

## **Younger Age and Self-Reported Anxiety about Paying Medical Bills are Associated with Decreased Odds of Flu Vaccination in Patients with Inflammatory Bowel Disease**

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### **Background:**

Patients with inflammatory bowel disease (IBD) have an increased risk of contracting infections that are preventable by vaccines. According to clinical guidelines, patients with IBD should receive the flu vaccination yearly. In this study, we used nationwide data from the United States National Health Interview Survey to determine demographic and socio-economic factors associated with flu vaccination in patients with IBD.

### **Methods:**

Data from the 2016 National Health Interview Survey were used in this study. All patients with a self-reported diagnosis of either Crohn's disease or ulcerative colitis were included. Data were weight-adjusted prior to analysis. Individuals were stratified based on report of completed flu vaccination which was defined as having received the vaccine within the last 12 months. The two study groups were compared based on demographic data, variables related to perceived ability to afford medical care, and reports of limiting various forms of medical care due to cost. Differences between groups were determined using a Chi-square test with Rao-Scott modification. A multivariable logistic regression model was used to determine the demographic and socio-economic factors associated with flu vaccination. A p-value less than 0.05 was considered statistically significant.

### **Results:**

Of 3,119,637 individuals with IBD, 56% of individuals were up-to-date with flu vaccination. Young adults (age 18-39y) with IBD were 200% less likely to be vaccinated than older adults (age > 65y) (15.4% young adults vs 30.4% older adults,  $p < 0.001$ ). (Table 1). Further, middle-aged (age 40-64y) and older adult patients with IBD had two-times and four-times greater odds of receiving the flu vaccine than young adults with IBD, respectively (middle-aged OR=2.04, 95%CI= 0.46-1.46; older adult OR=4.01, 95%CI= 1.88-8.54). Reported anxiety about paying medical bills was associated with decreased odds of having received the flu vaccination (OR-0.51, 95%CI = 0.27-0.94) (Table 2).

### **Discussion:**

This large retrospective study demonstrates that younger age and anxiety surrounding ability to afford medical care are associated with decreased odds of receiving the flu vaccination among patients with IBD. These findings have implications on the counseling that clinicians provide to patients with IBD and development of vaccination campaigns to ensure that they receive preventive healthcare in accordance with clinical guidelines.

