



Minnesota Department of Health

# Innovative Method for Assessing Vaccination Coverage Among Pregnant Women in Minnesota

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## Background

- Pertussis and influenza can result in severe disease in infants and can be dangerous for pregnant women.
- Pregnant women are recommended to receive inactivated influenza vaccine (1), and tetanus, diphtheria, acellular pertussis (Tdap) vaccine (2) to protect themselves and their infants before they are age-eligible for vaccination.
- Vaccination of pregnant women induces the production of antibodies that are transferred across the placenta to the fetus and provide passive protection until infants are old enough to be vaccinated (1–3).
- The Minnesota Department of Health (MDH) used a new approach to assess Tdap and influenza vaccination coverage among pregnant women in Minnesota.

## Methods

- Vital records birth certificate data containing maternal demographic characteristics, prenatal care data, and delivery payment methods were matched with vaccination data from the Minnesota Immunization Information Connection (MIIC) to assess vaccination coverage.
- 127,073 live births in Minnesota with available and complete vital records for the period March 2, 2013–December 31, 2014 were identified.
  - 113,730 (89.5%) were matched to MIIC records using maternal name and date of birth information captured on the birth certificate.
- Using gestational age data from vital records, a pregnancy time interval was calculated for the each woman in the cohort.
- Receipt of ≥1 doses of Tdap vaccine and ≥1 doses of influenza vaccine during the estimated pregnancy interval were assessed using MIIC data across selected demographic characteristics from vital records.
- Unadjusted risk ratios for Tdap and influenza vaccination were also calculated across these characteristics.

## Results

- Among 113,730 women, 66,222 (58.2%) had received ≥1 doses of Tdap vaccine and 52,248 (45.9%) had received ≥1 doses of influenza vaccine during pregnancy.
  - Among women who received Tdap vaccine, 57,215 (86.4%) were vaccinated during the recommended timeframe (27–36 weeks gestation).
- Coverage varied across demographic characteristics, including race, maternal birth country, maternal education, insurance coverage, and adequacy of prenatal care.

Tdap and influenza vaccination coverage and unadjusted relative risks among pregnant women by selected demographic characteristics, based on vital records data and immunization records — Minnesota, March 2, 2013–December 31, 2014

Characteristic	Total study population No. (%)	Tdap vaccination No. (%)	Tdap unadjusted RR (95% CI)	Influenza vaccination No. (%)	Influenza unadjusted RR (95% CI)
Overall	113,730	66,222 (58.2)	---	52,248 (45.9)	---
<b>Maternal race</b>					
White	88,209 (77.6)	51,765 (58.7)	ref	41,362 (46.9)	ref
Black	12,192 (10.7)	6,785 (55.7)	0.95† (0.93–0.96)	4,756 (39.0)	0.83‡ (0.81–0.85)
American Indian	2,174 (1.9)	1,025 (47.2)	0.80† (0.77–0.84)	852 (39.2)	0.84† (0.79–0.88)
Asian Indian	1,658 (1.5)	1,020 (61.5)	1.05 (1.01–1.09)	796 (48.0)	1.02 (0.97–1.08)
Asian	6,879 (6.1)	4,124 (60.0)	1.02 (1.00–1.04)	3,259 (47.4)	1.01 (0.98–1.04)
Other	2,618 (2.3)	1,503 (57.4)	---	1,223 (46.7)	---
<b>Maternal ethnicity</b>					
Non-Hispanic	107,716 (94.7)	62,897 (58.4)	ref	49,559 (46.0)	ref
Hispanic	6,014 (5.3)	3,325 (55.3)	0.95† (0.93–0.97)	2,709 (45.0)	0.98 (0.95–1.01)
<b>Maternal birth country/region*</b>					
United States	95,889 (84.3)	56,497 (58.9)	ref	44,833 (46.8)	ref
Africa (excluding Somalia)	6,750 (5.9)	3,424 (50.7)	0.86† (0.84–0.88)	2,494 (37.0)	0.79† (0.77–0.82)
Somalia	3,402 (3.4)	1,370 (40.3)	0.68† (0.66–0.71)	1,370 (40.3)	0.58† (0.55–0.61)
Western Europe/Canada	974 (0.9)	508 (52.2)	0.89† (0.83–0.94)	392 (40.3)	0.86† (0.80–0.93)
Asia	6,657 (5.9)	3,896 (58.5)	0.99 (0.97–1.01)	3,053 (45.9)	0.98 (0.95–1.01)
Central and South America/Mexico	2,460 (2.2)	1,473 (59.9)	1.02 (0.98–1.05)	1,209 (49.2)	1.05 (1.01–1.09)
Eastern Europe	787 (0.7)	303 (38.5)	0.65† (0.60–0.71)	185 (23.5)	0.50† (0.44–0.57)
Other	165 (0.2)	99 (60.0)	---	59 (35.8)	---
<b>Mother's education level</b>					
<High school diploma or GED	10,074 (9.0)	5,352 (53.1)	0.89† (0.87–0.91)	4,169 (41.4)	0.86† (0.84–0.89)
High school diploma or GED	18,665 (16.6)	10,476 (56.1)	0.94† (0.93–0.95)	8,061 (43.2)	0.90† (0.89–0.92)
<4 years college	22,158 (19.7)	12,781 (57.7)	0.97† (0.95–0.98)	9,666 (43.6)	0.91† (0.90–0.93)
Bachelor's/Associate's	46,688 (41.5)	27,879 (59.7)	ref	22,341 (47.9)	ref
Master's/PhD/ professional	14,878 (13.2)	9,284 (62.4)	1.05† (1.03–1.06)	7,669 (51.6)	1.08† (1.06–1.10)
<b>Marital status</b>					
Married	77,135 (68.0)	44,287 (57.4)	ref	35,567 (46.1)	ref
Not married	36,281 (32.0)	21,927 (60.4)	1.05† (1.04–1.06)	16,673 (47.0)	1.00 (0.98–1.01)
<b>Payment</b>					
Private	74,053 (65.5)	44,559 (60.2)	ref	35,714 (48.2)	ref
Military	1,114 (1.0)	673 (60.4)	1.00 (0.96–1.03)	505 (45.3)	0.94 (0.88–1.00)
Uninsured	2,499 (2.2)	781 (31.3)	0.52† (0.49–0.55)	661 (26.5)	0.55† (0.51–0.59)
Medical assistance	33,629 (29.7)	19,111 (56.8)	0.94† (0.93–0.95)	14,460 (43.0)	0.89† (0.88–0.90)
Other	1,778 (1.6)	1,014 (57.0)	---	845 (47.5)	---
<b>Adequacy of prenatal care†</b>					
Adequate	87,094 (76.6)	53,281 (61.2)	ref	42,314 (48.6)	ref
Intermediate	13,241 (11.6)	7,079 (53.5)	0.87† (0.86–0.89)	5,759 (43.5)	0.90† (0.88–0.91)
Inadequate	13,395 (11.8)	5,862 (43.8)	0.71† (0.70–0.73)	3,700 (32.3)	0.67† (0.65–0.68)
<b>Received WIC</b>					
Yes	36,700 (32.6)	21,268 (58.0)	1.01 (1.00–1.03)	16,543 (45.1)	1.04† (1.02–1.05)
No	76,014 (67.4)	44,685 (58.8)	ref	35,488 (46.7)	ref

