Child Health Evaluation and Research Unit
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Risk Factors for Delays in Age-Appropriate Vaccination

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Background

Childhood vaccinations are:

- considered to be the most cost-effective clinical preventive service
- well-defined nationally through ACIP recommendations
- integral to Healthy People 2010 and health plan performance measurement

Background

Age-appropriate vaccination is important:

- Lower morbidity expected with age-appropriate vaccinations
- Delay is a precursor to never receiving a vaccine dose
- Vaccination delays are associated with screening and developmental assessment delays

Background

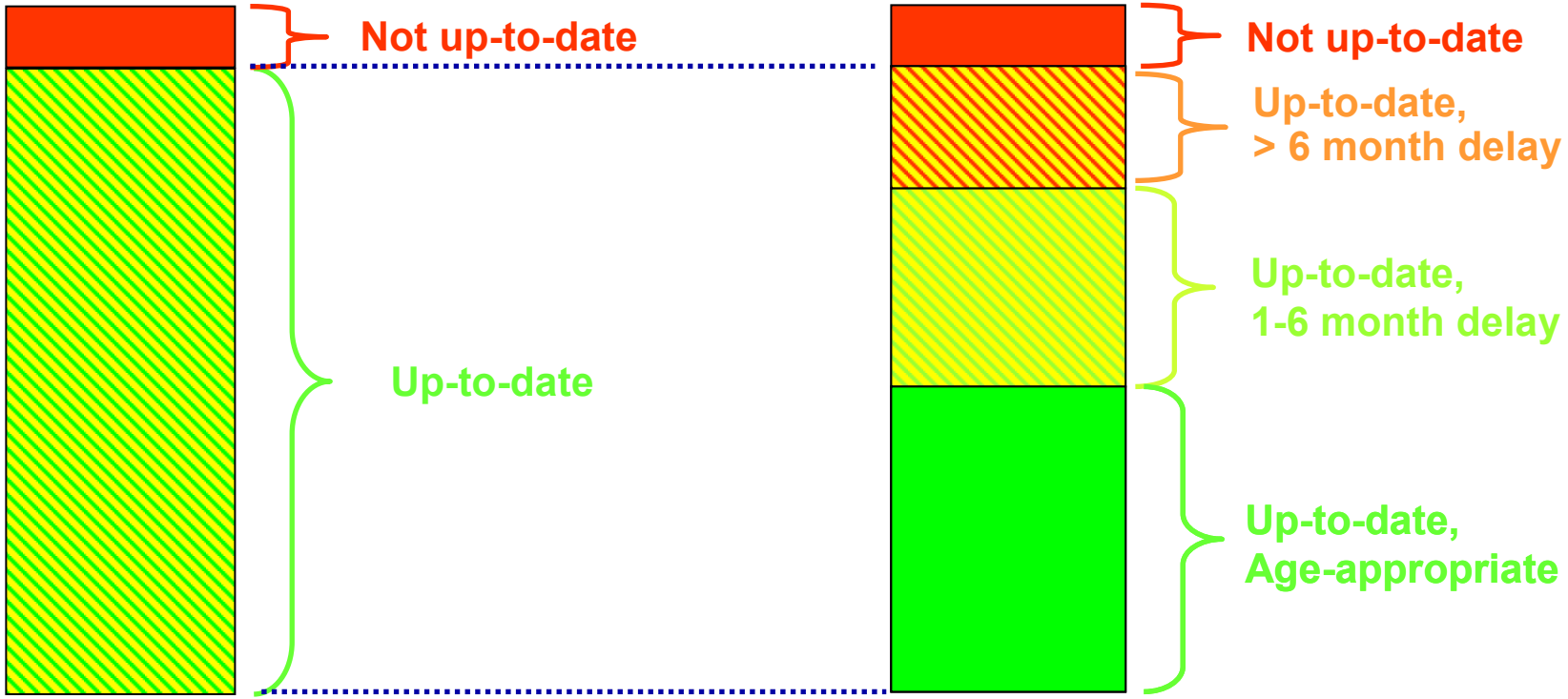
- A considerable body of literature exists related to vaccination coverage rates based on ***up-to-date*** status
- Very limited research on risks related to ***age-appropriate*** vaccination
- Few nationally-representative studies have been conducted on the risks of vaccination delay

