

# Hepatitis B birth dose vaccination patterns in the Military Health System, 2014-2017

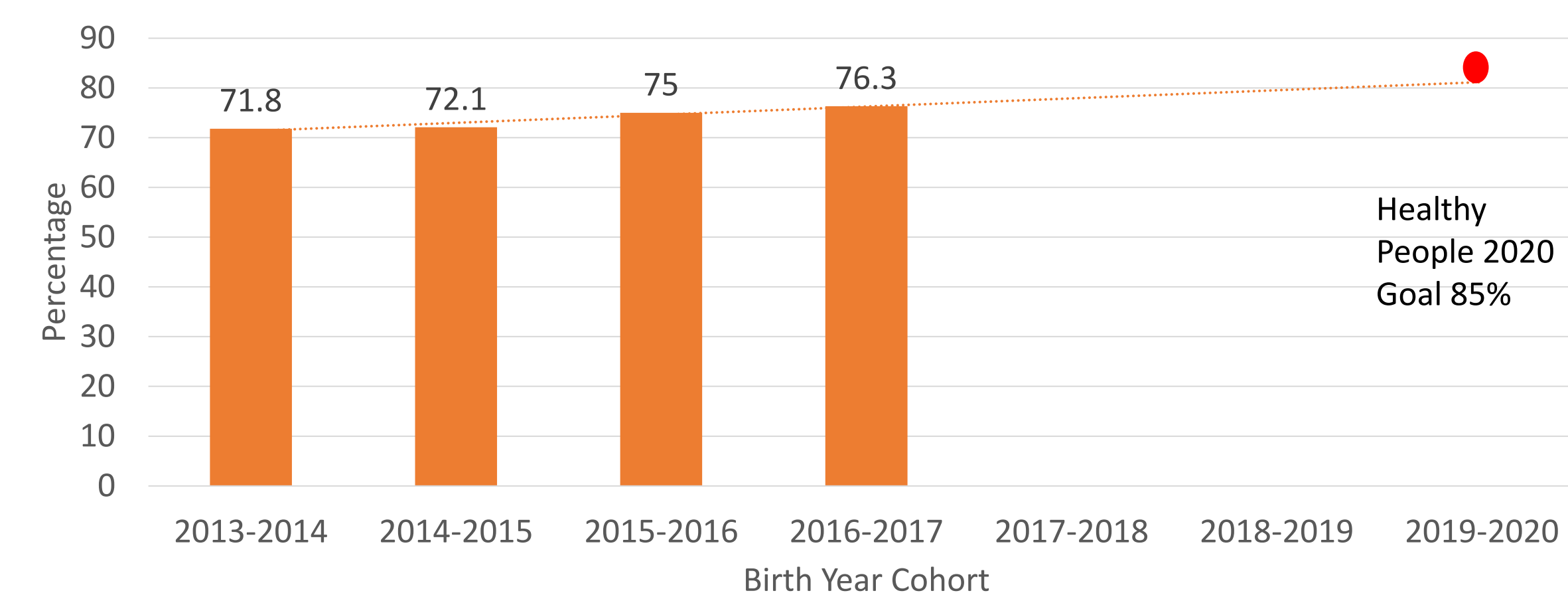
Jessica Fung Deerin<sup>a</sup>, PhD, MPH, Rebecca Clifton<sup>a</sup>, PhD, Angelo Elmi<sup>b</sup> PhD, Paul Lewis<sup>c</sup>, MD, MPH, Irene Kuo<sup>a</sup>, PhD, MPH

<sup>a</sup>The George Washington University, Milken Institute School of Public Health, Department of Epidemiology, <sup>b</sup>The George Washington University, Milken Institute School of Public Health, Department of Biostatistics and Bioinformatics, <sup>c</sup>Defense Health Agency, Armed Forces Health Surveillance Branch

## Background

Since 2005, the universal hepatitis B (HepB) birth dose has been recommended for all medically stable infants weighing >2,000 g at birth. The timing of the birth dose provides a critical safeguard and prevents infection among infants born to HBsAg-positive mothers not identified prenatally. We assess infant HepB vaccination in the U.S. Department of Defense's Military Health System (MHS) to identify trends in vaccination coverage and sociodemographic factors associated with non-receipt of the birth dose, receiving the first HepB vaccine >3 days of life, and not receiving any HepB vaccine in the first 18 months of life utilizing parental refusal codes. To our knowledge, this is one of the first studies assessing trends in parental refusal of the HepB birth dose utilizing administrative claims parental refusal codes.

