

# Hepatitis A among contacts of internationally adopted children

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NCHHSTP/CDC

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# Outline

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- Describe morbidity of hepatitis A associated with international adoption by providing some examples of recent cases
- Background features of hepatitis A virus infection
- Characteristics of international adoptees
- Estimate risk of hepatitis A among close contacts of these adoptees

# Hepatitis A among close contacts of international adoptees

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- June 2007, CDC was notified of a fulminant acute hepatitis A case, hospitalized
  - 51-year-old grandmother of 12 months old adopted twins
  - Twins were not jaundiced, confirmed to have hepatitis A (anti-HAV IgM+)
- Prompted further investigation – 20 cases in non-traveling contacts of international adoptees from 6 states, 2006-2007

# Hepatitis A in both non-traveling parents of international adoptee, Minnesota, 2008

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- Adoptee 18 month old, not-jaundiced, confirmed to have hepatitis A (anti-HAV IgM+)
- Impact of hepatitis A
  - Both parents hospitalized
  - Duration of illness 2 months
  - Too ill to care for child
  - Unable to work
  - Medical care costs

# Community spread of hepatitis A related to an international adoptee Maine, 2008

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- Adoptee, a non-jaundiced 10 month old, confirmed hepatitis A (anti-HAV IgM+)
- All (12) cases non-traveling contacts
  - 6 cases in household members (attack rate 100%)
  - 4 cases in 3<sup>rd</sup> and 5<sup>th</sup> grades of elementary school
  - Exposure in pre-kindergarten class
  - 2 cases in extended family members
- 2 adults hospitalized (one fulminant hepatitis)
- Public health: set up 2 vaccination clinics (pre-kindergarten class and elementary school)

# Hepatitis A in non-traveling contacts of international adoptee, Wisconsin, 2009

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- Two children, aged 8 and 14 months were adopted
  - 14 month old non-jaundiced, confirmed hepatitis A (anti-HAV IgM+)
- Both parents were vaccinated before travel (per ACIP recommendation), not sick
- 3 cases among 5 non-traveling household contacts (Attack rate 60%)
- IG and vaccine offered to other close contacts

# Summary

- International adoptees have been recognized as an important source of hepatitis A for their unvaccinated (non-traveling) contacts in the U.S.
- Incomplete ascertainment of cases
  - Cases of hepatitis A are substantially underreported
  - The current hepatitis A surveillance system does not capture international adoption as risk factor

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# Features of hepatitis A

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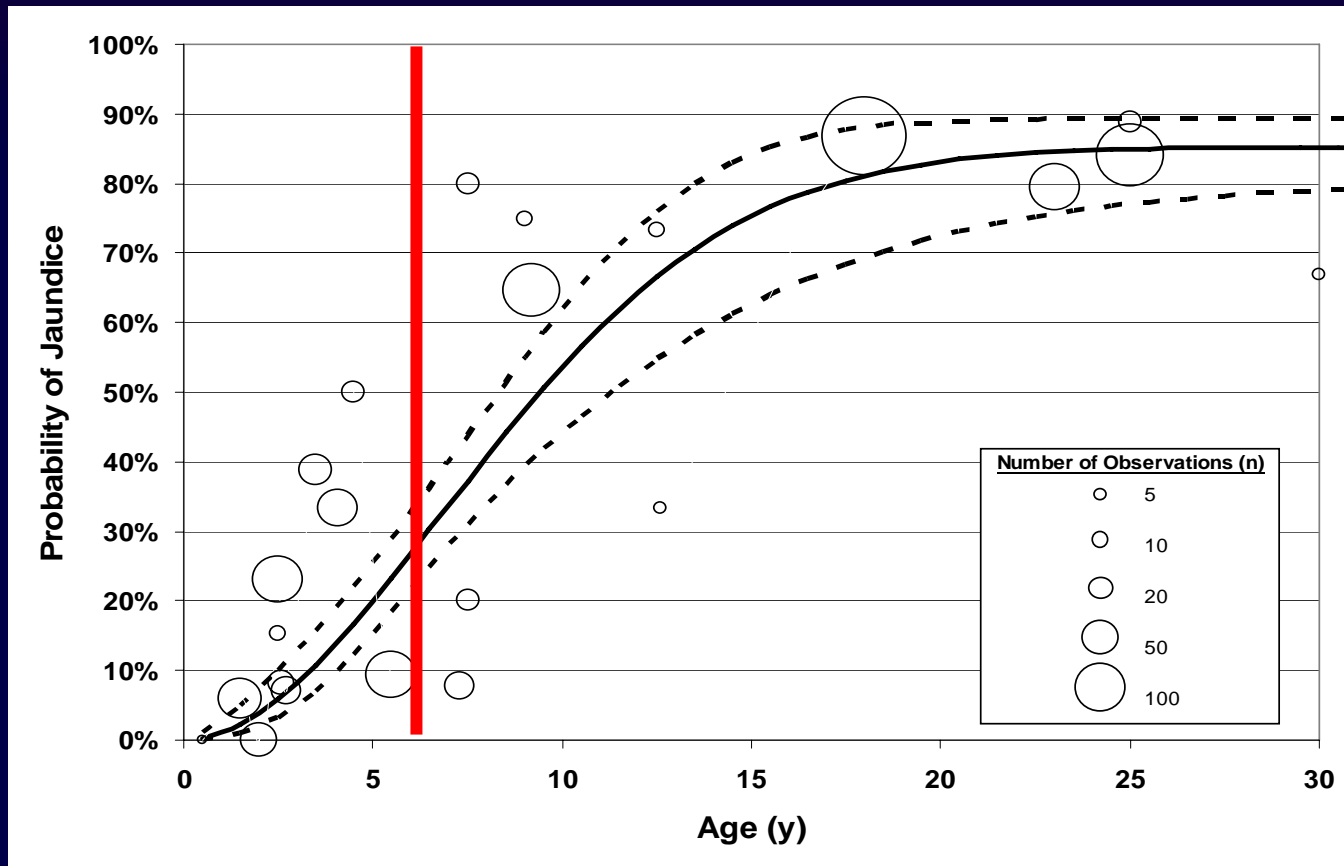
# Transmission of hepatitis A virus

