High Maternal Tdap Vaccine Uptake During Early Part of Vaccination Window: Implications for Future Maternal Vaccines

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BACKGROUND

- Respiratory syncytial virus (RSV) is a major cause of infant lower respiratory infection and the leading cause of infant hospitalization in the United States[1]
- Maternal vaccines to prevent infant RSV are currently in development
- Uptake of existing maternal vaccines can be used to predict uptake of future maternal vaccines; this may also inform vaccine policy decisions
- Previous reports do not estimate uptake of maternal vaccines by week of gestational age during pregnancy, which is needed for precise estimation of vaccine impact

OBJECTIVE

To estimate uptake of Tdap vaccination among pregnant women overall and by week of gestational age (wGA) over a recent 5-year period in a large electronic health records (EHR) database representing privately and publicly insured patients

BACKGROUND

Data Source

- Optum EHR database comprising >50 healthcare provider organizations representing >700 hospitals and 7,000 clinics

Study Population

- Pregnant women aged 15-44 years who had a live birth delivery (i.e., pre-term or full-term births) between Jan 1, 2017 – Dec 30, 2021
  - Continuous EHR activity, defined as having ≥1 medical encounter during the 6 months pre-gestation through ≥ 1 day after delivery, was required
  - For women with multiple pregnancies during the study period, each live birth was included if the deliveries were > 60 days apart
  - Live birth deliveries with unidentifiable wGA were excluded

Analysis

- Tdap vaccination was identified via CPT code (90715) or NDC codes at any medical encounter between start of pregnancy through 1 day after delivery
- To estimate the time of Tdap vaccination, we:
  - Applied a published validated algorithm[2] that estimated pregnancy start dates and gestational age at birth outcomes
  - Calculated wGA at time of Tdap vaccination in increments of 7 days from pregnancy start date
- Tdap vaccine uptake was assessed as the proportion of live births in which a Tdap vaccine was administered between start of pregnancy through day of delivery

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RESULTS

1. The study population included 1,063,744 live births among 923,520 pregnant women
2. Maternal Tdap vaccine uptake was 57.3% (**Figure 1, Table 1**)
   - Uptake ranged from 59.1% in 2017 to 53.5% in 2021; uptake was lowest during the COVID pandemic
3. Among vaccinated pregnancies:
   - 77.4% received a Tdap vaccine during the recommended administration period from 27 to 36 weeks gestation[3] (**Figure 2**)
   - 61.5% received a Tdap vaccine within the first 6 weeks (i.e., 27 – 32 wGA) of the recommended administration period from 27 to 36 weeks gestation[3] (**Figure 2**)

Figure 1. Uptake of Maternal Tdap Vaccine Overall and by Calendar Year, Jan 2017 – Dec 2021

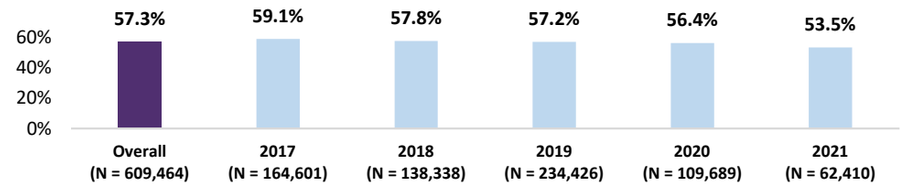

Figure 2. Uptake of Maternal Tdap Vaccine by wGA Among Vaccinated Pregnancies; Jan 2017 – Dec 2021

