

AIM paper analysis

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Identification and description of individuals who remain unvaccinated 12 weeks after becoming eligible for vaccination

Methods

Inclusion criteria:

- Individuals alive and registered at a single TPP practice for at least 1 year prior to vaccine eligibility date
- Individuals satisfying the criteria for one of the following:
 - JCVI priority group 2 (80-120 years and not in group 1, eligible from 8th December 2020)
 - JCVI priority group 9 (50-54 years and not in groups 1-8, eligible from 19th March 2021)
 - JCVI priority group 11 (30-39 years and not in groups 1-10, eligible from 13th - 26th May 2021)

For individuals in JCVI priority group 11, eligibility date was dependent on age:

| jcvi_group | ageband | elig_date |
|------------|---------|------------|
| 02 | 80+ | 2020-12-08 |
| 09 | 50-55 | 2021-03-19 |
| 11 | 30-31 | 2021-05-26 |
| 11 | 32-33 | 2021-05-25 |
| 11 | 34-35 | 2021-05-21 |
| 11 | 36-37 | 2021-05-19 |
| 11 | 38-39 | 2021-05-13 |

Outcome

- 0 if no record of COVID vaccination up until 12 weeks after eligibility date
- 1 if record of any brand of COVID vaccination any time up until 12 weeks after eligibility date

Covariates The following clinical variables were defined based on definitions given in *COVID-19: the green book, chapter 14a*¹: severe asthma, chronic respiratory disease, chronic heart disease, chronic kidney disease,

¹https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1018444/Greenbook_chapter_14a_16Sept21.pdf

chronic liver disease, chronic neurological disease, diabetes (other endocrine disorders), immunosuppressed, asplenia/dysfunction of spleen, severe mental illness.

All clinical and demographic covariates were defined based on information up until the individual’s eligibility date.

Covariates related to COVID infection were split according to whether they occurred before the eligibility date or in the 12-week period after the eligibility date:

- COVID +ve test before eligible
- COVID +ve test while eligible
- COVID hospitalisation before eligible
- COVID hospitalisation while eligible

Covariates relating to death or deregistration were defined during the 12-week period after the eligibility date:

- Death while eligible (COVID on certificate)
- Death while eligible (COVID +ve within 28 days)
- Death while eligible (any cause)
- Deregistered while eligible

Analysis plan

- From the individuals that satisfy the inclusion criteria, and for each eligibility group:
 - identify all unvaccinated individuals (no vaccination within 12 weeks of their eligibility date)
 - randomly select 10% of the individuals who received a first vaccination within 12 weeks of their eligibility date
- Generate summary table of the characteristics stratified by vaccinated/unvaccinated groups defined above (using inverse probability weights to correct for the random sampling of vaccinated patients)
- Fit logistic regression models for remaining unvaccinated (using inverse probability weights to correct for the random sampling of vaccinated patients)

Results

Table 1. Characteristics of individuals in JCVI priority group 2 aged 80+ years. ‘Unvaccinated’ = patients who did not receive a COVID vaccine within 12 weeks of becoming eligible; ‘Vaccinated’ otherwise. Age is summarised as mean (SD), all other characteristics are n (%). Inverse probability weights used to correct for the random sampling of ‘Vaccinated’ patients.

| Characteristic | Unvaccinated | Vaccinated |
|------------------|---------------|---------------|
| n (% of sample) | 33,119 (56.9) | 25,040 (43.1) |
| Age | 90 (6.1) | 90 (6) |
| Age group: 80-84 | 7,894 (23.8) | 5,980 (23.9) |
| Age group: 85-89 | 7,853 (23.7) | 5,800 (23.2) |
| Age group: 90-94 | 7,775 (23.5) | 6,130 (24.5) |
| Age group: 95+ | 9,597 (29) | 7,130 (28.5) |

