Perspectives on Vaccine Hesitancy

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Disclosures

Ad hoc consultant
Principal investigator

GlaxoSmithKline
Merck
Novartis
Pfizer
Sanofi Pasteur
Seqirus
Objectives

After completion of this activity, participants should be able to...

—Address thought patterns that lead to vaccine hesitancy
—Maintain coverage in the face of anti-vaccinationism
A Brief History of Vaccinology

Pre-vaccine era 1796 Discovery 1954 1998 Golden Age Hesitancy
A Brief History of Vaccinology

Pre-vaccine era

1796

Discovery

Jenner inoculates James Phipps

Shot heard ‘round the world

1954 1998

Golden Age

Hesitancy
A Brief History of Vaccinology

Pre-vaccine era

1796

Discovery

1954 1998

Polio Pioneers

Golden Age

Hesitancy
A Brief History of Vaccinology

Pre-vaccine era

1796

1954 1998

Technological advances

Discovery Golden Age Hesitancy

Protein-polysaccharide conjugation
Purified protein antigens
Engineered attenuation
Reassortment
Recombinant-expressed proteins
Virus-like particles
Reverse vaccinology
Adjuvants
Delivery methods
Manufacturing and quality control

A Brief History of Vaccinology

Pre-vaccine era 1796 1954 1998

Programmatic advances

Discovery Golden Age Hesitancy

Disease surveillance
Economic analysis
Safety monitoring
Refinement in clinical trials
Effectiveness studies
Correlates of protection
Authoritative recommendations

A Brief History of Vaccinology

Impact—US, 1994-2013

<table>
<thead>
<tr>
<th>Pre-vaccine era</th>
<th>1796</th>
<th>1954 1998</th>
</tr>
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<tbody>
<tr>
<td>Discovery</td>
<td></td>
<td>Golden Age</td>
</tr>
<tr>
<td>Hesitancy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cases prevented: 322 million
Hospitalizations prevented: 21 million
Premature deaths prevented: 732,000
Net societal costs saved: $1.4 trillion

Whitney. MMWR 2014;63:352
Cohort=78.6 million children. Analysis includes all vaccines except influenza and HepA. Costs adjusted to 2013 dollars.
A Brief History of Vaccinology

Epic successes

Pre-vaccine era

1796

1954 1998

Discovery Golden Age Hesitancy

Last case of smallpox anywhere on Earth—1977

Last endemic case of measles in the Americas—2002

Last case of type 2 polio anywhere on Earth—1999

Last case of type 3 polio anywhere on Earth—2012

Last endemic case of rubella in the Americas—2009
A Brief History of Vaccinology

Pre-vaccine era

1796

Discovery

Golden Age

1954 1998

Hesitancy

Science-mindedness
A Brief History of Vaccinology

Pre-vaccine era 1796 1954 1998

Science-mindedness Discovery Golden Age Hesitancy

1796: Edward Jenner introduces the first smallpox vaccine.
1954: Jonas Salk's polio vaccine is introduced.

Science-mindedness: The age of discovery.
Discovery: The golden age of vaccines.
Hesitancy: The age of doubt and uncertainty.
A Brief History of Vaccinology

Pre-vaccine era 1796 1954 1998

Science-mindedness Discovery Golden Age Hesitancy
A Brief History of Vaccinology

Pre-vaccine era 1796 1954 1998

Science-mindedness  Discovery  Golden Age  Hesitancy

A Brief History of Vaccinology

Pre-vaccine era 1796 1954 1998

Discovery Golden Age Hesitancy

Early report

Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children

A J Wakefield, S H Murch, A Anthony, J Linnell, D M Casson, M Malik, M Berelowitz, A P Dhillon, M A Thomson, P Harvey, A Valentine, S E Davies, J A Walker-Smith

Wakefield. Lancet 1998;351:637
A Brief History of Vaccinology

Pre-vaccine era

1796

Discovery

1954 1998

Golden Age

The New Anti-vaccinationism

Hesitancy
Era of Vaccine Hesitancy

United States

- Concerned about serious adverse events
- Following "alternative" schedule
- Willing to spread vaccines out

