

Myths, Lies and Rhetoric; Deconstructing the Anti- Vaccination Movement

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82HIES



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- The views expressed in this presentation are my own
- All images used are with permission or for the limited purpose of education
- I received no funding for this presentation
- I use humor as a tool for engagement

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What this talk ISN'T



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MYTH

An idea or story that is believed by many people but that is not true.

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LIE

To be or to stay at rest in a horizontal position.

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RHETORIC

The art or skill of communicating effectively, especially as a way to persuade or influence people.

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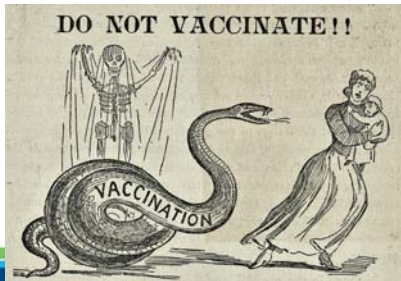
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STATISTICS

$$\begin{aligned}
 \hat{\beta}_{OLS} &= \frac{\sum(x_i - \bar{x})y_i}{\sum(x_i - \bar{x})^2} = \frac{\sum x_i y_i - \sum \bar{x} y_i}{\sum x_i^2 + \sum \bar{x}^2 - 2 \sum x_i \bar{x}} = \frac{\sum_{i=1}^{n_1} y_i - \frac{n_1}{n} \sum_{i=1}^{n_1} y_i}{n_1 + (n) \left(\frac{n_1}{n} \right)^2 - 2 \left(\frac{n_1}{n} \right) n_1} = \frac{\sum_{i=1}^{n_1} y_i - n_1 \bar{y}}{n_1 - \frac{n_1^2}{n_0 + n_1}} \\
 &= \frac{\frac{1}{n_0 + n_1} \sum_{i=1}^{n_1} y_i - \frac{n_1}{n_0 + n_1} \bar{y}}{\frac{1}{n_0 + n_1} \sum_{i=1}^{n_1} y_i - \frac{n_1}{n_0 + n_1} \left(\frac{1}{n_0 + n_1} \sum_{i=1}^{n_1} y_i \right)} = \frac{\frac{1}{n_0 + n_1} \sum_{i=1}^{n_1} y_i - \frac{n_1}{n_0 + n_1} \bar{y}}{\frac{n_1 n_0 + n_1^2 - n_1^2}{(n_0 + n_1)^2}} \\
 &= \frac{\left(\frac{1}{n_0 + n_1} \right) \left[\sum_{i=1}^{n_1} y_i - \frac{n_1}{n_0 + n_1} \left(\sum_{i=1}^{n_0} y_i + \sum_{i=1}^{n_1} y_i \right) \right]}{\frac{n_1 n_0}{(n_0 + n_1)^2}} \\
 &= \frac{\left(1 - \frac{n_1}{n_0 + n_1} \right) \sum_{i=1}^{n_1} y_i - \frac{n_1}{n_0 + n_1} \sum_{i=1}^{n_0} y_i}{\frac{n_1 n_0}{n_0 + n_1}} = \frac{\frac{n_0}{n_0 + n_1} \sum_{i=1}^{n_1} y_i - \frac{n_1}{n_0 + n_1} \sum_{i=1}^{n_0} y_i}{\frac{n_1 n_0}{n_0 + n_1}} \\
 &= \frac{\sum_{i=1}^{n_1} y_i}{n_1} - \frac{\sum_{i=1}^{n_0} y_i}{n_0} = \bar{y}_1 - \bar{y}_0
 \end{aligned}$$

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The First Anti-Vaxxers



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SMALLPOX

- AD 165 – 30% of Rome killed
- Today – 30% of New York City:

2,565,000

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SMALLPOX

- AD 1700s – 400,000 killed per year (population Earth: 629-961 million)
- Today – 7.7 billion on earth

3.2 – 4.9 million



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SMALLPOX

- AD 1797 – vaccine studied



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SMALLPOX

- AD 1853 – Vaccination Act
- AD 1866 – Anti-Compulsory Vaccination League



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SMALLPOX

- Last Smallpox case in the developed world: 1949
- Last Smallpox case worldwide: 1977
- WHO declared eradicated: 1980



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1. VACCINES KILL BABIES

(ergo, we should not vaccinate)



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NON SEQUITUR

An argument whose conclusion does not follow from its premises.



