Vaccine Hesitancy: Challenges and Solutions

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Disclosures

- I have no financial relationship with the manufacturer of any commercial product discussed in this activity

- All recommendations are in accordance with recommendations from the AAP, AAFP, ACP and ACIP

A mother of an infant comes to your practice and says that she does not want to immunize her infant. She says that vaccines are not safe and she is not going to administer them. What would you do?

1. Dismiss her from your practice
2. Tell her firmly that vaccines are safe and have been tested extensively
3. Listen to her concerns and address her specific questions
4. Tell her that the autism-measles link has been debunked and that her concerns are misplaced
5. Tell her to look on the internet about vaccines

A 75 year old man with heart disease refuses to be immunized with influenza vaccine. How would you respond?

1. Dismiss him from your practice
2. Talk about the impact of influenza disease on patients with heart disease
3. Tell him forcefully that influenza vaccine does not give him influenza
4. Tell him to look on the internet about influenza vaccine
5. Tell him to get the live attenuated influenza vaccine

Objectives

- 1. To understand the major reasons why parents decline vaccination for their children and adults decline vaccine for themselves
- 2. To recognize the central role that health care providers play in promoting vaccinations
- 3. To review approaches that have been associated with increased vaccine acceptance

Comparison of Maximum and Current Reported Vaccine-Preventable Diseases, United States

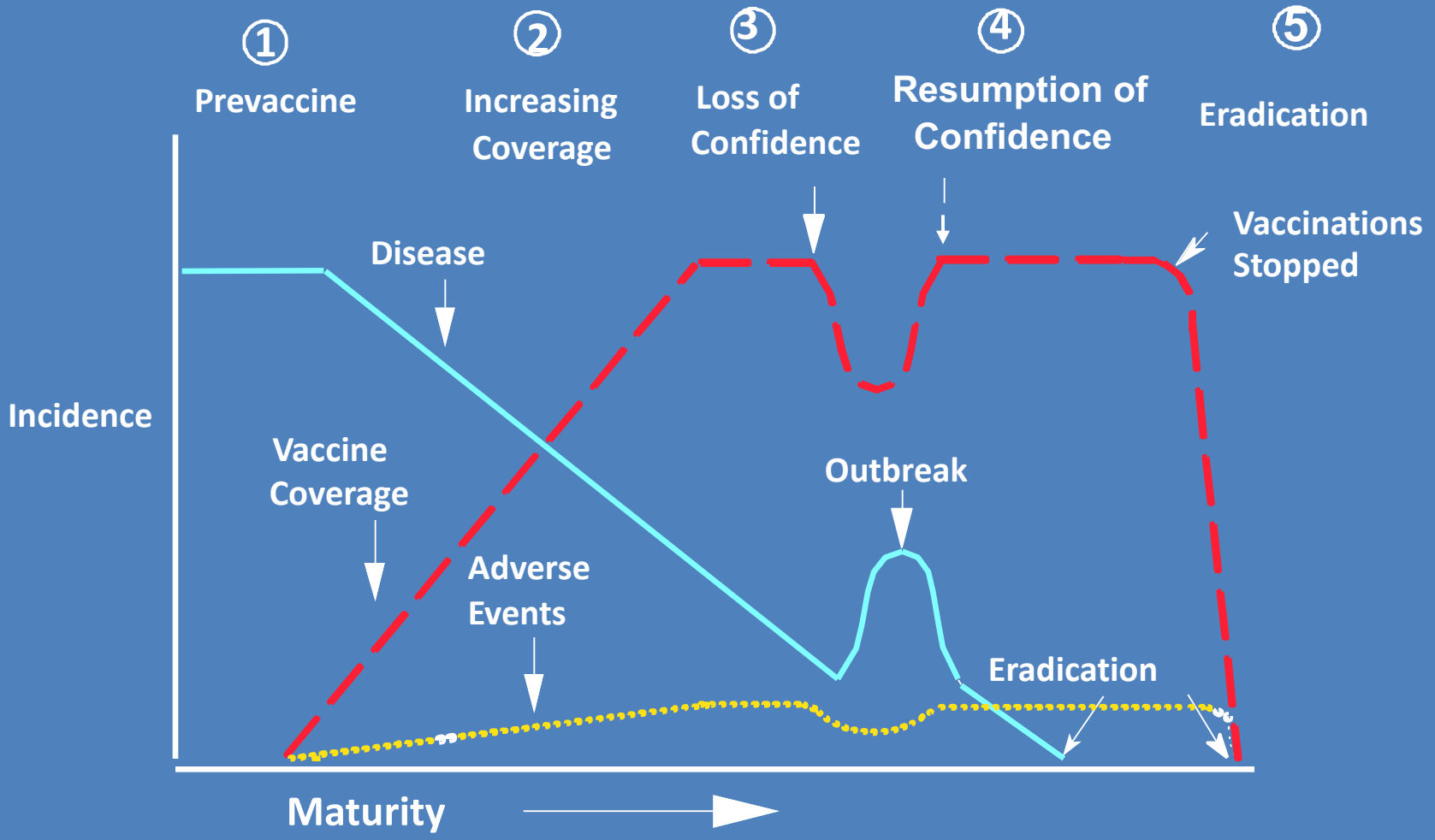
Disease	Pre-vaccine Era*	2000	% change
Diphtheria	31,054	1	-99
Measles	390,852	86	-99
Mumps	21,342	338	-99
Pertussis	117,998	7,867	-93
Polio (wild)	4,953	0	-100
Rubella	9,941	176	-98
Congenital Rubella	19,177	9	-99
Tetanus	1,314	35	-97
Hib Disease	24,856	112	-99
Total	566,706	8,624	-98

* Maximum cases reported in pre-vaccine era

\+ Estimated because no national reporting existed in the prevaccine era

Historical Perspective

Evolution of a Vaccine Program



Vaccine hesitancy

Definition of WHO Sage Group

A behaviour, influenced by a number of factors including issues of **confidence** [do not trust vaccine or provider], **complacency** [do not perceive a need for a vaccine, do not value the vaccine], and **convenience** [access]. Vaccine-hesitant individuals are a heterogeneous group who hold varying degrees of indecision about specific vaccines or vaccination in general. Vaccine-hesitant individuals *may accept* all vaccines *but remain concerned* about vaccines, some may refuse or delay some vaccines, but accept others; some individuals may refuse all vaccines.

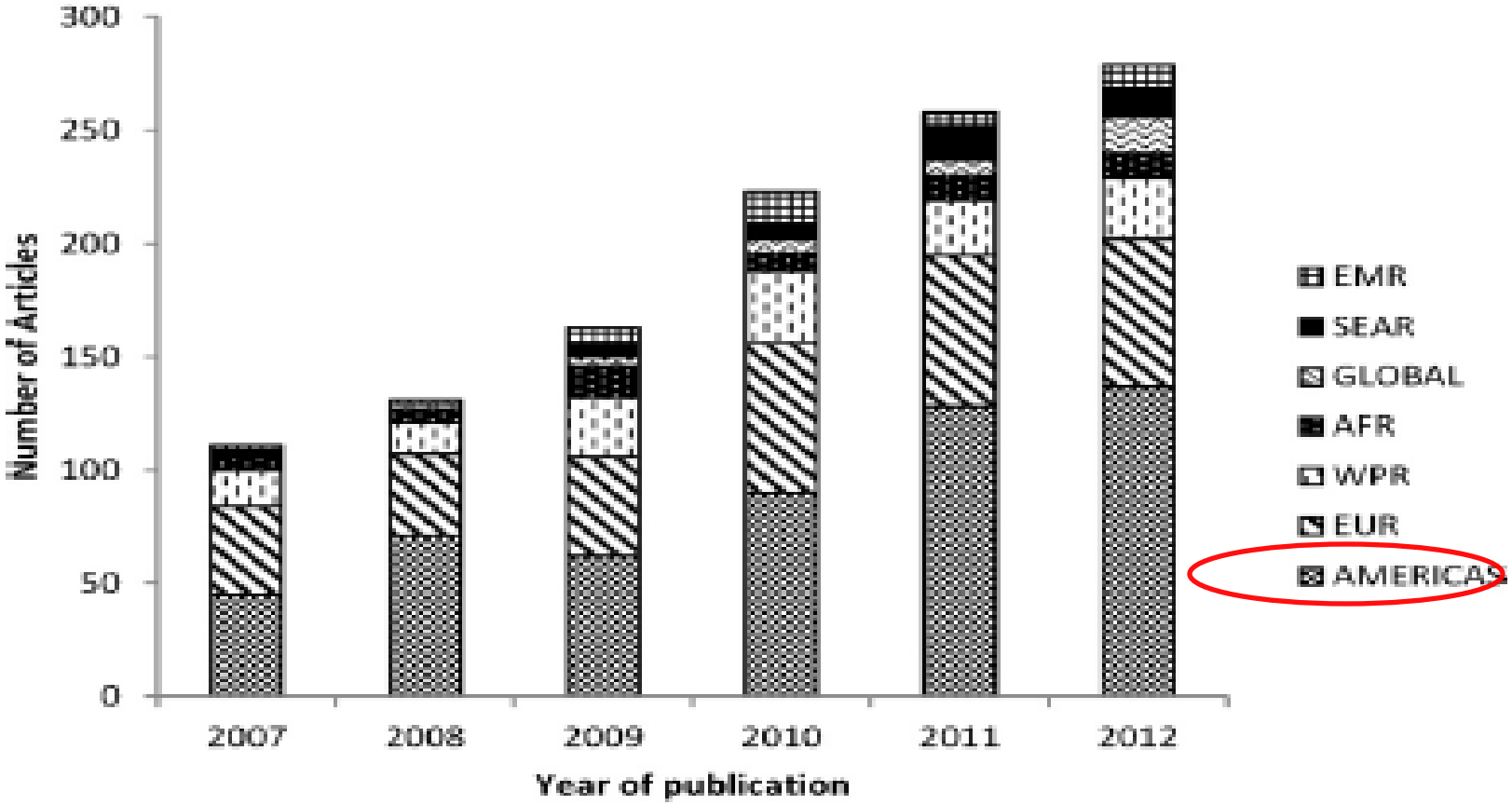
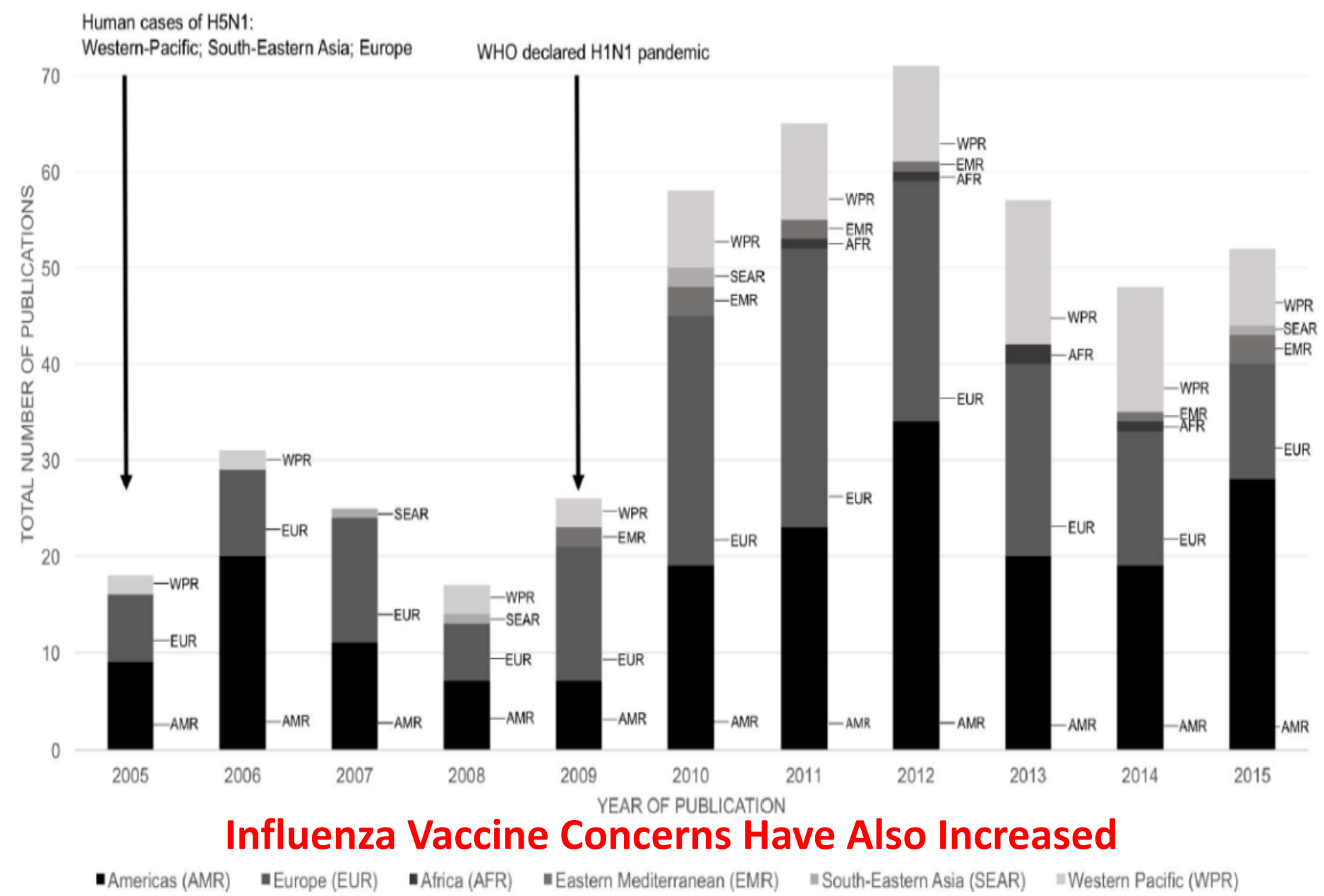


Fig. 3. Articles about vaccine and vaccination hesitancy by year [2007–2012] and WHO region [n – 1164].
NB: Numbers of articles (left axis) exceed the total number of articles reviewed as some articles discuss more than one region. Data is non-cumulative.