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- Incubation: 4 weeks (range 2-8 weeks; ~ 60 days)
- Infectiousness greatest ~2 weeks before jaundice
- In the U.S., transmission most common by person-to-person contact, especially household settings<sup>1</sup>
- Highest risk from children in diapers (0-3 years)<sup>2</sup>
- Infected, non-jaundiced children < 6 years most likely source of hepatitis A for adults without other risk factors<sup>3,4</sup>

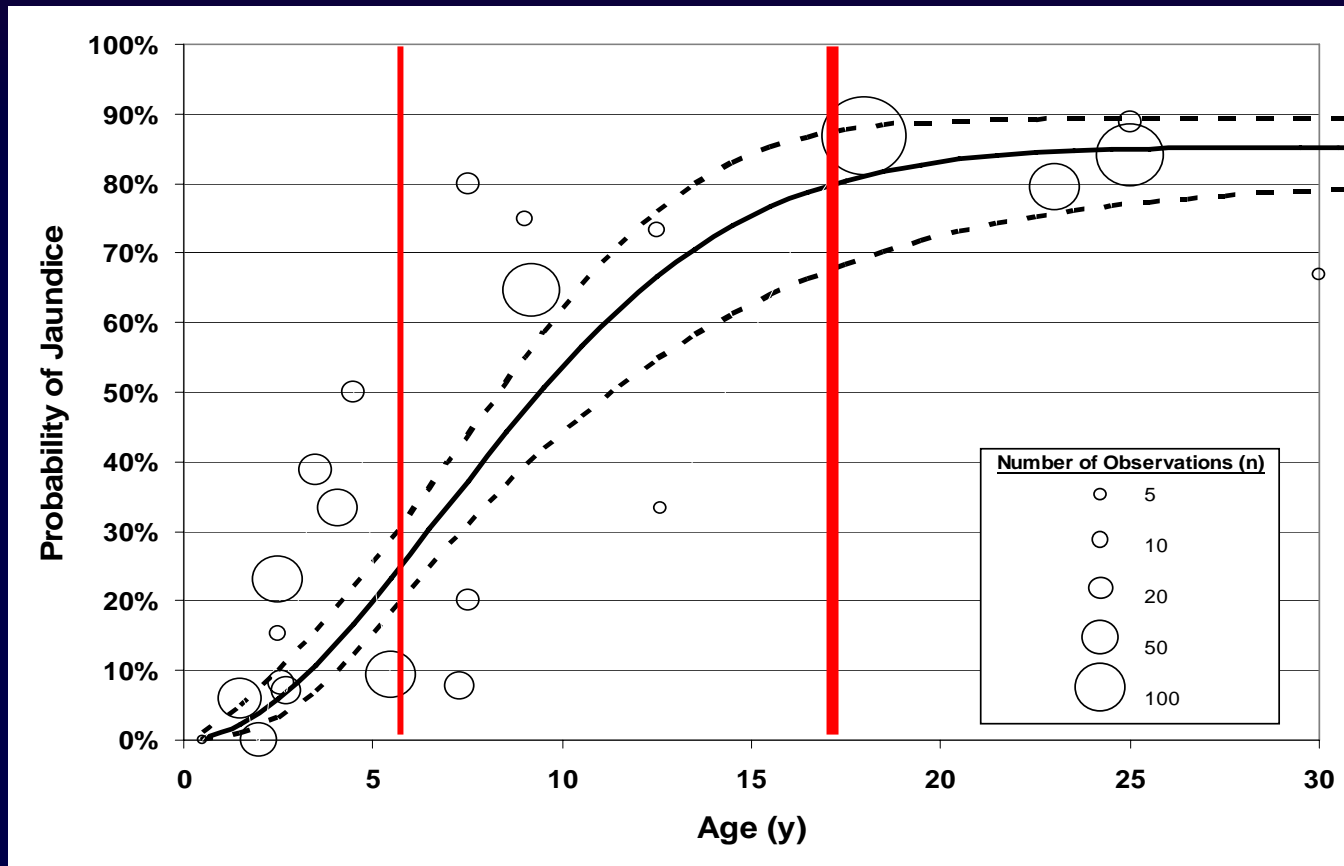
(1) Bell BP et al. J Infect Dis 1998;178(6):1579-84; (2) Hadler S et al. J Infect Dis 1982; 145: 255-61; (3) Staes CJ et al. Pediatrics 2000;106(4):E54; (4) Smith PF et al. Epidemiol Infect 1997; 118:243-52