Methods

- Retrospective analysis of 1992 - 1996 National Health Interview Survey and Supplements:
  - Immunization
  - Access to Care
  - Health Insurance
- 9,223 children 25 months – 6 years of age, with written vaccination records

Measuring Vaccination Status

Two Measures of Vaccination Status:



Methods

- Assessed age-appropriateness of:
  - DTP4, Polio3, MMR1 doses
  - 4:3:1 series completion
- Also assessed UTD status

Methods

Used multivariate logistic regression models to:

- Estimate adjusted odds ratios to assess risk factors
- Predict the likelihood of vaccination delay or non-receipt, relative to age-appropriate vaccination
- Perform policy simulations

Results

For the 4:3:1 series:

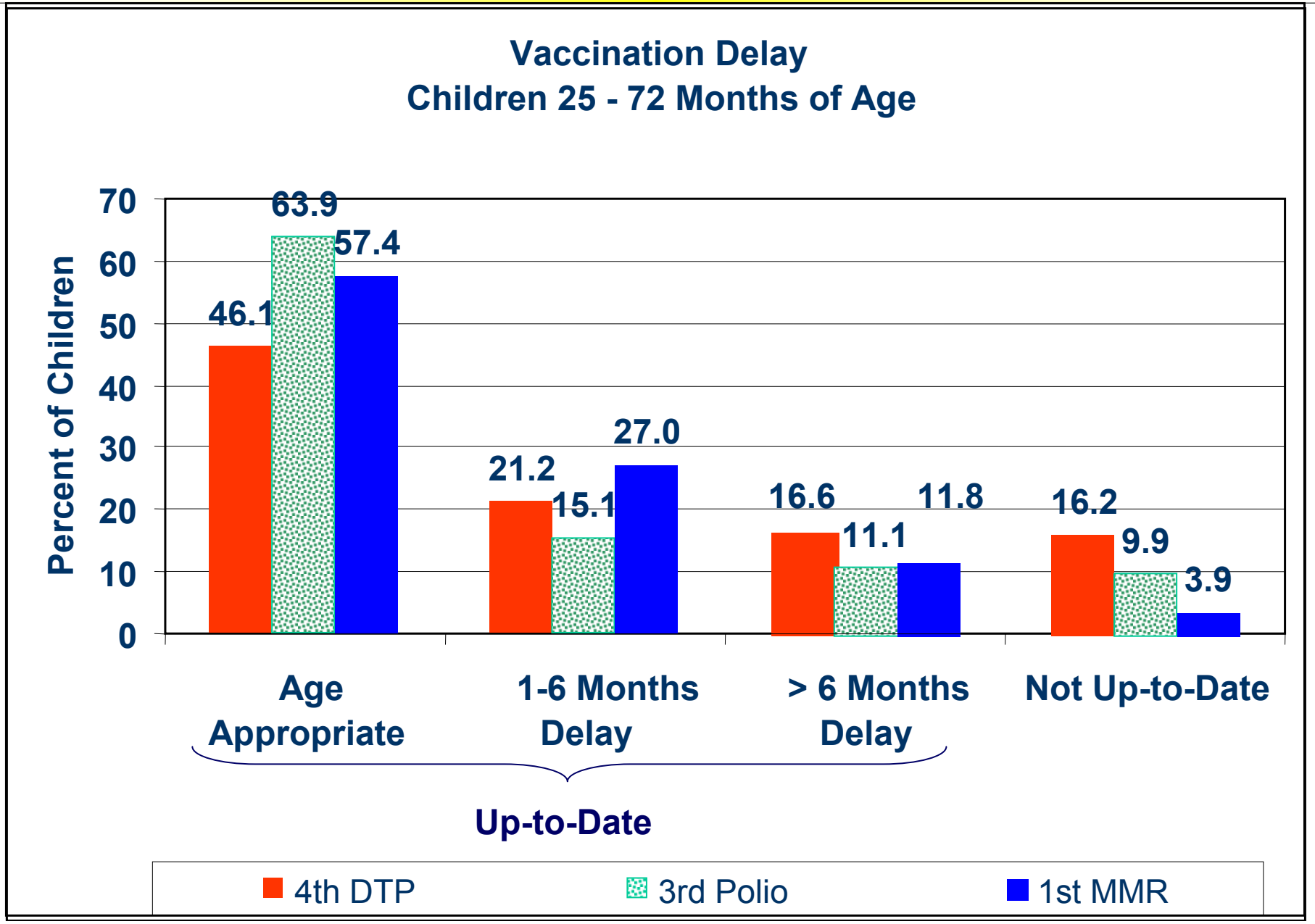
- 80% were up-to-date
- 33% were age-appropriately vaccinated

