Vaccine Hesitancy, Vaccine Exemptions, and the Return of Vaccine-Preventable Diseases

Implications for Policy and Clinical Practice

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Acknowledgement

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Comparison of 20\textsuperscript{th} Century Annual Morbidity and Current Morbidity: Vaccine-Preventable Diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>20\textsuperscript{th} Century Annual Morbidity*</th>
<th>2018 Reported Cases†</th>
<th>Percent Decreased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smallpox</td>
<td>29,005</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>21,053</td>
<td>1</td>
<td>&gt;99%</td>
</tr>
<tr>
<td>Pertussis</td>
<td>200,752</td>
<td>13,439</td>
<td>93%</td>
</tr>
<tr>
<td>Tetanus</td>
<td>580</td>
<td>20</td>
<td>97%</td>
</tr>
<tr>
<td>Polio (paralytic)</td>
<td>16,316</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Measles</td>
<td>530,217</td>
<td>273</td>
<td>&gt;99%</td>
</tr>
<tr>
<td>Mumps</td>
<td>162,344</td>
<td>2,251</td>
<td>99%</td>
</tr>
<tr>
<td>Rubella</td>
<td>47,745</td>
<td>5</td>
<td>&gt;99%</td>
</tr>
<tr>
<td>Congenital Rubella Syndrome</td>
<td>152</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td><em>Haemophilus influenzae</em></td>
<td>20,000 (est.)</td>
<td>27‡</td>
<td>&gt;99%</td>
</tr>
</tbody>
</table>

Sources:
* JAMA. 2007’298(18):2155-2163
† CDC. MMWR August 15, 2014;63(32);702-715. (MMWR 2013 final data)
‡ *Haemophilus influenzae* type b (Hib) <5 years of age. An additional 10 cases of Hib are estimated to have occurred among the 185 reports of Hi (<5 years of age) with unknown serotype
Impact of Routine Childhood Immunization

**U.S. Birth Cohort, 2009**

- Cases prevented: 20,000,000
- Deaths prevented: 42,000
- Direct costs saved: $13.5 billion
- Direct and indirect costs saved: $68.8 billion

Zhou. Pediatrics 2014
Vaccines have become victims of their own success
Increasingly, parents are skeptical of the safety and necessity of vaccines and are opting out of immunizing their children.
Media Frequently Gives Appearance of a Legitimate Debate, With Equal Sides
What Are the Origins for Vaccine Resistance?

Hume 1878
Birth of the Modern Anti-Vaccine Movement

Lea Thompson

Vaccination Roulette: Experiences, risks and alternatives.

April 19, 1982

Barbara Loe Fisher

A Shot in the Dark

“Builds a case that is cautious, credible, horrifying and outrageous all at once.”

San Francisco Chronicle
Modern Anti-Vaccine Origins

- British physician and researcher, gastroenterologist
- Study published in Lancet 1998
- Study of 12 children with a history of autism or developmental disorder “referred” to gastroenterology clinic.

Findings:
- Onset of behavioral symptoms, per parents, started after MMR immunization in 8 of the children
- Bowel abnormalities in all of the children on endoscopy

Conclusions: speculated a connection between bowel pathology after MMR immunization that allowed “toxins” to circulate to brain causing brain damage and autism
Brian Deer - Investigative Reporter
Deer’s Findings:

- No IRB approval
- Anti-vaccine group did recruiting
- All medical histories misreported or altered
- 8 mos prior - files patent for a new measles vaccine.
- Paid ~ $675,000 by a trial lawyer group building a case to sue vaccine makers
- No conflicts of interest disclosed to the Lancet

- Lab colleague later confessed non-supporting lab data was suppressed
- 5 patients found to have had problems BEFORE ever receiving the vaccine, 3 never had autism.
- His paper was retracted in 2011, co-authors removed their name from the paper, and an expose’ on the fraud appeared the BMJ.
- England’s General Medical Council removed his medical license for his “callous disregard” for putting children through clinically unnecessary invasive medical procedures.
What Do Americans Believe?