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WE ACCEPT

- Motor Vehicle Accidents: 1,399
- Second hand smoke → SIDS: 776
- Drowning: 702
- Death from guns: 448



deadlier than



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VAERS

Voluntary
Imprecise
No Causality



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Risk, VAERS method

VAERS: 165 deaths in 2018

CDC: 300,000,000 doses/year

Risk of death: 1:1.8 million



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Risk, VICP method

Between 2006 – 2016
3.1 billion vaccine doses
3,597 claims paid

Risk of harm: 1:1 million



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Risk for comparison

METHOD	RAW RISK	PROBABLE ACTUAL RISK
VAERS – death	1:8M	1:3.6M
VICP – compensable harm	1:1M	1:2.9M

- To avoid distraction in the details, consider the absolute risk of a serious outcome from a vaccine to be 1:1M
- This is what most vaccine manufacturers use in their labelling



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RISK:
1 : 1,000,000



Fig. 101. — Un gentleman anglais se promenant en pluie sous un parapluie. (D'après un dessin de la Revue des Deux Mondes, 1850.)

RISK vs BENEFIT

HARMED

2,100

SAVED

42,000



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MYTH BUSTED!

For every 1 person harmed by a vaccine, 20 people live who would have died.

For every 1 person killed by a vaccine, 254 people live who would have died.



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2. THE HERD PROTECTS US

(ergo, *my kid doesn't need it*)



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CIRCULAR REASONING

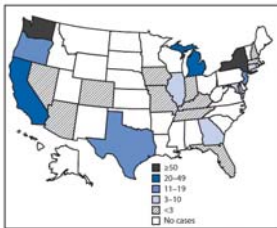
A fallacy in which the premise and the conclusion are essentially the same.

PERTUSSIS IN JAPAN

- 1940: 10,000 killed per year
- 1950: pertussis vaccine
- 1968: combined DTaP
- 1974: ZERO pertussis deaths
- 1975: safety concerns → pulled
- 1979: 41 deaths
- 1981: DTaP

WHOSE HERD?

Measles cases Jan 1 – Apr 26, 2019



MEDICAL ETHICS 101: JUSTICE



PENNSYLVANIA ACADEMY OF
FAMILY PHYSICIANS FOUNDATION

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MYTH BUSTED!

The herd is only as strong as its size
and members' compliance.

PENNSYLVANIA ACADEMY OF
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3. Why would my un-vaccinated kids be a threat to your vaccinated kids, if you're so sure that vaccines work?



your  cards
someecards.com

KEEP
HEALTHY

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STRAW MAN

Arguing against an opponent by misrepresenting the opponent's position.



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MYTH BUSTED!



BEFORE



AFTER



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4. VACCINES ARE AGAINST RELIGION



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ASYNDETON

A style of writing in which conjunction are omitted.



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TIMELINE OF RELIGIOUS LAW ON VACCINATION

- Hinduism 1600 BC
- Judaism 1300 BC
- Christianity 0 AD
- Roman Catholic 400 AD
- Islam 570 AD
- Amish 1700 AD
- **FIRST VACCINE 1796 AD**
- Jehovah's Witnesses 1870 AD



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HINDUISM



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JUDAISM



CHRISTIANITY



ROMAN CATHOLIC



ISLAM



AMISH



JEHOVAH'S WITNESSES



LIMITS OF RELIGIOUS FREEDOM

“Parents are free to become martyrs themselves. But it does not follow they are free . . . to make martyrs of their children . . .”



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MYTH BUSTED!

No major religion prohibits vaccination.



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5. VACCINES ARE TOXIC



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EXEMPLUM

Providing an example that may be fictional to support a point.



