Hepatitis A Vaccination Programs
Prevention Effectiveness

Beth P. Bell MD, MPH
Centers for Disease Control and Prevention
Atlanta, GA US
Hepatitis A Vaccines
Control and Prevention Strategies

• Population groups at increased risk (e.g., international travelers, injection drug users)
• “Mass vaccination”
  – Routine infant/childhood
  – Outbreaks
Hepatitis A Vaccines
Control and Prevention Strategies

- Population groups at increased risk (e.g., international travelers, injection drug users)
- “Mass vaccination”
  - Routine infant/childhood
  - Outbreaks
Reasons to Vaccinate Children

• Generally have the highest disease and infection rates
• Herd immunity results in benefits outside of vaccinated cohorts
• Eventually results in immunity in entire population as vaccinated cohorts age
Reported and Estimated Average Hepatitis A Incidence, by Age Group, United States, 1980-1999

Source: Armstrong & Bell, Pediatrics, 2002
### Selected Countries with Routine Childhood Hepatitis A Vaccination Programs; 2007

<table>
<thead>
<tr>
<th>Country</th>
<th>Target Ages</th>
<th>Year Begun</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhejiang Province, China</td>
<td>1-15 years</td>
<td>1992</td>
<td>Single dose live attenuated vaccine</td>
</tr>
<tr>
<td>North Queensland, Australia</td>
<td>18 months; catch-up to age 6 years</td>
<td>1999</td>
<td>Indigenous population</td>
</tr>
<tr>
<td>United States</td>
<td>2-18 (regional)</td>
<td>1999</td>
<td>2006 - national (12 months)</td>
</tr>
<tr>
<td>Catalonia, Spain</td>
<td>12 years</td>
<td>1998</td>
<td>A/B vaccine</td>
</tr>
<tr>
<td>Puglia Region, Italy</td>
<td>15 months 12 years</td>
<td>1997</td>
<td>A/B vaccine for adolescents</td>
</tr>
<tr>
<td>Israel</td>
<td>18 months</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>12 months</td>
<td>2005</td>
<td>Single dose</td>
</tr>
</tbody>
</table>
Hepatitis A Vaccination of Children
Shengsi County and Jiaojiang City, Zhejiang Province, China

• Begun as demonstration project in 1992
• Initial vaccination of children ages 1-15 years
• Subsequent ongoing vaccination of each new cohort
• Single dose live attenuated vaccine (ZhePu)
• Estimated coverage 85%-90%

Reported Hepatitis A Cases among Children < 16 years and Hepatitis A Vaccine Coverage, Shengsi County and Jiaozhang City, Zhejiang Province, China; 1983-2002

Before Program 1996-99                  After Program 2000-03

<table>
<thead>
<tr>
<th></th>
<th>&lt; 5 years</th>
<th>≥ 5 years</th>
<th>&lt; 5 years</th>
<th>≥ 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indigenous</td>
<td>41 cases</td>
<td>196 cases</td>
<td>1 case</td>
<td>8 cases</td>
</tr>
<tr>
<td>Non indigen</td>
<td>33 cases</td>
<td>517 cases</td>
<td>2 cases</td>
<td>55 cases</td>
</tr>
</tbody>
</table>

Childhood Hepatitis A Vaccination Program
Israel

• Beginning in July 1999, vaccination of all 18 month old children

• Vaccine provided free of charge, as part of regular immunization program

• Estimated first dose coverage in vaccinated cohorts – 90%

Source: Dagan et al, JAMA 2005
Hepatitis A Incidence, by Age and Population Group, Israel, 1993-2004

1-4 years

Vaccination Program

5-9 years

Vaccination Program

10-14 years

Vaccination Program

15-44 years

Vaccination Program

Source: Dagan et al, JAMA 2005
Hepatitis A Prevention Demonstration Project
Butte County, CA; 1995-2000

• Target population – children 2-12 years old
  – Ongoing vaccination of new cohorts

• Project features
  – Provision of free vaccine
  – Provider and school-based vaccination
  – Vaccination registry
  – Active surveillance

• 2000 vaccination coverage
  – 62% first dose
  – 40% complete series
Hepatitis A Annual Incidence, Butte County and California, 1990-2000