**Table 1:** Characteristics of the study cohort overall and stratified by flu vaccine status.

|                                                                                                             | All<br>n = 3,119,637  | Flu Shot in Last Year<br>n = 1,761,969 | No Flu Shot in Last<br>Year<br>n = 1,357,668 | p-value           |
|-------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------|----------------------------------------------|-------------------|
| <b>Age Group (n, %)</b>                                                                                     |                       |                                        |                                              | <b>&lt;0.001*</b> |
| <b>Young Adult (18-39Y)</b>                                                                                 | <b>716,099 (23.0)</b> | <b>271,792 (15.4)</b>                  | <b>444,307 (32.7)</b>                        |                   |
| <b>Middle-Aged Adult (40-64Y)</b>                                                                           | <b>1,672,069</b>      | <b>954,736 (54.2)</b>                  | <b>717,333 (52.8)</b>                        |                   |
| <b>Older Adult (65 and older)</b>                                                                           | <b>(53.6)</b>         | <b>535,441 (30.4)</b>                  | <b>196,028 (14.4)</b>                        |                   |
|                                                                                                             | <b>731,469 (23.4)</b> |                                        |                                              |                   |
| Female Sex (n, %)                                                                                           | 2,010,976<br>(64.5)   | 1,100,070 (62.4)                       | 910,906 (67.1)                               | 0.417             |
| Non-White Race (n, %)                                                                                       | 332,335 (10.7)        | 143,059 (8.1)                          | 189,276 (13.9)                               | 0.096             |
| Hispanic Ethnicity (n, %)                                                                                   | 458,855 (14.7)        | 231,505 (13.1)                         | 227,350 (16.7)                               | 0.585             |
| Cannot Afford Prescription Medications                                                                      | 510,791 (16.4)        | 259,664 (14.7)                         | 251,127 (18.5)                               | 0.470             |
| Cannot Afford Mental Healthcare                                                                             | 226,110 (7.2)         | 143,696 (8.2)                          | 82,414 (6.1)                                 | 0.625             |
| Cannot Afford Dental Care                                                                                   | 709,668 (22.7)        | 379,711 (21.6)                         | 329,957 (24.3)                               | 0.612             |
| Cannot Afford Eyecare                                                                                       | 381,630 (12.2)        | 174,508 (9.9)                          | 207,122 (15.3)                               | 0.287             |
| Cannot Afford Follow Up Care                                                                                | 187,892 (6.0)         | 82,892 (4.7)                           | 105,000 (7.7)                                | 0.238             |
| Cannot Afford to See a Specialist                                                                           | 341,297 (10.9)        | 148,853 (8.4)                          | 192,444 (14.2)                               | 0.105             |
| <b>Worried About Paying Medical Bills</b>                                                                   | <b>587,067 (18.8)</b> | <b>222,500 (12.6)</b>                  | <b>364,567 (26.9)</b>                        | <b>0.001*</b>     |
| Skip Medication Due to Cost                                                                                 | 412,943 (14.9)        | 195,233 (12.1)                         | 217,710 (18.8)                               | 0.129             |
| Take Less Medication Due to Cost                                                                            | 404,029 (14.6)        | 182,460 (11.3)                         | 221,569 (19.2)                               | 0.078             |
| Request Cheaper Medications                                                                                 | 842,293 (30.4)        | 460,693 (28.6)                         | 381,600 (33.0)                               | 0.461             |
| Obtain Medications Outside the US Due to Cost                                                               | 149,484 (4.8)         | 89,451 (5.1)                           | 60,033 (4.4)                                 | 0.862             |
| P-values reflect comparison between subgroup that received flu shot in past year and subgroup that did not. |                       |                                        |                                              |                   |

**Table 2:** Predictors of flu vaccination among individuals with IBD

|                                               | <b>Univariable<br/>OR (95% CI)</b> | <b>Multivariable<br/>OR (95% CI)</b> |
|-----------------------------------------------|------------------------------------|--------------------------------------|
| <b>Age Group (compared to Young Adult)</b>    |                                    |                                      |
| <b>Middle-Aged Adult</b>                      | <b>2.18 (1.25 - 3.78)*</b>         | <b>2.04 (1.13 - 3.71)**</b>          |
| <b>Older Adult</b>                            | <b>4.47 (2.19 - 9.11)*</b>         | <b>4.01 (1.88 - 8.54)**</b>          |
| <b>Non-White Race</b>                         | 0.55 (0.26 - 1.12)*                |                                      |
| <b>Hispanic Ethnicity</b>                     | 0.75 (0.27 - 2.10)                 |                                      |
| <b>Female Sex</b>                             | 0.82 (0.50 - 1.34)                 |                                      |
| <b>Cannot Afford Prescription Medications</b> | 0.76 (0.36 - 1.60)                 |                                      |
| <b>Cannot Afford Follow Up Care</b>           | 0.59 (0.24 - 1.43)                 |                                      |
| <b>Cannot Afford Specialist</b>               | 0.56 (0.27 - 1.14)                 | 0.87 (0.36 - 2.10)                   |
| <b>Worried About Paying Medical Bills</b>     | <b>0.39 (0.22 - 0.69)*</b>         | <b>0.51 (0.27 - 0.94)**</b>          |
| <b>Take Less Medication Due to Cost</b>       | 0.54 (0.27 - 1.08)*                | 0.76 (0.34 - 1.69)                   |
| * = p < 0.1; ** = p < 0.05                    |                                    |                                      |