# Probability of symptomatic (jaundice) hepatitis A infection by age



**70% children <6 years old infected without jaundice**

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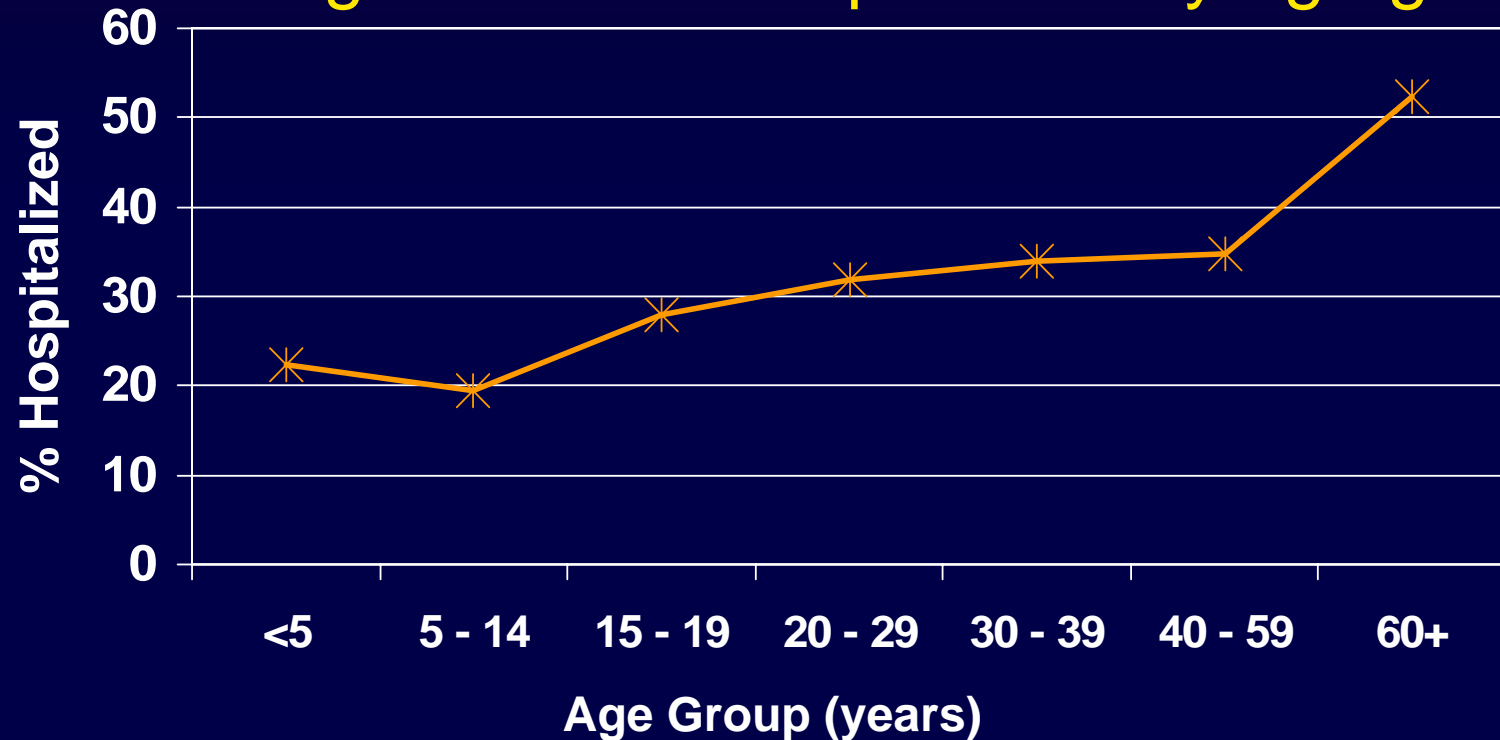


**20%-50% children 6-17 years old infected without jaundice**

# Severity of hepatitis A by age

## U.S. National Surveillance, 2006

- Percentage of cases hospitalized by age group



- Overall fatality rates 0.3% - 0.6%
  - 3 times higher (1.8%) among adults >50 years

# Hepatitis A: estimated costs, all ages U.S., 2004

Cost per case	Cost US \$	Source
Fulminant hepatitis w/ transplant	\$ 285,900	Houbold RA (1999)
Fulminant hepatitis w/o transplant	\$ 24,138	Berge JJ (2000)
Hospitalization	\$ 8,111	Dalton CB (1996); Berge JJ (2000)
Outpatient visits for acute icteric hepatitis	\$ 821	Dalton CB (1996); Berge JJ (2000)
Public health*	\$675	Rein DB Technical report

\* Not including outbreak control (e.g., vaccination clinics)