Source: Averhoff et al, JAMA, 2001
Average Age-Specific Hepatitis A Incidence, Butte County, CA, 1990-94 and 1995-2000

Source: Averhoff et al, JAMA, 2001
Incremental Recommendations for Hepatitis A Vaccination of Children
U.S. Advisory Committee on Immunization Practices

• 1996 - Children living in “high rate” communities
  – Mostly indigenous populations

• 1999 - Children living in states/communities with consistently elevated rates during “baseline period”
  – 17 primarily western and southwestern states
  – Approximately one third of US population

• 2006 – Nationwide
  – 12-23 month old cohort
Incremental Recommendations for Hepatitis A Vaccination of Children
U.S. Advisory Committee on Immunization Practices

- 1996 - Children living in “high rate” communities
  - Mostly indigenous populations
- 1999 - Children living in states/communities with consistently elevated rates during “baseline period”
  - 17 primarily western and southwestern states
  - Approximately one third of US population
- 2006 – Nationwide
  - 12-23 month old cohort
Features of Regional Hepatitis A Vaccination Program, United States, 1999-2006

• 17 states with consistently elevated rates during “baseline period”
  – Focus on areas with highest disease burden
• Children, aged 2-18 years
  – Focus on younger children
  – Multiple possible strategies
• Same funding mechanism as routinely recommended infant vaccines
1999 ACIP Recommendations for Statewide Routine Hepatitis A Vaccination of Children*

* Based on average incidence rate during baseline period (1987-97)
Hepatitis A Vaccine Coverage (≥1 dose) among 24-35 Month Old Children, National Immunization Survey, United States, 2005

Coverage range among 11 states: 13-71%

Coverage range among 6 states: 2-58%

Source: CDC, unpublished.
Hepatitis A vaccine coverage (one or more doses) among Arizona and Oregon children, 2004-5 (n=488)

Telephone survey with provider verification of immunization record
Hepatitis A Incidence, United States, 1980-2006

- 2006 rate = 1.2
- 4,000 cases
- 1995 vaccine licensure
- 25,000-35,000 cases/year
Hepatitis A Incidence, 1980-2006: Vaccinating and Non-Vaccinating States

Overall

No recommendation

Vaccine recommended or considered

Cases per 100,000
Medstat MarketScan Database

Comparing baseline (1996-97) to 2004, statistically significant declines:

- Hospitalizations – 69%
- Ambulatory visits – 42%

Adjusted to US population, medical expenditures for hospitalizations and ambulatory visits declined:

- $29.1 million (baseline) to $9.3 million (2004) – 68% reduction

Age-Adjusted Hepatitis A Mortality Rates, United States, 1990-2004

Source: Vogt et al; JID in press
Hepatitis A Vaccine to Control Outbreaks
Key Features of Successful Interventions

- Relatively small, well-defined target population
- Most adults already immune
- Rapid vaccination of majority of susceptible population
- Not long term solution unless coupled with ongoing vaccination program
Reported Hepatitis A Cases, by Year
Northern Plains Indian Reservation
South Dakota, 1968-1998

*Estimated first dose coverage (children 2-12 years) = 71%
Source: South Dakota Department of Health

*Vaccination program*
Impact of Childhood Hepatitis A Vaccination Programs Summary

- Extremely effective in protecting vaccinated individuals
  - Breakthrough infections rare
- Early results indicate considerable public health impact
  - May accelerate with catch-up program but need depends on epidemiology and objectives
Impact of Childhood Hepatitis A Vaccination Programs Summary

• Impressive reductions with modest vaccination coverage
  – Evidence of considerable out-of-cohort effects among unvaccinated children and adults
    • Pre-existing age-specific prevalence of immunity in population may affect specific pattern and degree

• When epidemiologic pattern is heterogeneous, consider novel strategies

• Need to monitor incidence to assess
Emerging Issues

- Global leadership
  - Need guidance for countries considering implementing programs

- Better surveillance and disease burden data
  - Hepatitis A in context of other public health priorities
  - Consideration of novel vaccination strategies

- Vaccine performance
  - Long term protection
  - Alternate schedules