- Online Harris poll of 1756 adults for the National Consumer League in 2013

- Only 39% of parents described themselves as being extremely or very knowledgeable about how vaccines work..... Yet....... 

- 33% of parents of children under 18, and 29% of adults agree with the statement, “vaccinations can cause autism”.

VACCINATION BELIEFS

Vaccine Rejector
- Unimmunized
- Completely reject vaccines
- High safety concerns
- Lack trust in health care provider

Vaccine-Hesitant
- Under-immunized
- Delay/question vaccines
- Select only certain vaccines
- Desire trustworthy health care provider

Vaccine Acceptor
- Fully immunized
- Few concerns about vaccines
- High trust in health care provider
How Hesitant Are Parents?
Summary of U.S. Parent/Guardian Survey - 2009

N = 1,278

- Vaccinators with no concerns: 43%
- Vaccinators with minor concerns: 6%
- Minor refusers: 5%
- Vaccinators with major concerns: 10%
- Significant refusers: 36%

ASTHO Survey, 2009
U.S. Trends in Influenza and Pneumococcal Immunization Coverage In Adults > 65 yo

Percent Vaccinated

Pneumococcus
Influenza

2020 Goal

High Risk
Adults
18 - 64

CDC Behavioral Risk Factor Surveillance System
Herd Protection
“The only purpose for which power can be rightfully exercised over any member of a civilized community, against his will, is to prevent harm to others”

John Stuart Mill
British Philosopher
What Is The Right Positive Balance?

Autonomy
Personal Liberty
Religious Freedom

Public Health
Common Good
Herd Immunity
How Do We Assure the Common Good Through Herd Immunity? Laws Regarding Vaccine Compulsion

- Jacobson v Massachusetts (1905)
  - Smallpox outbreak in Boston – established that compulsory vaccination is within state’s police power

- Zucht v King (1922)
  - Court stated ordinance prohibiting school attendance without vaccination reflected broad discretion needed to protect the public’s health

- Prince v Massachusetts (1944)
  - A parent “cannot claim freedom from compulsory vaccination for the child more than for himself on religious grounds. The right to practice religion freely does not include liberty to expose the community or the child to communicable disease or the latter to ill health or death.”
What Is The Right Negative Balance?

Free Riding
Increasing susceptibility
Dz outbreaks

Compulsion/force
Sense of violation
Organized opposition
Exemptions to School-Based Compulsion

- Medical
- Religious
- Philosophic
Vaccine Exemptions by State

Exemptions by State
- Personal Belief Exemptions
- Medical Only
- Religious and Medical
The state of the antivaccine movement in the United States: A focused examination of nonmedical exemptions in states and counties

Fig 2

NME: nonmedical exemption.
Correlation of Higher NME Rates and Lower Kindergarten MMR Immunization Rates

Spearman correlation: $\rho = -0.49$, p-value = 0.03
U.S. Counties With > 400 Kindergartners with NMEs – (2016-2017)
Measles Immunization and Cases in U.K.

Wakefield Paper Published


Measles Immunization and Cases in U.K.

Number of Measles Cases Reported by Year

2010-2019** (as of September 19, 2019)
2019 Measles Outbreak in U.S.

- 1,241 cases, most since 1992
- 131 hospitalized, 65 with serious complications
- Majority unvaccinated
- 75% came from NYC
- Cost to NYC - $6 million
- U.S. on cusp of losing our status of eliminating measles in 2000
High Prevalence of PBEs Among US Residents With Measles: January 1–May 23, 2014\(^1\)\(^a\)

Of 288 cases of measles in U.S, 200 were unvaccinated. 195 (85%) had philosophical or religious objections.