# Summary

- ~70% of infected children <6 years, ~20-50% of infected older children are not jaundiced
- Incubation period can be as long as 8 week or ~60 days
- Diaper-wearing aged children are the most efficient source of transmission to older age groups
- Death and hospitalization due to hepatitis A is more likely to occur among infected adults

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At-risk population:  
Contacts of international adoptees

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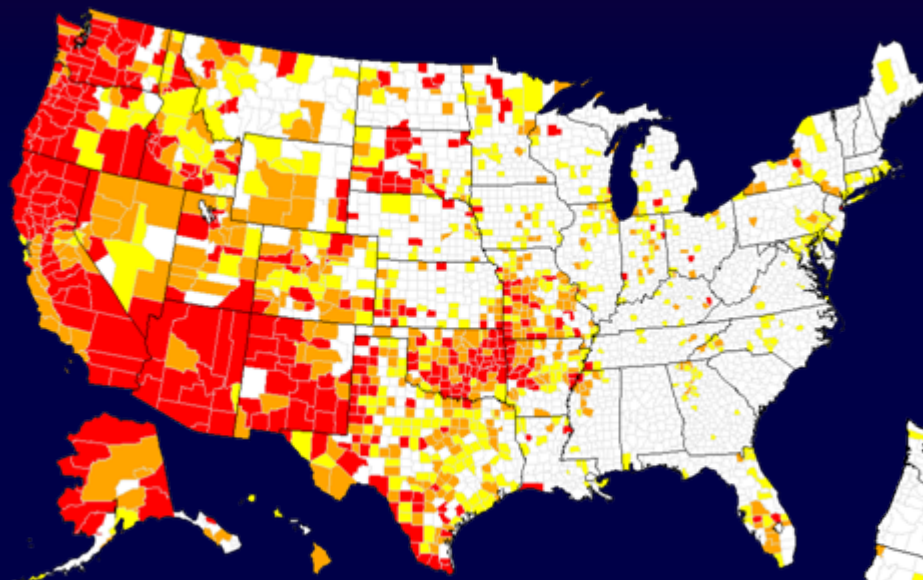
# Incremental recommendations for hepatitis A vaccination in the U.S.

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- Hepatitis A vaccine first available in 1995
- ACIP recommendations
  - Targeted vaccination for children in high endemic areas, and high risk groups, e.g., travelers (1996 & 1999)
  - Nationwide childhood immunization for 12-23 month olds (2006)
- Although children targeted, strong herd immunity effect described<sup>1</sup>

