Reducing Barriers, Enforcing Standards, and Providing Incentives to Immunize

Institute of Medicine
National Vaccine Plan Meeting: Goal 4
July 24, 2008
Chicago, Illinois

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Immunization Services Division
National Center for Immunization and Respiratory Diseases, CDC
Topics

- Reducing barriers
- School immunization laws
- Other enforcement and incentives
- Discussion
Admittedly, preventive medicine is hard to sell. Therefore, all barriers to immunization must be removed.
Immunization Health Services
Research: Childhood Immunization

Moving away from blaming parents to fixing the system

Barriers, true and false
- True: complicated schedule, cost, missed opportunities
- False: Insufficient parental desire to vaccinate, no provider access

Proven interventions to reduce barriers
- Reminder/recall
- Reducing out-of-pocket costs
- AFIX
- And others

Effective state and local public health programs
- Public- and private-sector collaboration
- High coverage; disparities by race/ethnicity/poverty small or eliminated
VFC
vaccines for children
Vaccinating virtually all children requires enforcement.

**BEYOND BARRIERS**

**REDUCTION – SCHOOL IMMUNIZATION LAWS**
Roles of School Immunization Laws in the U.S. System (1)

- Provide only universal access point for U.S. children – no jurisdiction list of children exists in public health or medicine

- Assure vaccination of children at key ages and stages of vaccination

- Help catch up the “stragglers” whose parents may have forgotten one or more vaccinations
Roles of School Immunization Laws in the U.S. System (2)

- Prevent outbreaks of vaccine preventable diseases in school settings
- Can be used to identify geographic areas of low vaccination coverage
- Are effective independent of SES and “Weave vaccines into the fabric of society”
- Are a lighting rod for controversy
School Laws Are Effective

- Disease reduction; outbreak prevention
- Increasing coverage among school children and adolescents
- Increasing coverage among preschool children!
Role of School Law Exemptions

- Schools have access to all children, but not all children can be vaccinated.
- Exemptions allow school participation (which is also legally required) for those unable to be vaccinated.
- Exemptions serve as an “escape valve” for school laws.
Types of Exemptions

$ Medical
  - Child on chemotherapy (temporary)
  - Child with immune deficiency (permanent)

$ Religious

$ Philosophical

$ Vaccination in-progress (temporary)
## School Entry Exemptions Allowed: 2007-2008

<table>
<thead>
<tr>
<th>Exemption Type</th>
<th># States + DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical, temporary or permanent</td>
<td>51</td>
</tr>
<tr>
<td>Medical, permanent</td>
<td>46</td>
</tr>
<tr>
<td>Medical, temporary</td>
<td>44</td>
</tr>
<tr>
<td>Religious or philosophical</td>
<td>49</td>
</tr>
<tr>
<td>Philosophical</td>
<td>18</td>
</tr>
<tr>
<td>Religious</td>
<td>48</td>
</tr>
</tbody>
</table>

Source: CDC, Assessment Branch. Childcare and school vaccination requirements, 2007-2008
When it comes to school laws,

**IMPLEMENTATION MATTERS**

Note. The proportion of exemptions filed for a state was based on the percentage of school entrants claiming exemptions in school surveys (see inset). Complexity level 1 corresponds to the simplest procedure (signing a school immunization form), whereas complexity level 3 involves the most requirements to obtain an exemption. The association between the percentage of exemptions claimed and the complexity of obtaining an exemption was significant (P=.0167, χ² test).
Nonmedical Exemptions by Ease of Exemption
1991 - 2004

Easy Exemption Policy | Medium Exemption Policy | Difficult Exemption Policy

Omer, Pan, Halsey et al., JAMA, 2006
Nonmedical Exemptions for States With Religious Exemptions and With Personal Belief Exemptions -1991 - 2004

Only Religious Exemptions Permitted

Personal Belief Exemptions Permitted

Omer, Pan, Halsey et al., JAMA, 2006
Adding Philosophical Exemptions

Increased Exemptors

Figure 1. Number of Arkansas students requesting immunization exemptions by type. Exemptions include all students reported to Arkansas Division of Health who attended daycare, pre-K programs, K through 12th grades, and colleges/universities.