- **Philosophical or religious beliefs**: 85%
- **Ineligible**: 5%
- **Missed opportunities**: 6%
- **Other**: 4%

\(^a\) Figure reproduced from CDC.\(^1\)

Measles cases hit record high in Europe, nearly doubling 2017 total

August 20, 2018

More than 41,000 adults and children in Europe were infected with measles in the first 6 months of 2018, exceeding all 12-month totals in this decade, WHO announced today.
If you have to get sick, sure can't beat the measles
Measles Complications

- 1:5 - hospitalized
- 1:20 – pneumonia
- 1:1000 – encephalitis (may lead to deafness or intellectual disability)
- 1:1300 under 5, and 1:600 under 1 y.o. – SSPE
- 1:500 – die
- “Immune amnesia” – like having mini-AIDS for up to 2-3 years
Indiana experiencing largest Whooping Cough outbreak since the 1950s
There have been 600 reported cases of whooping cough in Indiana this year

Severe Whooping Cough Outbreak In Jefferson Co.
Posted on Sunday, 12 of December, 2010 at 9:52 pm

Pertussis outbreak continues in Grant County
By Dee Riggs
World staff writer
Tuesday, December 28, 2010

Whooping cough outbreak reported in Tacoma
By DAN MITCHELSON
KIRO Radio
Philippines Declares Polio Outbreak After 19 Years Free of the Disease

The New York Times 9/19/19
Should non-medical exemptions to vaccination be allowed, and if so, what are the limits?
What Standard to Apply for Religious Freedom?

- *Sherbert v Verner*, 1963 - “Sherbert Test"
  - Does the law place a burden on an individual’s free exercise of religion?
  - Does it possess a compelling state interest that justifies that infringement?
  - No alternative form of regulation can avoid the infringement and still achieve the state’s end

- Religious Freedom Restoration Act, 1993
  - Reaffirmed the Sherbert Test
  - Government shall not substantially burden a person’s exercise of religion
    - Exception if: necessary to further a compelling interest (deals with core constitutional issues and not just improving government efficiency), and, rule must be the least restrictive way to further the government interest
Welsh v. United States (1970)

• “Congress could, entirely consistently with the requirements of the Constitution, eliminate all exemptions for conscientious objectors...However, **having chosen to exempt, it cannot draw the line between theistic or nontheistic religious beliefs, on the one hand, and secular beliefs, on the other. Any such distinctions are not, in my view, compatible with the Establishment Clause of the First Amendment.”**
McCarthy v. Boozman (WD Ark 2002)

- Arkansas religious exemption found to be unconstitutional
- “clearly runs afoul of the Establishment Clause of the First Amendment...because the exemption benefits only those who are members or adherents of a church or religious denomination recognized by the State”
- What is religion? Religious belief?
  - *Seeger* Court: “sincere and meaningful belief which occupies in the life of its possessor a place parallel to that filled by the God of those”
  - *Welsh* Court: moral, ethical, or religious beliefs about what is right and wrong
Exemption Law is Left to the States

- States are wrestling with how restrictive to be
- Only 15 states allow for personal belief exemptions
- Mississippi and West Virginia have had longstanding restrictions on all NMEs
- California eliminated all non-medical exemptions in 2014
- New York and Maine ended all NMEs in 2019
- Several other states are looking at removing all NMEs
Increase in Religious Exemptions After Vermont Eliminates PBEs in 2016

The chart shows a significant increase in religious exemptions starting in 2016, following Vermont's elimination of PBEs. The number of religious exemptions saw a sharp rise in 2016, with a steady increase throughout the following years.
Improved Kindergarten Immunization Rates in California After Passage of SB 277

Figure 1. Percentage of Kindergarten Students with All Required Immunizations, by School Type and School Year, 2011-2012 to 2017-2018
“Squeezing the Balloon” - Increase in Permanent Medical Exemptions in CA Kindergarten Students After Passage of SB 277

% with PMEs

School Year


All Public Private

5-8x ↑
Are Parents Getting Smarter at How to Get Their Child Exempt?