| Characteristic | Unvaccinated | Vaccinated |
|--------------------------------|---------------|---------------|
| Sex: F | 16,702 (50.4) | 12,460 (49.8) |
| Ethnicity: White | 6,169 (18.6) | 4,640 (18.5) |
| Ethnicity: Black | 6,256 (18.9) | 4,700 (18.8) |
| Ethnicity: South Asian | 6,266 (18.9) | 5,040 (20.1) |
| Ethnicity: Mixed | 6,353 (19.2) | 4,850 (19.4) |
| Ethnicity: Other | 6,444 (19.5) | 4,780 (19.1) |
| Ethnicity: Missing | 1,631 (4.9) | 1,030 (4.1) |
| Smoking status: Current-smoker | 19,736 (59.6) | 15,100 (60.3) |
| Smoking status: Ex-smoker | 3,330 (10.1) | 2,710 (10.8) |
| Smoking status: Non-smoker | 6,662 (20.1) | 4,820 (19.2) |
| Smoking status: Missing | 3,391 (10.2) | 2,410 (9.6) |
| IMD: 1 most deprived | 6,189 (18.7) | 4,750 (19) |
| IMD: 2 | 6,292 (19) | 4,660 (18.6) |
| IMD: 3 | 6,326 (19.1) | 4,660 (18.6) |
| IMD: 4 | 6,184 (18.7) | 4,690 (18.7) |
| IMD: 5 least deprived | 6,041 (18.2) | 4,690 (18.7) |
| IMD: Missing | 2,087 (6.3) | 1,590 (6.3) |
| Rural urban classification: 1 | 4,007 (12.1) | 3,290 (13.1) |
| Rural urban classification: 2 | 4,198 (12.7) | 2,990 (11.9) |
| Rural urban classification: 3 | 4,109 (12.4) | 3,210 (12.8) |
| Rural urban classification: 4 | 4,025 (12.2) | 3,250 (13) |
| Rural urban classification: 5 | 4,147 (12.5) | 2,930 (11.7) |
| Rural urban classification: 6 | 4,217 (12.7) | 3,280 (13.1) |
| Rural urban classification: 7 | 4,293 (13) | 3,190 (12.7) |
| Rural urban classification: 8 | 4,123 (12.4) | 2,900 (11.6) |
| STP: 1 | 3,287 (9.9) | 2,770 (11.1) |
| STP: 2 | 3,367 (10.2) | 2,230 (8.9) |
| STP: 3 | 3,257 (9.8) | 2,450 (9.8) |
| STP: 4 | 3,281 (9.9) | 2,480 (9.9) |
| STP: 5 | 3,328 (10) | 2,580 (10.3) |
| STP: 6 | 3,317 (10) | 2,460 (9.8) |
| STP: 7 | 3,375 (10.2) | 2,600 (10.4) |
| STP: 8 | 3,308 (10) | 2,440 (9.7) |
| STP: 9 | 3,323 (10) | 2,260 (9) |
| STP: 10 | 3,276 (9.9) | 2,770 (11.1) |

| Characteristic | Unvaccinated | Vaccinated |
|----------------------------------|---------------|---------------|
| Region: London | 6,595 (19.9) | 4,850 (19.4) |
| Region: East of England | 3,253 (9.8) | 2,520 (10.1) |
| Region: East Midlands | 3,353 (10.1) | 2,500 (10) |
| Region: North East | 3,322 (10) | 2,610 (10.4) |
| Region: North West | 3,283 (9.9) | 2,390 (9.5) |
| Region: South East | 3,256 (9.8) | 2,380 (9.5) |
| Region: South West | 3,416 (10.3) | 2,630 (10.5) |
| Region: West Midlands | 3,309 (10) | 2,480 (9.9) |
| Region: Yorkshire and the Humber | 3,332 (10.1) | 2,680 (10.7) |
| BMI: Not obese | 19,803 (59.8) | 15,120 (60.4) |
| BMI: Obese I (30-34.9) | 3,373 (10.2) | 2,420 (9.7) |
| BMI: Obese II (35-39.9) | 3,319 (10) | 2,370 (9.5) |
| BMI: Obese III (40+) | 3,314 (10) | 2,520 (10.1) |
| BMI: Missing | 3,310 (10) | 2,610 (10.4) |
| Hypertension | 6,679 (20.2) | 5,240 (20.9) |
| SSRI | 342 (1) | 230 (0.9) |
| DMARD | 312 (0.9) | 250 (1) |
| Any asthma | 1,655 (5) | 1,310 (5.2) |
| Severe asthma | 1,729 (5.2) | 1,420 (5.7) |
| Chronic respiratory disease | 1,652 (5) | 1,300 (5.2) |
| Chronic heart disease | 1,685 (5.1) | 1,160 (4.6) |
| Chronic kidney disease | 1,653 (5) | 1,420 (5.7) |
| Chronic liver disease | 1,662 (5) | 1,320 (5.3) |
| Chronic neurological disease | 1,685 (5.1) | 1,100 (4.4) |
| Diabetes | 1,645 (5) | 1,170 (4.7) |
| Immunosuppressed | 1,698 (5.1) | 1,230 (4.9) |
| Asplenia/dysfunction of spleen | 1,634 (4.9) | 1,440 (5.8) |
| Severe mental illness | 1,671 (5) | 1,240 (5) |
| Learning disability | 1,689 (5.1) | 1,310 (5.2) |
| Clinically extremely vulnerable | 316 (1) | 250 (1) |
| Long-term residential home | 359 (1.1) | 150 (0.6) |
| COVID +ve test before eligible | 1,642 (5) | 1,270 (5.1) |
| COVID +ve test while eligible | 1,629 (4.9) | 1,070 (4.3) |
| COVID hosp. before eligible | 1,576 (4.8) | 1,200 (4.8) |
| COVID hosp. while eligible | 1,629 (4.9) | 1,170 (4.7) |