# Impact of Exemptions on Disease Transmission

<table>
<thead>
<tr>
<th>Location</th>
<th>Impact Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>22.2 times more likely to acquire measles +</td>
</tr>
<tr>
<td></td>
<td>5.9 times more likely to acquire pertussis +</td>
</tr>
<tr>
<td></td>
<td>At least 11% of vaccinated children acquired measles from contact with an exemption +</td>
</tr>
<tr>
<td>National</td>
<td>Exemptors 35 times more likely to acquire measles ++</td>
</tr>
</tbody>
</table>

*Felkin DR et al. JAMA 2000; 284:3145-3150  
Salmon DA et al. JAMA 1999; 282 47-53*
Evidence of Disease Clusters and Exemption Clustering

- New study by Omer et al.
- Identified 23 clusters of high exemption rates
- Identified 6 clusters of high pertussis rates
- Odds ratio of census tract exemption clusters to be in pertussis clusters was 3.0, with confidence interval of 2.5 – 3.6
FIGURE. Number of reported measles cases* (N = 64) — United States, January 1–April 25, 2008

* Number of preliminary confirmed cases reported to CDC as of April 25, 2008.
Exemptors and Exemptors’ Health Care Providers

- Exemptors’ parents health beliefs differ **markedly** from vaccinated children’s parents health beliefs.

- Exemptors’ providers attitudes toward vaccination differ **modestly** from non-exemptors’ providers.
### Selected Differences Between Parents of Exempt and Non-exempt Children

<table>
<thead>
<tr>
<th>Statement</th>
<th>% exemptors</th>
<th>% non-exemptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaken children’s immune system</td>
<td>80%</td>
<td>32%</td>
</tr>
<tr>
<td>Better to be immune by being sick</td>
<td>51%</td>
<td>11%</td>
</tr>
<tr>
<td>Healthy children do not need immunizations</td>
<td>26%</td>
<td>2%</td>
</tr>
<tr>
<td>Immunizations do more harm than good</td>
<td>34%</td>
<td>4%</td>
</tr>
<tr>
<td>Freedom of choice critical</td>
<td>51%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Survey of 277 children with non-medical exemptions in Colorado, Massachusetts, Missouri and Washington and matched controls

Research Paper

Vaccine knowledge and practices of primary care providers of exempt vs. vaccinated children

Daniel A. Salmon,1,2 William K.Y. Pan,2 Saad B. Omer,1,2 Ann Marie Navar,2,3 Walter Orenstein,4 Edgar K. Marcuse,5 James Taylor,6 M. Patricia deHart,7 Shannon Stokley,8 Terrell Carter9 and Neal A. Halsey1,2,*

1Institute for Vaccine Safety; and 2Department of International Health; Johns Hopkins Bloomberg School of Public Health; Baltimore, Maryland USA; 3Duke University; School of Medicine; Durham, North Carolina USA; 4Emory University; College of Medicine; Atlanta, Georgia USA; 5Children’s Hospital and Medical Center; Seattle, Washington USA; 6University of Washington; Child Health Institute; Seattle, Washington USA; 7Washington State Department of Health; Immunization Program; Olympia, Washington USA; 8Centers for Disease Control and Prevention; National Center for Immunization and Respiratory Diseases; Atlanta, Georgia USA; 9The PATH Malaria Vaccine Initiative; Seattle, Washington USA

Abbreviations: PHCP, primary health care provider; CAM, complementary or alternative medicine; VIS, vaccine information statement

Key words: vaccines, primary care providers, parents, exemptions, school immunizations

Objectives: Compare vaccine knowledge, attitudes and practices of primary care providers for fully vaccinated children and children who are exempt from school immunization requirements.

Introduction

Immunizations have been remarkably successful in preventing...
As exemptions increase in clusters, outbreak risk increases and community protection declines.

How do communities reduce exemption rates while maintaining public support for school immunization laws?

- Evaluation of state practices to identify effective strategies could help
- Want to assure that an exempting parent makes that decision knowing its full implications
Although weaker than “no shots, no school” …

ADULT MANDATES AND INCENTIVES CAN MAKE A DIFFERENCE
I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, **at no charge to myself**. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.
FIGURE 2.  Hepatitis B vaccination coverage levels among healthcare workers, by job category and age group.
Table 2. Number of states with administration laws, by population and type of vaccine specified

<table>
<thead>
<tr>
<th>Vaccine type</th>
<th>Healthcare workers&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Patients/residents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Offer</td>
<td>Ensure</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Influenza</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Measles/mumps/rubella</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Varicella</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Routine/age-appropriate immunizations&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Overall number of states with law&lt;sup&gt;c&lt;/sup&gt;</td>
<td>21</td>
<td>15</td>
</tr>
</tbody>
</table>
HEDIS and Other Incentives

