

# Parental Knowledge, Attitudes, and Practices Associated With Not Receiving Hepatitis A Vaccine in a Demonstration Project in Butte County, California

Barbara Bardenheier, MPH, MA\*; Idalia M. González, MD, MPH\*; Michael L. Washington, PhD‡; Beth P. Bell, MD, MPH§; Francisco Averhoff, MD, MPH\*; Mehran S. Massoudi, PhD, MPH\*; Insu Hyams, BSRN||; Edgar P. Simard, BSS; and Hussain Yusuf, MBBS, MPH\*

**ABSTRACT.** *Objective.* To determine hepatitis A vaccination coverage and factors associated with not receiving hepatitis A vaccine among children.

*Methods.* A random cluster sample survey was conducted of parents of children who attended kindergarten in Butte County, California, in 2000. Because of a history of recurrent epidemics, an aggressive hepatitis A vaccination program was ongoing during the time this study was conducted. Receipt of 1 or 2 doses of hepatitis A vaccine was studied.

*Results.* Of 896 surveys sent, 648 (72%) were completed. The vaccination coverage for at least 1 dose of hepatitis A vaccine was 398 (62%) and for 2 doses was 272 (42%). Factors associated with not receiving the vaccine included lack of provider recommendation (vs having recommendation; odds ratio [OR]: 7.8; 95% confidence interval [CI]: 4.9–12.2), not having heard of the vaccine (OR: 2.4; 95% CI: 1.2–4.9), and parent's not perceiving child is likely to get hepatitis A (vs perceiving child might get disease; OR: 2.1; CI: 1.6–2.9).

*Conclusions.* Vaccination coverage among kindergartners did not reach high levels (ie, >90%), despite aggressive vaccination efforts in this community. Lack of provider recommendation and lack of parental awareness of hepatitis A vaccine were the 2 most significant factors associated with failure to receive vaccine. These findings will facilitate the development of vaccination strategies for communities in which hepatitis A vaccination is recommended. *Pediatrics* 2003;112:e269–e274. URL: <http://www.pediatrics.org/cgi/content/full/112/4/e269>; hepatitis A; knowledge, attitudes, and practices; vaccination.

ABBREVIATIONS. CDC, Centers for Disease Control and Prevention; ACIP, Advisory Committee on Immunization Practices; BCHD, Butte County Health Department; CI, confidence interval; SES, socioeconomic status.

From the \*Immunization Services Division, National Immunization Program, Centers for Disease Control and Prevention, Atlanta, Georgia; ‡Data Management Division, National Immunization Program, Centers for Disease Control and Prevention, Atlanta, Georgia; §Division of Viral Hepatitis, National Center for Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia; and ||Butte County Department of Public Health, Oroville, California.

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Address correspondence to Barbara Bardenheier, MPH, MA, Centers for Disease Control and Prevention, 1600 Clifton Rd, MS E-52, Atlanta, GA 30333. E-mail: bfb7@cdc.gov

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Hepatitis A is among the most frequently reported vaccine-preventable diseases in the United States; in 2001, >11 500 cases were reported (Centers for Disease Control and Prevention [CDC], unpublished data, 2002). Because of clinically unrecognized or asymptomatic infections, especially among children, the number of infections may be up to 10 times higher.<sup>1</sup> Because children account for at least one third of cases and also are a potential source of infection for others, routine vaccination of children is likely to be an effective way to reduce hepatitis A incidence.<sup>2</sup> In October 1999, the Advisory Committee on Immunization Practices (ACIP) updated recommendations for hepatitis A vaccination to include routine vaccination of children age  $\geq 2$  years in states, counties, and communities with hepatitis A incidence rates that were at least twice the 1987–1997 national average ( $\geq 20$  cases per 100 000 population).<sup>2</sup> Over time, this strategy has the potential to substantially lower disease incidence and possibly eliminate indigenous transmission of hepatitis A virus.<sup>3</sup>

Butte County is located in the Sacramento Valley of northern California and had an estimated population in 2000 of 207 000. The county has had recurrent outbreaks since hepatitis A became reportable in 1966 and meets the ACIP's criteria for routine childhood hepatitis A vaccination.<sup>4</sup> During 1987–1997, the average annual hepatitis A incidence rate was 45.3 per 100 000 (CDC, unpublished data, 2001).