Parents

Infants

Physicians

Freed. Pediatrics 2010;125:654 (N=1552 parental respondents)
Nadeau. J Pediatr 2015;166:151 (N=222,628 children ≤9 mo of age)
Kempe. Pediatrics 2015;135:666 (N=534 pediatricians and family physicians)
Era of Vaccine Hesitancy

United States

Data from AAP Periodic Surveys (N=852 respondents in 2006 and 854 in 2013)

Hough-Telford. Pediatrics 2016;138:e20162127

Data from AAP Periodic Surveys (N=852 respondents in 2006 and 854 in 2013)
Era of Vaccine Hesitancy

Heat map of nonmedical exemption rates, 2016–2017
Era of Vaccine Hesitancy

United States

Era of Vaccine Hesitancy

Worldwide

Important

Safe

Effective

Compatible with religion

Africa

Americas

Eastern Med

Europe

South-East Asia

Western Pacific

Percent

Strongly disagree

Tend to disagree

Tend to agree

Strongly agree

Era of Vaccine Hesitancy

Pertussis in England and Wales

Cherry. Curr Prob Pediatr 1984;14:1
Era of Vaccine Hesitancy

Measles outbreaks in Europe—2018

Measles cases hit record high in Europe

2-dose vaccine coverage

- 0–84%
- 85–94%
- 95–99%
- No data
- Not included

ECDC, Map produced on: 26 Jul 2018
ECDC map maker: https://emma.ecdc.europa.eu

Era of Vaccine Hesitancy

Measles outbreaks in the US—2019

The New York Times

90 New Cases of Measles Reported in U.S. as Outbreak Continues Record Pace

By Elisabeth Malkin

April 15, 2019

The number of new measles cases in the United States rose again this month, the Centers for Disease Control and Prevention said on Monday, bringing the total number to 555 in 2019. This year’s outbreak is on course to be the worst since the
Era of Vaccine Hesitancy

Reported measles cases—US

https://www.cdc.gov/measles/cases-outbreaks.html
Era of Vaccine Hesitancy

Reported measles cases—US, Jan 1–Jun 13, 2019

https://www.cdc.gov/measles/cases-outbreaks.html
Era of Vaccine Hesitancy

Measles outbreaks in the United States

Phadke. JAMA 2016;315:1149
Cumulative epidemic curve of 18 outbreaks, 2000–2015
Era of Vaccine Hesitancy

HPV

Attributable cancers—US, 2015

- Oropharyngeal
- Cervical
- Anal
- Vulvar
- Penile
- Vaginal

HPV vaccine series among adolescents—2017

- Complete
- Incomplete

Van Dyne. MMWR 2018;67:918
CDC. MMWR 2018;67:909
Era of Vaccine Hesitancy

https://www.who.int/emergencies/ten-threats-to-global-health-in-2019
This makes no sense
Pathways to Hesitancy

The facts
Misinformation on the Internet

The culture
Anti-science

The mind
Anecdotal thinking
Pathways to Hesitancy

The Internet

Google search for "dangers of vaccination"

Six Reasons to Say NO to Vaccination - The Healthy Home Economist
https://www.thehealthyhomeeconomist.com/six-reasons-to-say-no-to-vaccination/
Jun 5, 2017 - You should neither assume shots are dangerous just because your friend down the street doesn't vaccinate her kids. The key here is education ...

Objective, science-based analysis of vaccine dangers vaccinepapers ...
vaccinepapers.org/about/
Science shows that vaccines cause brain damage. VaccinePapers.org uses peer-reviewed science to report the truth about vaccine dangers.

Anti-Vaccine Scientific Support Arsenal – Scientific proof the media ...
hitascientificsupportarsenal.wordpress.com/
There is absolutely undeniable scientific proof that vaccines cause autism. ..... The website provides studies showing the dangers of mercury exposure and the ...

The Brilliance of Dr. Suzanne Humphries on The Dangers of Vaccines ...
https://www.youtube.com/watch?v=McfXd_Xuojs
Oct 21, 2014 - Uploaded by PreventDiseaseTV
http://preventdisease.com/Vaccines There will come a day when all Doctors will understand that vaccination ...