Gestational Age at Birth (weeks)		% of Births	wGA of Tdap Vaccination																				
			≤ 23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42+
Extreme preterm	≤ 23	0.05%	0.05%																			
	24	0.01%	0.00%	0.01%																		
	25	0.02%	0.00%	0.00%	0.02%																	
	26	0.03%	0.00%	0.00%	0.00%	0.02%																
	27	0.03%	0.00%	0.00%	0.00%	0.00%	0.02%															
Early preterm	28	0.06%	0.01%	0.00%	0.00%	0.00%	0.01%	0.04%														
	29	0.10%	0.01%	0.00%	0.00%	0.00%	0.01%	0.03%	0.05%													
	30	0.14%	0.01%	0.00%	0.00%	0.00%	0.01%	0.04%	0.03%	0.04%												
	31	0.20%	0.01%	0.00%	0.00%	0.00%	0.02%	0.04%	0.04%	0.03%	0.05%											
Late preterm	32	0.31%	0.01%	0.00%	0.00%	0.01%	0.02%	0.06%	0.06%	0.04%	0.03%	0.07%										
	33	0.47%	0.02%	0.01%	0.01%	0.01%	0.03%	0.08%	0.08%	0.05%	0.04%	0.05%	0.10%									
	34	0.85%	0.02%	0.01%	0.01%	0.02%	0.05%	0.16%	0.14%	0.09%	0.07%	0.06%	0.05%	0.16%								
	35	2.89%	0.38%	0.18%	0.17%	0.18%	0.21%	0.33%	0.30%	0.20%	0.17%	0.13%	0.10%	0.09%	0.45%							
	36	2.64%	0.04%	0.02%	0.03%	0.05%	0.15%	0.45%	0.40%	0.27%	0.21%	0.18%	0.14%	0.10%	0.08%	0.52%						
Full-term births	37	7.04%	0.10%	0.02%	0.04%	0.11%	0.37%	1.18%	1.13%	0.72%	0.55%	0.49%	0.37%	0.24%	0.19%	0.17%	1.35%					
	38	12.05%	0.14%	0.03%	0.05%	0.15%	0.60%	1.90%	1.89%	1.28%	0.95%	0.83%	0.63%	0.42%	0.32%	0.26%	0.23%	2.37%				
	39	32.09%	0.58%	0.07%	0.12%	0.35%	1.42%	4.95%	5.07%	3.35%	2.62%	2.22%	1.70%	1.11%	0.87%	0.66%	0.45%	0.35%	6.22%			
	40	24.79%	0.29%	0.04%	0.07%	0.20%	0.91%	3.64%	4.33%	2.79%	2.24%	1.87%	1.53%	0.94%	0.70%	0.54%	0.40%	0.22%	0.31%	3.79%		
	41	11.73%	0.14%	0.02%	0.03%	0.08%	0.34%	1.49%	2.04%	1.43%	1.17%	0.99%	0.83%	0.53%	0.39%	0.31%	0.24%	0.12%	0.09%	0.14%	1.36%	
	42+	4.50%	0.05%	0.00%	0.01%	0.01%	0.04%	0.19%	0.36%	0.41%	0.48%	0.58%	0.52%	0.39%	0.28%	0.22%	0.17%	0.12%	0.08%	0.07%	0.07%	0.45%
% vaccinated by wGA			1.86%	0.42%	0.57%	1.21%	4.22%	14.57%	15.91%	10.70%	8.58%	7.47%	5.96%	3.98%	3.28%	2.69%	2.82%	3.18%	6.70%	4.00%	1.43%	0.45%

77.4% Vaccinated during recommended vaccination window

61.5% vaccinated within first 6 weeks of recommended vaccination window

wGA: Week of gestational age

Table 1. Characteristics of Pregnant Women who Gave Birth to a Live Infants; Jan 2017 – Dec 2021

Characteristics of Study Population	Overall N = 1,063,744		Received Tdap N = 609,464	
Age at delivery (years)				
Mean (SD)	29.7	5.6	29.8	5.5
Age group	**N**	**%**	**N**	**%**
15-17	14,630	1.4%	7,613	1.2%
18-24	190,124	17.9%	104,378	17.1%
25-34	638,599	60.0%	372,294	61.1%
35-44	220,391	20.7%	125,179	20.5%
Race				
White	762,912	71.7%	445,352	73.1%
African American	151,743	14.3%	78,418	12.9%
Asian	34,299	3.2%	20,979	3.4%
Other/Unknown	114,790	10.8%	64,715	10.6%
Ethnicity				
Non-Hispanic	867,645	81.6%	503,782	82.7%
Hispanic	111,632	10.5%	66,195	10.9%
Unknown	84,467	7.9%	39,487	6.5%
Region				
Midwest	558,493	52.5%	320,883	52.7%
South	227,617	21.4%	119,503	19.6%
Northeast	124,602	11.7%	73,251	12.0%
West	86,796	8.2%	58,427	9.6%
Other/Unknown	66,236	6.2%	37,400	6.1%
Insurance type				
Commercial	615,015	57.8%	362,400	59.5%
Medicaid	403,028	37.9%	218,876	35.9%
Medicare	12,180	1.1%	8,724	1.4%
Other Payor Type	20,142	1.9%	12,623	2.1%
Uninsured/Unknown	13,379	1.2%	6,841	1.1%
Pregnancy outcome				
Full-term (≥37 wGA)	965,412	90.8%	561,890	92.2%
Late pre-term (32-36 wGA)	81,936	7.7%	43,610	7.2%
Early pre-term (28-31 wGA)	8,841	0.8%	3,058	0.5%
Extreme pre-term (<28 wGA)	7,555	0.7%	906	0.1%

SD: Standard deviation; wGA: Week of gestational age

LIMITATIONS

- The study population included pregnancies that resulted in a live birth delivery only
- The algorithm used to estimate gestational age was developed with administrative claims data and may have different accuracy when applied to EHR data
- The Optum EHR database may not have captured all vaccinations (e.g., vaccinations administered by providers who are not part of the database)
- Routine antenatal care patterns in 2020 and 2021 may have been impacted by the COVID-19 pandemic

CONCLUSIONS

- **In this analysis using a large EHR database, uptake of maternal Tdap vaccination was 57.3%, which is consistent with previously published estimates. [4-9]**
- **Notably, most Tdap vaccination occurred during the earliest weeks of the CDC-recommended vaccination period.**
- **These results may have important implications for estimating uptake of future maternal vaccines, therefore improving our understanding of potential vaccine impact.**