



REVIEW ARTICLE

Universal Administration of Hepatitis B Vaccine and its Impact on Public Health

Hannah Ship, BS¹; Nicole S. Torres, MD²

¹University of Miami Miller School of Medicine, Miami, FL

²University of Miami Miller School of Medicine, Department of Pediatrics, Miami, FL

ABSTRACT

As Florida faces declining pediatric vaccination rates, this paper delves into the public health success of universal hepatitis B vaccine implementation for newborns. With children at the highest risk of transmission of hepatitis B and chronic complications, health officials targeted this vulnerable population, thereby significantly decreasing infection rates. This paper explores the history behind including the vaccine in the routine childhood schedule. It presents current data from Florida to provide valuable guidance to clinicians in supporting public health.

INTRODUCTION

The three-series hepatitis B vaccine recommendation is standard practice for U.S. pediatricians and serves as the initial vaccine administered after birth, often initiating conversations regarding vaccinations with parents. Not long ago, before universal childhood hepatitis B vaccination was implemented in 1992, thousands of children were infected with the hepatitis B virus (HBV) each year.

Infants and children are particularly vulnerable to Hepatitis b due to perinatal transmission and early childhood exposure between infected children. Furthermore, once infected, children face a higher risk of developing chronic HBV infection, with over 80%-90% of infants infected during their first year of life developing chronic infections.¹ HBV is a class I carcinogen, contributing to premature deaths from liver cancer in approximately 25% of those who become chronically infected during childhood.²

Background: History of Hepatitis B vaccine

Before the vaccine's introduction, hepatitis B was a significant global health problem, with an estimated 240 million people living with chronic HBV infection worldwide. The plasma-derived vaccine was developed in 1982 and initially targeted high-risk groups like men who have sex with men, injection-drug users, and individuals with multiple sex partners.¹ However, low compliance and access barriers limited the administration of the three-dose series to high-risk groups. Moreover, as many as 30% of people with acute HBV infection did not have identifiable risk factors, rendering the high-risk group approach ineffective. Vaccine hesitancy was also addressed in 1986 by the implementation of a safer, recombinant HBsAg vaccine.^{1,3}

In the United States, universal hepatitis B vaccination for infants was recommended by the Advisory Committee on Immunization Practices in 1991, and the vaccination program commenced in 1992.⁴ Subsequently, from 1993 to 2000, the administration of the hepatitis B vaccine among children aged 19 to 35 months in the United States remarkably increased from 16% to 90%. A similar growth trend (67%) was observed among U.S. adolescents aged 13 to 15 years.⁵

Current Data

Currently, the Centers for Disease Control (CDC) schedule in the U.S. (followed in Florida) recommends the first dose at birth, the second dose between one and two months old, and the final dose administered between six and eighteen months.⁶ The State of Florida requires a complete series for children attending daycare, elementary, and middle/high schools. Since the introduction of universal hepatitis B vaccination programs for children, the incidence of HBV infection, especially perinatally acquired, has dramatically declined. The prevalence of chronic HBV infection in children younger than 5 years decreased from 4.7% in the pre-vaccine era to less than 1% in 2019.¹

The World Health Organization (WHO) has set a 90% vaccination target to eliminate hepatitis B by 2030. However, there is wide variability in reported birth dose coverage, with global coverage currently at only 42%.⁷ Current models have shown that achieving infant vaccination global coverage to 90% would avoid 4.3 million chronic hepatitis B infections during the same time frame and would prevent 1.1 million hepatitis-B-related deaths by 2030.⁷ Globally, birth-dose coverage varies by region, with low rates of vaccination reflected in high HBV rates, especially in the Southeast Asian and Sub-Saharan African countries⁸

Florida is falling short of hepatitis B vaccination goals, with rates of pediatric acute HBV infection in Florida doubling since 2002 (Figure 1). All-age total chronic infections are also increasing, from 3.3 cases per 100,000 to 20 per 100,000 (Figure 2), which is reflected in Florida's total immunization rates at age two, which were 87.2% in 2000 and 84% in 2020 (Figure 3).

