**Longitudinal Assessment of Immune Responses to Repeated Annual Influenza Vaccination in a Human Cohort of Adults and Teenagers**

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**Table S1. Descriptive statistics of UGA cohort study by years**

|  |  |  |
| --- | --- | --- |
|  | **2017-2018 (single year)** | **2018-2019 (single year)** |
| **Sample sizes** | 255 | 242 |
| **Age** | 31.96 (18.09) | 21.14 (16.12) |
| *Adults (>=18 years)* | 183 (71.8%) | 92 (38%) |
| *Teenagers (<18 years)* | 72 (28.2%) | 150 (62%) |
| **BMI** | 26.62 (6.4) | 24.45 (6.04) |
| **Sex (Male)** | 113 (44.3%) | 105 (43.4%) |
| **Race** |  |  |
| *White* | 205 (80.4%) | 203 (83.9%) |
| *African American* | 19 (7.5%) | 11 (4.5%) |
| *Other* | 31 (12.1%) | 28 (11.6%) |
| **Comorbidity (Yes)** | 59 (23.1%) | 53 (21.9%) |
| **Month of Vaccination** |  |  |
| *September* | 25 (9.8%) | 93 (38.4%) |
| *October* | 68 (26.7%) | 93 (38.4%) |
| *November* | 87 (34.1%) | 40 (16.5%) |
| *December* | 24 (9.4%) | 11 (4.5%) |
| *January* | 44 (17.3%) | 4 (1.7%) |
| *February* | 7 (2.7%) | 1 (0.4%) |
| *March* | 0 (0%) | 0 (0%) |
| **Last season vaccination (Yes)** | 181 (71%) | 193 (79.8%) |
| **HAI composite score** | 5.18 (5.46) | 4.83 (4.7) |

(standard deviations/percentages in parentheses for continuous/categorical variables)

**Table S2. Descriptive statistics of adults re-enrolled in both seasons**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **2017-2018** | | **2018-2019** | |
|  | **Age < 50** | **Age >= 50** | **Age < 50** | **Age >= 50** |
| **Sample sizes** | 60 | 26 | 60 | 26 |
| **Age** | 29 (8.58) | 61.19 (6.60) | 30.13 (8.66) | 61.69 (6.67) |
| **BMI** | 26.63 (5.17) | 30.86 (4.85) | 26.59 (5.28) | 30.79 (4.75) |
| **Sex (Male)** | 22 (36.7%) | 12 (46.2%) | 22 (36.7%) | 12 (46.2%) |
| **Race** |  |  |  |  |
| *White* | 48 (80%) | 21 (80.8%) | 48 (80%) | 21 (80.8%) |
| *African American* | 2 (3.3%) | 3 (11.5%) | 2 (3.3%) | 3 (11.5%) |
| *Other* | 10 (16.7%) | 2 (7.7%) | 10 (16.7%) | 2 (7.7%) |
| **Comorbidity (Yes)** | 11 (18.3%) | 13 (50%) | 10 (16.7%) | 12 (46.2%) |
| **Month of Vaccination** |  |  |  |  |
| *September* | 6 (10%) | 5 (19.2%) | 28 (46.7%) | 16 (61.5%) |
| *October* | 18 (30%) | 9 (34.6%) | 24 (40%) | 7 (26.9%) |
| *November* | 22 (36.7%) | 8 (30.8%) | 6 (10%) | 3 (11.5%) |
| *December* | 4 (6.7%) | 3 (11.5%) | 1 (1.7%) | 0 (0%) |
| *January* | 10 (16.7%) | 1 (3.8%) | 1 (1.7%) | 0 (0%) |
| *February* | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| **Last season vaccination (Yes)** | 55 (91.7%) | 23 (88.5%) | 60 (100%) | 26 (100%) |
| **HAI composite score** | 2.42 (2.59) | 2.96 (2.96) | 2.8 (2.23) | 3.35 (2.54) |

(standard deviations/percentages in parentheses for continuous/categorical variables)

**Table S3. Odds ratio estimates of host variables fitted in logistic model with GEE**

|  |  |  |
| --- | --- | --- |
|  | Overall (n=140) | Adults (n=86) |
| Baseline HAI titers |  |  |
| Age |  |  |
| Sex (Male) | 0.30  (0.07, 1.27) | 0.91  (0.05, 15.92) |
| Race (White) | 0.76  (0.37, 1.56) | 0.64  (0.25, 1.61) |
| BMI |  |  |
| Comorbidity (Yes) | 0.58  (0.20, 1.68) | 0.85  (0.20, 3.66) |
| Prior vaccination (Yes) |  |  |
| Flu season (18/19) |  | 0.73  (0.31, 1.70) |
| Age\*BMI |  |  |
| Age\* Sex (Male) | 1.02  (0.97, 1.06) | 0.99  (0.92, 1.07) |