Vaccine concerns are not new, but have increased in the past decade



Influenza Vaccine Concerns Have Also Increased

Fig 3. Total number of multivariate studies about influenza vaccine hesitancy by year of publication (2005–2015) and region (N = 470).

PLOS ONE | DOI:10.1371/journal.pone.0170550 January 26, 2017

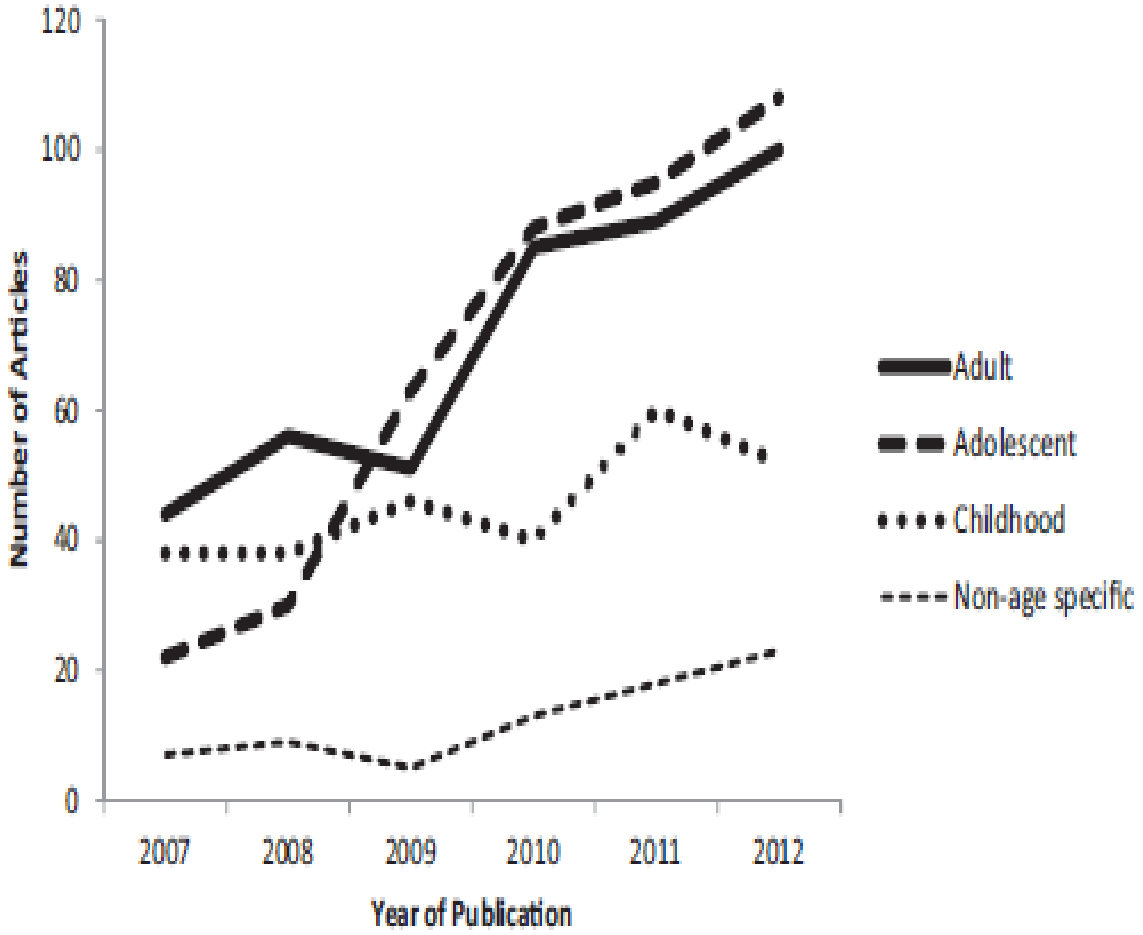


Fig. 4. Articles about vaccine and vaccination hesitancy by age between 2007 and 2012 ($n = 1164$). NB: Data is non-cumulative.

Concerns about adolescent/adult vaccines even more common

TABLE 3 Proportions of Vaccines Refused, Delayed Beyond Recommended Age, or Provided Over Prolonged Dosing Intervals, as Reported by Parents Who Use Alternative Vaccination Schedules

Vaccine	Proportion of Parents, %[a]		
	Refused This Vaccine[b]	Delayed This Vaccine to Age Older Than Recommended[c]	Provided Doses of This Vaccine Over Prolonged Dosing Interval[d]
H1N1	86	34	13
Seasonal influenza	76	35	13
Varicella	46	44	22
Rotavirus	44	16	17
Pneumococcal conjugate	31	10	33
Hepatitis B	28	31	29
Measles-mumps-rubella	26	54	45
Hepatitis A	24	24	13
Haemophilus influenzae type b	15	17	21
Diphtheria-tetanus-acellular pertussis	6	24	43
Polio	6	16	32

[a] Weighted proportions. Parents could select >1 vaccine, therefore, responses do not sum to 100%.

[b] Among parents who reported refusing some vaccines (unweighted $N = 60$).

[c] Among parents who reported delaying some vaccines (unweighted $N = 63$).

[d] Among parents who reported allowing a longer time interval between vaccine doses (unweighted $N = 36$).

Refusal rates differ for various vaccines

Dempsey et al. Pediatrics 2011

Demographics of Parents Who Refuse Vaccines

Table 2
Demographics of Study Population ($N = 502$)[a].

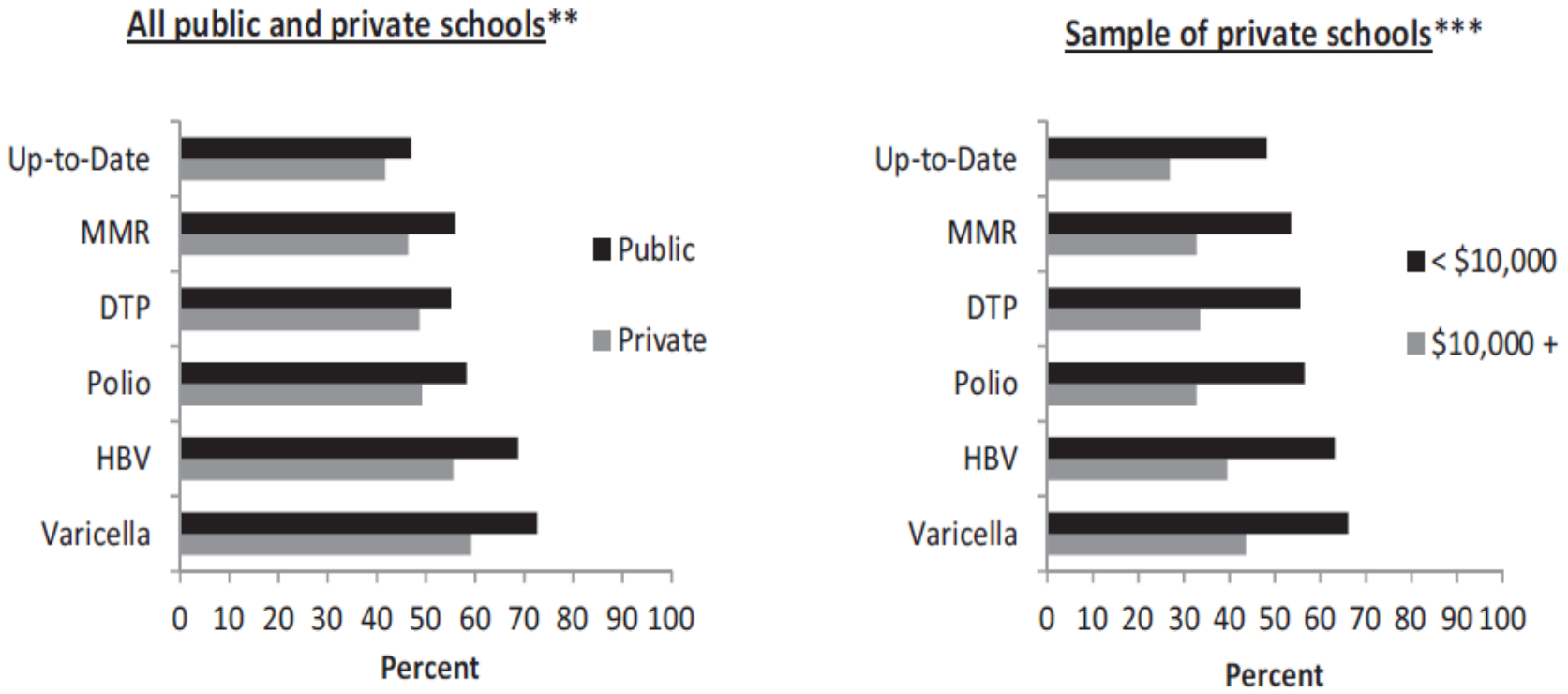
Demographic Characteristics	N (%)
Parent Age (years)	
≥30	344 (72)
Parent's marital status	
Married or living with a partner	448 (93)
Parent Education	
Some college/2 year degree or more	441 (92)
Household Income	
>$75,000	327 (70)
Parent race/ethnicity	
Non-Hispanic white	301 (63)
Black or African American	15 (3)
Hispanic/Latino	17 (4)
Asian	73 (15)
Native Hawaiian or other Pacific Islander	5 (1)
American Indian or Alaska Native	1 (<1)
Other or more than one race/ethnicity	66 (14)
Number of children in household	
1	207 (43)
Mean child age (months)	9.1

[a] Numbers do not equal total N because of missing data.

D.J. Opel et al. / Vaccine 31 (2013) 4699–4701

Proportion of California kindergartens with 95% coverage of each vaccine requirement and up-to-date status*, 2014–2015.

L.-A. McNutt et al. / Vaccine 34 (2016) 1733–1738



Vaccine Coverage Lower in Private Schools with High Tuition

Vaccine Delays, Refusals, and Patient Dismissals: A Survey of Pediatricians

Catherine Hough-Telford, MD,[a] David W. Kimberlin, MD,[a] Inmaculada Aban, MS, PhD,[a] William P. Hitchcock, MD,[b,†] Jon Almquist, MD,[c] Richard Kratz, MD,[d] Karen G. O'Connor, BS[e]

RESULTS: The proportion of pediatricians reporting parental vaccine refusals increased from 74.5% in 2006 to 87.0% in 2013 ($P < .001$). Pediatricians perceive that parents are increasingly refusing vaccinations because parents believe they are unnecessary (63.4% in 2006 vs 73.1% in 2013; $P = .002$). A total of 75.0% of pediatricians reported that parents delay vaccines because of concern about discomfort, and 72.5% indicated that they delay because of concern for immune system burden. In 2006, 6.1% of pediatricians reported "always" dismissing patients for continued vaccine refusal, and by 2013 that percentage increased to 11.7% ($P = .004$).