Abbreviations: CI = confidence interval; GED = general educational development certificate; ref = referent level; RR = relative risk; Tdap = tetanus, diphtheria, acellular pertussis vaccine; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.  
 \*Missing values for maternal birth country (n = 48), education (n = 1,267), marital status (n = 314), payment (n = 657), WIC status (n = 1,016).  
 † Based on the Kotelchuck Index, which considers time of initiation of prenatal care and number of prenatal visits attended.  
 ‡ p < 0.001.

## Limitations

- Vaccine coverage may be different than results suggest because submitting immunization data to MIIC is not required by health care providers resulting in possible incomplete or missing MIIC records.
- Vital records self-reported demographic data and inconsistent reporting of prenatal care data across different health care facilities may result in data misclassification.
- Study began one week after publication of the current Advisory Committee on Immunization Practices (ACIP) recommendation for Tdap vaccination during pregnancy regardless of prior Tdap history. Because it takes time for health care providers to become familiar with and begin implementing new vaccine recommendations, it is likely that initial coverage rates were low.
- Study looked at receipt of ≥1 doses of influenza vaccine during the pregnancy. If a pregnancy spanned two influenza seasons, women may have only received one vaccine that could result in sub-optimal protection because of annual strain selection changes made to the vaccine.

## Conclusions

- Coverage differences highlight potential health disparities that warrant further study.
- This data analysis method will assist MDH in more effectively targeting future maternal vaccination public health interventions.

## References

- Harper SA, Fukuda K, Uyeki TM, Cox NJ, Bridges CB; Advisory Committee on Immunization Practices (ACIP). Prevention and control of influenza. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2005;54(No. RR-8):1–40.
- CDC. Updated recommendations for use of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) in pregnant women—Advisory Committee on Immunization Practices (ACIP), 2012. MMWR Morb Mortal Wkly Rep 2013;62:131–5.
- Committee on Obstetric Practice and Immunization Expert Work Group; CDC's Advisory Committee on Immunization, United States; American College of Obstetricians and Gynecologists. Committee opinion no. 608: influenza vaccination during pregnancy. Obstet Gynecol 2014;124:648–51.

Refer to the following publication for more information on this study:  
 Coverage with Tetanus, Diphtheria, and Acellular Pertussis Vaccine and Influenza Vaccine Among Pregnant Women — Minnesota, March 2013–December 2014. MMWR. 2017;66:56–9.

**Protect those you love. Immunize.**

**It is safe to be vaccinated while pregnant.**  
 Pregnant women can protect themselves and their babies by getting their flu and whooping cough vaccines during every pregnancy.

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[www.cdc.gov/vaccines/adults/rec-vac/pregnant.html](http://www.cdc.gov/vaccines/adults/rec-vac/pregnant.html)

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