- **HEDIS**: measurement and feedback make a difference

- **Pay for Performance**

- **CMS**
  - Offering as condition of participation
  - Measuring nursing home coverage
Knowledge Gaps

How to move weave adult vaccinations into the fabric of society
- Health care professionals
- Workforce

How to balance barrier reduction, incentives, and enforcement for adults given the constrained public sector resources
DISCUSSION
Monitoring School Enterer
Coverage is Important

Table 1. Number and percentage of states* reporting ≥90% and ≥95% vaccination coverage among children enrolled in kindergarten, by vaccine — United States, 2006–07 school year

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>No. of states reporting</th>
<th>States reporting ≥90% coverage</th>
<th>States reporting ≥95%† coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polio</td>
<td>50</td>
<td>47 (94)</td>
<td>40 (80)</td>
</tr>
<tr>
<td>DTP/DTaP/DT§</td>
<td>50</td>
<td>47 (94)</td>
<td>38 (76)</td>
</tr>
<tr>
<td>MMR†</td>
<td>50</td>
<td>46 (92)</td>
<td>35 (70)</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>42</td>
<td>40 (95)</td>
<td>35 (83)</td>
</tr>
<tr>
<td>Varicella</td>
<td>43</td>
<td>40 (93)</td>
<td>32 (74)</td>
</tr>
</tbody>
</table>

*Includes District of Columbia.
†Healthy People 2010 vaccination coverage objective is ≥95% for children in kindergarten.
§Diphtheria and tetanus toxoids and pertussis vaccine, diphtheria and tetanus toxoids and acellular pertussis vaccine, or diphtheria and tetanus toxoids vaccine.
‖Measles, mumps, and rubella.

MMWR 2007; 56(32):819
Measles in 6 States Strictly Enforcing School Laws vs. Other States*

<table>
<thead>
<tr>
<th></th>
<th>Measles incidence †</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1975-76</td>
</tr>
<tr>
<td>6 states</td>
<td>47.0</td>
</tr>
<tr>
<td>Other states</td>
<td>50.4</td>
</tr>
</tbody>
</table>

* MMWR 1978; 27:303-4
† per 100,000 < 18 years
‡ 1st 31 weeks
Table 6. Differences in state immunization laws and enforcement in areas with high and low incidence of measles \(^a\)

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of areas</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Statewide laws</td>
<td>12 (92%)</td>
<td>9 (90%)</td>
</tr>
<tr>
<td>Mean duration of existence</td>
<td>6.4 yr</td>
<td>6.8 yr</td>
</tr>
<tr>
<td>Covers school entry</td>
<td>12 (92%)</td>
<td>9 (90%)</td>
</tr>
<tr>
<td>Covers all grades(^b)</td>
<td>6 (46%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>School exclusion(^b) enforced</td>
<td>10 (77%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>


\(^b\) Significant difference \(p < 0.025\).

Hepatitis B Coverage Following 7th Grade School Entry Requirement, San Diego*

*Using parent-held vaccination record

TABLE 1. Percentage of students in compliance with the California seventh grade vaccination law and antigen-specific coverage with hepatitis B vaccine (HepB) and measles-containing vaccine (MCV) — California, 1999–2000 and 2000–2001 school years

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>October 1999*</th>
<th>February–April 2000†</th>
<th>October 2000*</th>
<th>February–April 2001†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliant with law</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Doses HepB and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Doses MCV</td>
<td>65.1%</td>
<td>87.2%</td>
<td>69.5%</td>
<td>87.7%</td>
</tr>
<tr>
<td>Exemption</td>
<td>1.6%</td>
<td>2.7%</td>
<td>1.5%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Medical</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Personal</td>
<td>1.4%</td>
<td>2.5%</td>
<td>1.3%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Not compliant</td>
<td>33.3%</td>
<td>10.0%</td>
<td>29.1%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Individual vaccine coverage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Doses HepB</td>
<td>70.6%</td>
<td>89.9%</td>
<td>73.2%</td>
<td>91.4%</td>
</tr>
<tr>
<td>2 Doses MCV</td>
<td>91.4%</td>
<td>96.5%</td>
<td>95.3%</td>
<td>96.4%</td>
</tr>
</tbody>
</table>