% with Required Immunizations by Series

- Orange: 1+Var
- Purple: 3+HepB
- Red: 3+Polio
- Green: 2+MMR
- Blue: 4+DTP

Year:
- 2011-12
- 2012-13
- 2013-14
- 2014-15
- 2015-16
- 2016-17
- 2017-18
MONDAY, Oct. 29, 2018 (HealthDay News) -- A handful of California doctors are making hay off anti-vaccine parents, charging hundreds of dollars to issue medical exemptions for required childhood vaccinations, a new study claims.

In 2015, California passed a law eliminating personal belief exemptions for vaccinations that kids must receive before they can attend public school.

In the years since, there's been a major increase in the number of medical exemptions issued by doctors for these required immunizations, researchers found.
California may toughen immunization rules to block measles

State Sen. Richard Pan, D-Sacramento, center, discusses his proposed measure to have public health officials grant medical exemptions for vaccination instead of leaving the power to physicians, during a news conference, Tuesday, March 26, 2019, in Sacramento, Calif. Opponents say the move is unnecessary because current law has already increased the vaccination rate. (AP Photo/Rich Pedroncelli)
California Law to Restrict Medical Vaccine Exemptions Raises Questions Over Control

Restricting vaccine exemptions has raised questions of whether the actions of many states like California have exceeded legal and ethical limits of power.

By Katherine Drabik

California passed a law on Sept. 9, 2019 designed to curb the number of medical exemptions issued for childhood vaccinations. Called SB 276, it restricts these exemptions from mandatory vaccines for children attending school and childcare facilities.
Compulsion vs “Nudges”

- Compulsion may not always be necessary nor the best or most effective means of achieving the goal
  - Dynamic between personal autonomy and the common good
Raising the Bar to Obtain the Exemption

Turn in a Form

Notary Signature

Complete an online education module

Require an MD signature
Percentage of Michigan Children with an Immunization Waiver, 2007-2017

Passed law requiring exempting parents to attend a PH educational session
**CERTIFICATE OF IMMUNIZATION**

**NORTH DAKOTA DEPARTMENT OF HEALTH**

**SFN 1020 (Revised 01-2018)**

<table>
<thead>
<tr>
<th>Vaccine Type</th>
<th>Exemption Type</th>
<th>Enter Month/Day/Year for Each Immunization Given</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
<td>Hepatitis B</td>
<td></td>
</tr>
<tr>
<td>Rotavirus</td>
<td>Rotavirus</td>
<td></td>
</tr>
<tr>
<td>Hb</td>
<td>Haemophilus influenza type B</td>
<td></td>
</tr>
<tr>
<td>PCV</td>
<td>Pneumococcus</td>
<td></td>
</tr>
<tr>
<td>DTapDTaPDT</td>
<td>Diphteria-Tetanus-Pertussis</td>
<td></td>
</tr>
<tr>
<td>IPV/OPV</td>
<td>Polio</td>
<td></td>
</tr>
<tr>
<td>MMR</td>
<td>Measles-Mumps-Rubella</td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td>Chickenpox</td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Hepatitis A</td>
<td></td>
</tr>
<tr>
<td>Td/Tdap</td>
<td>Tetanus-Diptheria (and Pertussis)</td>
<td></td>
</tr>
<tr>
<td>MCV4</td>
<td>Measles</td>
<td></td>
</tr>
</tbody>
</table>

**Statement of Exemption to Immunization Law**

In the event of an outbreak, exempted persons may be subject to exclusion from school or childcare facility.

- **Medical (Med) Exemption:** (Indicate vaccine above, requires physician signature) The physical condition of the above-named person is such that immunization would endanger life or health or is medically contraindicated due to other medical conditions.

- **History of Disease (HD) Exemption:** (Indicate vaccine above, requires physician signature) To the best of my knowledge, the above named person has had prior infection as indicated by prior diagnosis or laboratory confirmation.