| Characteristic | Unvaccinated | Vaccinated |
|--|--------------|------------|
| Death while eligible (COVID on cert.) | 470 (1.4) | 350 (1.4) |
| Death while eligible (COVID +ve 28 days) | 19 (0.1) | 50 (0.2) |
| Death while eligible (any cause) | 464 (1.4) | 310 (1.2) |
| Deregistered while eligible | 441 (1.3) | 350 (1.4) |

Table 2. Characteristics of individuals in JCVI priority group 9 aged 50-54 years. ‘Unvaccinated’ = patients who did not receive a COVID vaccine within 12 weeks of becoming eligible; ‘Vaccinated’ otherwise. Age is summarised as mean (SD), all other characteristics are n (%). Inverse probability weights used to correct for the random sampling of ‘Vaccinated’ patients.

Table 3. Characteristics of individuals in JCVI priority group 11 aged 30-39 years. ‘Unvaccinated’ = patients who did not receive a COVID vaccine within 12 weeks of becoming eligible; ‘Vaccinated’ otherwise. Age is summarised as mean (SD), all other characteristics are n (%). Inverse probability weights used to correct for the random sampling of patients.

Table 4. Odds ratios of being vaccinated within 12 weeks of eligibility date for each characteristic (JCVI priority group 2 aged 80+ years). Partially adjusted model adjusted for: Age group, Sex, STP.

Table 5. Odds ratios of being vaccinated within 12 weeks of eligibility date for each characteristic (JCVI priority group 9 aged 50-54 years). Partially adjusted model adjusted for: Sex, STP.