To cite: Hough-Telford C, Kimberlin DW, Aban I, et al. Vaccine Delays, Refusals, and Patient Dismissals: A Survey of Pediatricians. *Pediatrics*. 2016;138(3):e20162127

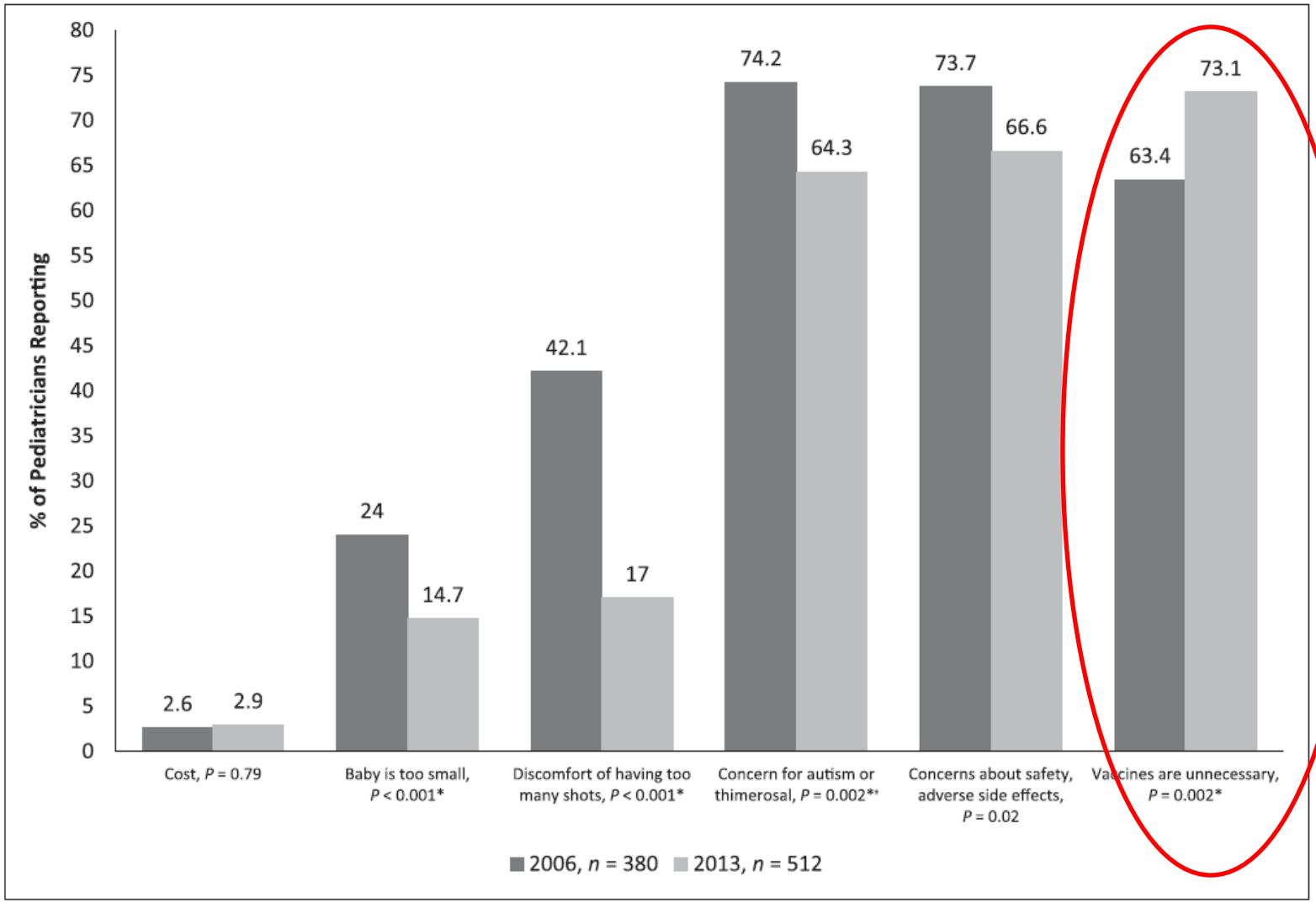


FIGURE 1

Change in pediatrician perceptions of parental reasons for vaccine refusals between 2006 and 2013. A total of 62 of the 442 respondents who experienced refusals in 2006 and 11 of the 523 in 2013 did not provide reasons for refusal. Reasons for refusal that were consistent between survey years are listed in the figure. *Ps <.0083 are considered significant. † In 2013, questions were asked separately about parental concerns for thimerosal and autism; in 2006 these questions were combined.

To cite: Hough-Telford C, Kimberlin DW, Aban I, et al. Vaccine Delays, Refusals, and Patient Dismissals: A Survey of Pediatricians. *Pediatrics*. 2016;138(3):e20162127

Parental Vaccine Safety Concerns in 2009

Gary L. Freed, Sarah J. Clark, Amy T. Butchart, Dianne C. Singer and Matthew M. Davis

Pediatrics 2010;125;654; originally published online March 1, 2010;

TABLE 2 Parental Perspectives on Vaccines

Perspective	% That Strongly Agreed or Agreed With Statement
Getting vaccines is a good way to protect my child(ren) from disease.	90
Generally I do what my doctor recommends about vaccines for my child(ren).	88
I am concerned about serious adverse effects of vaccines.	54
New vaccines are recommended only if they are as safe as older vaccines.	51
Parents should have the right to refuse vaccines that are required for school for any reason.	31
Some vaccines cause autism in healthy children.	25
My child(ren) does(do) not need vaccines for diseases that are not common anymore.	11

Motivators and barriers to vaccination of health professionals against seasonal influenza in primary healthcare

Table 2 Reasons FOR influenza vaccination in the 2014/15 season

Reasons for vaccination	*n* = 30	%
As a health professional, I belong to the risk group for infection	25	83.3
Self-protection against influenza	21	70.0
Protection of family members, co-workers	18	60.0
Protection of patients	14	46.7
My employer offers free vaccination against seasonal influenza	11	36.7
Easy access to vaccine or vaccination	11	36.7
Age over 50 years	8	26.7
I have a chronic illness	2	6.7

Table 3 Reasons AGAINST influenza vaccination in the 2014/15 season

Reasons against vaccination	*n* = 220	%
I do not belong to the influenza infection risk group	83	37.7
I have doubts in the effectiveness of the vaccine	82	37.3
Because of the adverse effects of the vaccine	67	30.5
Lack of time	15	6.8
I do not have sufficient information on the benefits of the vaccination and the consequences of the disease	8	3.6
Financial reasons	6	2.7
I am allergic to one of the components of the vaccine	4	1.8
Poor vaccine availability	0	0.0

Petek and Kamnik-Jug *BMC Health Services Research* (2018) 18:853

Medical Information on the Internet

- 80% of American Internet users, or 59% of American adults, seek health information online
- 70% say what they found influenced their treatment decisions
- 97% of the time, online information seekers examine only the first 10 search results
- Anti-vaccine sites are returned in web searches just as often as pro-vaccine sites

Fox S. Health topics: 80% of Internet users look for health information online. Pew Internet & American Life Project; 2011, February 1. Available at http://pewinternet.org/Reports/2011/Health Topics.aspx.

Eysenbach G. How do consumers search for an appraise health information on the world wide web? Qualitative study using focus groups, usability tests, and in-depth interviews. British Medical Journal 2002;324;573-7.

The Influence of Anti-Vaccine Websites

- Accessing vaccine-critical websites for 5-10 minutes increases the perception of risk of vaccinating and decreases the perception of risk of omitting vaccinations
  - Parents' risk judgments are affected independent of their preferences for conventional vs. alternative medicine
  - Characteristics associated with increased vulnerability: lower socioeconomic status, cognitive ability, health literacy, digital literacy, and numeracy and older age
  - Vaccine experience seems to moderate the influence of vaccine-critical information
- Younger individuals are not able to determine the accuracy of vaccine websites
  - Majority of students thought a vaccine Google search was accurate on the whole, but actually more than half had inaccurate information

Betsch C. The influence of vaccine-critical websites on perceiving vaccination risks.
J Health Psychol. 2010 Apr;15(3):446-55. doi: 10.1177/1359105309353647.

Tactics Used by the Anti-Vaccination Movement

Table 1
Tactics used by the anti-vaccination movement (i.e. actions undertaken to spread their messages).

Tactics	Description
Skewing the science:	Denigrating and rejecting science that fails to support anti-vaccine positions; endorsing poorly-conducted studies that promote anti-vaccine agendas.
Shifting hypotheses:	Continually proposing new theories for vaccines causing harm; moving targets when evidence fails to support such ideas.
Censorship:	Suppressing dissenting opinions; shutting down critics.
Attacking the opposition:	Attacking critics, via both personal insults and filing legal actions.

Anna Kata, Anti-vaccine activists, Web 2.0, and the postmodern paradigm – An overview of tactics and tropes used online by the anti-vaccination movement, Vaccine, Volume 30, Issue 25, 28 May 2012, Pages 3778-3789

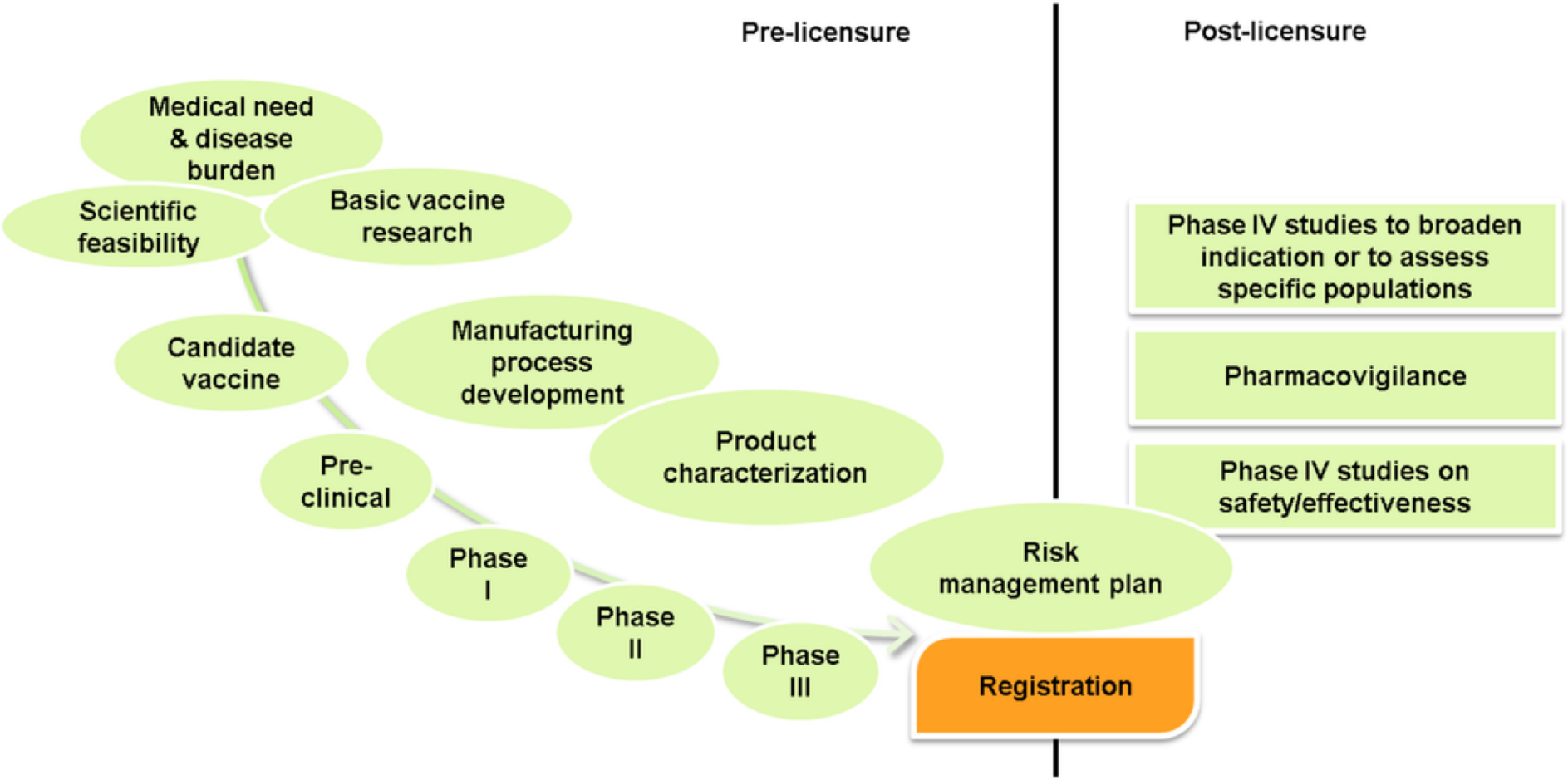
Tropes Used by the Anti-Vaccine Movement

Table 2
Tropes used by the anti-vaccination movement (i.e. oft-repeated mottos, phrases, and rebuttals).

Tropes	Description
"I'm not anti-vaccine, I'm pro-safe vaccines":	Denying one opposes vaccination, instead claiming they are for safer vaccines and further research.
"Vaccines are toxic!":	Listing potentially toxic vaccine ingredients while providing disingenuous explanations of their dangers (a.k.a. the "toxin gambit").
"Vaccines should be 100% safe":	Because absolute safety cannot be promised, vaccination is therefore flawed and dangerous.
"You can't prove vaccines are safe":	Demanding vaccine advocates demonstrate vaccines do not lead to harm, rather than anti-vaccine activists having to prove they do.
"Vaccines didn't save us":	Attributing improvements in health over recent decades to factors other than vaccines (e.g. better sanitation).
"Vaccines are unnatural":	Designating something "natural" to be the better option (e.g. naturally acquiring immunity from diseases rather than from vaccination).
"Choosing between diseases and vaccine injuries":	Framing vaccination choices as restricted between undesirable outcomes (e.g. catching a disease versus serious vaccine side-effects).
"Galileo was persecuted too":	Invoking the names of those persecuted by scientific orthodoxy, implying ideas facing close-mindedness will eventually gain acceptance (a.k.a. the "Galileo gambit").