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ALUMINUM

Total body aluminum at birth

➔ **0.4mg**

Total aluminum load first year of vaccines

➔ **4.225mg**



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ALUMINUM

1 st year vaccines:	4.225mg
Processed cheese:	9mg/slice
Bread:	15mg/slice
OTC antacid:	70mg in 5mL
Restaurant pancake:	182mg/serving
Minimum risk:	1mg/kg/DAY



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MERCURY

AKA
Thiomersal
Thimerosal



Ethyl(2-mercaptobenzoato-(2-)-O,S) mercurate(1-) sodium



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MERCURY

Single dose → 25mcg
multi-vial flu

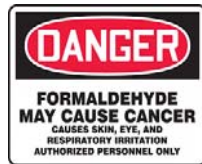
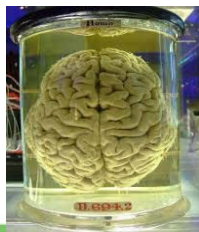


→ 50mcg



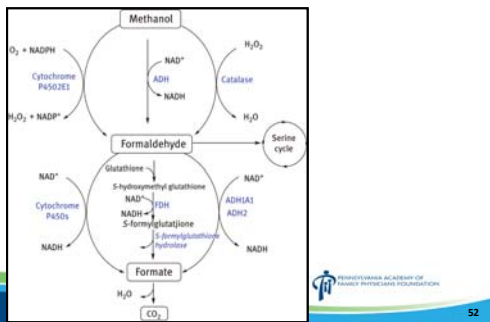
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FORMALDEHYDE



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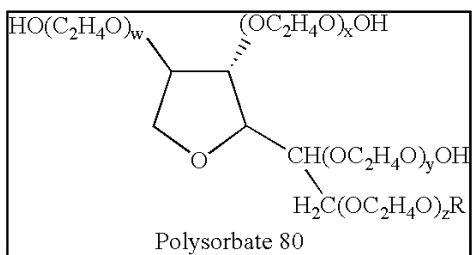
FORMALDEHYDE



FORMALDEHYDE

- Vaccine dose: 0.2mg
- Milk: 0.1-0.3mg/kg
- Fish: up to 200mg/kg
- Avg. Adult diet: 100mg/day
- Newborn: 1.1mg in body

POLYSORBATE 80



POLYSORBATE 80



MYTH BUSTED!

No component of any vaccine has the form or quantity to pose a toxicity risk to humans.

6. JENNY SAYS SO!



EPONYM

Referring to a specific famous person to evoke emotion and add credibility.



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MYTH BUSTED!

For every 1 person harmed by a vaccine, 20 people live who would have died.

For every 1 person killed by a vaccine, 254 people live who would have died.



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7. BIG PHARMA PUSHES VACCINES FOR PROFIT



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AD HOMINEM

An argument made personally against an opponent instead of against the argument.



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PFIZER'S PROFIT

DRUG	REVENUE*
Pevnar	1
Lipitor (PATENT)	13
Lipitor	2

* In billions of US dollars



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MYTH BUSTED!

Big Pharma grudgingly produces vaccines at a cost-per-product of 1 billion dollars per year.



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Estimating Disease Burden

Reported vs sampling

Outbreak vs baseline

Time to collect and collate



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Select Global vs US

Disease	World-wide		United States	
	Cases / year	Deaths / year	Cases / year	Deaths / year
Haemophilus	340K	30K	5.5K	0
Varicella	4.2M	4.2K	8.7K	2
Meningococcus	1.2M	50K	350	35
Pertussis	151K	160K	18K	13
Measles	353K	110K	1,241 (218)	0

350,000

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Select Global vs US

Disease	World-wide		United States	
	Cases / year	Deaths / year	Cases / year	Deaths / year
Viral Hepatitis	2.3B	1.4M	73K (new) 3.2M (chronic)	5,600
Cervical Cancer from HPV	371K	189K	33.7K	2,940
Influenza	3-5M (severe)	290-650K	48.8M	79K
Pneumococcus	3.7M	318K	1M	49K

2,370,000

136,000




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CAUSE	ANNUAL US DEATH RATE
Diseases of the heart	647,000
Malignant neoplasms	599,000
Accidents (all)	170,000
Chronic lower respiratory diseases	160,000
Cerebrovascular diseases	146,000
Alzheimer disease	121,000
Vaccine-preventable disease	100,000
Diabetes mellitus	84,000
Renal diseases	51,000
Suicide	47,000

Thank you!


