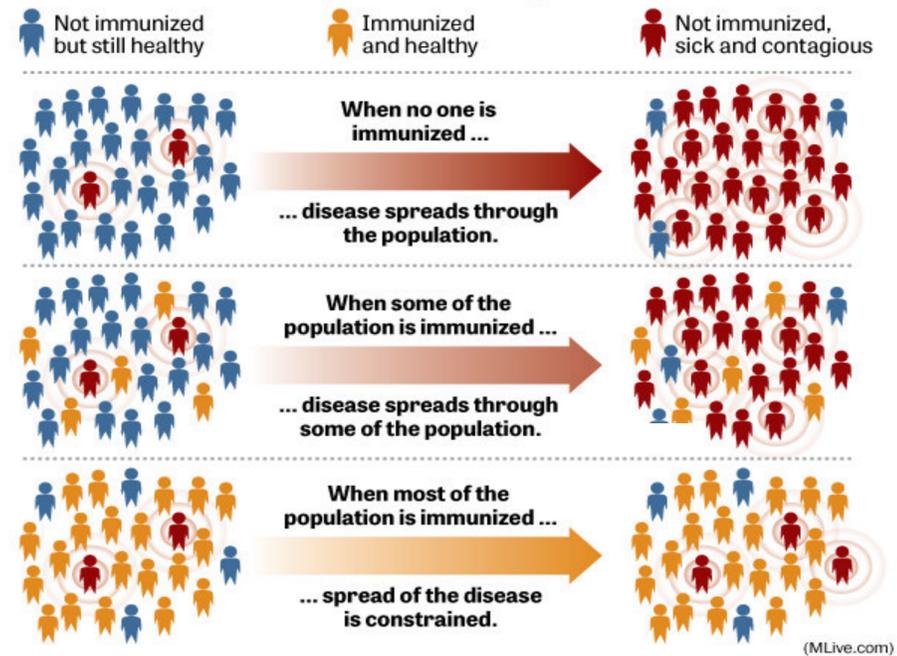


Figure 1: A representation of how being vaccinated affects not only the person themselves, but also those around them

[http://www.mlive.com/news/index.ssf/2014/12/how\\_do\\_vaccinations\\_work\\_the\\_s.html](http://www.mlive.com/news/index.ssf/2014/12/how_do_vaccinations_work_the_s.html)

## Problems that have risen with vaccines

- Inactivated polio vaccine preparations weren't fully inactivated and were associated with 56 cases of paralytic poliomyelitis and 5 deaths
- Side effects ~ adverse event
  - Can result in an acute reaction, like a rash or the common cold, or even more severe, like meningitis or sepsis
- Lack of knowledge about what's in them
- Severe allergic reactions that have resulted in casualty

## Organizations created to deal with negative effects of vaccines

- VAERS – Vaccine Adverse Events Reporting System
  - Accepts and analyzes reports of adverse events after a person has received a vaccination
  - Data collected goes towards more research on vaccines to see if a trend is present in negative effects
- VICP – National Vaccine Injury Compensation Program
  - Provides financial compensation to individuals who file a petition and are found to have been injured by a VICP-covered vaccine

Since vaccines were invented, the number of babies and adults that have gotten sick or died from vaccine-preventable diseases has decreased greatly; Some diseases have been wiped out like smallpox and polio.

## VACCINES WORK

These bubbles are sized according to the annual number of disease cases in the US during the 1900s versus 2010. We've come so far, it's a reminder that while disease rates are low, most diseases haven't disappeared. This is why we continue to vaccinate.

Disease	THEN (1900s)	NOW (2010)
SMALLPOX	29,005	0
DIPHTHERIA	21,053	0
PERTUSSIS	200,752	21,291
TETANUS	580	8
POLIO	16,316	0
MEASLES	530,217	61
MUMPS	162,344	2,528
RUBELLA	47,745	6
CRS	152	0
HAEMOPHILUS INFLUENZAE	20,000	270

\* Centers for Disease Control and Prevention (CDC). Parents Guide to Childhood Immunizations. <http://www.cdc.gov/vaccines/pubs/parents-guide/default.htm>. Accessed August 15, 2011.  
 \*\* CDC. Impact of Vaccines in the 20th & 21st Centuries. <http://www.cdc.gov/vaccines/pubs/prinkbook/downloads/appendices/0-impact-of-vaccines.pdf>. Updated January 2011. Accessed August 15, 2011.

Figure 4: A model showing the huge decrease in cases of select diseases between the 1990s (when vaccines were just beginning to develop) versus 2010.



Figure 2: A baby doll with about 25 needles injected into it to represent the high number of vaccines that a baby gets by the age of 2

## The Impact of Vaccines in the United States

Disease	Baseline 20th Century Pre-Vaccine Annual Cases	2009 Cases	Percent Decrease
Measles	503,282	71	99.9%
Diphtheria	175,885	0	100%
Mumps	152,209	1,991	98.7%
Pertussis	147,271	13,214	91.0%
Smallpox	48,164	0	100%
Rubella	47,745	3	99.9%
Haemophilus influenzae type b, invasive	20,000	35	99.8%
Polio	16,316	0*	100%
Tetanus	1,314	18	98.6%

Table 1: Data showing the correlation with vaccinations and the percent decrease of occurrence of specific diseases between the 20<sup>th</sup> century and 2009

## Conclusion

- The benefits of getting vaccinated outweigh the potential side effects that could result from them for both you and others
  - Vaccines have an overall positive impact on the overall population
  - They are effective in terms of decreasing the occurrence of diseases developing in people
  - They increase the possibility of a disease becoming eradicated
  - The more people who get vaccinated, the greater the herd immunity