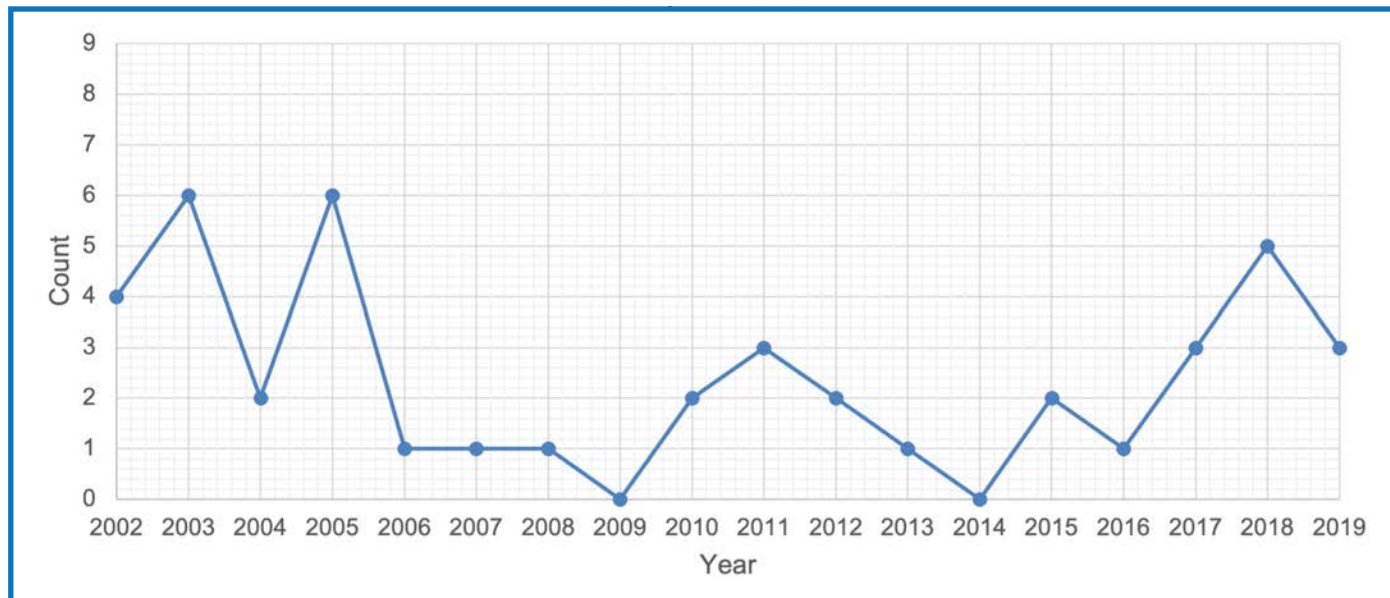


Figure 1: Acute Hepatitis B Cases for Pediatric Age Groups (Aged 0-19 Years) in Florida

Possible Reasons for Declining Vaccination Rates in Florida

All exemptions in Florida, including religious exemptions, have steadily increased since 2016. However, there was a sharper increase from 6.50% to 8.10% between the 2020-21 and 2021-22 school years (Figure 4). These are the highest exemption rates seen in over a decade. We must note that this data from the Florida Department of Health may be a proxy for vaccine hesitancy, but it does not mean that that number of children who have these exemptions have not already had the hepatitis B vaccine. Moreover, the sharp uprise in vaccine exemptions coincides with the COVID-19 pandemic. The trend of decreased vaccinations during the COVID-19 pandemic has been noted globally, with data pointing to a rise in vaccine hesitancy and a decrease in healthcare access.⁹ In the United States especially, over 30 states reported to the CDC that COVID-19 resulted in a decrease in vaccination coverage during the 2021-22 school year, primarily due to reduced access but also due to “local or school level extensions of grace period or provisional enrollment policies.”¹⁰

Vaccination against HBV has also affected the status of vaccinations in the early toddler years. Not receiving the birth dose of the hepatitis B vaccine correlates with under-immunization by age 24 months.^{11,12} One such study looked at birth dose before and after the COVID pandemic and found that although the pandemic did not significantly affect the uptake of the birth dose, study results