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References, General

- Merriam-Webster Dictionary
- Lichtenberg, GC. *Notebook H*.
- Gaither et al. *Gaither's Dictionary of Scientific Quotations*. Springer Science & Business Media.
- Goldacre, Ben. (September 2008). *Bad Science*. London: Fourth Estate.
- Vaccine Adverse Event Reporting System (VAERS). <https://vaers.hhs.gov> (2018 data)
- Offit PA. Why are pharmaceutical companies gradually abandoning vaccines? *Health Aff.* 2005 May-Jun;24(3):622-30.
- Riedel, S. Edward Jenner and the history of smallpox and vaccination. *Proc (Bayl Univ Med Cent)*. 2005 Jan; 18(1):21-25
- United States Census Bureau
- Patel M, Lee AD, Redd SB, et al. Increase in Measles Cases – United States, January 1–April 26, 2019. *MMWR Morb Mortal Wkly Rep* 2019;68:402-404.
- American Lung Association, Smoking Facts, www.lung.org.
- Kuwabara N, Ching M, A Review of Factors Affecting Vaccine Preventable Disease in Japan. *Hawaii J Med Public Health*. 2014 Dec; 73(12): 376-381
- Ramzy A and Ueno H. (2019, February 22). Japan Battles Worst Measles Outbreak in Years. *The New York Times*. Online at: <https://www.nytimes.com/2019/02/22/world/asia/japan-measles-outbreak.html>
- Zhou C, Chefer A, Wenger J, et al. Economic Evaluation of the Routine Childhood Immunization Program in the United State, 2009. *Pediatrics*. 2014 Apr;133(4):577-85.



References, General

- Pfizer earnings reports as reported by Reuters - 2011 data. Note: Following years Lipitor sales have dropped as more generic competitors have appeared, Plevnar sales have increased (expanded approval US and EU) then decreased. Lipitor comparison still used as it is common to the experience of this audience. Numerous examples support comparison outcome – see <http://www.pharmacytimes.com/news/10-best-selling-brand-name-drugs-in-2015/P-6> and <http://www.bloomberg.com/news/articles/2015-04-28/pfizer-cuts-2015-forecast-as-dollar-strength-cuts-into-sales>. 2015 sales in \$ Billions: Plevnar 1.31 vs Humira 8.6, Abilify 7.2, Enbrel 6.1, Crestor 6.1, Lantus 5, Sovaldi 4.9, Advair 4.8, Nexium 4.7, Januvia 3.8, Lyrica 3.4
- McCarthy J, Kartzinel J. Healing and Preventing Autism. 2010
- Massey, Edward. The Dangerous and Sinful Practice of Inoculation. Sermon, 1722
- Roush SW, Murphy TV. Historical Comparisons of Morbidity and Mortality for Vaccine-Preventable Diseases in the United States. JAMA. 2007;298(18):2155-2163
- Max W, Sung HY, Shi Y. Deaths From Secondhand Smoke Exposure in the United States: Economic Implications. Am J Public Health. 2012 November; 102(11):2173-2180
- Stratton KR, Howe CJ, Johnston RB, editors. Institute of Medicine. Adverse Events Associated with Childhood Vaccines: Evidence Bearing on Causality. Washington, DC: National Academies Press; 1994.



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References, General

- Stratton K, Almario DA, Wizemann TM, McCormick MC, editors. Institute of Medicine. Immunization Safety Review: Vaccination and Sudden Unexpected Death in Infancy. Washington DC: National Academy Press; 2003.
- McCarty NL, Weintraub E, Vellozzi C, et al. Mortality rates and cause-of-death patterns in a vaccinated population. Am J Prev Med. 2013 Jul;45(1):91-97.
- U.S. Department of Health and Human Services, Health Resources and Services Administration. Data and Statistics. National Vaccine Injury Compensation Program. <https://www.hrsa.gov/sites/default/files/hrsa/vaccine-compensation/monthly-website-stats-2-01-18.pdf>; <https://www.hrsa.gov/sites/default/files/hrsa/vaccine-compensation/data/monthly-stats-march-2019.pdf>
- Children's Hospital of Philadelphia compilation of Global Immunization and Worldwide disease incidence: <https://www.chop.edu/centers-programs/vaccine-education-center/global-immunization/diseases-and-vaccines-world-view>
- World Health Organization. Human Papillomavirus (HPV) and cervical cancer. [https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-\(hpv\)-and-cervical-cancer](https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer)
- Jefferies M, Rauff B, Rashid H, Lam T, Rafiq S. Update on global epidemiology of viral hepatitis and preventive strategies. World J Clin Cases. Nov 6, 2018;6(13):589-599



