The policy and epidemiology of mandates in the US & Europe

Saad B. Omer
Director, Yale Institute for Global Health
Reasons For Non-Vaccination Among Measles Cases
2000-2015

- Nonmedical exemptions: 349 (69%)
- Other: 156 (31%)

43% of all cases

Phadke et al. JAMA, 2016
Cumulative Epidemic Curve of 16 Measles Outbreaks
2000 - 2015, United States

Phadke et al. JAMA, 2016
Table 4. Likely Impact of Interventions to Increase Vaccination Coverage Based on Available Evidence

<table>
<thead>
<tr>
<th>Article section</th>
<th>Intervention</th>
<th>Likely impact</th>
<th>Especially effective when...</th>
<th>Amount of evidence</th>
<th>Amount of causal evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Messages that increase disease risk appraisals</td>
<td>○</td>
<td>People have low disease-risk appraisals or have become complacent about disease risk</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Education campaigns that increase confidence</td>
<td>○</td>
<td>People have low confidence that vaccination is effective and safe</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Decision aids</td>
<td>○</td>
<td>People initially do not agree to vaccination because they have questions</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Motivational interviewing</td>
<td>○</td>
<td>People initially express ambivalence about vaccination</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Descriptive norm messages</td>
<td>○</td>
<td>People are unsure or misunderstand what others are doing</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Social network interventions that build on contagion</td>
<td>○</td>
<td>People are at least minimally connected to a social network</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Messages that change altruism or free-riding motivation</td>
<td>○</td>
<td>People have low altruism or high free-riding motivation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2, 3, 4</td>
<td>Healthcare provider recommendations</td>
<td>●</td>
<td>People have favorable, ambivalent, or unfavorable intentions</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Presumptive healthcare provider recommendations</td>
<td>●</td>
<td>People have favorable or ambivalent intentions</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Reminders and recalls</td>
<td>○</td>
<td>People have favorable intentions but do not get vaccinated</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Implementation-intention interventions</td>
<td>○</td>
<td>People have favorable intentions but do not get vaccinated</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Mere-measurement interventions</td>
<td>○</td>
<td>People have favorable intentions but do not get vaccinated</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>On-site vaccination</td>
<td>●</td>
<td>People have favorable intentions but do not get vaccinated</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Default appointments</td>
<td>●</td>
<td>People have favorable intentions but do not get vaccinated</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Incentives</td>
<td>●</td>
<td>People have favorable, ambivalent, or unfavorable intentions</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Vaccination requirements</td>
<td>●</td>
<td>Vaccination rates are already high; most people affected by requirement support</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: Vacc = vaccination coverage; LMICs = low- or middle-income countries; ○ = little or no impact; ● = modest impact; ● ● = substantial impact; 0 = no evidence; 1 = some evidence; 2 = substantial evidence. Conclusions about evidence are based on consensus among authors who considered the available evidence, including the number of available studies, evidence for causal association, the quality of the studies, and the size of the effect. See the relevant section of the article for more information on the interventions.

Brewer et al., Psychol Sci Public Interest. 2017
School Immunization Requirements

State laws (not federal)

Major role in low rates of vaccine preventable diseases

3 types of exemptions allowed

1. Medical
2. Religious
3. Personal belief (philosophical)
School vaccine exemptions by state

Only 3 states have no vaccine exemptions

All states have medical exemptions. Missouri's philosophical exemption only applies to daycare, preschool and nursery school.

SOURCE: National Conference of State Legislatures
Ease of Obtaining Vaccine Exemptions –by State

Figure (with updated 2013 data) created by Mother Jones
Ease of Obtaining Vaccine Exemptions in the U.S. - by State

Exemption Policies & Whooping Cough Incidence, 1986-2004

<table>
<thead>
<tr>
<th>Exemption ease</th>
<th>Incidence Rate Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficult</td>
<td>Reference</td>
</tr>
<tr>
<td>Medium</td>
<td>1.35 (0.96-1.91)</td>
</tr>
<tr>
<td>Easy</td>
<td>1.53 (1.10-2.14)</td>
</tr>
</tbody>
</table>