Figure 1. Percentage of children who received hepatitis B birth dose within 3 days of birth



Source: National Immunization Survey, CDC

## Methods

We conducted a retrospective cohort analysis of MHS live births from January 1, 2014 through June 30, 2017 utilizing administrative claims data. Data were included from 44 hospitals in 24 unique states, territories, or countries. We analyzed inpatient delivery claims data and post-discharge vaccination data through 18 months of age, which provided detail on timing of administration of first HepB vaccine and reflected vaccine hesitancy categories. We analyzed diagnosis codes for vaccine refusal and vaccination and current procedural terminology (CPT) codes. The outcome was categorized as receipt of HepB birth dose, HepB vaccine received >3 days of life, no HepB vaccine received in first 18 months of life, and missing. Generalized linear mixed effects models with a logit link were used to assess factors associated with vaccination patterns.

Figure 2. Locations of military hospitals with labor and delivery services in the United States, 2014-2017

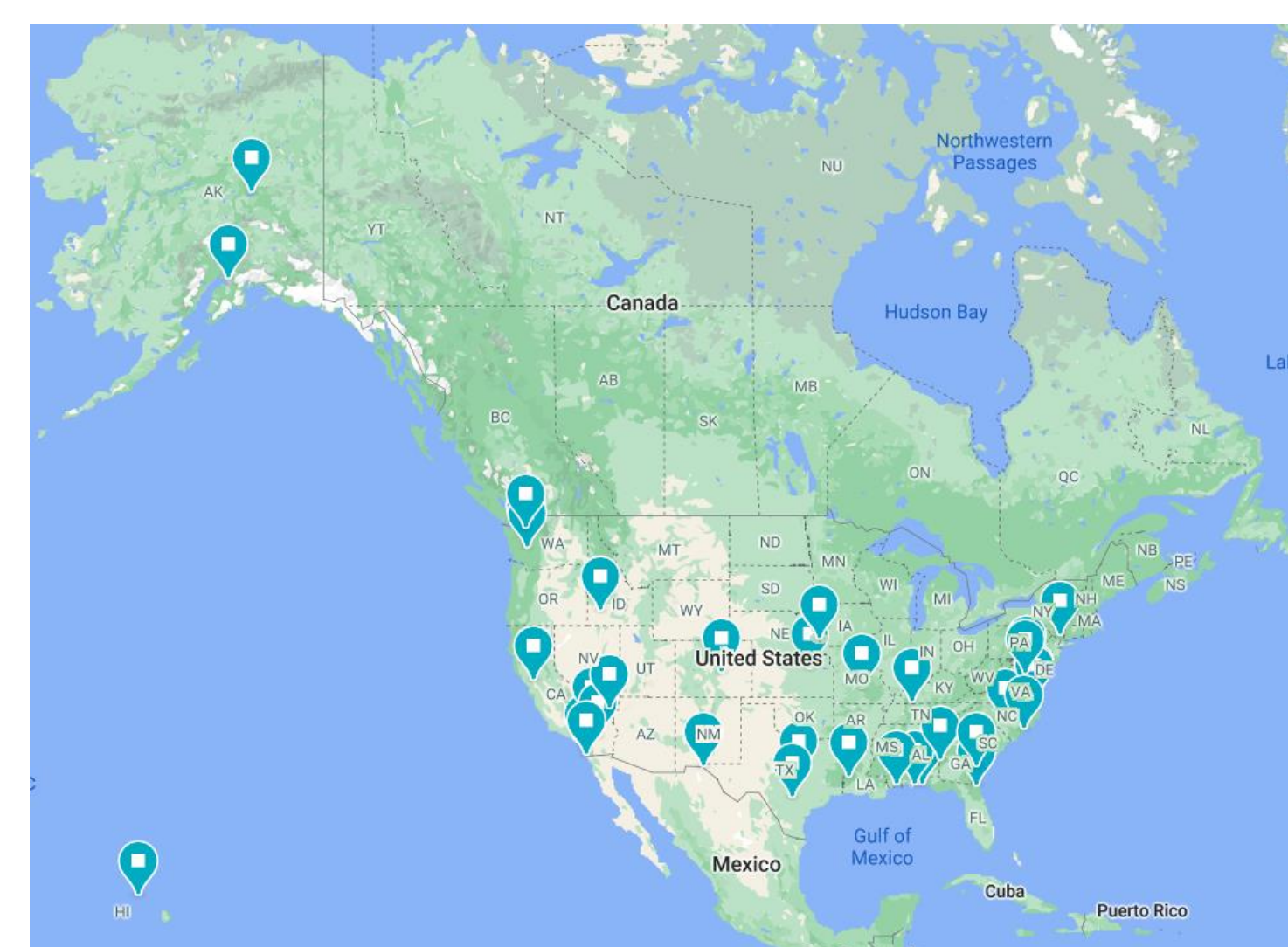


Table 1. Inpatient diagnosis codes for receipt and refusal of hepatitis B birth dose