| Characteristic | OR (95% CI) | | |
|--------------------------------|------------------|--------------------|------------------|
| | Unadjusted | Partially adjusted | Fully adjusted |
| Sex: F | 1 (ref) | 1 (ref) | 1 (ref) |
| Sex: M | 1.05 (0.94-1.17) | 1.08 (0.96-1.20) | 1.11 (0.99-1.25) |
| Ethnicity: White | 1 (ref) | 1 (ref) | 1 (ref) |
| Ethnicity: Black | 1.11 (0.93-1.34) | 1.11 (0.92-1.33) | 1.13 (0.93-1.36) |
| Ethnicity: South Asian | 0.93 (0.77-1.11) | 0.94 (0.78-1.12) | 0.95 (0.79-1.14) |
| Ethnicity: Mixed | 0.89 (0.74-1.07) | 0.87 (0.72-1.04) | 0.84 (0.69-1.01) |
| Ethnicity: Other | 1.07 (0.89-1.28) | 1.06 (0.89-1.28) | 1.10 (0.91-1.32) |
| Ethnicity: Missing | 0.85 (0.62-1.15) | 0.85 (0.62-1.16) | 0.86 (0.63-1.19) |
| Smoking status: Current-smoker | 1 (ref) | 1 (ref) | 1 (ref) |
| Smoking status: Ex-smoker | 0.92 (0.77-1.12) | 0.93 (0.77-1.12) | 1.00 (0.83-1.22) |
| Smoking status: Non-smoker | 0.87 (0.76-1.01) | 0.87 (0.75-1.01) | 0.90 (0.78-1.05) |
| Smoking status: Missing | 1.43 (1.17-1.75) | 1.42 (1.17-1.74) | 1.49 (1.22-1.84) |
| IMD: 1 most deprived | 1 (ref) | 1 (ref) | 1 (ref) |
| IMD: 2 | 0.75 (0.63-0.91) | 0.75 (0.62-0.90) | 0.73 (0.60-0.89) |
| IMD: 3 | 0.90 (0.74-1.09) | 0.90 (0.74-1.09) | 0.88 (0.72-1.07) |
| IMD: 4 | 0.81 (0.67-0.97) | 0.80 (0.66-0.97) | 0.78 (0.64-0.95) |
| IMD: 5 least deprived | 0.79 (0.65-0.95) | 0.76 (0.63-0.92) | 0.77 (0.64-0.94) |
| IMD: Missing | 0.88 (0.68-1.15) | 0.85 (0.65-1.11) | 0.76 (0.58-1.00) |
| Rural urban classification: 1 | 1 (ref) | 1 (ref) | 1 (ref) |
| Rural urban classification: 2 | 0.90 (0.73-1.12) | 0.86 (0.69-1.07) | 0.85 (0.68-1.06) |
| Rural urban classification: 3 | 1.14 (0.92-1.42) | 1.14 (0.91-1.42) | 1.10 (0.88-1.37) |
| Rural urban classification: 4 | 1.13 (0.90-1.42) | 1.12 (0.89-1.41) | 1.04 (0.83-1.32) |
| Rural urban classification: 5 | 0.86 (0.69-1.07) | 0.85 (0.68-1.06) | 0.83 (0.66-1.03) |
| Rural urban classification: 6 | 0.86 (0.69-1.08) | 0.87 (0.70-1.09) | 0.84 (0.67-1.06) |
| Rural urban classification: 7 | 0.71 (0.57-0.88) | 0.70 (0.56-0.87) | 0.65 (0.52-0.81) |
| Rural urban classification: 8 | 0.92 (0.73-1.15) | 0.90 (0.72-1.13) | 0.86 (0.68-1.08) |
| STP: 1 | 1 (ref) | 1 (ref) | 1 (ref) |
| STP: 2 | 0.92 (0.71-1.21) | 0.92 (0.71-1.21) | 0.96 (0.73-1.27) |
| STP: 3 | 1.27 (0.99-1.62) | 1.27 (0.99-1.62) | 1.28 (1.00-1.65) |
| STP: 4 | 1.13 (0.87-1.46) | 1.13 (0.87-1.47) | 1.27 (0.97-1.66) |
| STP: 5 | 1.45 (1.13-1.86) | 1.47 (1.14-1.88) | 1.55 (1.20-2.00) |
| STP: 6 | 1.20 (0.93-1.55) | 1.21 (0.94-1.57) | 1.28 (0.98-1.67) |

| Characteristic | OR (95% CI) | | |
|---------------------------------------|------------------|--------------------|------------------|
| | Unadjusted | Partially adjusted | Fully adjusted |
| STP: 7 | 1.39 (1.08-1.79) | 1.40 (1.09-1.81) | 1.46 (1.13-1.90) |
| STP: 8 | 0.92 (0.71-1.19) | 0.93 (0.71-1.20) | 0.90 (0.69-1.17) |
| STP: 9 | 1.14 (0.89-1.48) | 1.15 (0.89-1.49) | 1.22 (0.94-1.59) |
| STP: 10 | 1.21 (0.95-1.56) | 1.22 (0.95-1.57) | 1.24 (0.96-1.60) |
| BMI: Not obese | 1 (ref) | 1 (ref) | 1 (ref) |
| BMI: Obese I (30-34.9) | 0.97 (0.81-1.18) | 1.00 (0.83-1.22) | 1.02 (0.84-1.24) |
| BMI: Obese II (35-39.9) | 0.94 (0.78-1.13) | 0.96 (0.79-1.16) | 0.98 (0.81-1.20) |
| BMI: Missing | 0.92 (0.77-1.10) | 0.91 (0.76-1.09) | 0.91 (0.76-1.09) |
| Hypertension | 1.05 (0.92-1.21) | 1.03 (0.90-1.19) | 1.09 (0.95-1.26) |
| Any asthma | 0.85 (0.66-1.11) | 0.83 (0.64-1.08) | 0.79 (0.61-1.04) |
| COVID +ve test before eligible | 1.23 (0.97-1.59) | 1.20 (0.94-1.55) | 1.19 (0.93-1.54) |
| COVID +ve test while eligible | 1.48 (1.15-1.92) | 1.49 (1.16-1.95) | 1.53 (1.18-2.01) |
| COVID hosp. before eligible | 1.23 (0.98-1.58) | 1.22 (0.96-1.56) | 1.12 (0.88-1.45) |
| COVID hosp. while eligible | 0.70 (0.55-0.90) | 0.67 (0.53-0.87) | 0.65 (0.51-0.85) |
| Death while eligible (COVID on cert.) | 0.97 (0.72-1.32) | 0.99 (0.73-1.36) | 1.00 (0.73-1.38) |
| Death while eligible (any cause) | 0.95 (0.70-1.30) | 0.95 (0.70-1.31) | 0.96 (0.70-1.33) |
| Deregistered while eligible | 0.94 (0.68-1.32) | 0.92 (0.67-1.30) | 0.92 (0.66-1.31) |