Doctors-Scientists Warn about Dangers of Vaccination Immunisation
www.medicinekillsmillions.com/.../doctors-scientists-warn-dangers-of-vaccination-im... Quotes from Doctors & Scientists who warn against Dangers of Vaccination & Immunization.
Pathways to Hesitancy

The facts: Misinformation on the Internet

...I read that vaccines cause autism

The culture: Anti-science

The mind: Anecdotal thinking
Pathways to Hesitancy

Culture of anti-science

Kyetrak Glacier, Cho Oyu Region, Himalayan mountains
Pathways to Hesitancy

Culture of anti-science

Kyettrak Glacier, Cho Oyu Region, Himalayan mountains
Pathways to Hesitancy

Culture of anti-science

Kyetrak Glacier, Cho Oyu Region, Himalayan mountains

Fascinating.

Hoax!

UNIVERSITY OF LOUISVILLE
SCHOOL OF MEDICINE
Pathways to Hesitancy

The facts
Misinformation on the Internet
...I read that vaccines cause autism

The culture
Anti-science
...Science isn’t always right

The mind
Anecdotal thinking

I read that vaccines cause autism

Science isn’t always right
### Pathways to Hesitancy

#### Anecdotal thinking

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Outcome</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>b</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>c</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>d</td>
</tr>
</tbody>
</table>
Pathways to Hesitancy

The facts
Misinformation on the Internet
...I read that vaccines cause autism

The culture
Anti-science
...Science isn’t always right

The mind
Anecdotal thinking
...One case is enough for me
Pathways to Hesitancy

The facts: Occurrence of adverse events

The culture: Poor science literacy

The mind: Heuristics
# Pathways to Hesitancy

## Adverse events

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Event</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any</td>
<td>Anaphylaxis</td>
<td>1 in a million</td>
</tr>
<tr>
<td>RV5</td>
<td>Intussusception</td>
<td>1 in 67,000</td>
</tr>
<tr>
<td>MMR</td>
<td>ITP</td>
<td>1 in 40,000</td>
</tr>
<tr>
<td>RV1</td>
<td>Intussusception</td>
<td>1 in 19,000</td>
</tr>
<tr>
<td>RRV-TV</td>
<td>Intussusception</td>
<td>1 in 10,000</td>
</tr>
<tr>
<td>MMRV</td>
<td>Febrile seizures</td>
<td>1 in 2,300</td>
</tr>
</tbody>
</table>

Pathways to Hesitancy

The facts
Occurrence of adverse events
...Vaccines can have serious side effects

The culture
Poor science literacy

The mind
Heuristics
Pathways to Hesitancy

How much do you personally know about science?

- A lot
- Some
- Not much
- Nothing/don’t know

Wellcome Global Monitor—2018 (survey of 140,000 people around the world)
Pathways to Hesitancy

Perceived knowledge about science

Personally know “a lot” or “some” about science

9%  79%

Wellcome Global Monitor—2018 (survey of 140,000 people around the world)
Pathways to Hesitancy

How much trust do you have in scientists?

- High
- Medium
- Low
- Don't know/refused

Wellcome Global Monitor—2018 (survey of 140,000 people around the world)
Pathways to Hesitancy


International Student Assessment Science Literacy Scale

- Singapore
- Japan
- Finland
- Canada
- New Zealand
- United Kingdom
- Germany
- Poland
- United States
- France
- Russia
- Israel
- Chile
- Turkey
- Mexico
- Brazil

Pathways to Hesitancy

The facts

Occurrence of adverse events

...Vaccines can have serious side effects

The culture

Poor science literacy

...They can’t prove vaccines are safe

The mind

Heuristics
Pathways to Hesitancy

How science works

- All people who were ever vaccinated
- All people who were ever not vaccinated

Compare outcomes
Pathways to Hesitancy

The facts
Occurrence of adverse events
...Vaccines can have serious side effects

The culture
Poor science literacy
...They can’t prove vaccines are safe

The mind
Heuristics
## Pathways to Hesitancy

### Heuristics

<table>
<thead>
<tr>
<th>Availability</th>
<th>The perceived probability of an event correlates with how easily similar events are remembered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do no harm</td>
<td>A bad outcome seems more tolerable if it occurs because of inaction rather than action</td>
</tr>
<tr>
<td>Ambiguity</td>
<td>A known risk is more acceptable than an unknown risk</td>
</tr>
<tr>
<td>Compression</td>
<td>Rare risks are overestimated and common risks are underestimated</td>
</tr>
</tbody>
</table>

