**Appendix**

**Two-level generalized linear mixed modeling**

**Patient-level Model:**

Logistic (vaccination status ij (yes vs. no)) = b0j + b1j (age groupij)+ b2j (raceij) + b3j (insuranceij) + εij

**Practice-Level Model:**

b0j = β 00 + β01 (pre-intervention ratej) + β02 (interventionj (yes vs. no)) + u0j

b1j = β10

b2j = β20

b3j = β30

b4j = β40

**Mixed Model**

Logistic (vaccination statusij) = β00 + β01 (pre-intervention ratej) + β02 (interventionj (yes vs. no)) + β10 (age groupij) + β20 (raceij) + β30 (insuranceij) + u0j + εij