# Hepatitis A incidence based on passive reporting – All ages

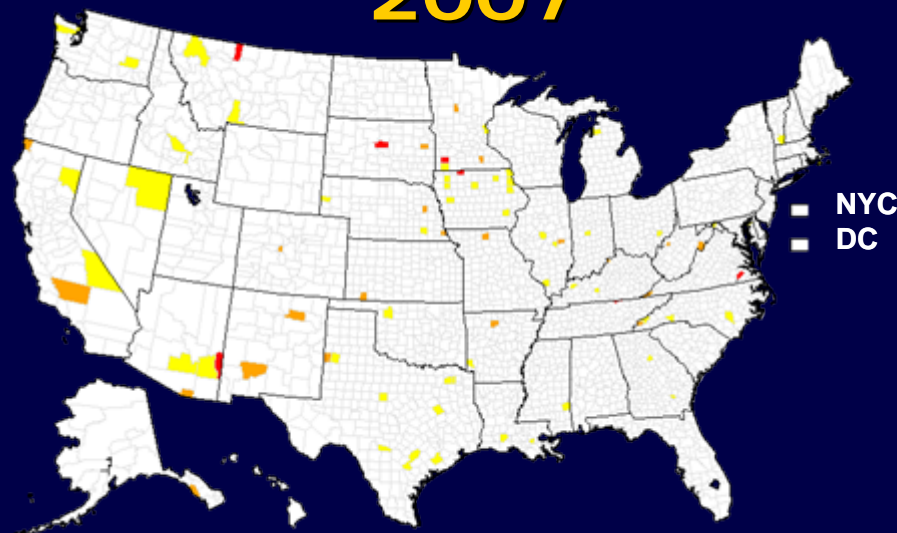
1987–1997



Rate\*

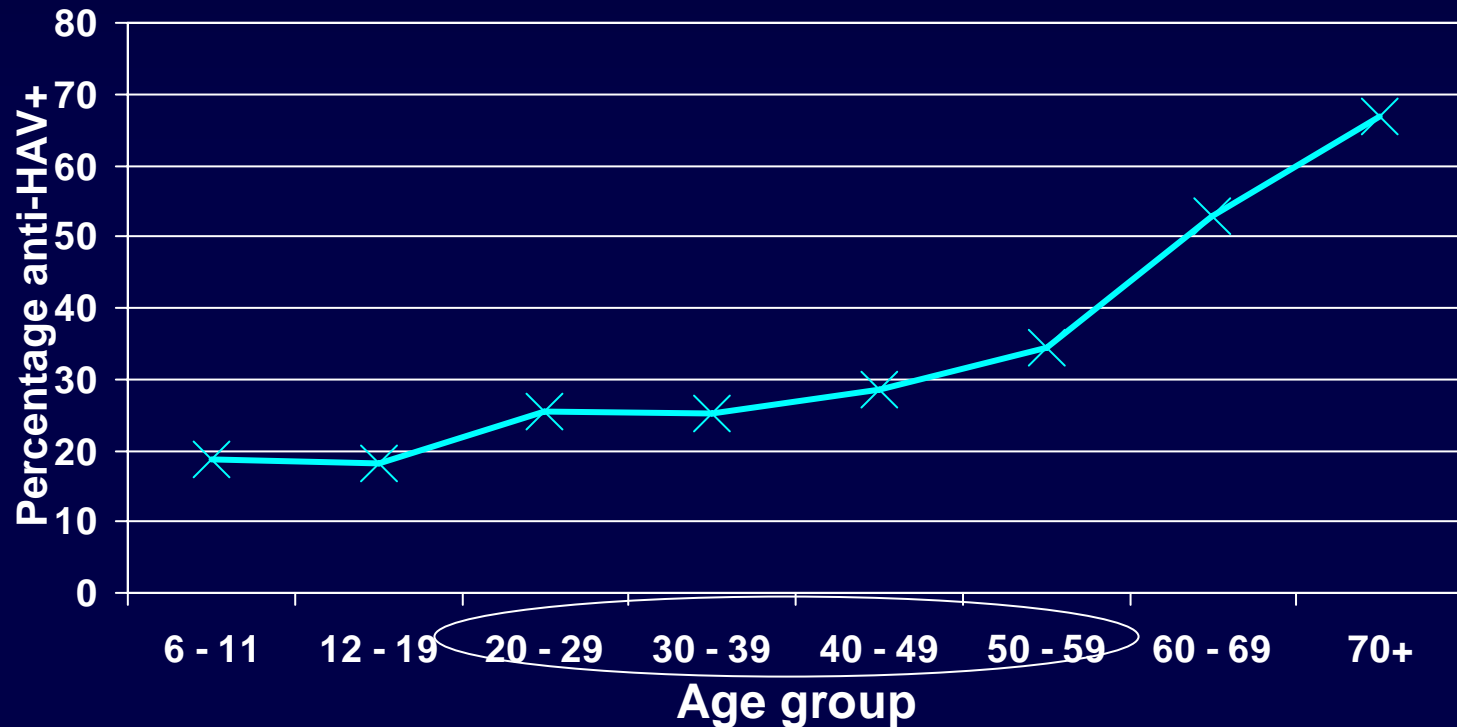


2007



\*Per 100,000 population

# Seroprevalence of antibody to hepatitis A among U.S. born persons ages 6–74 