Pathways to Hesitancy

The facts
Occurrence of adverse events

...Vaccines can have serious side effects

The culture
Poor science literacy

...They can’t prove vaccines are safe

The mind
Heuristics

...Serious side effects are common
Pathways to Hesitancy

The facts: Success of vaccine programs

The culture: Modern medical training

The mind: Faulty risk perception
Pathways to Hesitancy

Vaccine successes—*Haemophilus influenzae* type b

Briere. MMWR 2014;63:RR-1
Pathways to Hesitancy

The facts  Success of vaccine programs
...I’ve never seen a case

The culture  Modern medical training

The mind  Faulty risk perception
Pathways to Hesitancy

Medical training

Paternalism

Marcus Welby, MD

Shared decision-making
Pathways to Hesitancy

Medical training

VACCINE EFFICACY CONSTRUCT (OVERALL)

VACCINE SAFETY CONSTRUCT (OVERALL)

Health Professional Graduation Year

Mergler. Vaccines 2013;1:154 (N=551)
Pathways to Hesitancy

The facts  Success of vaccine programs
...I’ve never seen a case

The culture  Modern medical training
...I need to partner with the parent

The mind  Faulty risk perception
You should replace the timing belt at 100,000 miles. What do you think? Let’s revisit this each time you come in and maybe we’ll eventually reach common ground.
Pathways to Hesitancy

The facts  Success of vaccine programs
...I’ve never seen a case

The culture  Modern medical training
...I need to partner with the parent

The mind  Faulty risk perception
# Pathways to Hesitancy

## Risk perception

<table>
<thead>
<tr>
<th>What we’re afraid of</th>
<th>What the real risk is</th>
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<tbody>
<tr>
<td>Shark attacks (28)</td>
<td>Dog bites (4.5 million)</td>
</tr>
<tr>
<td>Murder (14,180)</td>
<td>Suicide (33,289)</td>
</tr>
<tr>
<td>Death by peanut allergy (50)</td>
<td>Death by poisoning (27,531)</td>
</tr>
<tr>
<td>Death by plane crash (321)</td>
<td>Death by car crash (34,017)</td>
</tr>
</tbody>
</table>

Kalb. Newsweek 2010;155:64
Pathways to Hesitancy

Risk perception

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</table>

Deaths from...
the 9/11 attacks: 2,976
automobile accidents attributable to the 9/11 effect: 350-1,200

Kalb. Newsweek 2010;155:64
Pathways to Hesitancy

The facts
Success of vaccine programs
...I’ve never seen a case

The culture
Modern medical training
...I need to partner with the parent

The mind
Faulty risk perception
...Vaccination is riskier than disease
Being Human
**Background rate in general population**

<table>
<thead>
<tr>
<th>Rate in vaccinated population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-fold higher</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>1 in 10,000</td>
</tr>
<tr>
<td>1 in 100,000</td>
</tr>
<tr>
<td>1 in 1,000,000</td>
</tr>
</tbody>
</table>
Being Human

*Patternicity*

Grilled cheese sandwich sold on eBay in 2004 for $28,000
Toast the Pope!

Celebrate Pope Francis's first visit to America with The Pope Toaster—the best thing since sliced bread! The Pope Toaster brands the pope's picture and other images onto your toast.

The 2015 commemorative, one-of-a-kind, 2-slice toaster comes with two impression inserts: the pope's picture and the words "Spread the Love." Just pop in some bread and enjoy your pope on toast.

Spread the Love

Only $48.95

BUY NOW!

Included:
- White toaster with two pope inserts and two Spread the Love Inserts

Additional impression inserts available for all occasions.