From January 1995 through December 2000, a demonstration project was implemented in Butte County to assess the impact of routine vaccination of children on disease incidence over time. Hepatitis A vaccine was made widely available free of charge to children aged 2 to 12 years in 1995 and to successive cohorts of 2-year-old children through public and private providers in the county. Initially, hepatitis A vaccine was administered primarily in school-based clinics. Starting in 1996, private and public health care providers administered the vaccine. To evaluate further the vaccination program, we surveyed parents and providers of kindergarten children to assess their knowledge, attitudes, and practices toward hepatitis A vaccination and to identify factors associated with not receiving hepatitis A vaccine. This report presents findings from the survey of parents.

## METHODS

### Study Population and Sampling Method

The study population included parents or legal guardians of kindergarten-enrolled children who resided in Butte County for at least 1 year and attended a public or private school in the county. Children who were aged 4 to 5 years in 2000 were one of the first cohorts of age-appropriate children to have received the hepatitis A vaccine, which was licensed in 1995.<sup>3</sup> From February through April 2000, we conducted a cross-sectional survey using a random cluster sample design. Butte County has 13 school districts with 166 kindergarten classrooms in 16 private and 50 public schools. The primary sampling units were classrooms, each with an equal chance of being selected. To ensure 80% power when testing hypotheses regarding parents' decisions about children's receiving hepatitis A vaccine, using a 2-sided test with  $\alpha = 0.05$  and assuming that half the population was vaccinated, 60 classrooms were randomly selected, which included 901 enrolled students. For confidentiality reasons, we were not told the actual number of children per classroom. However, we were told the total number of kindergartners and the number of kindergarten classrooms for each school, from which we estimated the classroom size. The study was approved by the Institutional Review Board of the CDC.

The teachers of the selected classrooms were given English and Spanish surveys to distribute to all students in their classrooms to take to their parents. Parents/legal guardians signed an informed consent form either agreeing or declining to participate in the study. Envelopes were provided so that respondents could return the consent form and survey confidentially through their child to the teacher. When a teacher did not receive a survey back from a child in 3 to 5 days, the teacher sent a reminder home with the child. After an additional 3 to 5 days, all forms and surveys that were returned to the teacher were mailed back to the Butte County Health Department (BCHD). Parents who did not respond were contacted by the BCHD and, if interested, were interviewed by telephone.

### Survey Questionnaire and Outcome Measure

The survey questionnaire included questions related to demographics, health-seeking practices, and knowledge and attitudes about hepatitis A disease and the vaccine. To determine the vaccination status of students, we first used vaccination documentation contained in the BCHD hepatitis A immunization registry because all vaccinations that were given free-of-charge during the demonstration project were recorded from provider records in the registry. Second, because a child could have received the vaccine from a provider not participating in the demonstration project, a child was considered vaccinated when he or she was not included in the registry but the parent provided vaccination dates from a vaccination card on the survey. When vaccination was not recorded in the registry or by the parent-held vaccination card, the child was considered unvaccinated. Because the registry in our study was set up only as part of the demonstration project and contained information on only 1 vaccine, we did not explore the use of or accuracy of the registry.

### Statistical Analyses

The study design was a random cluster sample (schools being clusters), with sampled clusters grouped into strata by school districts. Data were weighted to be generalizable to Butte County; however, although our study was designed to be related to the specific circumstances of Butte County's demonstration project, we believe that many of the study's important findings are likely to be generalizable to communities similar to Butte County. We examined the association between receipt of at least 1 dose of hepatitis A vaccine and selected child/parent characteristics using logistic regression to calculate odds ratios. After testing for collinearity, variables that were significant in the bivariate analyses were included in the logistic regression model. Analyses were conducted using SUDAAN, release 7.5.6 (Research Triangle Institute, Research Triangle Park, NC).