Omer et al., New England Journal of Medicine, 2012
Omer et al., JAMA, 2006

Figure (with updated 2013 data) created by Mother Jones
Non-Medical Exemptions by Year

1991 - 2003
Nonmedical Exemptions for States With Religious Exemptions and With Personal Belief Exemptions

1991 - 2004

Only Religious Exemptions Permitted

Personal Belief Exemptions Permitted

Omer et al., Journal of American Medical Association, 2006

Data updated
Nonmedical Exemptions by Ease of Exemption 1991 - 2007

Easy Exemption Policy

Medium Exemption Policy

Difficult Exemption Policy

Omer et al., JAMA, 2006

Data updated
Mean (95% CI) Rates of Nonmedical Exemptions by Type of Exemption, 2006–2011

Omer et al., NEJM, 2012
Mean (95% CI) Rates of Nonmedical Exemptions by Ease of Exemption, 2006–2011

Omer et al., New Eng Journal of Medicine, 2012
Relative Locations of Pertussis Space-time Clusters & Exemptions Spatial Clusters

Overlap of Exemptions Clusters with Pertussis Clusters

Unadjusted OR

3.0 (2.5 – 3.6)

Adjusted OR

2.7 (2.2 – 3.3)

Omer et al., Am. J. Epi., 2008
Washington Exemption Law

• SB 5005
  • Educational counseling and signed form from a licensed (in WA) health care provider in order to obtain a nonmedical exemption

Law in effect July 22, 2011
Impact of Change in Washington Exemption Law

Omer et al., Pediatrics, 2017
WA State Counties’ School Entry Exemption Rates - 2006-2007

Omer et al., New Eng Journal of Medicine, 2009
Elimination of Nonmedical Immunization Exemptions in California & School-Entry Vaccine Status

Categories of California kindergarteners entering school not up-to-date on vaccinations.
Clusters of high not-up-to-date rates in California

Pingali et al., 2019, JAMA
Association of State Non-medical Exemption Policies With Medical Exemption Rates

Medical Exemptions /100,000

Non Medical Exemption Category

Difficult
Medium
Easy

Stadlin, Bednarczyk, Omer JID 2012
Parent reports to VAERS increased after introduction of SB277 in California

Hause at al., unpublished data
Reporting time increased after introduction of SB277 (parent reports)

Hause et al., unpublished data
Association Between Mandatory Vaccination Policies and Measles Vaccination Rates

Differences in Measles Vaccination Rates by Vaccine Policy

<table>
<thead>
<tr>
<th>Vaccine Policy</th>
<th>Percent Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory Vaccination*</td>
<td>+ 3.7 (1.7, 5.7)</td>
</tr>
<tr>
<td>Mandatory Vaccination without Non-Medical Exemptions*</td>
<td>+ 3.8 (1.2, 6.4)</td>
</tr>
<tr>
<td>Financial Penalty for Non-Compliance (per €500)*</td>
<td>+ 0.8 (0.5, 1.2)</td>
</tr>
</tbody>
</table>

*p-value < 0.01

Vaz et al., Pediatrics, In press
Association Between Mandatory Vaccination Policies and Pertussis Vaccination Rates

Difference in Pertussis Vaccination Rates by Vaccine Policy

<table>
<thead>
<tr>
<th>Policy</th>
<th>Percent Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory Vaccination*</td>
<td>+ 2.1 (0.3, 4.2)</td>
</tr>
<tr>
<td>Mandatory Vaccination without Non-Medical Exemptions</td>
<td>+ 2.1 (-1.7, 5.9)</td>
</tr>
<tr>
<td>Financial Penalty for Non-Compliance (per €500)*</td>
<td>+ 1.1 (1.0, 1.3)</td>
</tr>
</tbody>
</table>

Vaz et al., *Pediatrics, In press*

*p-value < 0.05*
Effects of potential legislative and administrative actions on vaccine up-to-date rates

Delamater et al., Unpublished
Sign a form that discusses the risks of non-vaccination

In-person counseling

Procedures to review each request for exemption

Letter elaborating on the reason their child should be exempt

Obtain the form by specifically requesting from the state or local health department, vs. downloading it online

Annual renewal
Acknowledgments
Thank You!

Yale Institute for Global Health