Inserts are removable and interchangeable. For wholesale orders, email us at info@fresnostyledesign.com.
Being Human

Confirmation bias

2500 scientists say we’ve caused global warming

I’d like a second opinion
Finding Our Inner Spock

- Anecdotal thinking → Scientific thinking
- Heuristics → Deductive reasoning
- Folk numeracy → Statistical numeracy
- Patternicity → Hypothesis testing
- Perception of risk → Risk-benefit analysis

Logical.
Take a Stand

Presumptive
“We’ve got some shots due today.”

Participatory
“What do you want to do about shots today?”
Take a Stand

My daughter doesn’t need a vaccine against an STD.
Take a Stand

My daughter doesn’t need a vaccine against an STD.

It’s a vaccine against CANCER.

Modified from Immunization Action Coalition. Needle Tips; Nov 2013
Take a Stand

She’s too young to get this shot.

Modified from Immunization Action Coalition. Needle Tips; Nov 2013
Take a Stand

She’s too young to get this shot.

I want her to be protected BEFORE she’s exposed.

Modified from Immunization Action Coalition. Needle Tips; Nov 2013
Take a Stand

This will open the door to sexual activity.

Modified from Immunization Action Coalition. Needle Tips; Nov 2013
Take a Stand

This will open the door to sexual activity.

NO IT WON’T.

Modified from Immunization Action Coalition. Needle Tips; Nov 2013
Retrain the Elephant

Old
Intuitive
Emotional
Automatic
Reactive
Visceral
Fast

New
Rational
Deliberative
Controlled
Analytic
Cerebral
Slow

Retrain the Elephant

Myth-busting targets the rider

Common Misconceptions Surrounding Vaccines

- **Diseases had already begun to disappear before vaccines were introduced because of better hygiene and sanitation.** Not true- The Soviet Union is a good example of this. From 1989-1994 low primary vaccination numbers and lack of boosters resulted in a jump of 839 cases of diphtheria in 1989 to nearly 50,000 cases and 1,700 deaths in 1994.

- **The majority of people who get diseases have been vaccinated.** Not true- measles for example is 98% effective and other vaccines are effective for 85-95% of children vaccinated. Some just don’t develop appropriate immunity.

- **There are “hot lots” of vaccines that parents should find and avoid.** Again, misleading. Just because an “adverse” reaction (which could be as simple as a sore arm or a fever) has been
Retrain the Elephant

*Disease risk targets the elephant*

![Bar chart showing vaccine attitude change scores for Disease Risk, Autism Correction, and Control groups. The Disease Risk group shows a significantly higher score compared to the other two groups.](image-url)
Know Your Audience

People are different
Parental phenotypes

- Health advocates: 25%
- Go along to get alongs: 26%
- Immunization advocates: 33%
- Worrieds: 3%
- Fencesitters: 13%
Know Your Audience

*Moral foundations theory*

- Care ↔ Ham
- Authority ↔ Subversion
- Loyalty ↔ Betrayal
- Liberty ↔ Oppression
- Purity ↔ Degradation
- Fairness ↔ Cheating

Vaccine mandates are an example of excessive government control.

Know Your Audience

Moral foundations theory

- Care
- Authority
- Loyalty
- Liberty
- Purity
- Fairness

- Ham
- Subversion
- Betrayal
- Oppression
- Degradation
- Cheating

Know Your Audience

Moral foundations theory

Vaccine mandates are an example of excessive government control

Vaccines contain toxins but diseases are natural

- Care 
- Authority
- Loyalty
- Liberty
- Purity
- Fairness

- Ham
- Subversion
- Betrayal
- Oppression
- Degradation
- Cheating

Know Your Audience

Worldview and rejection of science

Lewandowsky. PLOS One 2013;8:e75637
Internet-based survey of 1001 representative residents of the U.S.
Know Your Audience

Worldview and rejection of science

Lewandowsky. PLOS One 2013;8:e75637
Internet-based survey of 1001 representative residents of the U.S.
Know Your Audience