**Physician Signature:**

**Date:**

- **Religious (Rel), Philosophical/Moral (PBE) Exemption:** (Indicate vaccine above, requires parental signature)

**Parent/Guardian Signature:**

**Date:**

*Medical = Med, History of Disease = HD, Religious = Rel, Philosophical/Moral = PBE*
MMR and DTaP Vaccination Rates in ND for Children Entering Kindergarten

Target for Optimal Herd Immunity

Sources: CDC Vaccine Coverage, North Dakota Department of Health
North Dakota’s Low Vaccination Rate Should Be a Mark of Statewide Shame

Over the weekend Robin Huebner published a very interesting look at the vaccination issue here in North Dakota.
Percent of Personal Belief Exemptions in ND Kindergarteners
(includes religious, moral, and philosophical exemptions)*

![Graph showing the percent of personal belief exemptions in ND kindergarteners from 2007-2008 to 2018-2019. The percent increases over the years.](image-url)
"Vaccine / Exemption Gap" in ND Kindergarteners MMR Immunization 2012

- Vaccinated: 88.9%
- Exempt: 1.9%
- Unknown: 9.2%
Marked Immunization Disparities Between Enforcing and Non-Enforcing Schools/School Districts in ND

Nonenforcing

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>% Kindergartners Fully Immunized</th>
<th>Nonenforcing</th>
<th>Enforcing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polio</td>
<td>96% (p &lt; 0.0001)</td>
<td></td>
<td>98%</td>
</tr>
<tr>
<td>DTaP</td>
<td>94% (p &lt; 0.0001)</td>
<td></td>
<td>96%</td>
</tr>
<tr>
<td>MMR</td>
<td>92% (p &lt; 0.0001)</td>
<td></td>
<td>94%</td>
</tr>
<tr>
<td>Hep B</td>
<td>90% (p = 0.0006)</td>
<td></td>
<td>92%</td>
</tr>
<tr>
<td>Varicella</td>
<td>88% (p = 0.0002)</td>
<td></td>
<td>90%</td>
</tr>
</tbody>
</table>

Findings:

• Vaccine/Exemption “Gap” - majority of unimmunized not explained by being exempt
  • Vaccinations just not done or documentation not provided
  • Most school officials did not enforce Century Code requirements for immunization
  • Schools that had principles and superintendents that enforced had very high immunization rates

• Legislators were very nervous about trying to introduce legislation to remove/restrict vaccine exemptions “Opening Pandora’s Box”

• Encouraged State’s Attorney to inform/enforce fines on schools that were not in compliance
Nearly 200 ND public school students without up-to-date vaccines sent home

By Ty Filley on Oct 5, 2018 at 7:58 a.m.
North Dakota kindergarten vaccinations rates continue to rise.

The North Dakota Department of Health's 2017-18 kindergarten immunization rates have remained at about 94 percent for all required vaccines, the department reported Thursday in a news release.

The Department of Health's goal is to get kindergarten vaccination rates to 95 percent. State health officials have worked with North Dakota State University's Center for Immunization Research and Education to increase rates that, in previous years, dipped below 90 percent.
MMR and DTaP Vaccination Rates in ND for Children Entering Kindergarten

Target for Optimal Herd Immunity

Sources: CDC Vaccine Coverage, North Dakota Department of Health
No Status (Vaccine-Exemption Gap)

Vaccinated or Exempt
Potential Reasonable Nudges in Right Direction

1. Close Vaccine/Exemption Gap by enforcing school entry laws already on books

2. Make exemptions harder to get than going to the doctor to get a vaccine
   - Parent must complete some annual public health education or counseling
   - Exemption must be signed by a provider that works in a vaccine-related field (i.e. not chiropractors, naturopaths, dermatologists etc.)

3. Conscience exemptions are available, but more restrictive
   - Must demonstrate consistency of belief and how it violates conscience (not that you don’t believe the science on safety and necessity)
   - Written or interview appeal to a Board or Tribunal that assesses conscience claims

4. Commensurate community obligation from objectors
   - Tax or community service to offset free-riding
CDC releases new list of vaccine side effects: old age, grey hair, top list

By SP Team on February 3, 2019
Any Questions?