### Response Rates

Of 901 parent surveys distributed, 896 met the study criterion; 5 children did not live in Butte County for at least 1 year before the survey and were excluded. The number of surveys completed and

returned was 648, yielding a response rate of 72.3%. Of the 59 classrooms, the average estimated class size was 18.32 (range: 1–30). The average number of surveys returned per classroom was 11.0 (range: 1–20).

Because only 36, or 5.5%, of the entire study group reported receipt of vaccination by a parent vaccination card (with vaccination dates) but was not reported to be vaccinated by the registry, we did not further examine data for differences between those using parent-reported data not in the registry and the parent-reported data in the registry. Because the vaccine was offered free of charge by participating providers during the demonstration project, which was documented in the registry, parents would have had more incentive to take their children to those providers to receive the vaccine. Therefore, parents were probably more likely to have gone to a provider who was participating in the demonstration project and thus would be included in the registry.

## RESULTS

The majority of children were non-Hispanic white, and most mothers surveyed had greater than high school education (Table 1). The annual household income for the vast majority of children was <\$50 000, and for almost a third, it was <\$15 000. Approximately one half of the parents reported that either their child's doctor or the health department had recommended hepatitis A vaccine for their child, and one fourth said that no one had recommended it.

In all, 398 (61.8%; 95% confidence interval [CI]: 56.9–66.8) children received at least 1 dose of hepatitis A vaccine and 272 (42.2%; 95% CI: 37.5–46.8) received 2 doses of the vaccine. The vaccination history of 362 (91.0%) vaccinated children was based on documentation in the registry; the status of the remaining 9% was based on parents' vaccination records. Twenty-four children who received 1 dose only were immunized within 6 months of the survey and could not have completed the series by the time of the survey.

The majority of parents reported that they had heard of hepatitis A disease and of hepatitis A vaccine (Table 2). Approximately half believed that hepatitis A was a major problem in Butte County and that it was likely that their child would get hepatitis A in the county. However, almost all parents believed that it would be serious if their child were to get hepatitis A. Seventy-four percent of parents reported that they believed that the hepatitis A vaccine is safe, and two thirds believed that the vaccine should be required before school entry. Among parents of children who did not receive hepatitis A vaccine, the most commonly reported reasons given for why the child did not receive the vaccine were that they had never heard about it (32.5%), their doctor did not recommend it (20.1%), and they intended to have their child vaccinated but had not done so yet (21.5%).

Results of the bivariate analyses indicated that the factor most strongly associated with not receiving the vaccine was not having received a doctor's or the health department's recommendation for it (Table 1). Black children were more likely to be vaccinated than white children. Children of parents with less than a high school education and income <\$50 000 were more likely to be vaccinated. Children who usually received immunizations at a health department or community clinic and those with public or no insurance were more likely to be vaccinated. We

**TABLE 1.** Child and Health Care Characteristics of Respondents, Butte County, California, 2000 (*n* = 648)

Characteristics	<i>n</i> (Weighted %)	% Who Received 1 + Doses of Hepatitis A Vaccine	0 Versus 1–2 Doses
			OR 95% CI
Race			
White	411 (65.7)	56.3	1.0 Referent
Black	14 (2.3)	95.0	0.1 (0.0–0.7)*
Hispanic	112 (16.8)	69.8	0.6 (0.3–1.0)
Asian	52 (8.6)	68.7	0.5 (0.3–1.0)
American Indian	26 (4.2)	80.3	0.3 (0.1–1.0)
Other	15 (2.4)	87.1	0.2 (0.0–1.0)
Highest level of education of child's mother			
>High school	366 (61.8)	54.2	1.0 Referent
High school	132 (20.2)	68.8	0.5 (0.3–1.0)
<High school	113 (18.0)	80.2	0.3 (0.2–0.6)*
Income			
≥\$50 000	127 (22.6)	38.7	1.0 Referent
\$15 000–50 000	264 (45.7)	62.1	0.4 (0.3–0.7)*
<\$15 000	178 (31.7)	80.4	0.2 (0.1–0.3)*
Who recommended hepatitis A shot?			
Doctor/health department	334 (54.9)	77.7	1.0 Referent
School/child care/WIC/media/other	109 (18.7)	56.8	2.6 (1.8–3.8)*
No one recommended	170 (26.4)	31.5	7.8 (4.9–12.2)*
Is there a regular doctor/clinic for well/sick visit?			
Yes	613 (96.4)	62.6	1.0 Referent
No	24 (3.6)	57.1	1.2 (0.5–2.9)
Where do you usually take child for shots?			
Doctor's office	511 (80.5)	58.4	1.0 Referent
Health department	62 (10.3)	77.3	0.4 (0.2–0.7)*
Community clinic	59 (9.2)	80.1	0.4 (0.2–1.1)
What type of insurance do you have for your child?			
Private	259 (41.5)	44.5	1.0 Referent
Public	288 (47.3)	77.0	0.3 (0.2–0.4)*
Neither	67 (11.2)	64.5	0.5 (0.3–0.8)*