Anna Kata, Anti-vaccine activists, Web 2.0, and the postmodern paradigm – An overview of tactics and tropes used online by the anti-vaccination movement, Vaccine, Volume 30, Issue 25, 28 May 2012, Pages 3778-3789

The Vaccine Evaluation Process



http://www.mdpi.com/2076-393X/1/3/204/htm

How Many Safety Data are Enough?

SAMPLE SIZES NEEDED TO DETECT RARE EVENTS

Rate	*Sample Size*
1 / 5,000	19,200
1 / 10,000	38,500
1 / 100,000	384,250

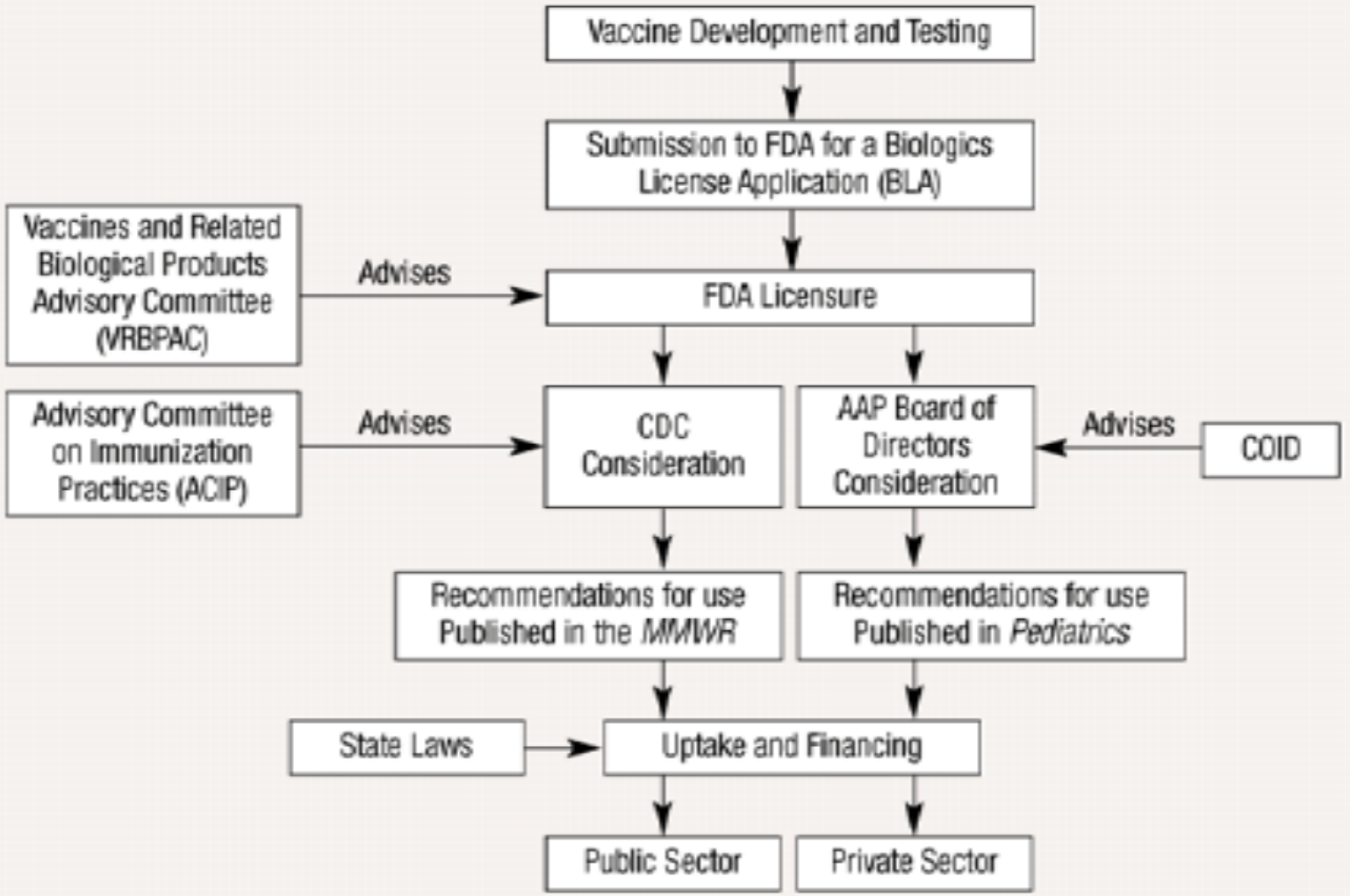
Rate	*Sample Size*	*% of Birth Cohort*	*# Potentially Affected*
0.1% vs 0.2%	50,000	1.25%	4,000
0.1% vs 0.3%	17,500	0.44%	8,000
0.01% vs 0.02%	500,000	12.50%	400
0.01% vs 0.03%	175,000	4.40%	800

Adapted from Ellenberg 1997, Davis 2000

Currently available rotavirus vaccines

	Rotarix® (GSK)	RotaTeq® (Merck)
Origin	Human monovalent	Bovine pentavalent
Strain	G1, P(8)	G1, G2, G3, G4, P(8)
Vaccine course	2 doses - oral	3 doses - oral
Presentation	Lyophilized, reconstituted	Liquid
Phase III trials	n=63,225	n=70,301
Efficacy vs rotavirus g-e	85% - 100% vs severe	98% vs severe
Efficacy vs all-cause severe g-e	42-70% hospitalization for severe g-e	59% hospitalization for diarrhea of any cause
Intussusception	No association	No association

Development of pediatric vaccine recommendations and policies



Modified from Pickering LK, Orenstein WA. Development of pediatric vaccine recommendation and polices. *Semin Pediatr Infect Dis.* 2002;13:148-154. Reprinted with permission.

The Impact of Nonmedical Exemptions

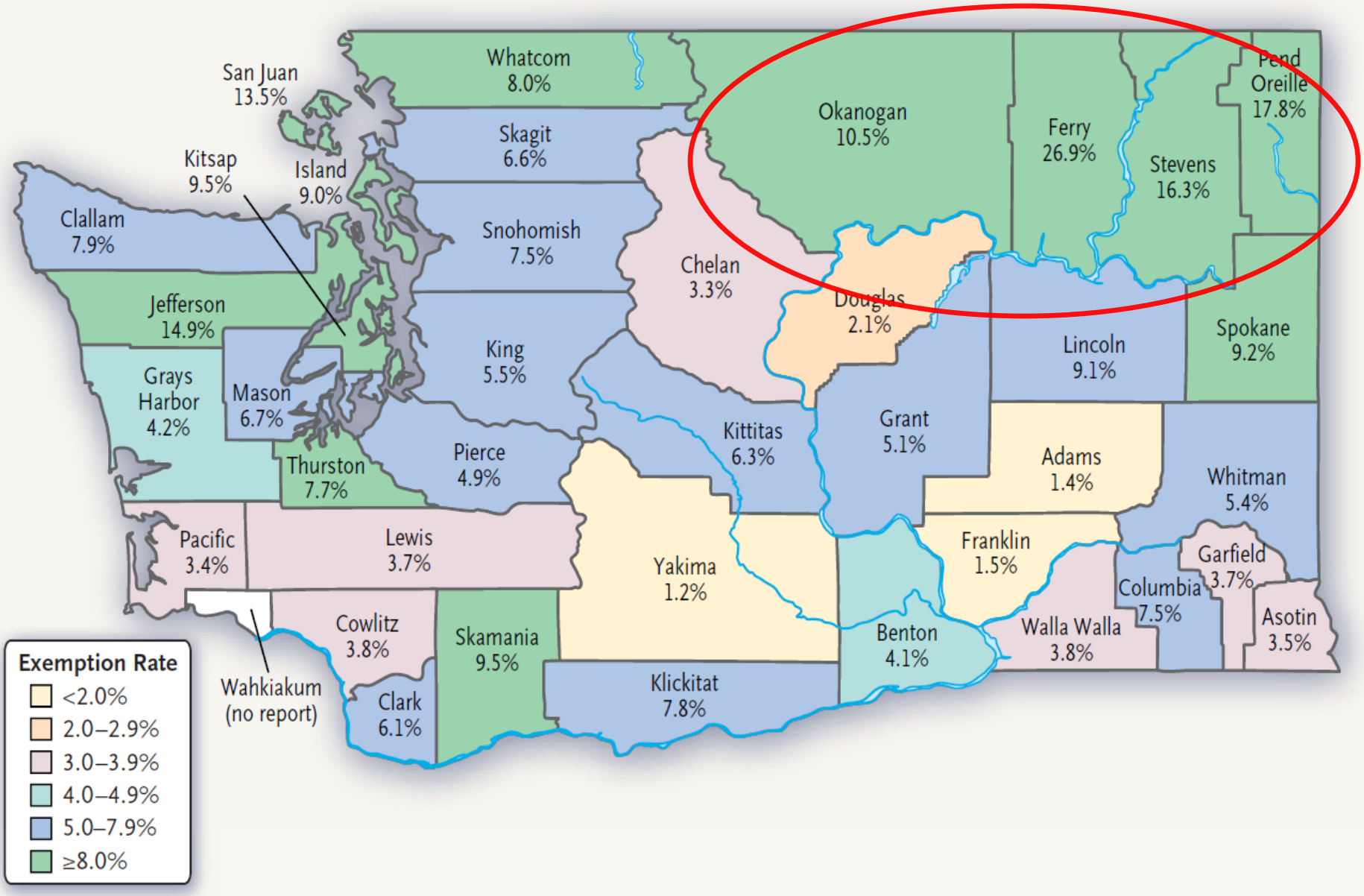
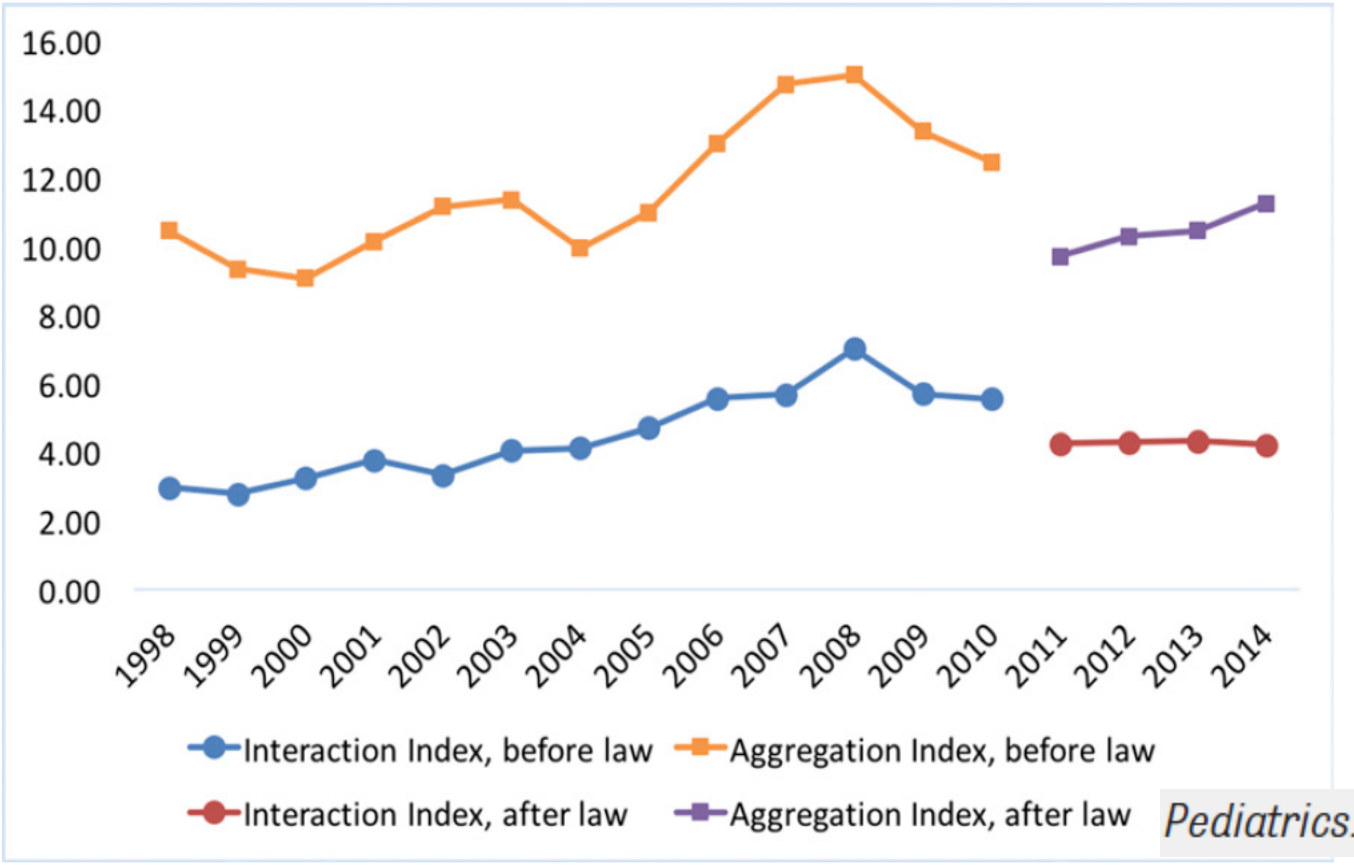


Figure 1. Rates of Exemption from Vaccination for Nonmedical Reasons in Washington Counties, 2006–2007.