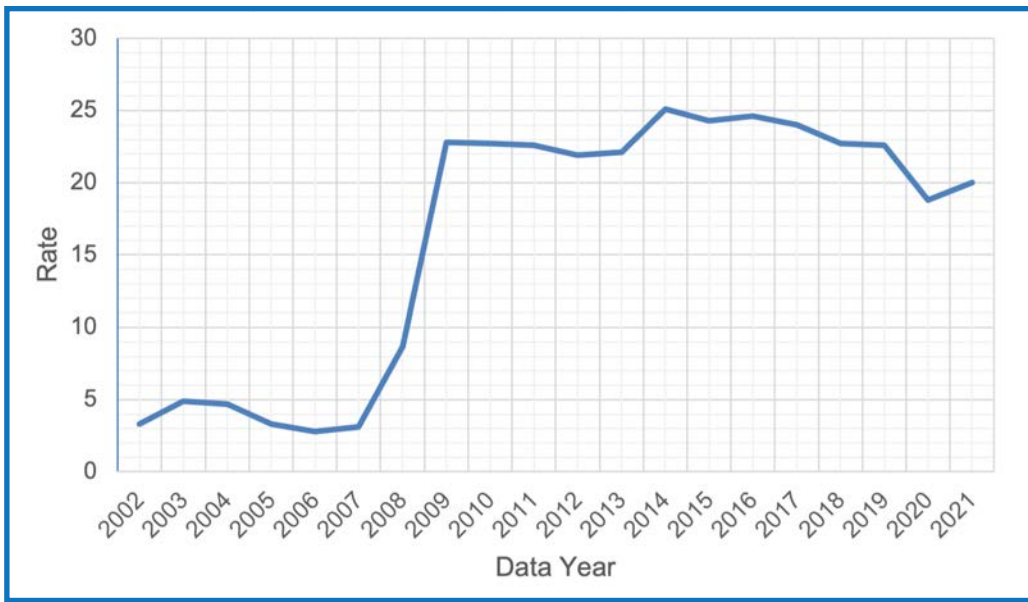


Figure 2: Rate of All-Age Total Chronic Hepatitis B (Per 100,000 Population) in Florida

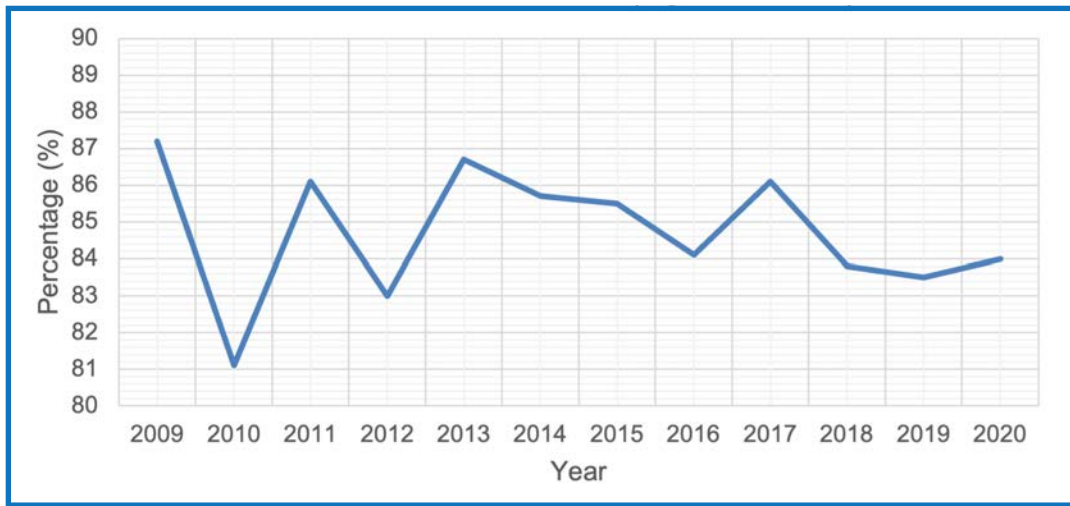


Figure 3: Florida rates of Pediatric Full Immunization: Basic Immunization Series (Aged 2 Years)

pointed to caregiver factors that resulted in suboptimal vaccination uptake.¹³ The generalizability of the studies mentioned above may be limited by geography, but all took place at large academic institutions similar to those in Florida. The door remains open for advocacy to complete hepatitis B vaccination and timely administration of the birth dose.