Worldview and rejection of science

Lewandowsky. PLO One 2013;8:e75637
Internet-based survey of 1001 representative residents of the U.S.
 Know Your Audience

*Worldview and rejection of science*

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Lewandowsky, PLOS One 2013;8:e75637
Internet-based survey of 1001 representative residents of the U.S.
Know Your Audience

Worldview and rejection of science

Lewandowsky. PLOS One 2013;8:e75637
Internet-based survey of 1001 representative residents of the U.S.
Don’t Wrestle With a Pig in the Mud
Don’t Wrestle With a Pig in the Mud

You can’t win
Don’t Wrestle With a Pig in the Mud

You can’t win
You get dirty
Don’t Wrestle With a Pig in the Mud

You can’t win
You get dirty
The pig loves it
Don’t Wrestle With a Pig in the Mud

Larry King Live, 2008
Don’t Wrestle With a Pig in the Mud

Larry King Live, 2008

The elephant feels the passion

The rider assesses the arguments
Don’t Wrestle With a Pig in the Mud
Focus on the 99%

Infant coverage rates, 2017

Hill. MMWR 2017;67:1123
Focus on the 99%

Community immunity

![Graph showing herd immunity threshold vs. basic reproduction number with Measles highlighted]

Appeal to the Social Norms
Appeal to the Social Norms

Help save the environment

Join your fellow guests in helping to save the environment
Appeal to the Social Norms

*Groupiness is an elephant property*

**Us (In-group)**

I am one of the vast majority who embrace science and see vaccination as a means to maintaining health

**Them (Out-group)**

They are closed-minded outliers subject to groupthink, confirmation bias and over-confidence in their own expertise

Atwell. Vaccine 2018;36:1621
Appeal to the Social Norms

集团公司 is an elephant property

Us (In-group)

I am one of the enlightened but besieged minority who see vaccines for the poisons they really are

Them (Out-group)

They are the unhealthy mainstream who have broken from nature and embraced medicines to conform to Western lifestyle expectations
Appeal to Social Norms

Groupiness can work for the common good
Put the Law on Your Side

Legal basis for school mandates

Beneficence (ensure that the right thing happens)

Nonmaleficence (don’t let bad things happen)

Justice (protect everyone equally)
Put the Law on Your Side

*Washington State—SB5005*

**Counseling Signature**

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Exemption Rates (predicted per 100)
- 0.00-3.19
- 3.2-4.75
- 4.76-6.75
- 6.76-9.99
- 10.00+

Omer. Pediatrics 2018;141:e20172364

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Put the Law on Your Side

California—SB277

Medical exemptions only

Change in percentage of incoming kindergarteners with medical exemption, 2015–2016
Put the Law on Your Side

*Transparency and unintended consequences*

Enforcement should not be the public face of immunization
Restriction of liberty versus reduction of threat
Eliminating exemptions could heighten safety concerns
Values inherent in the policy
Come Together

Perception

Academia

Educate people
Seek answers
Increase knowledge
Accountable to trustees

Industry

Produce products
Seek markets
Increase revenue
Accountable to shareholders
Come Together

Reality

Educate people
Seek answers
Increase knowledge
Accountable to trustees

Academia

Produce products
Seek markets
Increase revenue
Accountable to shareholders

Industry
$36 billion (2015)

$18 billion (2017)
Development costs = $500 million
Return on investment = 15 years
Failure rate = 8:1

$36 billion (2015)
$18 billion (2017)

Davis MM. Vaccine 2011;29:9414
Plotkin S. Vaccine 2017;35:4046
https://www.statista.com
Humira® (adalimumab; Abbvie)
Come Together

*Industry-sponsored clinical research sites in the U.S.*

It was a shock to realize that for the first time in my life, my decisions about research projects were truly important... This gave me a new respect for people in industry, whom I found to be just as dedicated as those outside, but with plates that were very full and perhaps more difficult to empty.

