



ISSUE BRIEF

BOOSTING PUBLIC HEALTH PREPAREDNESS: PUBLIC HEALTH PREPAREDNESS ACTIVITIES AND RESPONSES TO THE 2008 – 2009 *HAEMOPHILUS INFLUENZAE* TYPE B VACCINE SHORTAGE

ABSTRACT Objective: To explore the importance of preparedness activities in immunization programs by examining vaccine shortages and demand in the context of large-scale public health emergencies. Methods: The Emory Preparedness and Emergency Response Research Center conducted a study of immunization program managers in jurisdictions funded by the Centers for Disease Control's (CDC) National Center for Immunization and Respiratory Diseases. The study assessed immunization programs' experiences with the 2008 – 2009 Haemophilus influenzae type B (Hib) vaccine shortage and involvement in public health preparedness activities. Perceived level of engagement in six preparedness activities included in the survey were combined to create a single preparedness scale which was compared to jurisdictions' change in Hib coverage rates between 2007 (prior to the Hib vaccine shortage) to 2008 (during the shortage). Linear regression was used to model the preparedness scale scores against the differences in vaccination coverage between the two years. ANOVA was used to compare three levels of preparedness. Results: The linear relationship between Hib vaccine coverage rate change from 2008 to 2009 compared to a 10 unit increase in the preparedness score resulted in a 3% lower change in Hib vaccine rates from the baseline year to the shortage year. Specifically, for every 10 unit increase in preparedness, we observed an average change of -3.43 (95% CI -8.132, 1.265) percentage points between the Hib vaccine coverage rates during a normal year and a shortage year (Figure 1). Results of the crude linear regression produced a non-statistically significant result ($p = 0.14$). Conclusion: The results demonstrate a meaningful relationship between immunization programs' level of involvement in preparedness activities and stability or volatility in their jurisdiction's Hib vaccine coverage as a result of the shortage.



ISSUE BRIEF

BOOSTING PUBLIC HEALTH PREPAREDNESS: PUBLIC HEALTH PREPAREDNESS ACTIVITIES AND RESPONSES TO THE 2008 – 2009 *HAEMOPHILUS INFLUENZAE* TYPE B VACCINE SHORTAGE

INTRODUCTION

Public health officials and staff have reported that the skills and resources needed to respond to a shortage in the routine vaccine supply are similar to those needed during a larger public health emergency^{1,2}. Yet there have been few studies to date to indicate the utility of preparedness activities for public health practices outside of a disaster setting. To examine the relationship between shortages in the routine vaccine supply and public health preparedness activities, the Emory PERRC compared the 2008 – 2009 *Haemophilus influenzae* type B (Hib) vaccine shortage with the immunization programs' involvement in six public health preparedness activities. The Hib vaccine shortage was a national-level shortage that resulted from the manufacturer Merck & Co. issuing a voluntary recall of certain batches of Hib vaccine because they could not guarantee the sterility of equipment used in production³. The recall was announced in December 2007, which resulted in a Hib vaccine shortage for all of 2008 and part of 2009.

Increased attention has been paid to public health preparedness in the past decade, especially after Congress initiated annual appropriations to state and local health departments, exceeding \$1.5 billion dollars in 2002 to enhance the

With limited resources available to public health departments, it is important to critically examine ways in which engagement in public health preparedness activities can have broader applications to other challenges faced by public health departments.

capacity and capabilities of the nation to prevent and respond to public health emergencies.⁴ States received much of this funding through the Public Health Emergency Preparedness (PHEP) cooperative agreements offered by the Centers for Disease Control and Prevention (CDC).⁵ To assess preparedness in state and large city immunization programs, this study looked at involvement in six specific preparedness activities. The activities ranged from pandemic influenza planning to participation in the smallpox vaccination campaign during the early 2000s.

METHODS

- A cross-sectional survey of the 64 Immunization Program Managers (IPMs) in CDC's National Center for Immunization and Respiratory Diseases (NCIRD) grantee jurisdictions was conducted from July 2009 to October 2009.
- Feedback Server 2008.1 (Data Illusion, Stockholm, Sweden), a web-based survey software, was used to create the survey and collect the data
- The survey was designed by Emory University Researchers in conjunction with a working group that consisted of members from: the Association of Immunization Managers (AIM), the American Immunization Registry Association (AIRA), the Task Force for Global Health, and state immunization program managers.
- The survey asked immunization program managers to rate their staff's involvement in 6 preparedness activities (pandemic influenza planning, bioterrorism/all hazards planning, Cities Readiness Initiative or other mass-vaccination/dispensing exercises, Strategic National Stockpile activities, participation in training on use of incident command system and National Incident Management System, and participation in the smallpox vaccination program during the early 2000s). These six preparedness activities were selected based on their connection with immunization programs following input from research collaborators.
- The possible scores for each preparedness activity level were: full partner (4 points); routine consultant (3 points); *ad hoc* or occasional consultant (2 points); rarely involved (1 point); and not involved (0 points).
- The values for each preparedness activity were combined to create an overall preparedness score to be used as a single predictor variable that ranged from 0 to 24.
- The overall preparedness score was then compared to the jurisdictions' Hib vaccine coverage rate change between 2008 and 2009.