Data are from the Washington State Department of Health, School Status Reports, 2006–2007.[25]

Exemptions From Mandatory Immunization After Legally Mandated Parental Counseling

Saad B. Omer, MBBS, MPH, PhD,[a,b,c,d] Kristen Allen, MPH,[a] D.H. Chang, MD, MPH,[e] L. Beryl Guterman, MSPH,[a] Robert A. Bednarczyk, PhD,[a,b,d] Alex Jordan, MPH,[a] Alison Buttenheim, PhD, MBA,[f,g] Malia Jones, MPH, PhD,[h] Claire Hannan, MPH,[i] M. Patricia deHart, ScD,[j] Daniel A. Salmon, PhD[k]



Pediatrics. 2018;141(1):e20172364

AAP Recommendations for Nonmedical Exemptions

1. The AAP supports laws and regulatory measures that require certification of immunization to attend child care and school as a sound means of providing a safe environment for attendees and employees of these settings.
2. The AAP supports medically indicated exemptions to specific immunizations as determined for each individual student.
3. The AAP recommends that all states and the District of Columbia use their public health authority to eliminate nonmedical exemptions from immunization requirements.

Pediatrics. 2016;138(3):e20162145

AAP Recommendations for Nonmedical Exemptions

4. The AAP recommends that all child care centers, schools, and other covered entities comply with state laws and regulations requiring current and accurate documentation of appropriate immunization status and appropriate medical exemptions of attendees and students.

5. The AAP recommends that the appropriate public health authorities provide the community with information about immunization rates in child care centers, schools, and other covered entities and determine whether there are risks to community immunity on the basis of this information.

Pediatrics. 2016;138(3):e20162145

Why are we experiencing outbreaks of Measles?

Annual Measles Disease Burden United States, 1950s

- ~4 million cases per year
  - 500,000 reported
- Severe complications
  - 150,000 respiratory complications
  - 48,000 hospitalizations
  - 4,000 encephalitis cases
    - 1,000 resulting in permanent disability
- 500 deaths

Facts about Measles Vaccine

- First dose is 95% effective, 2nd is 99%
- Need to have high immunization rates to maintain disease control
- Rates <95% will sustain outbreak

Global Coverage Rates in 2015

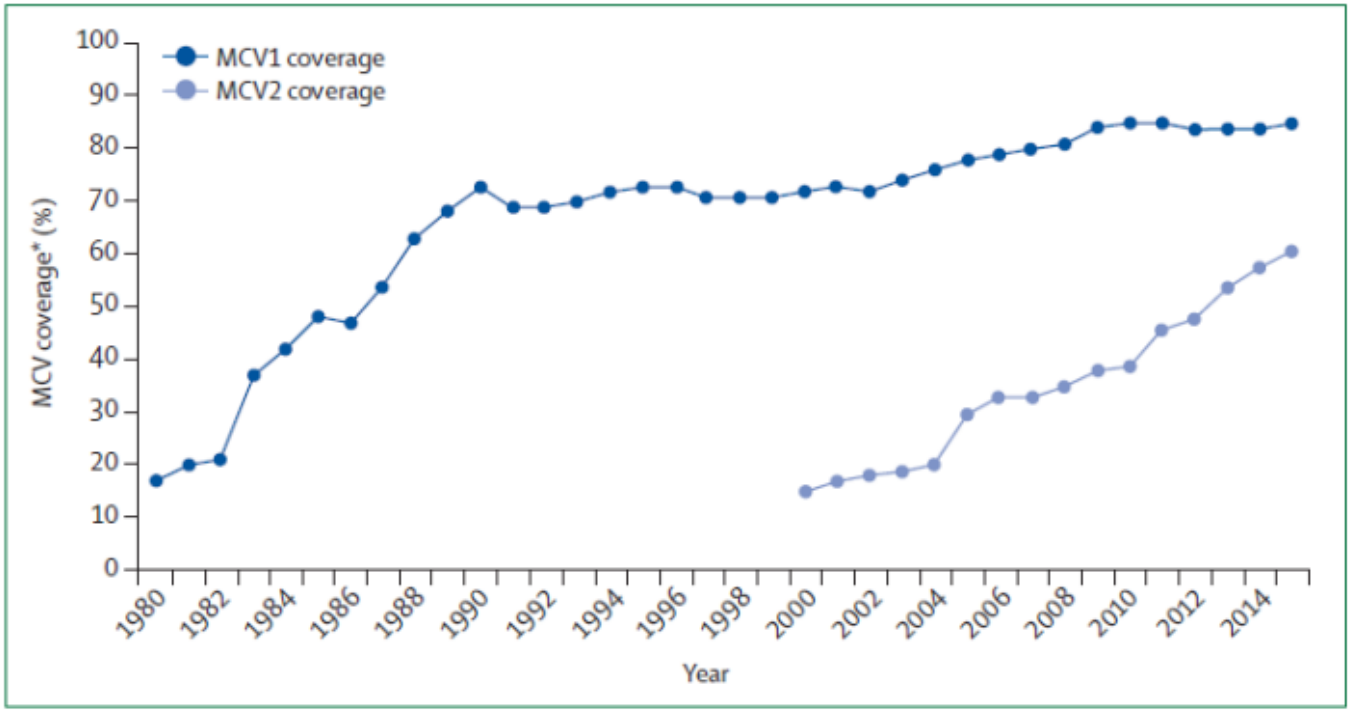


Figure 3: **Global measles vaccine coverage for the first (MCV1) and second (MCV2) doses**
Reproduced from WHO, by permission of WHO. MCV=measles-containing vaccine. *Coverage as estimated by WHO and UNICEF.

Morbidity and Mortality Weekly Report

Vaccination Coverage Among Children Aged 19–35 Months — United States, 2017

Holly A. Hill, MD, PhD[1]; Laurie D. Elam-Evans, PhD[1]; David Yankey, PhD[1]; James A. Singleton, PhD[1]; Yoonjae Kang, MPH[1]

TABLE 1. Estimated vaccination coverage among children aged 19–35 months, by selected vaccines and doses — National Immunization Survey-Child, United States, 2013–2017*

	Survey year % (95% CI)				
Vaccine/Dose	2013	2014	2015	2016	2017
DTaP†					
≥3 doses	94.1 (93.2–95.0)	94.7 (94.0–95.4)	95.0 (94.4–95.5)	93.7 (92.8–94.5)§	94.0 (93.3–94.7)
≥4 doses	83.1 (81.8–84.3)	84.2 (83.0–85.4)	84.6 (83.5–85.7)	83.4 (82.1–84.6)	83.2 (82.0–84.3)
Poliovirus (≥3 doses)	92.7 (91.6–93.6)	93.3 (92.5–94.1)	93.7 (93.0–94.3)	91.9 (90.9–92.9)§	92.7 (91.9–93.5)
MMR (≥1 dose)¶	91.9 (90.9–92.7)	91.5 (90.6–92.4)	91.9 (91.0–92.7)	91.1 (90.1–92.0)	91.5 (90.6–92.3)

TABLE 2. Estimated vaccination coverage among children aged 19–35 months, by selected vaccines and doses, metropolitan statistical area (MSA) status,* and health insurance status† — National Immunization Survey-Child, United States, 2017§

	MSA status % (95% CI)			Health insurance status % (95% CI)			
Vaccine/Dose	MSA, principal city (referent) (n = 6,689)	MSA, non-principal city (n = 5,846)	Non-MSA (n = 2,798)	Private only (referent) (n = 8,536)	Any Medicaid (n = 5,714)	Other insurance (n = 644)	Uninsured (n = 439)
DTaP¶							
≥3 doses	94.6 (93.4–95.6)	94.1 (92.9–95.0)	91.6 (89.1–93.6)**	96.5 (95.7–97.2)	92.6 (91.2–93.8)**	93.7 (90.7–95.8)**	78.2 (71.3–83.8)**
≥4 doses	85.0 (83.3–86.5)	82.6 (80.6–84.5)	78.1 (74.9–80.9)**	86.9 (85.2–88.5)	80.8 (78.9–82.5)**	83.6 (79.3–87.2)	62.4 (55.0–69.1)**
Poliovirus (≥3 doses)	93.2 (91.9–94.4)	92.9 (91.7–93.9)	90.1 (87.4–92.2)**	95.2 (94.3–96.0)	91.2 (89.6–92.5)**	92.7 (89.5–95.0)	77.9 (71.0–83.6)**
MMR†† (≥1 dose)	92.5 (91.2–93.6)	90.9 (89.3–92.3)	89.9 (88.0–91.6)**	93.7 (92.3–94.8)	90.4 (89.1–91.6)**	91.0 (87.5–93.6)	74.6 (67.5–80.6)**