Results

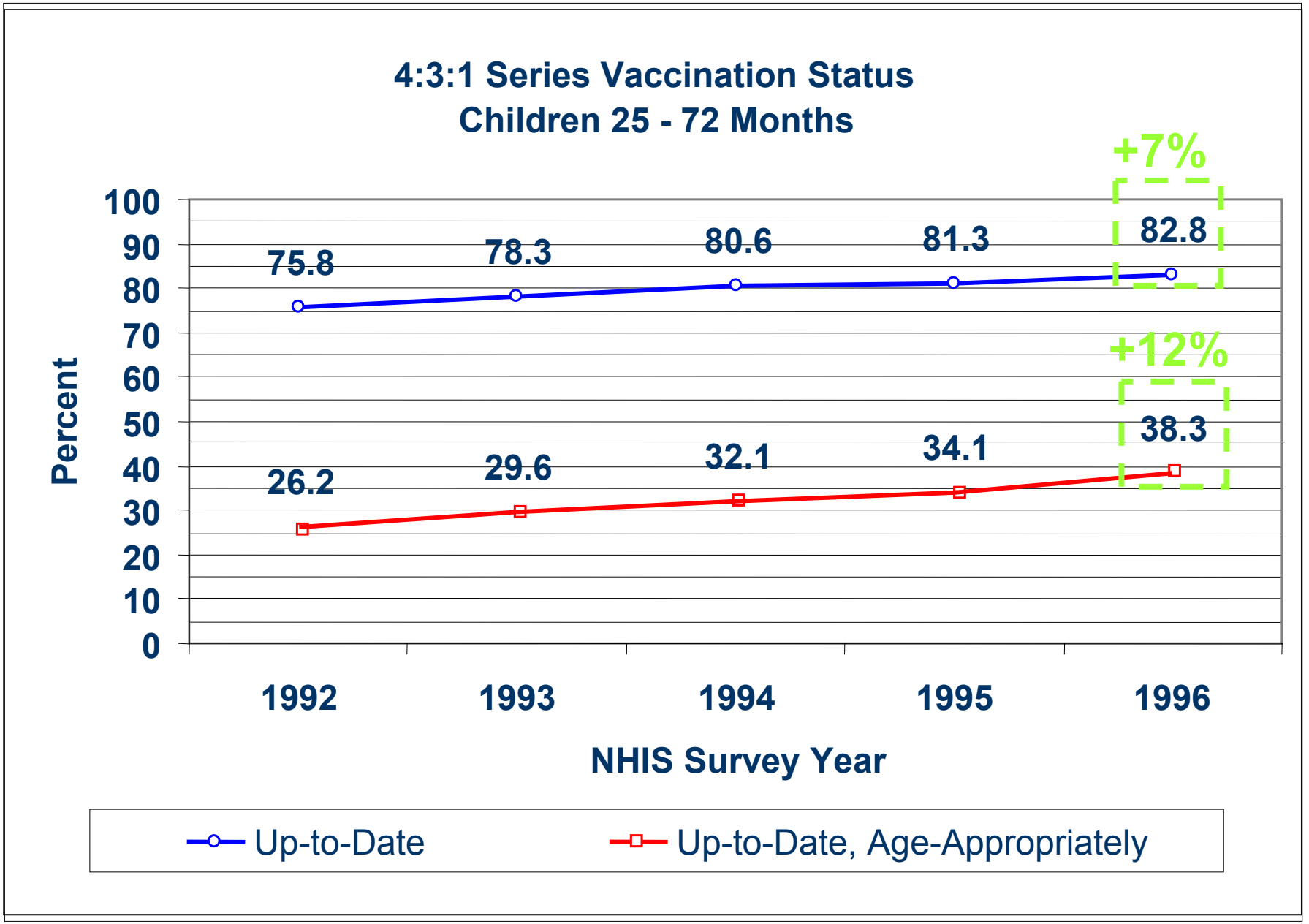
School-entry aged children:

- 88% up-to-date for 4:3:1 series
- 39% were age-appropriately vaccinated
- 25+% had delays of > 6 months

Age-Appropriate Status



Age-Appropriate Status Trends



Risk Factors for >6 Month Vaccination Delays

Characteristic	Odds Ratios for > 6 Months Delay		
	DTP4	Polio 3	MMR1
No Insurance Coverage	2.00 ‡	1.79 ‡	2.04 ‡
No Telephone in Home	1.73 †	1.86 ‡	1.46 §
Single Parent Family	1.56 ‡	1.85 ‡	1.52 †
Black Race	1.54 †	1.59 ‡	1.43 §
Two Children in Family	1.47 ‡	1.46 ‡	1.37
High School or Less Education	1.32 †	1.49 †	1.64 ‡
Medicaid Eligible	1.24	1.36 §	1.53 †

§ p = .05
† p = .01
‡ p = .001

Comparison of Modeling Approaches

Characteristic	Up-to-Date Models			Delay Models		
	DTP4	Polio3	MMR1	DTP4	Polio3	MMR1
Female Gender	×			×		
Black Race			×	×	×	×
Hispanic Ethnicity		×			×	×
Urban Residence	×	×		×	×	×
Suburban Residence						×
Two Parent Family				×	×	×
Number of Children in Family		×		×	×	×
Income Below Poverty Limit					×	
At Least Some College				×	×	×
Has Insurance Coverage				×	×	×
Medicaid Status					×	×
No Medical Home			×	×		×
No Telephone in Home				×	×	×

Policy Simulations

Estimate baseline probabilities, with all barriers present:

$$\text{Probability of Delay} = \beta_0 + \beta_1 \text{Female} + \beta_2 \text{Black Race} + \beta_3 \text{Non-Hispanic} + \beta_4 \text{Urban} + \beta_5 \text{Two Parents} + \beta_6 \text{Two Children} + \beta_7 \text{Poverty} + \beta_8 \text{Less than College} + \beta_9 \text{No Insurance} + \beta_{10} \text{Not Medicaid} + \beta_{11} \text{No Usual Source of Medical Care} + \beta_{12} \text{Owns Telephone}$$

Estimate baseline probabilities, with selected barriers removed:

$$\text{Probability of Delay} = \beta_0 + \beta_1 \text{Female} + \beta_2 \text{Black Race} + \beta_3 \text{Non-Hispanic} + \beta_4 \text{Urban} + \beta_5 \text{Two Parents} + \beta_6 \text{Two Children} + \beta_7 \text{Poverty} + \beta_8 \text{Less than College} + \beta_9 \text{Has Insurance} + \beta_{10} \text{Not Medicaid} + \beta_{11} \text{Has Usual Source of Medical Care} + \beta_{12} \text{Owns Telephone}$$

Policy Simulation

Vaccine Dose	No Insurance or Medical Home		Has Insurance and Medical Home	
	Likely to be Up-to-Date	Likely to be Age-Appropriate	Likely to be Up-to-Date	Likely to be Age-Appropriate
DTP4	81%	28%	85%	44%
Polio3	85%	54%	89%	64%
MMR1	86%	50%	92%	67%

Summary of Results

- Vaccination delay is quite prevalent in 25 - 72 month old children
- Up-to-date status assessments tend to understate degree of underimmunization

Summary of Results

- Risks of delay vary across demographic, economic, and access to care boundaries
- Risks not fully revealed by models of up-to-date status

Summary of Results

- Some children have exceeding low likelihood of on-time vaccination
- Health insurance and medical home can substantially reduce likelihood of delay

Policy Implications

- Age-appropriate vaccination status should be monitored in conjunction with coverage rates
- Having insurance and a usual source of medical care have a substantial influence on vaccination timeliness

Vaccination Delivery Implications

- Increased vigilance of DTP4 and MMR1 missed opportunities is most likely to improve 4:3:1 vaccination rates
- Interventions may improve age-appropriateness more substantially than overall coverage rates