OR indicates odds ratio; WIC, the Special Supplemental Nutrition Program for Women, Infants, and Children.

\* *P* < .05.

**TABLE 2.** Parental Knowledge and Attitudes Regarding Hepatitis A Disease and Vaccine, Butte County, California, 2000 (*n* = 648)

Parental Belief	<i>n</i> (Weighted %)	% Who Received 1 + Doses of Hepatitis A Vaccine	0 Versus 1–2 Doses
			OR 95% CI
Have you heard of hepatitis A disease?			
Yes	577 (90.3)	65.1	1.0 Referent
No	63 (9.7)	36.0	3.2 (1.8–6.0)*
Have you heard of vaccine to prevent hepatitis A?			
Yes	525 (82.1)	67.7	1.0 Referent
No	114 (17.9)	36.9	3.6 (2.4–5.5)*
Do you think hepatitis A is major problem in Butte County?			
Yes	361 (56.0)	68.4	1.0 Referent
No	274 (44.0)	54.4	1.9 (1.3–2.8)*
Do you think it's serious if your child got hepatitis A?			
Yes	582 (90.9)	63.8	1.0 Referent
No	58 (9.1)	46.9	2.2 (1.2–4.1)*
Is it likely your child will get hepatitis A in Butte County?			
Yes	293 (46.1)	71.2	1.0 Referent
No	342 (53.9)	54.3	2.1 (1.6–2.9)*
Is hepatitis A vaccine safe for your child?			
Yes	467 (74.3)	68.6	1.0 Referent
No	166 (25.7)	43.1	3.1 (2.0–4.7)*
Should kindergartners be required to get hepatitis A vaccine before school entry?			
Yes	443 (68.4)	70.3	1.0 Referent
No	193 (31.6)	45.6	2.9 (2.1–4.1)*

OR indicates odds ratio; WIC, the Special Supplemental Nutrition Program for Women, Infants, and Children.

\* *P* < .05.

also examined the relationship between place where children usually received immunizations and parental knowledge and attitudes about the hepatitis A vaccine, but most respondents had the same type of usual immunization provider, and we found no significant associations.

Parental knowledge and attitudes associated with not being vaccinated included not having heard of hepatitis A and the vaccine and believing that hepatitis A is not a major problem in Butte County, that it would not be serious if the child got the disease, that the child would not get the disease, that the

vaccine is not safe, and that the vaccine should not be required before school entry (Table 2).

Before multivariate analysis, variables found to be highly collinear with other variables that were excluded from the model include whether the parent had heard of the disease, whether the parent believed that the vaccine was effective, and type of insurance. Variables that remained significant in the bivariate analysis were entered into the model (Tables 1 and 2). Factors that remained independently associated with not receiving at least 1 dose of hepatitis A vaccine were mother's education, family income, not having heard of the vaccine, perceiving that the child is not likely to get hepatitis A disease, believing that kindergartners should not be required to get hepatitis A vaccine before school entry, and lack of a provider recommendation for the vaccination, which was the strongest predictor (Table 3).

### DISCUSSION

In 1995–2000, Butte County was 1 of only a few communities with an ongoing hepatitis A vaccination program that successfully vaccinated more than half of the children in the county with at least 1 dose of hepatitis A vaccine. The impact of this program in reducing the incidence of hepatitis A in the county was reported recently.<sup>4</sup> In the current study, we identified selected socioeconomic status (SES) characteristics, provider recommendation for vaccination, and parental knowledge and attitude factors as being associated with not receiving the vaccine. These findings may be used to develop strategies for improving and maintaining high coverage levels in Butte County. Because risk factors for not receiving other vaccines are similar among communities, these findings can be used by other, similar communities in identifying groups that can be potentially targeted by hepatitis A vaccination programs.