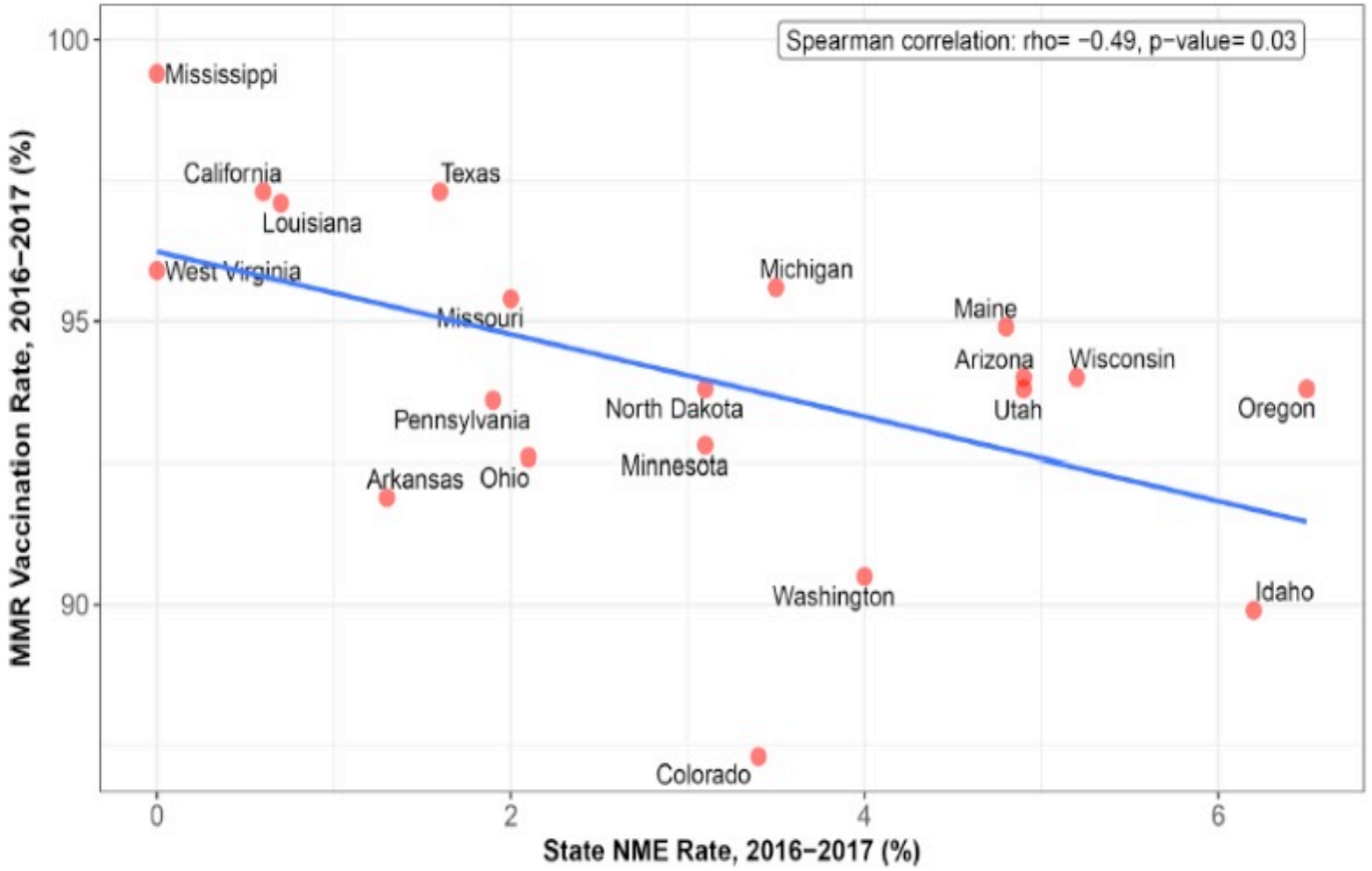


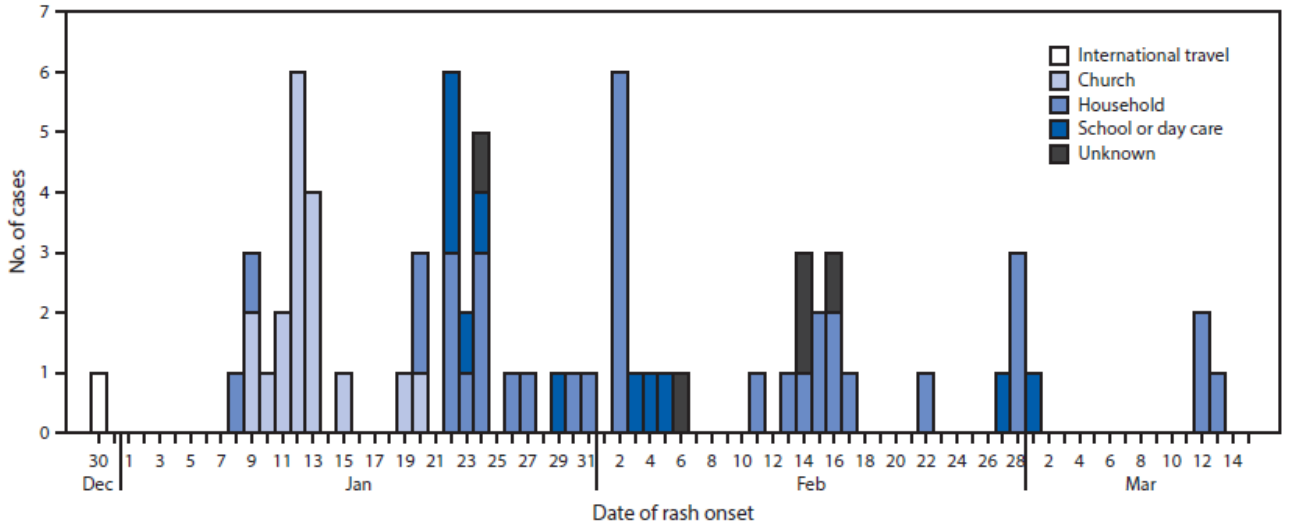
Fig 4. Negative relationship between state percentage of kindergarten MMR vaccine uptake and NME rate in the 2016 to 2017 school year. MMR, measles, mumps, and rubella; NME, nonmedical exemption.

Community Outbreak of Measles — Clark County, Washington, 2018–2019

Alyssa Carlson, MPH[1]; Madison Riethman, MPH[1]; Paul Gastañaduy, MD[2]; Adria Lee, MSPH[2]; Jessica Leung, MPH[2]; Michelle Holshue, MPH[3]; Chas DeBolt, MPH[4]; Alan Melnick, MD[1]

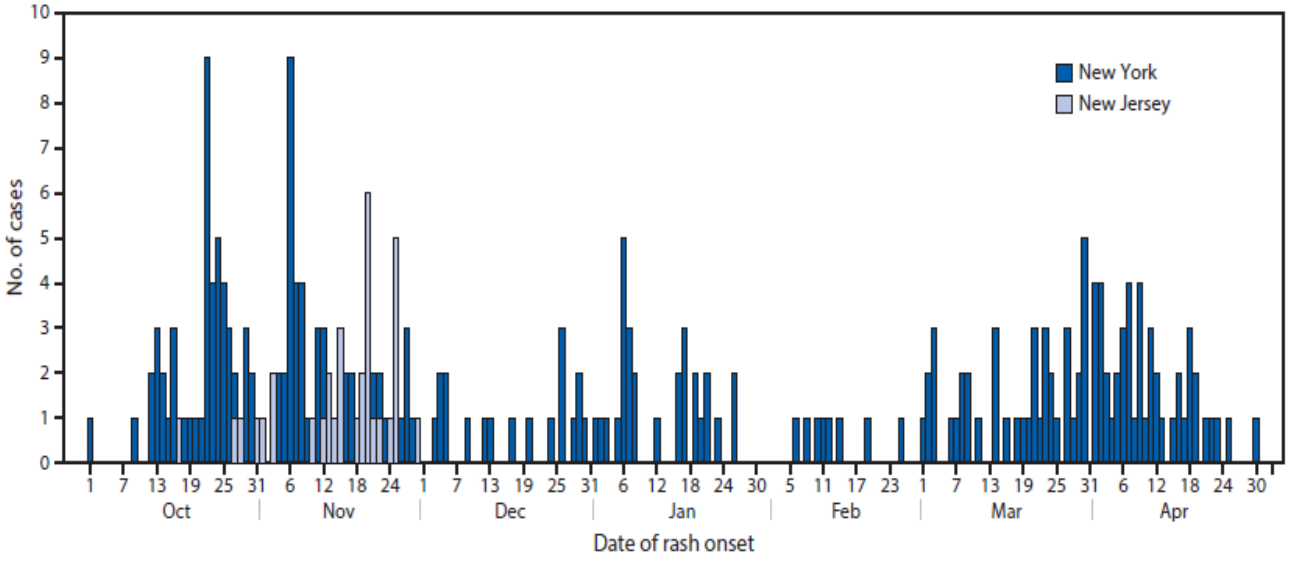
Measles was diagnosed in 71 individuals

FIGURE. Number of measles cases, by transmission setting and date of rash onset (N = 71) — Clark County, Washington, December 30, 2018–March 13, 2019



Measles Outbreaks from Imported Cases in Orthodox Jewish Communities — New York and New Jersey, 2018–2019

FIGURE. Number of measles cases, by date of rash onset — New York (n = 242)* October 1, 2018–April 30, 2019, and New Jersey (n = 33) October 17, 2018–November 30, 2018



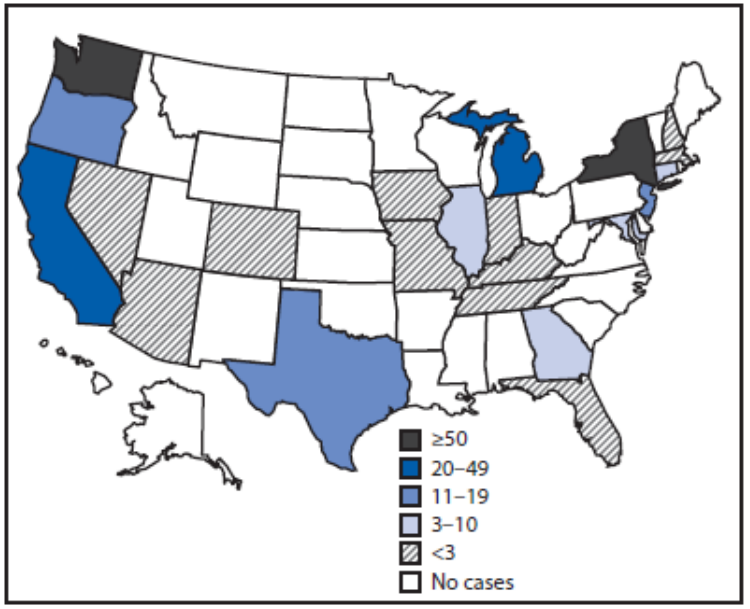
* Excludes New York City.

TABLE. Selected characteristics of patients with reported measles — United States, January 1–April 26, 2019*

Characteristic	No. (%)
Total	**704 (100)**
Age group	
<6 mos	25 (4)
6–11 mos	68 (10)
12–15 mos	76 (11)
16 mos–4 yrs	167 (24)
5–19 yrs	203 (29)
20–49 yrs	138 (20)
≥50 yrs	27 (4)
Vaccination status	
Vaccinated	76 (11)
Unvaccinated	503 (71)
Unknown	125 (18)
Hospitalizations	66 (9)
Complications	
Pneumonia	24 (3)
Encephalitis	0 —
Death	0 —
Residency	
U.S. resident	689 (98)
Internationally imported measles cases	
Total	**44 (6)**
Vaccination status†	
Vaccinated†	4 (9)
Unvaccinated/Unknown	40 (91)
U.S. resident	34 (77)
Source countries†	
Philippines	14 (32)
Ukraine	8 (18)
Israel	5 (11)
Thailand	3 (7)
Vietnam	2 (5)
Germany	2 (5)
Other	10 (23)

* Data are preliminary as of April 26, 2019.
† Percentages are of all 44 international importations.

FIGURE 1. Reported number of measles cases (N = 704) — United States, January 1–April 26, 2019*



Studies Do Not Support Association Between MMR and Autism

Table 1. Studies that fail to support an association between measles-mumps-rubella vaccine and autism.

Source	Study design	Study location
Taylor et al., 1999 [5]	Ecological	United Kingdom
Farrington et al., 2001 [6]	Ecological	United Kingdom
Kaye et al., 2001 [7]	Ecological	United Kingdom
Dales et al., 2001 [8]	Ecological	United States
Fombonne et al., 2006 [9]	Ecological	Canada
Fombonne and Chakrabarti, 2001 [10]	Ecological	United Kingdom
Taylor et al., 2002 [11]	Ecological	United Kingdom
DeWilde et al., 2001 [12]	Case-control	United Kingdom
Makela et al., 2002 [13]	Retrospective cohort	Finland
Madsen et al., 2002 [14]	Retrospective cohort	Denmark
DeStefano et al., 2004 [15]	Case-control	United States
Peltola et al., 1998 [16]	Prospective cohort	Finland
Patja et al., 2000 [17]	Prospective cohort	Finland

Gerber and Offit. CID 2009:48;456-61

Annals of Internal Medicine ORIGINAL RESEARCH

Measles, Mumps, Rubella Vaccination and Autism

A Nationwide Cohort Study

Anders Hviid, DrMedSci; Jørgen Vinsløv Hansen, PhD; Morten Frisch, DrMedSci; and Mads Melbye, DrMedSci

Results: During 5 025 754 person-years of follow-up, 6517 children were diagnosed with autism (incidence rate, 129.7 per 100 000 person-years). Comparing MMR-vaccinated with MMR-unvaccinated children yielded a fully adjusted autism hazard ratio of 0.93 (95% CI, 0.85 to 1.02). Similarly, no increased risk for autism after MMR vaccination was consistently observed in subgroups of children defined according to sibling history of autism, autism risk factors (based on a disease risk score) or other childhood vaccinations, or during specified time periods after vaccination.

Limitation: No individual medical charts were reviewed.

Conclusion: The study strongly supports that MMR vaccination does not increase the risk for autism, does not trigger autism in susceptible children, and is not associated with clustering of autism cases after vaccination. It adds to previous studies through significant additional statistical power and by addressing hypotheses of susceptible subgroups and clustering of cases.

Ann Intern Med. 2019;170:513-520. doi:10.7326/M18-2101

Prevalence of Parental Concerns About Childhood Vaccines
The Experience of Primary Care Physicians

Table 3. Frequency of practices for dealing with risk communication (n=605)

	Often or always	Sometimes	Never/rarely
Require parents to sign a form if they refuse vaccination[a]	**44 (40, 47)**	**18 (15, 21)**	**39 (35, 42)**
Address vaccine concerns at a prenatal visit[a]	**31 (28, 35)**	**32 (28, 36)**	**37 (33, 40)**
Dismiss families from their practice if they refuse vaccines in the primary series for their child	**10 (8, 13)**	**5 (4, 7)**	**84 (81, 87)**
Agree to spread out vaccines in the primary series[b]	**13 (10, 16)**	**51 (47, 55)**	**36 (33, 40)**
Send information about vaccines to parents before visits[b]	**9 (7, 12)**	**9 (7, 12)**	**81 (78, 84)**
Schedule an extra visit solely to address vaccine concerns	**2 (1, 4)**	**16 (13, 39)**	**81 (78, 84)**
Refer parents who are concerned about vaccine safety to one provider in the practice with interest and expertise in this area	0 (0, 0)	4 (2, 5)	96 (95, 98)
Hold group information meetings for parents to be educated about vaccine safety	0 (0, 0)	1 (0, 1)	99 (99, 100)

Note: Values are % (95% CI). Boldface indicates significance.