*State Mandated Immunization Survey.
† State School Selective Review.
Effect of State Middle School Vaccination Requirements on Coverage in 9\textsuperscript{th} Grade, Kansas City (Missouri and Kansas), 2002

<table>
<thead>
<tr>
<th></th>
<th>Missouri</th>
<th>Kansas</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMR #2*</td>
<td>81%</td>
<td>97%</td>
<td>NS</td>
</tr>
<tr>
<td>Tetanus†</td>
<td>48%</td>
<td>27%</td>
<td>NS</td>
</tr>
<tr>
<td>Hepatitis B‡</td>
<td>73%</td>
<td>19%</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

\* Both states have K entry requirements (KS effective 1992; MO effective 1994)
† Both states have requirements for 10 years after the last dose (KS effective 1991; MO effective 1993)
‡ Only Missouri has requirement (7\textsuperscript{th} grade, effective 1999)

Philosophical Exemptions Are Associated with More Exemptors

### TABLE 1—Study Populations, by State, and Proportions of Exemptions

<table>
<thead>
<tr>
<th>State</th>
<th>Respondents, No. (%)</th>
<th>Proportion of Exemptions in Participating Schools</th>
<th>State-Reported Proportion of Exemptions*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Quartile</td>
<td>Median Quartile</td>
</tr>
<tr>
<td>State does not permit philosophical exemption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massachusetts</td>
<td>161 (27.0)</td>
<td>0.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Missouri</td>
<td>153 (25.8)</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>State permits philosophical exemption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado</td>
<td>137 (23.0)</td>
<td>1.0</td>
<td>4.5</td>
</tr>
<tr>
<td>Washington</td>
<td>135 (22.8)</td>
<td>1.3</td>
<td>6.6</td>
</tr>
<tr>
<td>Not identified</td>
<td>8 (1.4)</td>
<td>1.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Total</td>
<td>594 (100.0)</td>
<td>0.3</td>
<td>1.7</td>
</tr>
</tbody>
</table>

*Data were derived from school reports submitted to state health departments and were determined by summing the exemptions for all schools and dividing by the total school population.
1. School and child care immunization requirements must be used sparingly, approached cautiously, and considered only after an appropriate vaccine implementation period. This vaccine implementation period is critical to ensure that

2. Vaccine mandates must be evaluated carefully, including their epidemiologic, economic, and ethical concerns. Inappropriate application of mandates risks loss of support for immunization programs and reversal of policy and program gains.

3. School and child care requirements for any vaccine must be pursued through existing state processes. Legislators, advocates, consumer groups, manufacturers, and others interested in pursuing school and child care immunization requirements should first contact the state health agency immunization program. Most states have a process in place to add new vaccines to

4. Measures to add or alter exemptions to immunization requirement laws and regulations for school and child care must be carefully coordinated with state immunization policy and goals. Most states allow religious exemptions from

Available at www.immunizationmanagers.org
Drug firm pushes vaccine mandate

Merck lobbies Md. on HPV preventive

By Laura Smitherman sun reporter
January 29, 2007

Just a few months after federal regulators approved a vaccine against a sexually transmitted virus that causes cervical cancer, more than a dozen states - including Maryland - are considering a requirement that girls entering middle school get it.

One of the primary drivers behind the legislative push: Merck & Co., the pharmaceutical giant that manufactures Gardasil, the only vaccine for human papillomavirus, or HPV, on the market.

The vaccine is expected to reach $1 billion in sales next year, and state mandates could make Gardasil a mega-blockbuster drug within five years, with sales of more than $4 billion, according to Wall Street analysts.
Merck to Halt Lobbying for Vaccine for Girls

By ANDREW POLLACK and STEPHANIE SAUL
Published: February 21, 2007

Reacting to a furor from some parents, advocacy groups and public health experts, Merck said yesterday that it would stop lobbying state legislatures to require the use of its new cervical cancer vaccine.

The company said it made the decision after realizing that its lobbying campaign had fueled objections across the country that could undermine adoption of the vaccine.

At least 20 states are considering making its use mandatory for schoolgirls, and the governor of Texas, Rick Perry, has already done so by executive order. Part of the states’ rush
More than 3,000 county students still need vaccinations

by Dennis Carter | Staff Writer

About 3,300 students in Prince George’s will be banned from county schools if they fail to get vaccinations for hepatitis B and chickenpox by Sept. 21.