years, NHANES, 1999-2004



**>60% susceptible**

# Summary

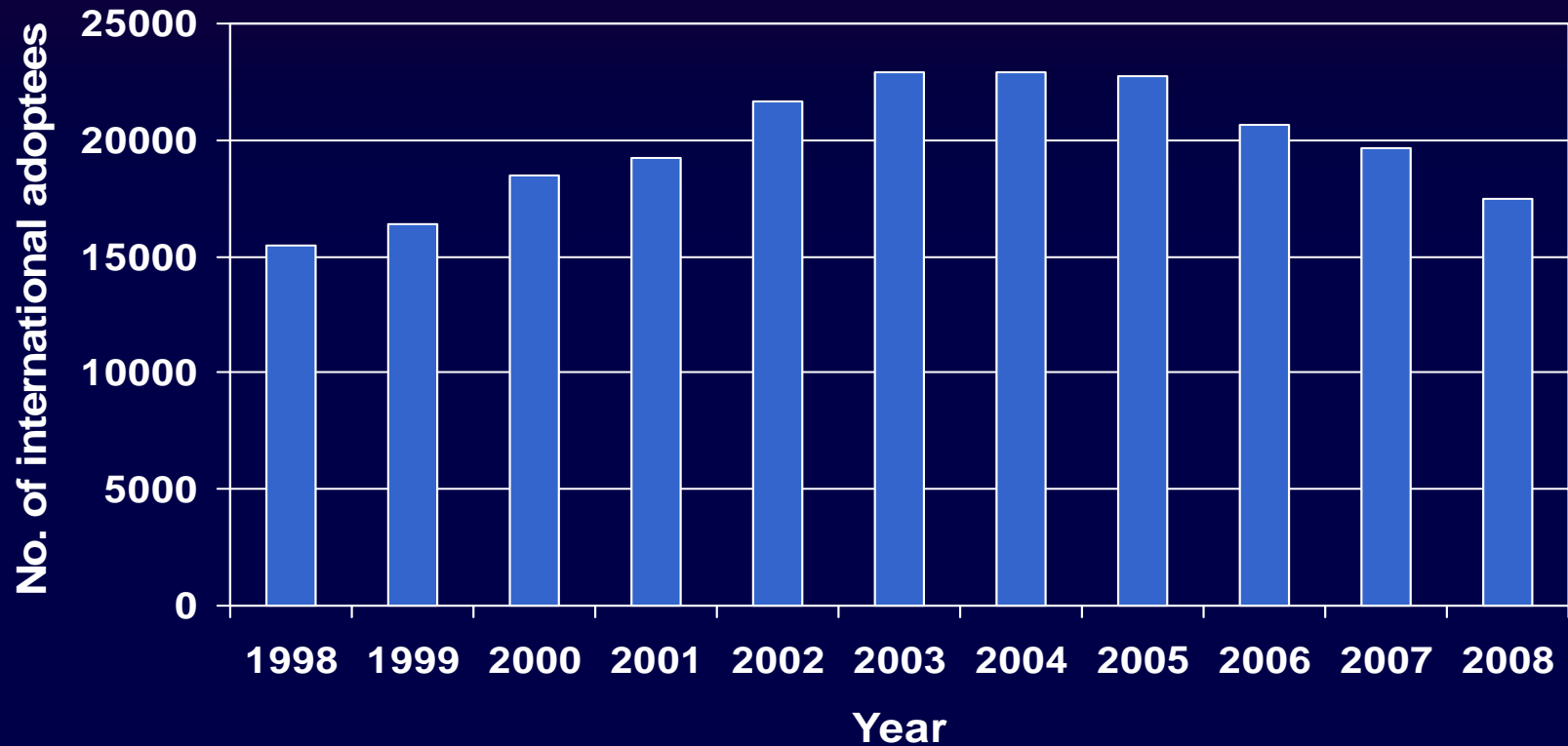
- Hepatitis A infections decreased in all age groups – strong herd immunity effect
- ~ 60% of adults 20-59 years are susceptible to hepatitis A – age group most likely to be adoptive parents