| Variable | GVIF | Df | GVIF $\hat{1}/(2*Df)$ |
|---------------------------------------|----------|----|-----------------------|
| Deregistered while eligible | 1.062875 | 1 | 1.030958 |
| COVID hosp. while eligible | 1.053103 | 1 | 1.026208 |
| Death while eligible (COVID on cert.) | 1.052239 | 1 | 1.025787 |
| IMD | 1.283846 | 5 | 1.025301 |
| Sex | 1.050689 | 1 | 1.025031 |
| Death while eligible (any cause) | 1.047509 | 1 | 1.023479 |
| Hypertension | 1.047320 | 1 | 1.023386 |
| Ethnicity | 1.257960 | 5 | 1.023215 |
| COVID +ve test while eligible | 1.045388 | 1 | 1.022442 |
| STP | 1.455185 | 9 | 1.021059 |
| BMI | 1.132715 | 3 | 1.020987 |
| Rural urban classification | 1.332241 | 7 | 1.020702 |
| Smoking status | 1.125379 | 3 | 1.019882 |
| COVID +ve test before eligible | 1.039669 | 1 | 1.019642 |

| Variable | GVIF | Df | GVIF $\hat{1}/(2*Df)$ |
|-----------------------------|----------|----|-----------------------|
| Any asthma | 1.037317 | 1 | 1.018487 |
| COVID hosp. before eligible | 1.036779 | 1 | 1.018223 |

Table 6. Odds ratios of being vaccinated within 12 weeks of eligibility date for each characteristic (JCVI priority group 11 aged 30-39 years). Partially adjusted model adjusted for: Age group, Sex, STP.