Dr. Stanley Plotkin
(after receiving the Sabin Gold Medal)
The Rise of Anti-Anti-Vaccinationism

Anti-vaxxers added as an option for wiping out humanity

https://www.pcgamer.com/plague-inc-is-getting-anti-vaxxers-thanks-to-a-petition/
Workshop
Start Early

Tdap and IIV for pregnant women
Prenatal meetings
HepB in the nursery
Have a Plan

Outline scheduled vaccines for each visit
Give VIS
Explain importance of each vaccine
Screen for contraindications
Anticipate common side effects
Use a Team Approach

“Good news—protection from measles today!”

“Can I answer any questions?”
Be Consistent
Organize

- Preparatory phone call
- Screening questionnaire
- Printed brochures
- Take-home materials
- Off-peak scheduling
- Maximize face-to-face time
Layer Information Appropriately

Raising Arizona, 1987
You want kids to be vaccinated because you make money.
Purchase price
Tax
Ordering
Inventory
Storage
Insurance
Contract negotiation
Claims tracking
Wastage
Documentation
Opportunity costs
Staff (administration)
Provider (counseling)
Primary Care Physician Perspectives

- Reimbursement for purchase is adequate
- Reimbursement for administration is adequate
- Reimbursement is timely
- Would not vaccinate if reimbursement was less than purchase price

Freed. Pediatrics 2008;122:1319
The federal government has paid out $3.3 billion in vaccine injury claims. How can you say there’s not a problem?
National Vaccine Injury Compensation Program

Cumulative payout ($ billions)

Year

**Vaccine Injury Table**

Applies Only to Petitions for Compensation Filed under the National Vaccine Injury Compensation Program on or after March 27, 2017

In accordance with sections 300aa-1(b)(1) of the National Childhood Vaccine Injury Act of 1986, Pub. L. 99-660, and sections 300aa-13(a)(1) and (2) of the National Vaccine Injury Compensation Act of 1984, Pub. L. 98-213, as added by the Public Health Service Act, as amended (42 U.S.C. 300a-14(a)), the following is a table of vaccines, the injuries, disabilities, illnesses, conditions, and deaths resulting from the administration of said vaccines, and the time period in which the first symptom or manifestation of onset of the injury or significant aggravation of such injury, disability, illness, condition, or death occurs to serve as a reference for the vaccine injury compensation program.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Illness, disability, injury, or condition covered</th>
<th>Time period for first symptom or manifestation of onset or significant aggravation after vaccine administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Vaccines containing thimerosal (e.g., DTP, DTP, DT, Td, or T1)</td>
<td>A. Anaphylaxis</td>
<td>2/24 hours (not less than 7 days and not more than 28 days)</td>
</tr>
<tr>
<td></td>
<td>B. Brachial Neuritis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C. Shoulder Injury Related In Vaccine Administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D. Vaccine-associated</td>
<td></td>
</tr>
<tr>
<td>II. Vaccines containing whole cell pertussis vaccine or diphtheria toxoid (or both) or vaccines containing pertussis antigen (e.g., DTP, DTP, DT, DTP-Hib)</td>
<td>A. Anaphylaxis</td>
<td>2/24 hours</td>
</tr>
<tr>
<td></td>
<td>B. Encephalopathy or encephalitis</td>
<td>2/24 hours</td>
</tr>
<tr>
<td></td>
<td>C. Shoulder Injury Related In Vaccine Administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D. Vaccine-associated</td>
<td></td>
</tr>
<tr>
<td>III. Vaccines containing measles, mumps, and rubella vaccine or any of its components</td>
<td>A. Anaphylaxis</td>
<td>2/24 hours (not less than 6 days and not more than 15 days)</td>
</tr>
<tr>
<td></td>
<td>B. Encephalopathy or encephalitis</td>
<td>2/24 hours (not less than 6 days and not more than 15 days)</td>
</tr>
<tr>
<td></td>
<td>C. Shoulder Injury Related In Vaccine Administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D. Vaccine-associated</td>
<td></td>
</tr>
</tbody>
</table>
It’s too many too soon
## Antigen Burden