- Vaccine rate changes between 2008 and 2009 were determined using data from the annual National Immunization Survey (NIS) conducted by the CDC. The 2008 NIS covered children born between January 2005 and June 2007, and these children would have been unaffected by the shortage. The 2009 NIS covered children born between January 2006 and July 2008.
- Since the shortage was announced in December 2007 and the first two-to-three doses of Hib are typically administered to infants less than seven months, the effects of the vaccine shortage, if any, are likely to be seen in this cohort of children.
- Mean state-specific Hib vaccination coverage rates, as reported in the NIS, were compared between 2008 and 2009 to estimate any change in coverage rates.
- Jurisdictions were removed from analysis if data on their involvement in one or more of the six preparedness activities or their Hib vaccine rates for 2008 or 2009 were not available.
- Data analysis was performed using SAS 9.2 (SAS Institute, Cary, NC), SPSS 17 (SPSS Inc., Chicago, IL), and Microsoft Office Excel 97-2003 (Microsoft Corporation, Redmond, WA).
- Linear regression was used to analyze a jurisdiction's overall preparedness score against the jurisdiction's change in Hib vaccine coverage between 2008 and 2009. Confounders were assessed both separately and together in the model.
- Researchers kept confounders in the model if more than a 10% difference was detected between the original model and the confounder-adjusted model.
- Population size and supply policies were considered as possible confounders. The 2000 U.S. Census was used to estimate each jurisdiction's population size. The 2008 Vaccines for Children (VFC) Management Survey, conducted by CDC, was used to obtain data about each jurisdiction's supply policy during the time of the shortage. We dichotomized vaccine supply policies. Jurisdictions with universal (universal or universal-select) supply policies, in which all or most routine pediatric vaccines are provided to all children regardless of insurance status, were compared with jurisdictions with more stringent supply policies (VFC only, VFC and underinsured, VFC and underinsured-select, and other), in which public funds are used to provide vaccines to uninsured or underinsured children meeting VFC program eligibility requirements.^{6,7}

- The Emory University Institutional Review Board, the AIM research subcommittee and the AIM Executive Committee reviewed and approved the survey.

RESULTS

Data collected from the 2008 and 2009 NIS surveys indicated a statistically significant decline (-7.2% , $\pm 1.2\%$; $p < 0.05$) of children 19 – 35 months of age receiving ≥ 3 doses of Hib vaccine ⁸.

The linear relationship between Hib vaccine coverage rate change from 2008 to 2009 compared to a 10 unit increase in the preparedness score resulted in a 3% lower change in Hib vaccine rates from the baseline year to the shortage year. Specifically, for every 10 unit increase in preparedness, we observed an average change of -3.43 (95% CI -8.132 ,

1.265) percentage points between the Hib vaccine coverage rates during a normal year and a shortage year (Figure 1). Results of the crude linear regression produced a non-statistically significant result ($p = 0.14$).

For every 10 unit increase in preparedness, we observed an average change of -3.52 when population size was included; -3.25 when vaccine supply was included; and -3.36 when both confounders were included.