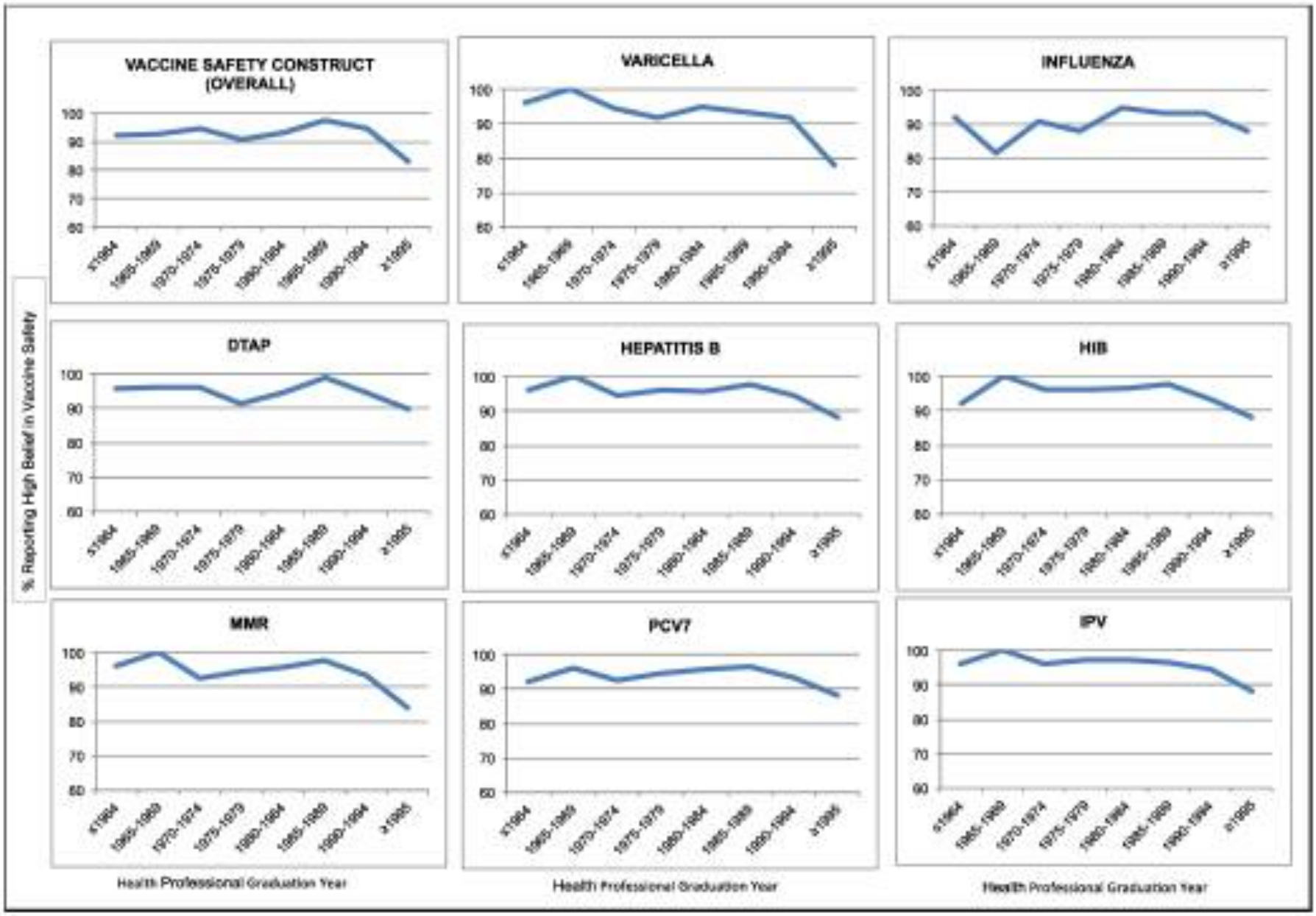
[a]Pediatricians more likely than family medicine physicians to use (p<0.001 by Kolmogorov–Smirnov test)

[b]Pediatricians more likely than family medicine physicians to use (p<0.01 by Kolmogorov–Smirnov test)

(Am J Prev Med 2011;40(5):548–555)

Pediatricians have different methods to deal with parental concerns

Younger Physicians More Concerned About Vaccine Safety



Countering Vaccine Hesitancy

Countering antivaccination attitudes

Zachary Horne[a,1,2], Derek Powell[b,1], John E. Hummel[a], and Keith J. Holyoak[b]

[a]Department of Psychology, University of Illinois at Urbana–Champaign, Champaign, IL 61802; and [b]Department of Psychology, University of California, Los Angeles, CA 90095

Edited by Susan Gelman, University of Michigan, Ann Arbor, MI, and approved June 11, 2015 (received for review February 26, 2015)

Three times as many cases of measles were reported in the United States in 2014 as in 2013. The reemergence of measles has been linked to a dangerous trend: parents refusing vaccinations for their children. Efforts have been made to counter people's antivaccination attitudes by providing scientific evidence refuting vaccination myths, but these interventions have proven ineffective. This study shows that highlighting factual information about the dangers of communicable diseases can positively impact people's attitudes to vaccination. This method outperformed alternative interventions aimed at undercutting vaccination myths.

(the second term in the equation above) or increasing estimates of positive effects of vaccines (the first term in the equation).

Efforts to directly counter vaccination myths often take aim at the second term. However, we know that parents who oppose vaccinations have strong beliefs about the side effects of vaccines—presumably, these beliefs are the reason that they do not vaccinate their children. Since attempts to influence attitudes are often thwarted by people's tendency to discount or ignore evidence contrary to their existing attitudes [a phenomenon known as confirmation bias (10)], such manipulations may be largely

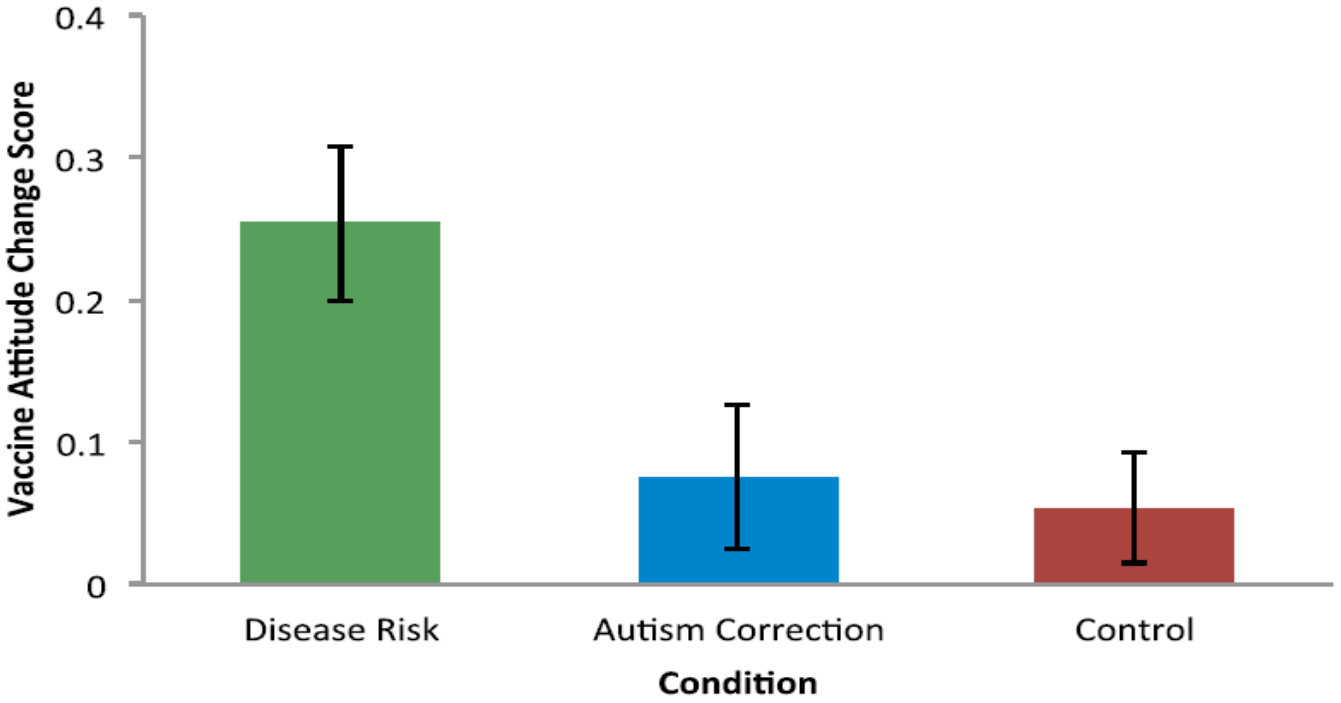


Fig. 1. Vaccine attitude change scores across conditions (posttest – pretest). A one-way ANOVA revealed a significant difference between the three conditions [$F(2,312) = 5.287$, $P = 0.006$]. This effect was driven by the disease risk condition, which led to larger changes in vaccination attitudes than either the control [$t(212) = 3.04$, $P = 0.003$, $d = 0.41$, 95% highest density interval (HDI; a Bayesian estimate of the most credible values of the difference) (15) = 0.058, 0.292] or the autism correction condition [$t(203) = 2.41$, $P = 0.017$, $d = 0.33$, 95% HDI of the difference = 0.009, 0.269]. The effect of the autism correction condition was no greater than that observed in the control condition [$t(209) = 0.358$, $P = 0.721$, $d = 0.05$, 95% HDI of the difference = –0.066, 0.138].

Effective Messages in Vaccine Promotion: A Randomized Trial

Brendan Nyhan, Jason Reifler, Sean Richey and Gary L. Freed

Pediatrics; originally published online March 3, 2014;

TABLE 3 Effects of Interventions on MMR Intention

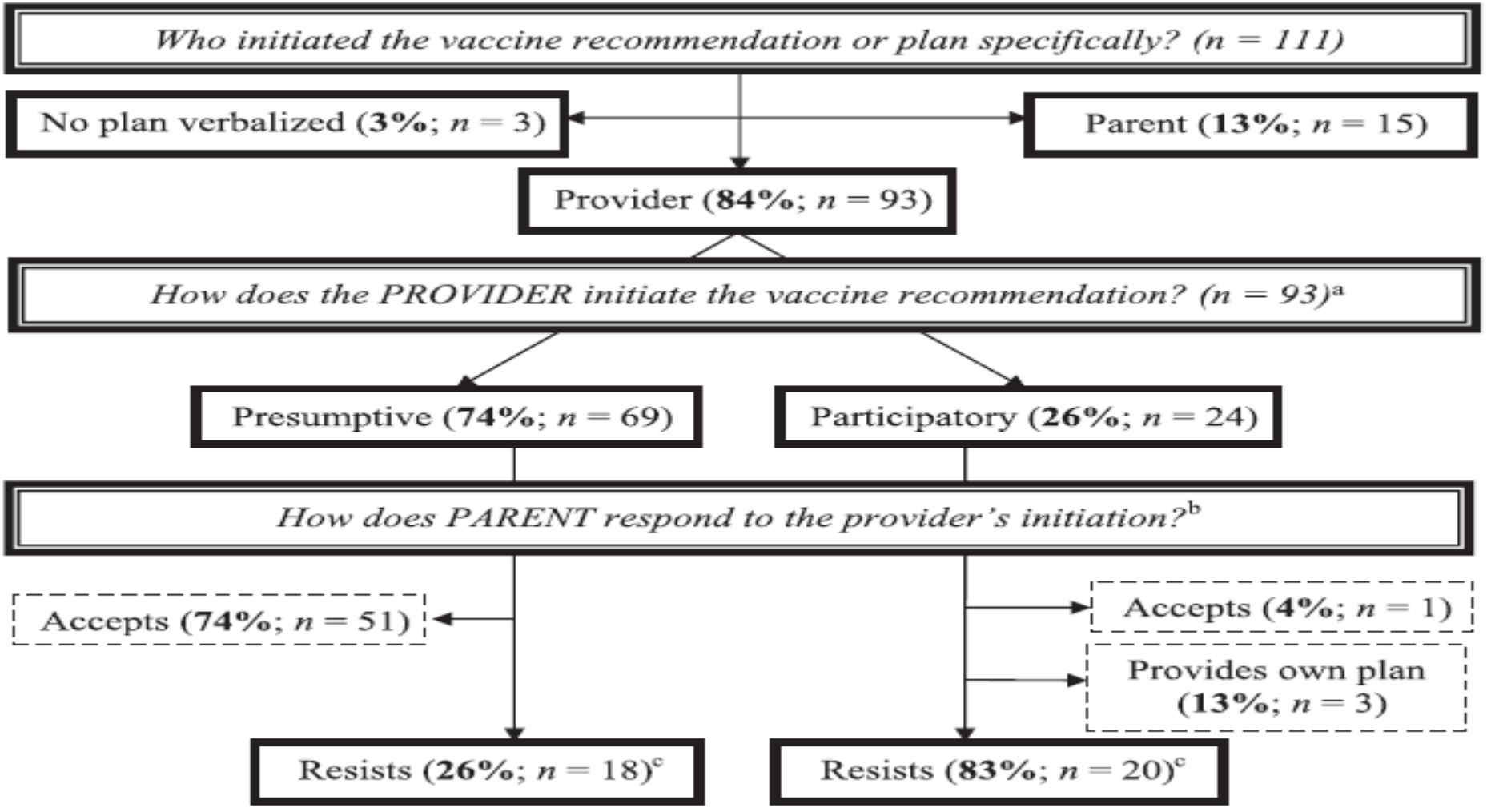
	All	Vaccine Attitudes		
		Least Favorable	Somewhat Favorable	Most Favorable
Autism correction	0.52* (0.32–0.84)	0.36* (0.20–0.64)	1.12 (0.36–3.52)	2.98 (0.48–18.36)
Disease risks	0.98 (0.54–1.77)	0.96 (0.50–1.86)	1.23 (0.29–5.30)	0.82 (0.12–5.45)
Disease narrative	1.09 (0.62–1.94)	0.87 (0.45–1.68)	2.26 (0.60–8.45)	7.29 (0.64–82.77)
Disease images	1.29 (0.73–2.26)	1.20 (0.64–2.26)	2.00 (0.71–5.67)	0.86 (0.09–8.48)
Somewhat favorable toward vaccines (baseline: least favorable)	7.61* (4.74–12.22)			
Most favorable toward vaccines (baseline: least favorable)	16.19* (7.16–36.59)			
N	1751	678	529	544

Ordered logit models with coefficients expressed as aORs and 95% confidence intervals in parentheses (cutpoints omitted; * $P < 0.05$). "MMR intention" measures responses on a 6-point scale from "Very unlikely" (1) to "Very likely" (6) to the question "If you had another child, how likely is it that you would give that child the measles, mumps, and rubella vaccine, which is known as the MMR vaccine?" Indicators for vaccine attitudes groups (least, somewhat, and most favorable) are based on a tercile split of responses to the vaccine attitudes scale from Freed et al,[11] which was administered in a previous wave of the study. The experimental interventions are provided in the Supplemental Information.