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References, General

- Wutzler P, Bonanni P, Burgess M et al. Varicella vaccination – the global experience. Expert Rev Vaccines. 2017 Aug;16(8):833-843
- Wahl B, O'Brien KL, Greenbaum A et al. Burden of *Streptococcus pneumoniae* and *Haemophilus influenzae* type b disease in children in the era of conjugate vaccines: global, regional and national estimates for 2000-15. Lancet Global Health. 2018 Jul;6(7):e744-e757
- www.Antivaccinebodycount.com – looking at common childhood vaccine preventable deaths between June 3, 2007 and May 9, 2015 → 1,153 vaccine preventable deaths per year
- Watchtower online library. Should my family be immunized? <https://wol.jw.org/en/wol/d/r1/lp-e/101993568>
- Australian Vaccination-risks Network Inc. Vaccine Ingredients. <https://avn.org.au/information/vaccines-and-diseases/vaccine-ingredients/>
- Ramzy A and Ueno H. (2019, February 22). Japan Battles Worst Measles Outbreak in Years. *The New York Times*. Online at: <https://www.nytimes.com/2019/02/22/world/asia/japan-measles-outbreak.html>



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References, CDC

- Births and Deaths, 2013 compiled data.
- Vaccines and Immunizations. <http://www.cdc.gov/vaccines/vac-gen/side-effects.htm>
- MMWR January 9, 2009/57(53);1420-1430.
- National Vital Statistics Reports, Vol 68 No. 9, June 24, 2019.
- <https://www.cdc.gov/flu/about/burden/index.html>
- Surveillance for Viral Hepatitis – United States, 2017. <https://www.cdc.gov/hepatitis/statistics/2017surveillance/index.htm>
- National Center for Health Statistics. Viral Hepatitis. <https://www.cdc.gov/nchs/fstats/hepatitis.htm>, Influenza. <https://www.cdc.gov/nchs/fstats/flu.htm>, Pneumonia. <https://www.cdc.gov/nchs/fstats/pneumonia.htm>
- Estimated Influenza Illnesses, Medical Visits, Hospitalizations, and Deaths in the United States – 2017-2018 influenza season
- 2017 Final Pertussis Surveillance Report. <https://www.cdc.gov/pertussis/downloads/pertussis-survey-report-2017.pdf>
- Enhanced Meningococcal Disease Surveillance Report, 2017. <https://www.cdc.gov/meningococcal/downloads/NCIRD-EMS-Report-2017.pdf>
- Motor Vehicle Crash Deaths. <https://www.cdc.gov/vitalsigns/motor-vehicle-safety/index.html>
- Agency for Toxic Substances and Disease Registry, Aluminum. <https://www.atsdr.cdc.gov/ToxProfiles/tp22-c8.pdf>
- Understanding thimerosal, mercury, and vaccine safety. <https://www.cdc.gov/vaccines/hcp/patient-ed/conversations/downloads/vacsafe-thimerosal-color-office.pdf>
- National Health Statistics Reports. Number 76. July 30, 2014.



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References, Religion

- Price, R. (2014, June 19). A nice Jewish shot: why vaccinations are kosher and required. <https://www.judaismandscience.com/a-nice-jewish-shot-why-vaccinations-are-kosher-and-required/>
- Grabenstein JD. What the world's religions teach, applied to vaccines and immune globulins. *Vaccine*. 2013 Apr 12;31(16):2011-23.
- *Employment Division, Department of Human Resources of Oregon v. Smith*, 494 U.S. 872 (1990).
- *Prince v. Commonwealth of Massachusetts*, 321 U.S. 158, 64 S.Ct. 438,88 L. Ed. 645, 1944.
- *Jacobson v. Massachusetts*, 197 U.S. 11 (1905).
- Imdad A, Tserenpuntsag B, Blog DS et al. Religious exemptions for immunization and risk of pertussis in New York State, 2000-2011. *Pediatrics*. 2013 Jul;132(1):37-43.
- Wombwell E, Fangman MJ, Yoder AK, Spero DL. Religious barriers to measles vaccination. *J Community Health*. 2015 Jun;40(3):507-604.
- Moral reflections on vaccines derived from cells derived from aborted fetuses. *The National Catholic Bioethics Quarterly*. 2006;6:541-549. (This paper is the result of research by the Pontifical Academy for Life, commissioned by the Congregation for the Doctrine of Faith, hence, represents the Pope's interpretation of the will of God on this subject.)
- Gezairy HA. 17 July 2001. Letter describing Islamic scholar position on animal products including pork. <https://www.immunize.org/talking-about-vaccines/porcine.pdf>
- Shagar LK. (2016, July 28). Hindu groups want vaccines without beef gelatin. *The Star*. Online at: <https://www.thestar.com.my/news/nation/2016/07/28/hindu-groups-want-vaccines-without-beef-gelatin>
- World Health Organization. Global and regional immunization profile. https://www.who.int/immunization/monitoring_surveillance/data/gs_gloprofile.pdf?ua=1