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**Who are the children adopted  
internationally?**

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# Annual number of internationally adopted children coming to the US, 1998-2008\*

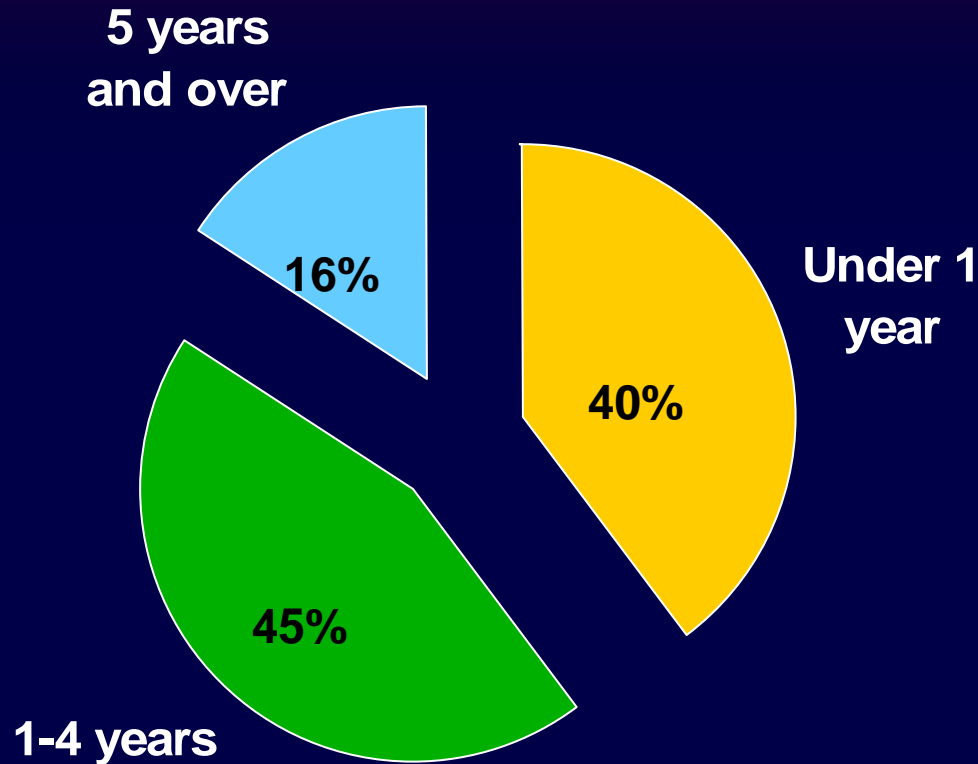


**Average annual number ~ 18,000**

\* Estimated from immigrant visas issued to orphans

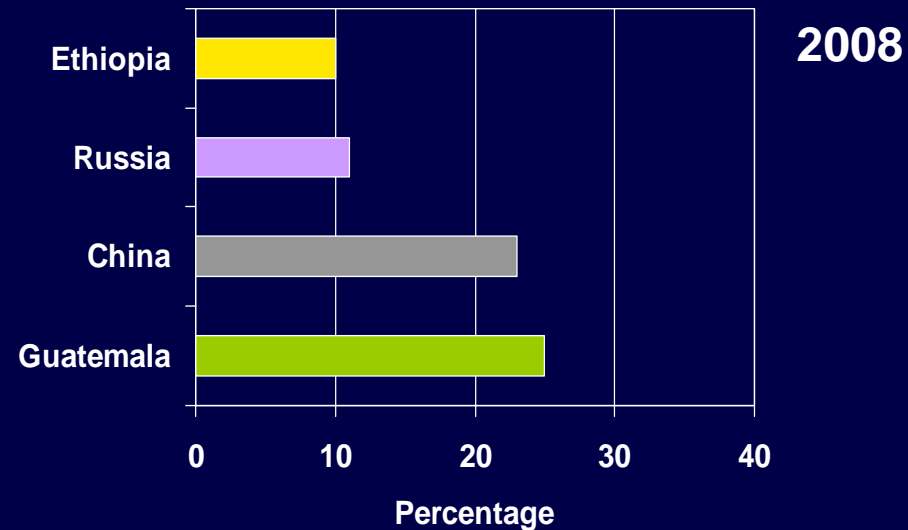
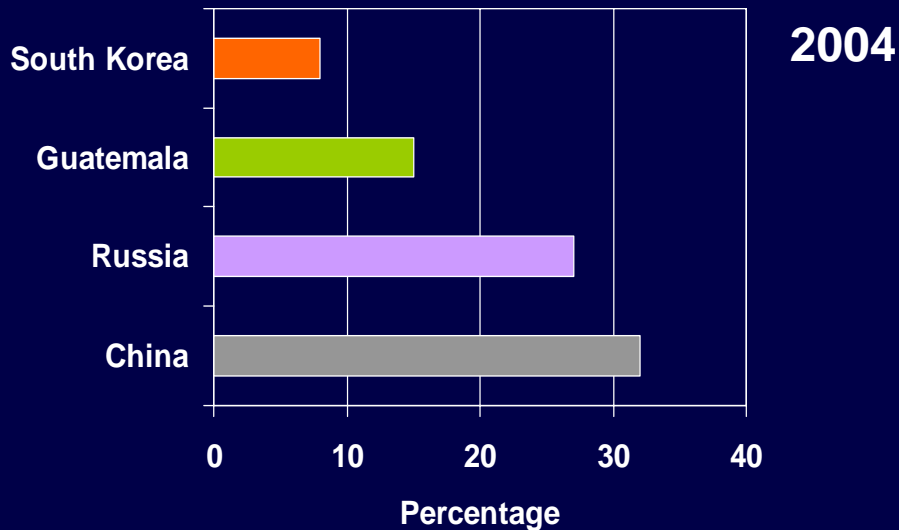
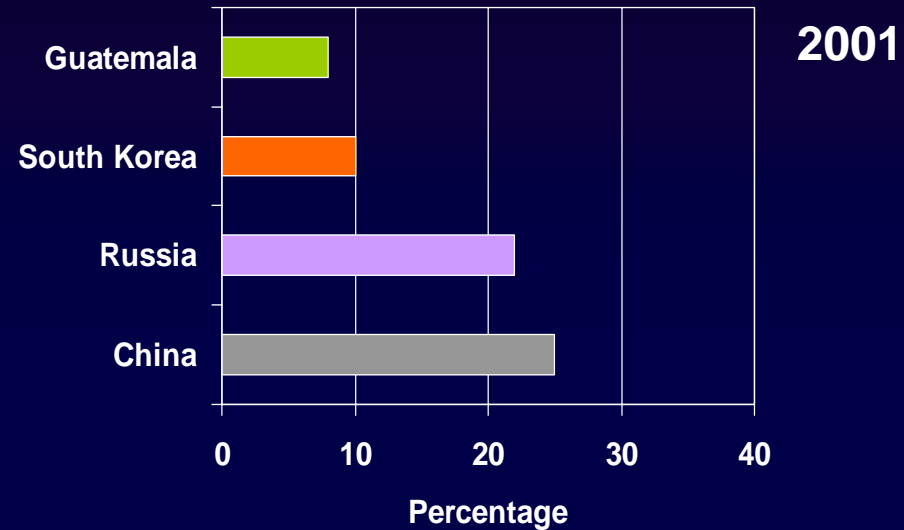
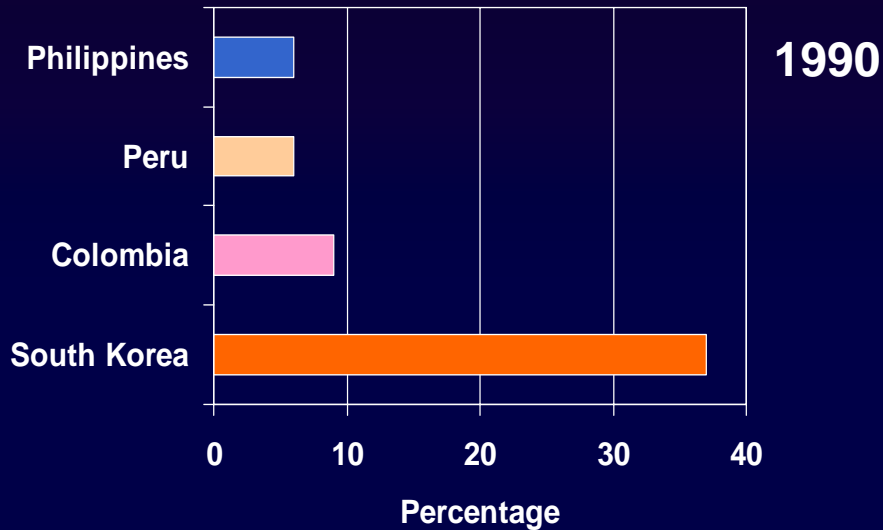
Source: [http://adoption.state.gov/news/total\\_chart.html](http://adoption.state.gov/news/total_chart.html)