The Architecture of Provider-Parent Vaccine Discussions at Health Supervision Visits

Douglas J. Opel, John Heritage, James A. Taylor, Rita Mangione-Smith, Halle Showalter Salas, Victoria DeVere, Chuan Zhou and Jeffrey D. Robinson

Pediatrics 2013;132;1037; originally published online November 4, 2013;



Selected Focus Group Findings About Vaccine Hesitancy

- Parents trusted vaccine information given orally by physicians
- Parents with concerns responded to providers giving personalized risk/benefit information or
  - reporting they immunized their own children
- Parents did not want the provider to lecture or argue with them

Fredrickson et al. Clinical Res Meth, 2004

Interacting with Vaccine Hesitant Parents

- Share honestly what is and is not known about the risks and benefits of the vaccine in question
- Listen respectfully to parental concerns
- Explain the risk of being unimmunized
- Discuss specific vaccines that parents are most concerned about

Diekema & AAP Committee on Bioethics, 2004

Approaches to Reduce Exemption Rates & Vaccine Hesitancy

- Rational administrative requirements for granting exemptions
- Informed declination
- Effective provider-parent communication tools
- Development of a robust evidence base of effective interventions

Guidance from CDC Communication Experts

Key Drivers to Communication Planning

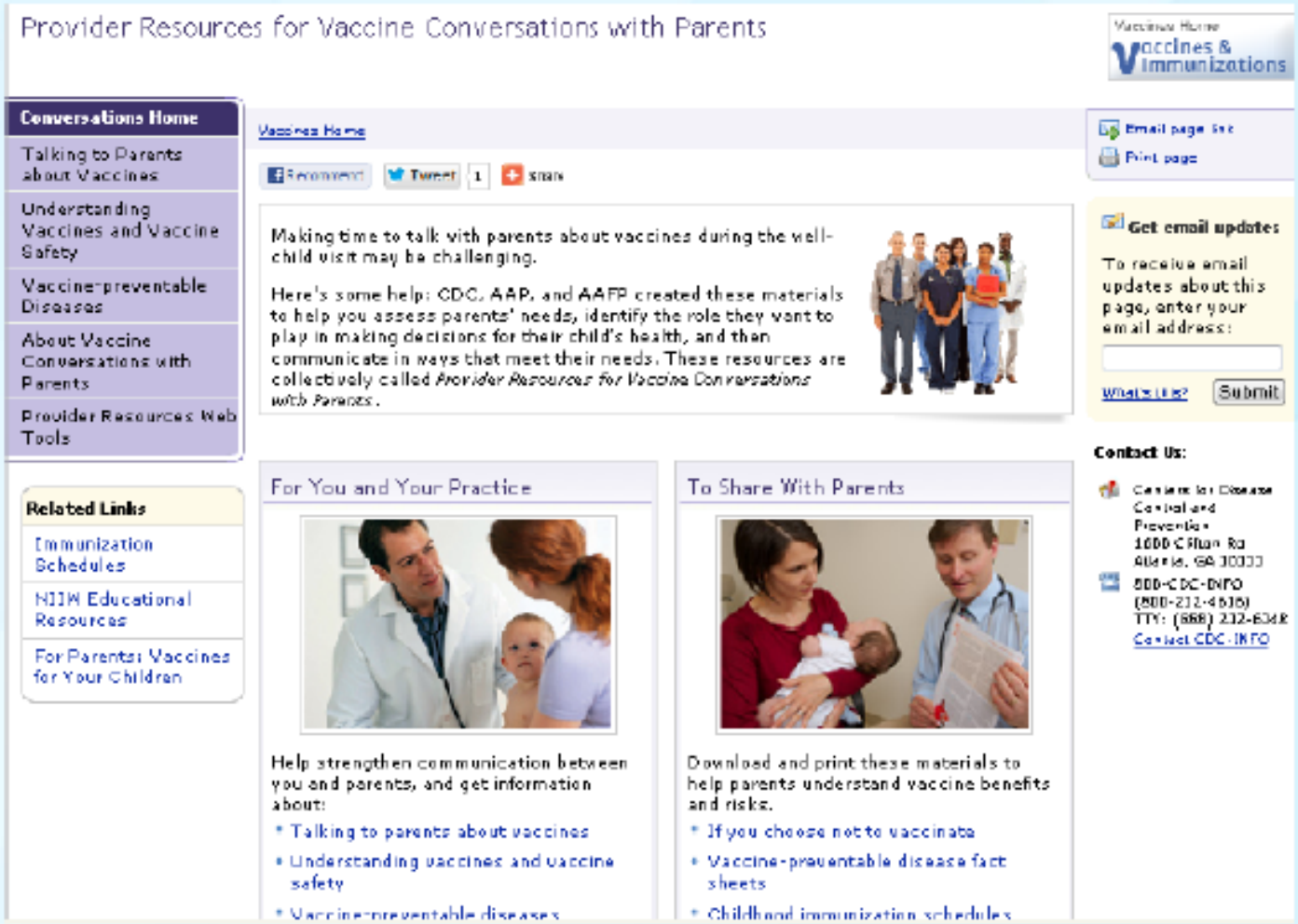
- Vaccine safety issues are a concern for many parents. Risk communication approach is needed to maintain trust.
- The facts don't speak for themselves. Personal accounts from peers or health care professionals are persuasive and memorable.
- There is a spectrum of parental attitudes, beliefs, and behaviors requiring some tailoring and layering of communication practices and materials.
- Health care professionals play the most important role in addressing parents' questions and concerns.
- Recommendations from providers are persuasive.
- Reinforcing the social norm around vaccination is important.

Information Available on the CDC Website

Materials: Provider Resources

- Understanding Vaccines and Vaccine Safety
  - How Vaccines Work
  - The Recommended Childhood Immunization Schedule
  - Ensuring the Safety of U.S. Vaccines
  - Understanding the Vaccine Adverse Reaction Reporting System
  - Understanding MMR Vaccine Safety
  - Understanding Thimerosal, Mercury, and Vaccine Safety
  - The Advisory Committee on Immunization Practices
- Diseases and the Vaccines that Prevent Them
  - 14 vaccine-preventable disease sheets, each with 2 versions (one for high-information seeking parents and the other with basic information); Basic sheets are also available in Spanish
- If You Choose Not to Vaccinate, Understand the Risk and Your Responsibilities

Where to Find these Resources



www.cdc.gov/vaccines/conversations

Conclusions from CDC Website

Summary, Recommendations, and Future Research

- Remember that parents fall along a spectrum; this is not an "either/or" decision
- The healthcare professional is the most important source of information, but don't ignore other social influences
- Questions and concerns do not equal lack of confidence; vaccinating is still the social norm
- There is no quick fix media message; grassroots education and partnerships are the key

CLINICAL REPORT Guidance for the Clinician in Rendering Pediatric Care

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Countering Vaccine Hesitancy

Kathryn M. Edwards, MD, Jesse M. Hackell, MD, THE COMMITTEE ON INFECTIOUS DISEASES, THE COMMITTEE ON PRACTICE AND AMBULATORY MEDICINE

Immunizations have led to a significant decrease in rates of vaccine-preventable diseases and have made a significant impact on the health of children. However, some parents express concerns about vaccine safety and the necessity of vaccines. The concerns of parents range from hesitancy about some immunizations to refusal of all vaccines. This clinical report provides information about addressing parental concerns about vaccination.

PEDIATRICS Volume 138, number 3, September 2016

TABLE 2 Parental Concerns About Vaccines

- Vaccine safety
  - Too many vaccines
  - Development of autism
  - Vaccine additives (thimerosal, aluminum)
  - Overload the immune system
  - Serious adverse reactions
  - Potential for long-term adverse events
  - Inadequate research performed before licensure
  - May cause pain to the child
  - May make the child sick
- Necessity of vaccines
  - Disease is more "natural" than vaccine
  - Parents do not believe diseases being prevented are serious
  - Vaccine-preventable diseases have disappeared
  - Not all vaccines are needed
  - Vaccines do not work
- Freedom of choice
  - Parents have the right to choose whether to immunize their child
  - Parents know what's best for their child
  - Believe that the risks outweigh the benefits of vaccine
  - Do not trust organized medicine, public health
  - Do not trust government health authorities
  - Do not trust pharmaceutical companies
  - Ethical, moral, or religious reasons

Vaccine Safety, Necessity of Vaccines, And Freedom of Choice are Major Concerns

PEDIATRICS Volume 138, number 3, September 2016

TABLE 3 Number of Immunogenic Proteins and Polysaccharides Contained in Vaccines Over the Past 100 Years

1890		1960		1980		2000	
Vaccine	Proteins	Vaccine	Proteins	Vaccine	Proteins	Vaccine	Proteins and Polysaccharides
Smallpox	~200	Smallpox	~200	Diphtheria	1	Diphtheria	1
Total	~200	Diphtheria	1	Tetanus	1	Tetanus	1
		Tetanus	1	WC-pertussis	~3000	AC-pertussis	2–5
		WC-pertussis	~3000	Polio	15	Polio	15
		Polio	15	Measles	10	Measles	10
		Total	~3217	Mumps	9	Mumps	9
				Rubella	5	Rubella	5
				Total	3041	Hib	2
						Varicella	69
						Pneumococcus	8
						Hepatitis B	1
						Total	123–126

Adapted from Offit et al.[52]

AC-pertussis, acellular pertussis vaccine; WC-pertussis, whole cell pertussis vaccine.

DISMISSAL OF PATIENTS WHO REFUSE VACCINATION

The decision to dismiss a family who continues to refuse immunization is not one that should be made lightly, nor should it be made without considering and respecting the reasons for the parents' point of view.[44] Nevertheless, the individual pediatrician may consider dismissal of families who refuse vaccination as an acceptable option. In all practice settings, consistency, transparency, and openness regarding the practice's policy on vaccines is important.

Communication Highlights

- Vaccines are safe and effective, and serious disease can occur if your child and family are not immunized.
- Vaccine-hesitant individuals are a heterogeneous group and their individual concerns should be respected and addressed.
- Vaccine are tested thoroughly prior to licensure and vaccine safety assessment networks exist to monitor vaccine safety after licensure.
- Nonmedical vaccine exemptions increase rates of unvaccinated children.
- Unvaccinated children put vaccinated children and medically exempt children who live in that same area at risk.

PEDIATRICS Volume 138, number 3, September 2016

Communication Highlights

- Health care providers play a major role in educating parents about the safety and effectiveness of vaccines.
- Strong provider commitment to vaccination can influence hesitant or resistant parents.
- Personalizing vaccine acceptance is often an effective approach.
- The majority of parents accepted the provider's vaccine recommendations when they were presented as required immunizations to maintain optimal disease prevention.
- The current vaccine schedule is the only one recommended by the CDC. Alternative schedules have not been studied.

A mother of an infant comes to your practice and says that she does not want to immunize her infant. She says that vaccines are not safe and she is not going to administer them. What would you do?

1. Dismiss her from your practice
2. Tell her firmly that vaccines are safe and have been tested extensively
3. Listen to her concerns and address her specific questions
4. Tell her that the autism-measles link has been debunked and that her concerns are misplaced
5. Tell her to look on the internet about vaccines

A 75 year old man with heart disease refuses to be immunized with influenza vaccine. How would you respond?

1. Dismiss him from your practice
2. Talk about the impact of influenza disease on patients with heart disease
3. Tell him forcefully that influenza vaccine does not give him influenza
4. Tell him to look on the internet about influenza vaccine
5. Tell him to get the live attenuated influenza vaccine