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References, Toxicity

- Mitkus RJ, King DB, Hess MA, Forshee RA, Walderhaug MO. Updated aluminum pharmacokinetics following infant exposures through diet and vaccination. *Vaccine*. 2011 Nov 28;29(51):9538-43
- World Health Organization. Evaluations of the Joint FAO/WHO Expert Committee on Food Additives (JECFA). Aluminum-containing food additives. <http://apps.who.int/food-additives-contaminants-jecfa-database/chemical.aspx?chemID=6179>
- Mason MM, Cate CC, Baker J. Toxicology and carcinogenesis of various chemicals used in the preparation of vaccines. *Clin Toxicol* 1971;4:185-204.
- Clarkson TW, Magos L. The toxicology of mercury and its chemical compounds. *Critical reviews in toxicology*. 2005 35:8-609-652
- Gosselin RE, Hodge HC, Smith RP, Gleason MN. *Clinical toxicology of commercial products*. 4th ed. Baltimore: Williams and Wilkins, 1976.
- EFSA Journal 2014;12(2):3550. European food safety authority. Endogenous formaldehyde turnover in humans compared with exogenous contribution from food sources. <https://efsa.onlinelibrary.wiley.com/doi/pdf/10.2903/j.efsa.2014.3550>
- US Food and Drug Administration. Common ingredients in US licensed vaccines. <https://www.fda.gov/vaccines-blood-biologics/safety-availability-biologics/common-ingredients-us-licensed-vaccines>
- Sayed SM, Yokel RA. Aluminum content of some foods as food products in the USA, with aluminum food additives. *Food Additives and Contaminants*. 22:3, 234-44. <https://doi.org/10.1080/02652030500073584>



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AD MISERICORDIAM

An appeal to emotion that argues that a conclusion should be made based on feeling sorry for someone when that feeling is irrelevant to the conclusion.



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VAERS ADVERSE EVENT

A health problem that happens after vaccination (in time, may or may not be caused by the vaccine).



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VAERS SIGNIFICANT ADVERSE EVENT

Death	Paralytic Polio
Anaphylaxis	Manu. Inserts
Encephalitis	Throm. Purpura
Chronic Arthritis	Any Acute Comp.



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VACCINE

A substance used to provide immunity against disease without inducing the disease.



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IMMUNIZATION

The process whereby a person is made immune or resistant to a disease.



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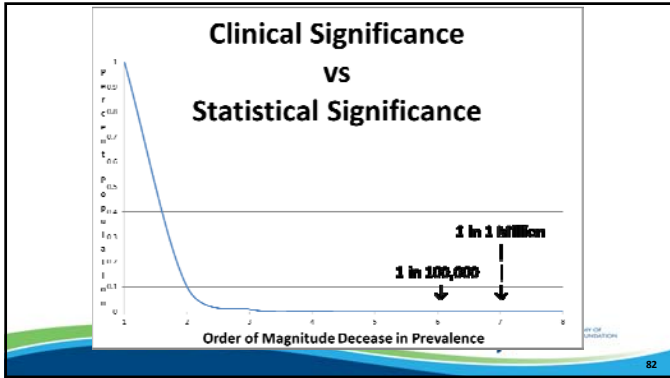
200

Estimated direct deaths from vaccine per year.

Dollars to prevent one death from vaccine preventable disease in third world.



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Likelihood

If you gave 2,000 pediatric vaccines
per year, you'd need, on average, to
practice for:

500 years

before you caused a single fatality.

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U.S. VACCINE MORBIDITY

DISEASE	PRE	POST
SMALLPOX	29,005	0
DIPHTHERIA	21,053	0
MEASLES	530,217	132
MUMPS	162,344	386
PERTUSSIS	200,752	10,007
POLIO	16,316	0
RUBELLA	47,745	17
TOTAL	1,007,432	10,542

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