Vaccination in Pregnancy: Table of Evidence

Citation	Methods	Participants	Outcomes
Parboosing, R., Bao, Y., Shen, L., Schaefer, C. A., & Brown, A. S. (2013). Gestational influenza and bipolar disorder in adult offspring. *JAMA psychiatry*, *70*(7), 677-685.	Nested case-control study of a population-based birth cohort from the Child Health and Development Study (CHDS). From January 1, 1959, through December 31, 1966	Cases of BD (n = 92) confirmed by structured research interviews and consensus diagnosis among the 214 subjects who participated and control subjects (n = 722) matched on date of birth, sex, and membership in KPNC or residence in Alameda County	Authors found a significant, nearly 4-fold increase in the risk of bipolar disorder after exposure to maternal influenza at any time during pregnancy. The findings were not confounded by maternal age, race, educational level, gestational age at birth, and maternal psychiatric disorders.
Brown, A. S., Begg, M. D., Gravenstein, S., Schaefer, C. A., Wyatt, R. J., Bresnahan, M., ... & Susser, E. S. (2004). Serologic evidence of prenatal influenza in the etiology of schizophrenia. *Archives of general psychiatry*, *61*(8), 774-780.	Archived maternal serum was assayed for influenza antibody in pregnancies giving rise to offspring with schizophrenia and matched control offspring, born from 1959 through 1966, and followed up for psychiatric disorders 30 to 38 years later.	Cases were 64 birth cohort members diagnosed as having schizophrenia spectrum disorders. Controls were 125 members of the birth cohort.	The risk of schizophrenia was increased 7-fold for influenza exposure during the first trimester. There was no increased risk of schizophrenia with influenza during the second or third trimester.
Legge, A., Dodds, L., MacDonald, N. E., Scott, J., & McNeil, S. (2014). Rates and determinants of seasonal influenza vaccination in pregnancy and association with neonatal outcomes. *Cmaj*, *186*(4), E157-E164.	Used a population-based perinatal database in the province of Nova Scotia, Canada, to examine maternal vaccination rates, determinants of vaccination status and neonatal outcomes.	12,223 women in the province of Nova Scotia, Canada, who gave birth between Nov. 1, 2010, and Mar. 31, 2012.	The odds of preterm birth was lower among infants of vaccinated women than among those of nonvaccinated women. The rate of low-birth-weight infants was also lower among vaccinated women.
Fell, D. B., Sprague, A. E., Liu, N., Yasseen III, A. S., Wen, S. W., Smith, G., ... & Better Outcomes Registry & Network (BORN) Ontario. (2012). H1N1 influenza vaccination during pregnancy and fetal and neonatal outcomes. *American journal of public health*, *102*(6), e33-e40.	Population-based perinatal database in Canada, to examine preterm birth (PTB), small-for-gestational-age (SGA) births, 5-minute Apgar score below 7, and fetal death via multivariable regression.	Of the 55,570 mothers with a singleton birth, 23,340 (42.0%) received an H1N1 vaccination during pregnancy.	Vaccinated mothers were less likely to have an SGA infant growth percentiles; PTB at less than 32 weeks' gestation were also less likely among these women.