# Age distribution of internationally adopted children (0-17 years), 2007



**~ 85% are children <5 years of age**

# Country of origin for international adoptions in the U.S., by year



# Medical requirements for internationally adopted children

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- Before admission must have medical examination in country of origin by a US State Department designated physician
- Examination focuses on “serious physical or mental defects” - no screen for acute HAV infection
- International adoptees  $\leq 10$  years exempt from immunization requirements for entry in the US
  - Immigration and Nationality Act - Oct 21, 1997

# Seroprevalence of antibody to hepatitis A among international adoptees <6 years, by country of origin, first medical encounter

Country of origin	Cincinnati, OH		Minneapolis, MN	
	2006-2008		2008	
	No. Tested	Total anti-HAV+	No. Tested	Total anti-HAV+
<b>Ethiopia</b>	<b>18</b>	<b>55%</b>	<b>18</b>	<b>72%</b>
<b>Guatemala</b>	<b>54</b>	<b>25%</b>	<b>32</b>	<b>25%</b>
<b>Russia</b>	<b>56</b>	<b>19%</b>	<b>21</b>	<b>9%</b>
<b>China</b>	<b>79</b>	<b>10%</b>	<b>20</b>	<b>10%</b>

Data unpublished: Cincinnati Children's Hospital Medical Center, Mary Staat; and University of Minnesota, International Adoption Medicine Program, Cindy Howard

# Recent or current hepatitis A virus infection among international adoptees by age group in 3 adoption clinics

Age group (years)	Cincinnati, OH 2006-2008		Lexington, KY 2007-2008		Minneapolis, MN 2008	
	No. Tested	Anti-HAV IgM+	No. Tested	Anti-HAV IgM+	No. Tested	Anti-HAV IgM+
< 2	157	1	126	2	82	7
2-5	72	2	39	0	41	2
6-11	33	0	14	2	15	0
12-17	11	0	3	2	0	0
<b>Total</b>	<b>273</b>	<b>3</b>	<b>182</b>	<b>6</b>	<b>138</b>	<b>9</b>
<b>Percent</b>		<b>1.1%</b>		<b>3.3%</b>		<b>6.5%</b>

Data unpublished: Cincinnati Children's Hospital Medical Center, Mary Staat; A Caring Touch Pediatrics & International Adoptions, Lexington, Shawn Taylor; and University of Minnesota, International Adoption Medicine Program, Cindy Howard

# Summary

- ~18,000 internationally adopted children from hepatitis A endemic countries annually
- Exempt from immunization requirements before entry in the U.S.
- Estimated 1% - 6% international adoptees are infectious on arrival in the U.S. based on anti-HAV IgM testing, 2006-2008

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# Estimated risk of infection

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# Assumptions to estimate risk of hepatitis A infection among close contacts of international adoptees 0-17 years

Parameters & Assumptions	Baseline	Sensitivity analysis
Annual no. of internationally adopted children	18,000	<i>constant</i>
Contacts per adoptee ( <i>Sentinel Counties Study, CDC unpublished</i> )	7	<i>constant</i>
Total no. of contacts at risk (7 X 18,000)	126,000	<i>constant</i>
Susceptibility among contacts	0.5	0.3 – 0.9
Attack rate among contacts	0.3	0.1– 0.5
Proportion of infectious adoptees at arrival*	0.012	0.006 – 0.039

\*Assuming 60 day risk of infection, based on upper limit of incubation period

# Estimated hepatitis A among persons in close contact with international adoptees in the U.S.

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	Baseline	Sensitivity analysis
Number of cases of hepatitis A per year	136	113 - 1031
Risk of hepatitis A (within 60 days of adoptees' arrival )	106* per 100,000	90 – 819 per 100,000

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\*2006 annual incidence hepatitis A in U.S., 1.2 /100,000 (MMWR 2008; 57 SS-2)

# Limitations of risk assessment

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- Risk of transmission among close contacts will vary
  - by age of adopted child (highest among children in diapers, i.e., 0-3 years)
  - by country of origin of adopted child
  - by time of arrival of adopted child related to infectiousness period
- Estimate of number of “close contacts” – denominator – might not be accurate

# To conclude

- International adoptees come from countries endemic for hepatitis A
- A substantial proportion of U.S. adults are susceptible to hepatitis A and at risk for severe disease
- Adoptees with unrecognized hepatitis A virus infection on arrival in the U.S. are a source of hepatitis A for their close contacts
- Current recommendations for pre-exposure hepatitis A vaccination do not address non-traveling close contacts of international adoptees

# Thank you!

## Working group

Mark Sawyer (Chair)

Paul Cieslak (ACIP member)

Kris Ehresmann (ACIP member)

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AAP, NACCHO, IDSA, AGS,  
HICPAC, SHEA

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