



# Vaccination and Health Outcomes: A Survey of 6- to 12-year-old Vaccinated and Unvaccinated Children based on Mothers' Reports

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## ABSTRACT

**Background:** Vaccinations have prevented millions of infectious illnesses, hospitalizations and deaths among US children. Yet the long-term health outcomes of the routine vaccination program remain unknown. Studies have been recommended by the Institute of Medicine to address this question.

**Specific Aims:** To compare vaccinated and unvaccinated children on a broad range of health outcomes, and to determine whether an association found between vaccination and neurodevelopmental disorders (NDD), if any, remains significant after adjustment for other measured factors.

**Design:** A cross-sectional survey of mothers of children educated at home.

**Methods:** Homeschool organizations in four states (Florida, Louisiana, Mississippi, and Oregon) were asked to forward an email to their members, requesting mothers to complete an anonymous online questionnaire on the vaccination status and health outcomes of their biological children ages 6 to 12.

**Results:** A total of 415 mothers provided data on 666 children, of which 261 (39%) were unvaccinated. Vaccinated children were significantly less likely than the unvaccinated to have been diagnosed with chickenpox and pertussis, but significantly more likely to have been diagnosed with pneumonia, otitis media, allergies and NDDs (defined as Autism Spectrum Disorder, Attention Deficit Hyperactivity Disorder, and/or a learning disability). After adjustment, the factors that remained significantly associated with NDD were vaccination (OR 3.1, 95% CI: 1.4, 6.8), male gender (OR 2.3, 95% CI: 1.2, 4.3), and preterm birth (OR 5.0, 95% CI: 2.3, 11.6). In a final adjusted model, vaccination but not preterm birth remained associated with NDD, while the interaction of preterm birth and vaccination was associated with a 6.6-fold increased odds of NDD (95% CI: 2.8, 15.5).

**Conclusions:** In this study based on mothers' reports, the vaccinated had a higher rate of allergies and NDD than the unvaccinated. Vaccination, but not preterm birth, remained significantly associated with NDD after controlling for other factors. However, preterm birth combined with vaccination was associated with an apparent synergistic increase in the odds of NDD. Further research involving larger, independent samples is needed to verify and understand these unexpected findings in order to optimize the impact of vaccines on children's health.