(95% confidence interval in parentheses, ‘\*\*\*’: p<0.001, ‘\*\*’: p< 0.01, ‘\*’: p< 0.05)

**Table S4. Coefficient estimates of host variables fitted in linear model with GEE stratified by younger and older adults**

|  |  |  |
| --- | --- | --- |
|  | **Age < 50**  (n=60) | **Age >= 50** (n=26) |
| Baseline HAI titers | **(-1.49, -0.78)** | -0.52 (-1.08, 0.05) |
| Sex (Male) | -0.19 (-0.95, 0.58) | -0.89 (-2.16, 0.37) |
| Race (White) | 0.45 (-0.50, 1.40) | -0.17 (-1.05, 0.71) |
| BMI | -0.06 (-0.15, 0.02) | 0.02 (-0.12, 0.16) |
| Comorbidity (Yes) | -0.19 (-1.30, 0.91) | -0.75 (-1.86, 0.36) |
| Prior vaccination (Yes) | **(-4.55, -0.83)** | **(-5.18, -2.28)** |
| Flu season (18/19) | **(-1.56, -0.12)** | -0.38 (-2.04, 1.28) |

(95% confidence interval in parentheses, ‘\*\*\*’: p<0.001, ‘\*\*’: p< 0.01, ‘\*’: p< 0.05)

**Table S5. Descriptive statistics of teenagers re-enrolled in both seasons and newly enrolled in 2018-2019**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **2018-2019** | | | | | |
|  | **Teens (Repeatedly Enrolled)** |  | | **Teens (Newly Enrolled in 2018-2019)** | | |
|  |  | |  | All | Prior vaccination | No Prior vaccination |
| **Sample sizes** | 54 | |  | 96 | 49 | 47 |
| **Age** | 15.13 (1.29) | |  | 14.26 (1.71) | 14.22 (1.74) | 14.30 (1.69) |
| **BMI** | 22.16 (3.61) | |  | 22.54 (6.21) | 22.35 (6.56) | 22.74 (5.90) |
| **Sex (Male)** | 23 (42.6%) | |  | 46 (47.9%) | 25 (51.0%) | 21 (44.7%) |
| **Race** |  | |  |  |  |  |
| *White* | 45 (83.3%) | |  | 85 (88.5%) | 44 (89.8%) | 41 (87.2%) |
| *African American* | 1 (1.9%) | |  | 5 (5.2%) | 1 (2.0%) | 4 (8.5%) |
| *Other* | 8 (14.8%) | |  | 6 (6.3%) | 4 (8.2%) | 2 (4.3%) |
| **Comorbidity (Yes)** | 14 (25.9%) | |  | 17 (17.7%) | 8 (16.3%) | 9 (19.1%) |
| **Month of Vaccination** |  | |  |  |  |  |
| *September* | 17 (31.5%) | |  | 29 (30.2%) | 13 (26.5%) | 16 (34.0%) |
| *October* | 24 (44.4%) | |  | 35 (36.5%) | 19 (38.8%) | 16 (34.0%) |
| *November* | 12 (22.2%) | |  | 19 (19.8%) | 14 (28.6%) | 5 (10.6%) |
| *December* | 0 (0%) | |  | 10 (10.4%) | 3 (6.1%) | 7 (14.9%) |
| *January* | 1 (1.9%) | |  | 2 (2.1%) | 0 (0%) | 2 (4.3%) |
| *February* | 0 (0%) | |  | 1 (1.0%) | 0 (0%) | 1 (2.1%) |
| *March* | 0 (0%) | |  | 0 (0%) | 0 (0%) | 0 (0%) |
| **Last season vaccination (Yes)** | 54 (100%) | |  | 49 (51.0%) | 49 (100%) | 0(0%) |
| **HAI composite score** | 2.74 (2.17) | |  | 7.77 (5.83) | 4.10 (4.07) | 11.60 (4.86) |

(standard deviations/percentages in parentheses for continuous/categorical variables)

**Figure S1. HAI Composite Scores from Teenagers with and without Prior Vaccination**