	ICD-9-CM	ICD-10-CM
Received HepB birth dose	V05.3	Z23
Refused HepB birth dose	V64.05, V64.06, V64.07, V64.09	Z28.20, Z28.21, Z28.29, Z28.82, Z28.1, Z28.89, Z28.9

Figure 3. Flow diagram of generation of inpatient dataset

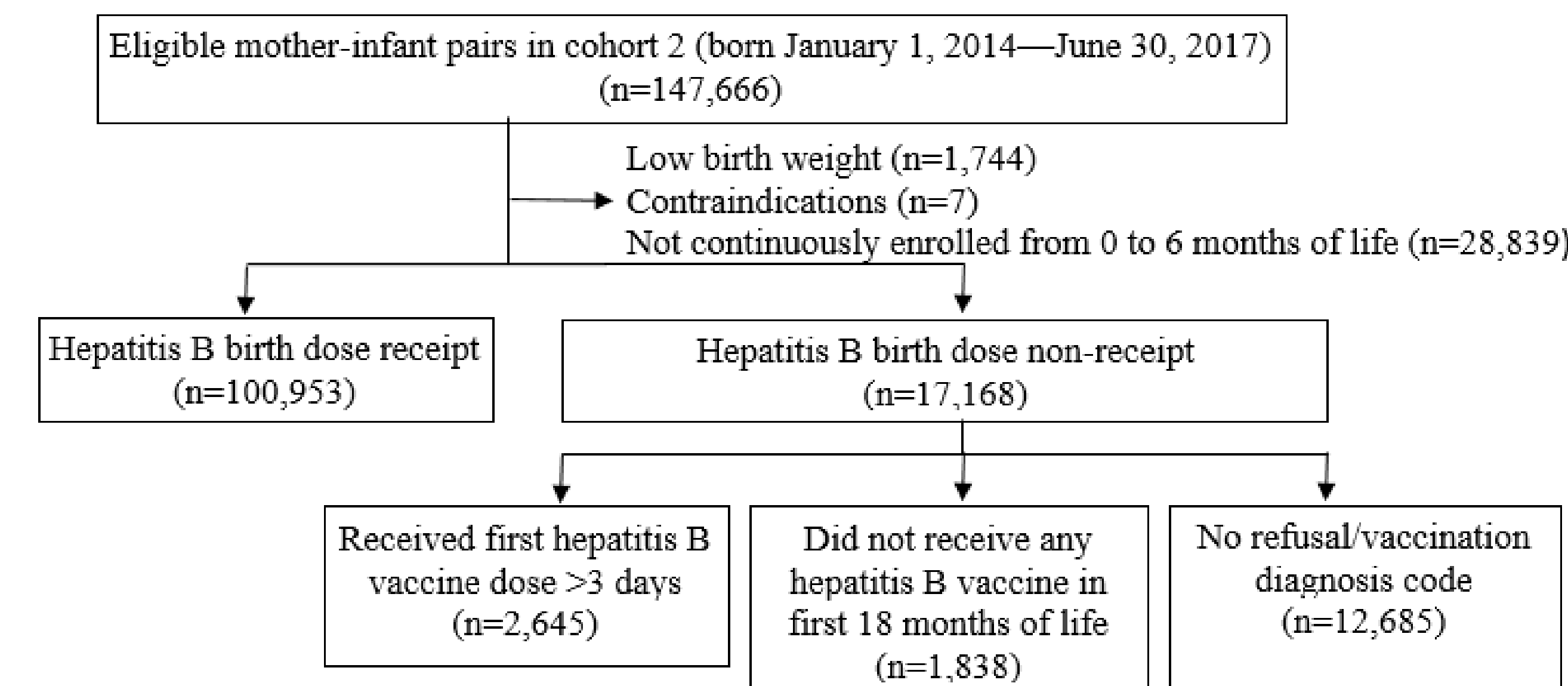


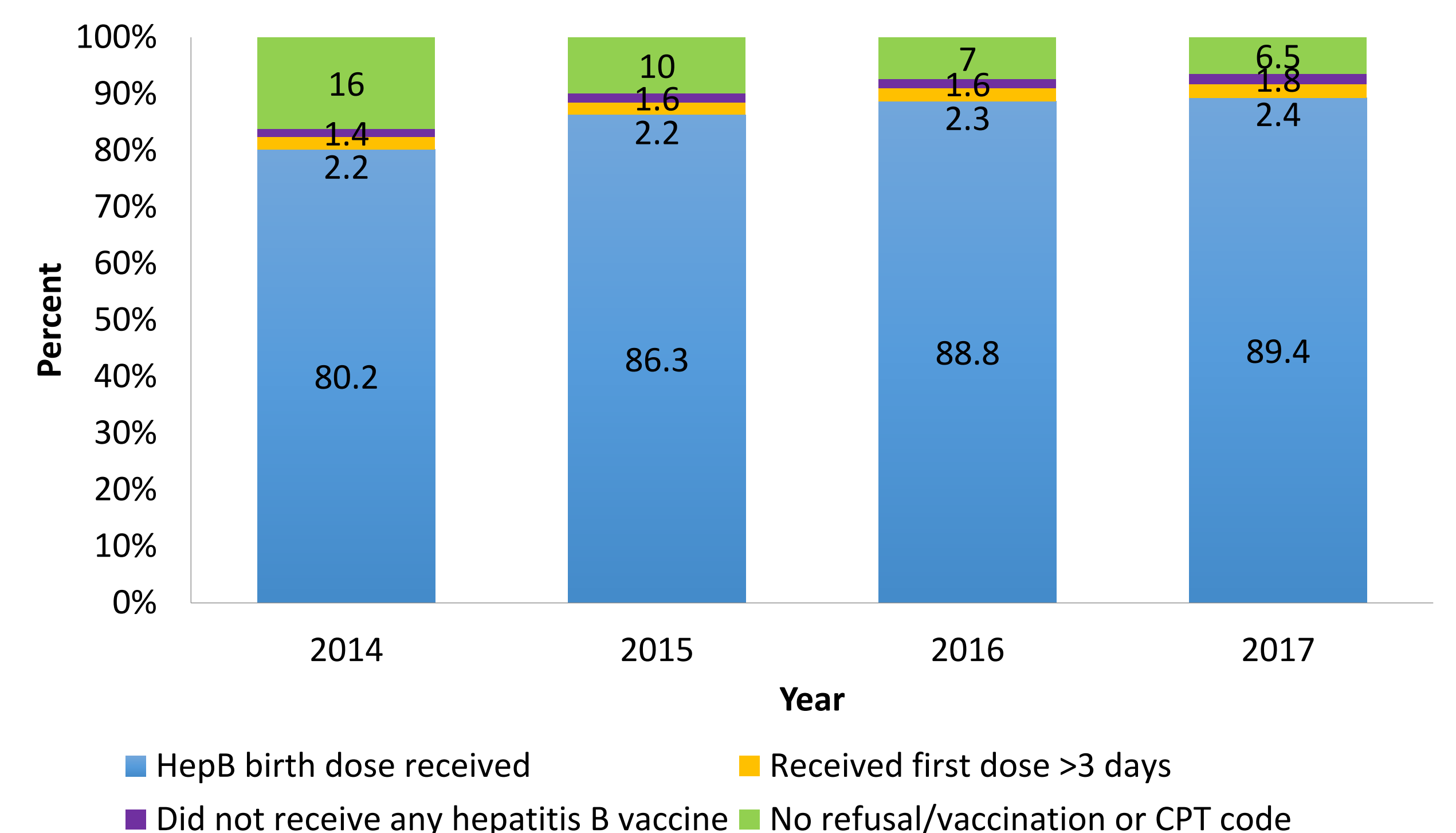
Table 1. Hepatitis B vaccination patterns by individual characteristic and adjusted odds ratios for receiving first hepatitis B vaccine >3 days of life and not receiving any hepatitis B doses in first 18 months of life among MHS beneficiaries in cohort 2, 2014 - 2017