The factor most strongly associated with failure to be vaccinated was not having received a doctor's or health department's recommendation for it. This finding is consistent with previous reports<sup>5</sup> and underscores the critical role of provider recommendation in vaccine acceptance by parents and the importance of educating and mobilizing providers to offer hepatitis A vaccine in their offices.

Poverty and other measures of low SES, including lower education level, have been consistently reported to be strongly related to underimmunization.<sup>6,7</sup> In our study, we found that children with mothers who had 12 or fewer years of education and children in households with <\$50 000 annual incomes were more likely to have received hepatitis A vaccine than children of mothers with higher education level or in families with greater income, respectively. The hepatitis A vaccination program in Butte County was not specifically targeted toward children of low SES. However, it is possible that perception regarding likelihood of infection control and need for vaccination varied between parents in lower and higher income groups. We also do not know whether providers and others involved in the vaccination program perceived children of low SES to be at higher risk of infection and therefore in greater need

**TABLE 3.** Multivariate Analysis of Risk Factors Associated With Not Receiving Hepatitis A Vaccine, Butte County, California, 2000 (*n* = 648)

Factor	0 Versus 1–2 Doses
OR (95% CI)	
Race	
White	1.0 Referent
Black	0.1 (0.0–1.6)
Hispanic	1.5 (0.7–3.1)
Asian	1.0 (0.4–2.4)
American Indian	0.4 (0.1–1.6)
Other	0.1 (0.0–1.2)
Mother's education	
>High school	1.0 Referent
High school	0.4 (0.2–0.9)*
<High school	0.4 (0.2–0.8)*
Income	
≥\$50 000	1.0 Referent
\$15 000–50 000	0.4 (0.2–0.8)*
<\$15,000	0.2 (0.1–0.4)*
Heard of vaccine	
Yes	1.0 Referent
No	2.4 (1.2–4.9)*
Hepatitis A is a major problem in Butte County	
Yes	1.0 Referent
No	1.0 (0.5–2.2)
Child is likely to get hepatitis A in Butte County	
Yes	1.0 Referent
No	1.9 (1.1–3.2)*
Vaccine is safe	
Yes	1.0 Referent
No	1.6 (0.9–2.8)
Kindergartners should be required to get hepatitis A vaccine prior to school entry	
Yes	1.0 Referent
No	1.7 (1.1–2.8)*
Do you think it's serious if your child got hepatitis A?	
Yes	1.0 Referent
No	0.6 (0.3–1.6)
Where do you usually take child for shots?	
Doctor's office	1.0 Referent
Health department/community clinic	0.5 (0.2–1.2)
Who recommended that your child get the vaccine?	
Doctor or health department	1.0 Referent
School/WIC/child care/media	1.8 (0.9–3.5)
No one	4.0 (2.4–6.8)*

OR indicates odds ratio; WIC, the Special Supplemental Nutrition Program for Women, Infants, and Children.

\* Remained significant in the final model with *P* < .05.

to be vaccinated or whether providers of low-income children were more likely to participate in the program. A number of studies have reported that lower SES is a risk factor for getting hepatitis A.<sup>8–10</sup>

Although the vast majority of parents in our survey were aware of the vaccine, only half believed that hepatitis A was a major problem in Butte County or that it was likely that their child would get hepatitis A in Butte County. Whether parental attitudes are associated with underimmunization has been debated.<sup>11,12</sup> Several studies have reported that parental knowledge and attitudes related to the importance of vaccination and susceptibility to disease do not explain the failure to receive vaccines.<sup>13–17</sup> Among participants in our study, parental aware-

ness of hepatitis A vaccine and belief regarding susceptibility of the child to hepatitis A were associated with receipt of at least 1 dose of hepatitis A vaccine. The importance of parental awareness is also suggested in our finding that lack of knowledge about the vaccine was the most frequently cited reason that the child did not receive it. Parental education, when implemented as part of a multicomponent intervention, has been shown to raise immunization coverage.<sup>18</sup>