Citation	Methods	Participants	Outcomes
Regan, A. K., Moore, H. C., De Klerk, N., Omer, S. B., Shellam, G., Mak, D. B., & Effler, P. V. (2016). Seasonal trivalent influenza vaccination during pregnancy and the incidence of stillbirth: population-based retrospective cohort study. *Clinical Infectious Diseases*, *62*(10), 1221-1227.	Probabilistic linking of perinatal and maternal vaccination records of 58,008 births between April 2012 and December 2013. Cox regression models adjusted for maternal smoking, Indigenous status, and propensity for vaccination were used to calculate adjusted hazard ratios in vaccinated and unvaccinated mothers	58,008 births occurring in Western Australia	Stillbirth was 51% less likely among vaccinated vs unvaccinated mothers. Mothers who received seasonal TIV during pregnancy were significantly less likely to experience stillbirth compared with unvaccinated mothers
Zaman, K., Roy, E., Arifeen, S. E., Rahman, M., Raqib, R., Wilson, E., ... & Steinhoff, M. C. (2008). Effectiveness of maternal influenza immunization in mothers and infants. *New England Journal of Medicine*, *359*(15), 1555-156 4.	Mothers were randomized to receive either flu or pneumococcal vaccine. They were interviewed weekly to assess illnesses until 24 weeks after birth. Subjects with febrile respiratory illness were assessed clinically, and ill infants were tested for influenza antigens	340 mothers assigned to receiving either the flu shot or pneumococcal vaccine.	Inactivated influenza vaccine reduced proven influenza illness by 63% in infants up to 6 months of age and averted approximately a third of all febrile respiratory illnesses in mothers and young infants
Shakib, J. H., Korgenski, K., Presson, A. P., Sheng, X., Varner, M. W., Pavia, A. T., & Byington, C. L. (2016). Influenza in infants born to women vaccinated during pregnancy. *Pediatrics*, *137*(6), e20152360.	The study included all women who delivered from 12/2005 to 3/2014 at Intermountain facilities and their infants. Influenza outcomes included infant influenza-like illness (ILI), lab-confirmed influenza, and flu hospitalizations.	The cohort included 245,386 women and 249,387 infants. Overall, 23,383 (10%) pregnant women reported influenza immunization.	Infants born to women reporting influenza immunization during pregnancy had risk reductions of 64% for ILI, 70% for laboratory-confirmed influenza, and 81% for influenza hospitalizations in their first 6 months
Baxter, R., Bartlett, J., Fireman, B., Lewis, E., & Klein, N. P. (2017). Effectiveness of vaccination during pregnancy to prevent infant pertussis. *Pediatrics*, *139*(5), e20164091.	A retrospective cohort study of infants born at Kaiser Permanente Northern California from 2010 to 2015	148,981 newborns	The vaccine effectiveness of maternal Tdap was 91.4% during the first 2 months of life and 69.0% during the entire first year of life.

Becker-Dreps, S., Butler, A. M., McGrath, L. J., Boggess, K. A., Weber, D. J., Li, D., ... & Layton, J. B. (2018). Effectiveness of prenatal tetanus, diphtheria, acellular pertussis vaccination in the prevention of infant pertussis in the US. *American journal of preventive medicine*, *55*(2), 159-166.	Commercial insurance claims data were analyzed in 2016–2017 to identify Tdap receipt by pregnant women, and hospitalizations and outpatient visits for pertussis in their infants until the infants reached 18 months of age. Pertussis occurrence was compared between infants of mothers who received prenatal Tdap (overall and stratified by gestational age at administration) and infants of unvaccinated mothers	There were 675,167 mother–infant pairs in the cohort	Among infants whose mothers received prenatal Tdap, the rate of pertussis was 43% lower than infants whose mothers did not receive Tdap; this reduction was consistent across pertussis definitions. Pertussis rates were also lower for infants whose mothers received Tdap during the third trimester.
Skoff, T. H., Blain, A. E., Watt, J., Scherzinger, K., McMahon, M., Zansky, S. M., ... & Martin, S. W. (2017). Impact of the US maternal tetanus, diphtheria, and acellular pertussis vaccination program on preventing pertussis in infants< 2 months of age: a case-control evaluation. *Clinical Infectious Diseases*, *65*(12), 1977-1983.	Conducted a case-control evaluation among pertussis cases <2 months old with cough onset between 1 January 2011 and 31 December 2014 from 6 US Emerging Infection Program Network states. Controls were hospital-matched and selected by birth certificate		The overall effectiveness of vaccination at any time during the third trimester of pregnancy was 77.7% (95% confidence interval [CI], 48.3%–90.4%; Table 3); the effectiveness of Tdap given during the first or second trimester was 64.3%