	aORa of first HepB >3 days of life versus birth dose receipt (95% CI)	aORa of not receiving any HepB vaccine versus birth dose receipt (95% CI)
<b>Year</b>		
2014 (%)	Ref	Ref
2015 (%)	0.97 (0.87, 1.08)	1.08 (0.95, 1.23)
2016 (%)	0.95 (0.85, 1.06)	1.04 (0.91, 1.19)
2017 (%)	1.06 (0.92, 1.22)	1.22 (1.02, 1.45)
<b>Maternal Race</b>		
★ White (%)	Ref	Ref
Asian (%)	0.44 (0.35, 0.56)	0.29 (0.20, 0.42)
Black (%)	0.50 (0.43, 0.59)	0.43 (0.35, 0.53)
Other/Unknown (%)	0.69 (0.63, 0.77)	0.75 (0.67, 0.84)
<b>Maternal Age</b>		
Under 20 (%)	Ref	Ref
20-24 (%)	1.40 (0.92, 2.13)	0.83 (0.56, 1.22)
★ 25-29 (%)	2.05 (1.36, 3.09)	1.07 (0.73, 1.57)
30-34 (%)	2.48 (1.64, 3.77)	1.19 (0.81, 1.77)
35 and over (%)	2.82 (1.85, 4.31)	1.38 (0.92, 2.07)
<b>Birth Order</b>		
1 (%)	Ref	Ref
2 (%)	0.94 (0.85, 1.05)	1.14 (1.01, 1.29)
3 (%)	0.99 (0.87, 1.12)	1.34 (1.16, 1.56)
★ 4 (%)	0.96 (0.81, 1.15)	1.81 (1.49, 2.20)
5 (%)	0.92 (0.70, 1.23)	1.59 (1.16, 2.20)
>5 (%)	1.31 (0.95, 1.80)	3.77 (2.81, 5.06)
Other (%)	1.27 (0.31, 5.28)	1.00 (0.13, 7.54)
<b>Infant Bed Days</b>		
Under 4 (%)	Ref	Ref
4 to 10 (%)	0.90 (0.74, 1.10)	0.89 (0.68, 1.15)
11 and over (%)	0.67 (0.37, 1.19)	0.43 (0.16, 1.17)
<b>Military Branch</b>		
Marine Corps (%)	Ref	Ref
Army (%)	0.85 (0.68, 1.07)	0.80 (0.60, 1.05)
Air Force (%)	0.45 (0.35, 0.58)	2.09 (1.61, 2.72)
Navy (%)	0.88 (0.73, 1.08)	0.97 (0.75, 1.26)
Other (%)	1.04 (0.74, 1.47)	1.72 (1.14, 2.62)

## Results

HepB birth dose vaccination coverage increased from 80.2% in 2014 to 89.4% in 2017. The percentage of children who did not receive any HepB vaccine in the first 18 months of life increased slightly from 1.4% in 2014 to 1.8% in 2017 and the percentage of children who received the first dose >3 days of life increased slightly from 2.2% in 2014 to 2.4% in 2017. The rate of missing diagnosis codes for vaccine refusal or vaccination decreased over time from 16.2% in 2014 to 6.5% in 2017. Among the 4,533 infants with a diagnosis code for refusal of the HepB birth dose prior to hospital discharge, 2,645 (58%) received the first dose >3 days of life. The majority (88%) of infants receiving the first vaccine >3 days of life received the first dose at greater than 42 days of life. Factors associated with delay of HepB birth dose include white maternal age and older maternal age. Factors associated with refusal or not vaccine in the first 18 months of life include white maternal age and later birth order.

Figure 4. Hepatitis B birth dose vaccination patterns, 2014-2017



## Conclusion

HepB birth dose coverage in the MHS is higher than the national estimate and has increased over time from 2014 to 2017. Concurrently, parental refusal of the birth dose has also increased. However, missing diagnosis codes for vaccine refusal or vaccination have decreased over time, implying improvements in hospital implementation of universal HepB birth dose policies or improvements in coding. The MHS provides a comprehensive longitudinal dataset to link mothers and their infants from inpatient claims data to outpatient claims data. In this population, when immunization information systems are not available for analysis, claims data provide an acceptable, if not better, alternative to understand the HepB birth dose vaccination trends over time and risk factors associated with different vaccination patterns. Utilizing administrative claims data has the benefit of differentiating reasons for non-receipt of the birth dose over time.

Table 2. Comparison of hepatitis B birth dose vaccination coverage

Year	Military Health System (%)	Year	National Estimate (%)
2014	79.6	2013-2014	71.8
2015	86.0	2014-2015	72.1
2016	88.4	2015-2016	75.0
2017	89.2	2016-2017	76.3