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Smallpox</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphtheria</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tetanus</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pertussis</td>
<td>3000</td>
<td>3000</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Polio</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>MMR</td>
<td></td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Hib</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Varicella</td>
<td>1</td>
<td>69</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>PCV7/PCV13</td>
<td></td>
<td>8</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>HepB</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HepA</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>HPV9</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Rotavirus</td>
<td></td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>MCV4</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Influenza</td>
<td></td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3217</strong></td>
<td><strong>3041</strong></td>
<td><strong>126</strong></td>
<td><strong>186</strong></td>
</tr>
</tbody>
</table>

What’s wrong with an alternative schedule?
Violates the social contract
Violates the social contract

Necessitates prioritization
Violates the social contract
Necessitates prioritization
Requires more visits
Violates the social contract
Necessitates prioritization
Requires more visits
Creates risk
Violates the social contract
Necessitates prioritization
Requires more visits
Creates risk
Offers no benefit
Natural immunity is better
Sometimes that’s true
The cost of natural immunity is the risk of disease
Vaccine-induced immunity is “natural”
You can’t prove that vaccines are safe
Test statistic

Frequency

Fail to reject $H_0$

Reject $H_0$

$1.96$ $0$ $1.96$

Test statistic
My nephew stopped interacting 2 weeks after receiving MMR
<table>
<thead>
<tr>
<th>NCAA Basketball Championship</th>
<th>Year</th>
<th>World Series Winner</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Kentucky</td>
<td>1949</td>
<td>Yankees</td>
</tr>
<tr>
<td>University of Kentucky</td>
<td>1951</td>
<td>Yankees</td>
</tr>
<tr>
<td>University of Kentucky</td>
<td>1958</td>
<td>Yankees</td>
</tr>
<tr>
<td>University of Kentucky</td>
<td>1978</td>
<td>Yankees</td>
</tr>
<tr>
<td>University of Kentucky</td>
<td>1996</td>
<td>Yankees</td>
</tr>
<tr>
<td>University of Kentucky</td>
<td>1998</td>
<td>Yankees</td>
</tr>
</tbody>
</table>

Sequence or consequence?
I’m in charge of my kids
“The relationship of parent and child is one in which the law concerns itself more with parental duties than with parental rights. The relationship carries with it a duty resting upon the parent to provide the child with food, clothing and shelter and to protect the child from preventable exposure to danger, disease and immorality.”
Our faith will keep our children safe
BAD FAITH

When Religious Belief Undermines Modern Medicine

PAUL A. OFFIT, M.D.
Seriously.
Don't even go there.
Aborted fetuses are used to make some vaccines
# Vaccines Made in Fetal Cell Lines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Trade name</th>
<th>Cell line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubella</td>
<td>MMR(_{II})</td>
<td>WI-38</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Havrix, Vaqta</td>
<td>MRC-5</td>
</tr>
<tr>
<td>Rabies</td>
<td>Imovax rabies (HDC)</td>
<td>MRC-5</td>
</tr>
<tr>
<td>Varicella</td>
<td>Varivax</td>
<td>MRC-5</td>
</tr>
<tr>
<td>Herpes zoster</td>
<td>Zostavax</td>
<td>MRC-5</td>
</tr>
<tr>
<td>Polio</td>
<td>Poliovax (Pentacel, Quadracel)</td>
<td>MRC-5</td>
</tr>
<tr>
<td>Adenovirus</td>
<td>Types 4 and 7, live oral</td>
<td>WI-38</td>
</tr>
</tbody>
</table>
Moral distance

WI-38 cells (1962)
What should we do with families who refuse all vaccinations?
These families should be retained in the practice

Jane, you misguided, ignorant…
They should be dismissed!
Immunization may be the most important thing we do for children.

Immunization is only one of the good things that pediatricians do for children.
The positive outweighs the negative

The negative of unimmunized children goes beyond the individual
Dismissed families will seek care from quacks

The number of families who agree to vaccinate may exceed the number who seek alternative providers
The therapeutic relationship will be poor if you can’t come to terms on something as basic as vaccines.

Retention is an investment in a long-term relationship.
Retention poses little risk in terms of VPDs

VPDs will resurge if there are many unvaccinated children
The AAP says you should retain these families

The APP says you can dismiss these families
This many people can’t be wrong
Vaccine Confidence