The two vaccination requirements, a result of state legislation passed last year, took effect Jan. 2. At
The Onondaga County Health Department is warning parents about required shots of kids. Hundreds of sixth graders in Onondaga County still have not received their Tdap vaccine. According to state law, students have until two weeks after the first day of school to get the vaccine. For many students, that deadline is approaching in the next few days. Without the vaccine, hundreds of students might be excluded from school.
Tdap protects against tetanus, diptheria, and pertussis, or whooping cough. Onondaga County Health Commissioner Cynthia Morrow says "Over the past several years, pertussis has been a
Recommended vaccines received

Survey of 277 children with non-medical exemptions in Colorado, Massachusetts, Missouri and Washington

Impact of School Entry Laws on Preschool Coverage Rates

- Analysis of 2002 NIS with varicella vaccination as outcome

- Logistic regression model
  - School entry laws
  - Household and child demographics

- Results
  - Higher coverage if school law present: 83% vs 77%
  - Strongest UTD predictor in multivariate analysis

- First direct evidence of positive impact of school laws on preschool vaccination coverage

Davis MM, Gaglia MA. Vaccine 2005 online at www.elsevier.com/locate/vaccine
School Immunization Laws ...

- Are legal requirements that children have received certain vaccinations as a condition of participation in school ("no shots, no school")
- Are all state and local laws (no federal school vaccination requirements exist for children)
- Are specific for grades and vaccines
- Vary by markedly by state
Recommended vaccines not received

Survey of 277 children with non-medical exemptions in Colorado, Massachusetts, Missouri and Washington

## Critical Differences Between Exempt and Non-Exempt Children - II

<table>
<thead>
<tr>
<th></th>
<th>% exemptors</th>
<th>% non-exemptors</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vaccines one of safest medicines</strong></td>
<td>11%</td>
<td>44%</td>
<td>0.16</td>
</tr>
<tr>
<td><strong>Immunizations getting better and safer</strong></td>
<td>27%</td>
<td>68%</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Vaccines strengthen immune system</strong></td>
<td>14%</td>
<td>52%</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Immunization requirement protect against disease from unvaccinated children</strong></td>
<td>39%</td>
<td>78%</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Survey of 277 children with non-medical exemptions in Colorado, Massachusetts, Missouri and Washington and matched controls

WA State Counties’ School Entry Exemption Rates 2005-2006

Statewide Total: 5.1%
San Diego County Personal Belief Exemption Rates by School District: 2007

Adapted from a map created by Kimberly Ralston (2008) with data from County of San Diego HHSA Public Health Services and CDPH Kindergarten Assessment 2007
No Shots, No School

Keeping students in Broward's public schools safe from infectious diseases is very important. Students must have the proper immunizations. The following is a guide as to what immunizations required immunizations for religious or other reasons - parents should contact the Health Education 754-321-2272 for more information.

Forms:
The proper form needed to document a student's immunization history is the Department of health

Minimum Required Immunizations:

Vaccine

- Diphtheria Tetanus Pertussis (DTP) 5 doses
  If 4th dose was given on or required

From [http://www.browardschools.com/info/shots.htm](http://www.browardschools.com/info/shots.htm)
Requiring Vaccinations for Child Care, School, and College Attendance is Recommended to Increase Coverage with Universally Recommended Vaccines

Despite the availability of safe and effective vaccines and substantial progress in reducing vaccine-preventable diseases, continuing efforts are needed to achieve or maintain high levels of vaccination coverage and low rates of vaccine-preventable disease. Low vaccine coverage (the proportion of the target population that is vaccinated) may be the result of low community demand for vaccines, lack of access to vaccination services, or system- or provider-related factors.

A systematic review of published studies, conducted on behalf of the Task Force on Community Preventive Services by a team of subject matter specialists and other scientists, found that requiring vaccinations for child care, school, and college attendance is effective in increasing community demand for vaccinations. Based on the strong evidence of effectiveness found in this review, the Task Force recommends implementation of this intervention.

Background on the Interventions

- These laws or policies require vaccinations or other proof of immunity before someone can attend school.

Findings from the Systematic Review

- 3 studies that specifically looked for changes in vaccine coverage showed a median improvement of 15 percentage points.
- Vaccination requirements are effective in improving vaccination coverage and immunity and/or reducing rates of vaccine-preventable disease.
- The available studies did not allow for evaluation of how differences in specific state laws affected the usefulness of this approach.