Our vaccination coverage findings are consistent with those reported for all eligible age groups,<sup>4</sup> including second-dose coverage that was approximately 24% to 27% lower than first-dose coverage. Immunogenicity studies have shown that virtually all children have protective concentrations of antibody when measured 1 month after receiving the first dose of vaccine.<sup>2</sup> However, the second dose is recommended to ensure long-term protection, which is extremely important for hepatitis A because the disease can be more severe in adulthood.<sup>19</sup>

State vaccination requirements for child care and school entry are effective strategies to achieve high vaccination coverage rates among children.<sup>20</sup> As of June 2002, hepatitis A school entry requirements were in effect in selected counties or statewide in 5 states. Our findings indicate that a hepatitis A vaccination requirement would be acceptable to the majority of parents in Butte County. However, even without a law in place, the voluntary program in Butte County was shown to have been successful in vaccinating a substantial proportion of children and seems to have resulted in dramatic declines in the incidence of hepatitis A in the county.<sup>4</sup> The level of hepatitis A vaccination coverage needed to achieve herd immunity sufficient to reduce overall hepatitis A rates is unknown. Ongoing monitoring of hepatitis A incidence in Butte County and additional studies are needed to answer this question.

Cost of the vaccine was not a factor in Butte County, where the vaccine was provided free of charge to parents, but has been reported as a barrier to childhood vaccination, especially among poor and underserved children.<sup>7</sup> Because the Vaccines for Children Program provides public-purchased hepatitis A vaccine to eligible children aged 2 to 18 years, who are covered by the ACIP recommendation,<sup>21</sup> cost should not prevent vulnerable children from receiving the vaccine within their medical homes. The Vaccines for Children Program provides vaccines to public and private providers for use in children who are Medicaid-enrolled, uninsured, Native American, or Alaska Native and to children who are underinsured with respect to vaccination, but only when served at a federally qualified health center or rural health clinic.<sup>22</sup>

A potential limitation of the study is that the study's finding that children of parents with higher SES were less likely to receive hepatitis A vaccine may be related to the specific circumstances of Butte County's demonstration project and may not be generalizable to other communities. Another potential limitation is that we did not validate hepatitis A vaccinations by following up with the children's

health care providers. However, information on vaccinations received by 91% of the vaccinees came from the immunization registry, which contains provider-reported information, and vaccination data for the remaining children were based on documentation of vaccination dates on parent-held vaccination cards. Therefore, most of these records are likely to be accurate. In addition, provider knowledge, attitudes, and practices play a key role in vaccination of children.<sup>6,7,23</sup> However, in this study, we did not account for the potential influence of provider knowledge, attitudes, and practices on receipt of hepatitis A vaccine by children in our study and, therefore, possibly on results of our study.

Routine hepatitis A vaccination of children has been successful in markedly reducing hepatitis A incidence in Butte County and other communities.<sup>4,24</sup> Extending and sustaining adequate vaccination coverage levels among all children in areas with consistently elevated rates of hepatitis A should substantially reduce hepatitis A incidence nationwide. Vaccination promotion strategies should include increasing parent and provider awareness. Some states may choose to consider using child-care or school-entry vaccination requirements as a strategy to achieve high vaccination coverage levels. However, in Butte County, voluntary hepatitis A vaccination was also able to achieve coverage levels that resulted in disease reduction, especially when backed by strong provider endorsement.

Our findings suggest important implications for future research regarding the delivery of immunizations. First, because the vast majority of the children in our study received hepatitis A vaccination through the demonstration project, we could not examine the role of public purchase of vaccine in uptake and disease control, which would be particularly important for immunization programs in high-risk communities. Second, understanding doctor-patient dialogue and information sharing about the disease and the vaccine would support hepatitis educational efforts that could potentially improve immunization coverage. Finally, because new vaccines are increasingly being introduced into the market, it would be important to investigate the impact of 1 vaccine (eg, hepatitis A) program on parent and provider attitudes toward and acceptance of other recommended vaccines.

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