Communication Techniques for Talking with Parents Regarding Hepatitis B Vaccination Series

The CDC provides resources for discussing vaccines with parents of infants, outlining three main steps: 1) Assume parents will vaccinate, 2) Give a strong recommendation, and 3) Listen and respond to parents' questions.¹⁴

Regarding the hepatitis B vaccination series, healthcare providers are recommended to emphasize four main points:

1. People have a very high risk of developing chronic HBV infection if they become infected at birth or during childhood, with an increased risk of dying prematurely from liver cancer or cirrhosis.
2. Hepatitis B infection in infants and young children usually produces no symptoms, so these individuals can spread it to others without knowing it.
3. Most early childhood spread of hepatitis B occurs in households where a person has chronic HBV infection, but the spread of the virus has also been recognized in daycare centers and schools.
4. Long-term protection following infant vaccination is expected to last for decades and will ultimately protect against acquiring infection at any age.¹⁵

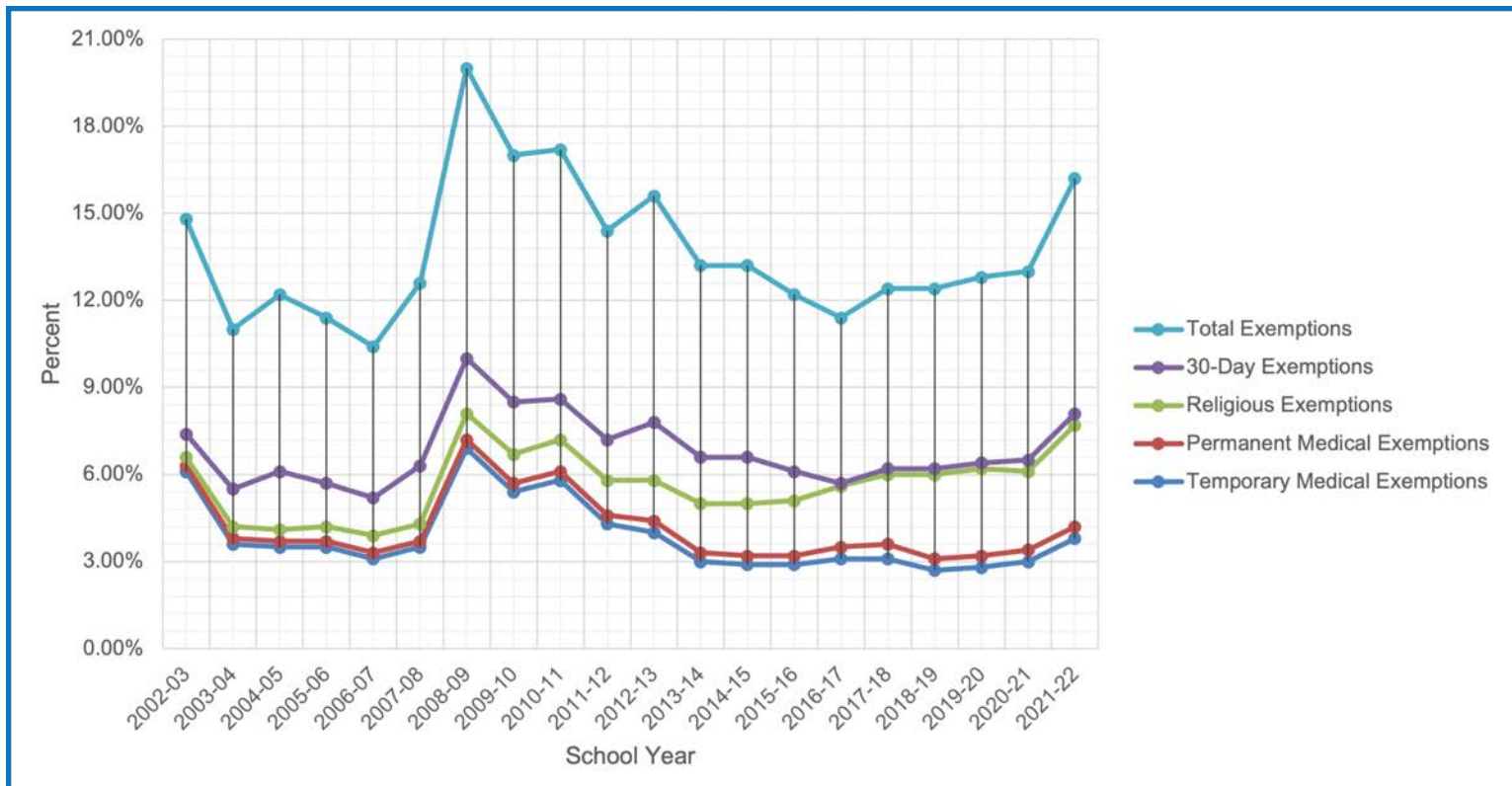


Figure 4: Vaccination exemption status among children enrolled in public and private kindergarten, by school years, Florida, 2002-03 through 2021-22 – Kindergarten and Seventh Grade