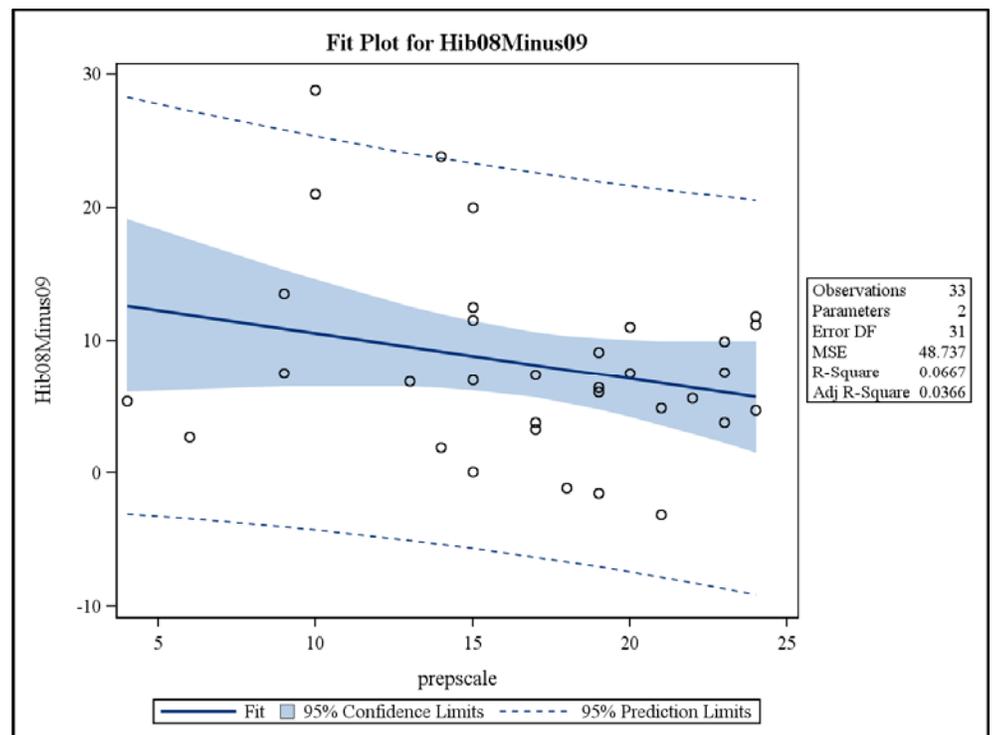


Figure 1: Association of Reduction of Vaccine Coverage in Shortage year with Preparedness Score (n=33). Linear relationship between Hib vaccine coverage rate change from 2008 to 2009 compared to a one unit increase in preparedness score. Each 10 unit increase results in a 3% lower change in Hib vaccine rates from the baseline year to the shortage year ($p=0.14$). Although the preparedness scale goes from 0 to 24, no observations had a value below 4.

CONCLUSION

This is one of the first studies to try to measure the utility of preparedness activities for public health situations outside of a disaster setting. With limited resources available to public health departments, it is important to critically examine ways in which engagement in public health preparedness activities can have broader applications to other challenges faced by public health departments. Further research should be conducted to quantify the impact and utility of preparedness activities on health departments' responses to vaccine shortages or other more traditional public health activities.

RECOMMENDATIONS

- *Foster a strong relationship between state immunization programs and emergency preparedness programs. These relationships are vital to lessening the burden on immunization programs during a vaccine shortage.*
- *Practice preparedness-related activities during routine vaccination campaigns. Routine activities, such as determining priority risk groups and monitoring provider adherence to vaccination guidelines, are applicable during a large-scale public health emergency.*
- *Use routine events as opportunities for immunization programs and emergency preparedness programs to work together. Members of both programs benefit from knowing the unique capabilities and resources each team has to offer. These activities are useful for improving the health department's preparedness capabilities while simultaneously strengthening routine public health responsibilities.*

AUTHORS

Amanda Kudis¹, Allison Chamberlain¹, Katelyn Wells², Walt Orenstein³, Paul Weiss¹, Ellen Whitney¹, Katy Seib¹, Claire Hannan², Alan Hinman⁴, Saad B. Omer¹, Ruth Berkelman¹

1. Emory University Preparedness and Emergency Response Research Center, Rollins School of Public Health, Emory University, Atlanta, GA
2. Association of Immunization Managers, Rockville, MD
3. Bill & Melinda Gates Foundation, Seattle, WA
4. The Task Force for Global Health, Decatur, GA

REFERENCES

1. Bashir Z, Ransom J. Full-Use Preparedness: Addressing the 2004-2005 Influenza Vaccine Shortage. *Journal of Public Health Management & Practice*. 2005;11(4):375-377.
2. Boursard TE. Four Phases of a Public Health Emergency: A County Health Department Works Through the Flu Vaccine Shortage. *Public Health Readiness E-Link*. 2005.
3. Centers for Disease Control and Prevention. Notice to Readers: Updated Recommendations on the Use of Pneumococcal Conjugate Vaccine: Suspension of Recommendation for Third and Fourth Dose. *MMWR Morbidity and Mortality Weekly Report*. 2004;53(8):177-178.
4. Office of Public Health Preparedness and Response Centers for Disease Control and Prevention. Our Story.
5. Centers for Disease Control and Prevention. Public Health Preparedness: Strengthening the Nation's Emergency Response State by State. In: Office of Public Health Preparedness and Response, ed2010.
6. Centers for Disease Control and Prevention, The National Center for Immunization and Respiratory Diseases. 2008 VFC Program Management Survey. *Immunization Services Division, Program Operations Branch* 2008; <http://www2a.cdc.gov/nip/irar/grantee/vfcprovider08.asp>. Accessed 4/29/10.
7. Centers for Disease Control and Prevention. Glossary of Important VFC Terms.
8. Difference in Estimated Vaccination Coverage with Individual Vaccines and Selected Vaccination Series Among Children 19-35 Months of Age by State and Local Area. 2009.