Providers can reassure parents that most vaccinated children experience no side effects, and serious reactions are rare.⁵ Offering reading materials, such as those provided by the Immunization Action Coalition, is also recommended to support informed decision-making. It is highly recommended that parents unsure about vaccination be provided with literature for their consideration. One such resource can be accessed at <https://www.immunize.org/catg.d/p4205.pdf>.

CONCLUSION

Achieving the WHO's goal of eradicating hepatitis B worldwide by 2030 and the Healthy People 2030 goal of acute infection reduction necessitates maintaining high vaccination coverage rates for infants, children, and adolescents. Acknowledging the significant public health impact of the universal hepatitis B vaccination program, healthcare providers should continue conversing with patients and parents to ensure impactful vaccine implementation.

REFERENCES

1. Pattyn J, Hendrickx G, Vorsters A, Van Damme P. Hepatitis b vaccines. *J Infect Dis.* 2021;224(12 Suppl 2):S343-s351.
2. Haber P, Schillie S. Hepatitis B. Centers for Disease Control and Prevention, Epidemiology and Prevention of Vaccine-Preventable Diseases. Updated 2021. <https://www.cdc.gov/vaccines/pubs/pinkbook/hepb.html>
3. Van Damme PWJ, Shouval D, Zanetti A. Hepatitis B Vaccines. In: Plotkin SA OW, Offit PA, Edwards KM, eds. *Plotkin's Vaccines*. 7th edition. Elsevier; 2017.
4. Centers for Disease Control. Achievements in Public Health: Hepatitis B Vaccination --- United States, 1982--2002. <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5125a3.htm> Accessed May 15, 2023.
5. Haber P, Moro PL, Ng C, et al. Safety of currently licensed hepatitis B surface antigen vaccines in the United States, Vaccine Adverse Event Reporting System (VAERS), 2005–2015. *Vaccine.* 2018;36(4):559-564.
6. Centers for Disease Control and Prevention. Child and Adolescent Immunization Schedule by Age. https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvaccines%2Fschedules%2Fhcp%2Fchild-adolescent.html Accessed May 23, 2023.
7. Flores JE, Thompson AJ, Ryan M, Howell J. The global impact of hepatitis b vaccination on hepatocellular carcinoma. *Vaccines (Basel).* 2022;10(5). doi:10.3390/vaccines10050793.

8. Franco E, Bagnato B, Marino MG, et al. Hepatitis B: Epidemiology and prevention in developing countries. *World J Hepatol.* 2012;4(3):74-80.
9. Altman JD, Miner DS, Lee AA, et al. Factors affecting vaccine attitudes influenced by the COVID-19 pandemic. *Vaccines.* 2023;11(3):516.
10. Rosenthal J. Reversing the Decline in routine childhood immunization rates is good health, equity, and economic policy. Center for American Progress (CAP). <https://www.americanprogress.org/article/reversing-the-decline-in-routine-childhood-immunization-rates-is-good-health-equity-and-economic-policy/> Accessed June 7, 2023.
11. Oster NV, Williams EC, Unger JM, et al. Hepatitis B birth dose: first shot at timely early childhood vaccination. *Am J Prev Med.* Oct 2019;57(4):e117-e124.
12. Wilson P, Taylor G, Knowles J, et al. Missed hepatitis B birth dose vaccine is a risk factor for incomplete vaccination at 18 and 24 months. *J Infect.* 2019;78(2):134-139.
13. Dugovich AM, Cox TH, Weeda ER, Garner SS. First hepatitis B vaccine uptake in neonates prior to and during the COVID-19 pandemic. *Vaccine.* 24 2023;41(17):2824-2828.
14. Centers for Disease Control. Talking with parents about vaccines for infants: provider resources for vaccine conversations with parents..<https://www.cdc.gov/vaccines/hcp/conversations/talking-with-parents.html> Accessed April 11, 2018
15. Hepatitis B: Questions and answers. information about the disease and vaccine. Immunize.org. <https://www.immunize.org/catg.d/p4205.pdf> Accessed Aug 8, 2023.