| Characteristic | OR (95% CI) | | |
|--------------------------------|------------------|--------------------|------------------|
| | Unadjusted | Partially adjusted | Fully adjusted |
| Age group: 30-34 | 1 (ref) | 1 (ref) | 1 (ref) |
| Age group: 35-39 | 0.91 (0.82-1.00) | 0.91 (0.82-1.01) | 0.92 (0.83-1.01) |
| Sex: F | 1 (ref) | 1 (ref) | 1 (ref) |
| Sex: M | 1.03 (0.93-1.14) | 1.04 (0.94-1.15) | 1.04 (0.93-1.15) |
| Ethnicity: White | 1 (ref) | 1 (ref) | 1 (ref) |
| Ethnicity: Black | 0.94 (0.80-1.10) | 0.93 (0.80-1.10) | 0.95 (0.80-1.11) |
| Ethnicity: South Asian | 0.95 (0.80-1.11) | 0.94 (0.80-1.10) | 0.95 (0.81-1.12) |
| Ethnicity: Mixed | 0.90 (0.76-1.06) | 0.90 (0.76-1.06) | 0.90 (0.76-1.06) |
| Ethnicity: Other | 0.96 (0.82-1.13) | 0.95 (0.81-1.12) | 0.96 (0.82-1.13) |
| Ethnicity: Missing | 1.14 (0.88-1.50) | 1.14 (0.88-1.50) | 1.16 (0.90-1.53) |
| Smoking status: Current-smoker | 1 (ref) | 1 (ref) | 1 (ref) |
| Smoking status: Ex-smoker | 1.02 (0.86-1.22) | 1.01 (0.85-1.20) | 1.01 (0.85-1.21) |
| Smoking status: Non-smoker | 1.05 (0.92-1.19) | 1.04 (0.92-1.18) | 1.03 (0.90-1.17) |
| Smoking status: Missing | 0.95 (0.80-1.13) | 0.94 (0.79-1.12) | 0.93 (0.79-1.12) |
| IMD: 1 most deprived | 1 (ref) | 1 (ref) | 1 (ref) |
| IMD: 2 | 0.97 (0.83-1.15) | 0.97 (0.83-1.14) | 0.96 (0.81-1.13) |
| IMD: 3 | 1.01 (0.86-1.19) | 1.00 (0.85-1.18) | 1.01 (0.85-1.19) |
| IMD: 4 | 1.03 (0.87-1.21) | 1.03 (0.88-1.22) | 1.03 (0.87-1.21) |
| IMD: 5 least deprived | 1.04 (0.88-1.23) | 1.03 (0.87-1.22) | 1.04 (0.87-1.23) |
| IMD: Missing | 1.09 (0.86-1.38) | 1.10 (0.87-1.39) | 1.08 (0.86-1.38) |
| Rural urban classification: 1 | 1 (ref) | 1 (ref) | 1 (ref) |
| Rural urban classification: 2 | 1.09 (0.89-1.33) | 1.06 (0.87-1.30) | 1.04 (0.85-1.28) |
| Rural urban classification: 3 | 1.09 (0.89-1.33) | 1.06 (0.87-1.30) | 1.09 (0.89-1.34) |
| Rural urban classification: 4 | 1.08 (0.89-1.32) | 1.07 (0.88-1.31) | 1.08 (0.89-1.33) |
| Rural urban classification: 5 | 1.03 (0.85-1.26) | 1.03 (0.84-1.25) | 1.02 (0.83-1.24) |
| Rural urban classification: 6 | 1.14 (0.93-1.40) | 1.12 (0.92-1.38) | 1.11 (0.91-1.37) |
| Rural urban classification: 7 | 1.25 (1.02-1.53) | 1.23 (1.00-1.51) | 1.24 (1.01-1.52) |
| Rural urban classification: 8 | 1.19 (0.97-1.45) | 1.18 (0.97-1.45) | 1.18 (0.96-1.44) |
| STP: 1 | 1 (ref) | 1 (ref) | 1 (ref) |
| STP: 2 | 1.15 (0.91-1.45) | 1.14 (0.90-1.44) | 1.13 (0.90-1.44) |
| STP: 3 | 0.79 (0.63-1.00) | 0.79 (0.63-0.99) | 0.79 (0.63-0.99) |
| STP: 4 | 1.04 (0.83-1.32) | 1.04 (0.82-1.31) | 1.03 (0.82-1.30) |

| Characteristic | OR (95% CI) | | |
|---------------------------------------|------------------|--------------------|------------------|
| | Unadjusted | Partially adjusted | Fully adjusted |
| STP: 5 | 0.99 (0.79-1.25) | 0.98 (0.78-1.23) | 0.97 (0.77-1.22) |
| STP: 6 | 0.86 (0.68-1.07) | 0.86 (0.69-1.08) | 0.88 (0.70-1.10) |
| STP: 7 | 0.96 (0.77-1.21) | 0.96 (0.77-1.20) | 0.95 (0.76-1.20) |
| STP: 8 | 1.02 (0.81-1.29) | 1.02 (0.81-1.29) | 1.04 (0.82-1.31) |
| STP: 9 | 0.97 (0.77-1.22) | 0.97 (0.77-1.22) | 0.97 (0.77-1.23) |
| STP: 10 | 0.72 (0.57-0.90) | 0.71 (0.57-0.89) | 0.71 (0.57-0.89) |
| BMI: Not obese | 1 (ref) | 1 (ref) | 1 (ref) |
| BMI: Obese I (30-34.9) | 0.94 (0.80-1.11) | 0.93 (0.79-1.10) | 0.93 (0.79-1.10) |
| BMI: Obese II (35-39.9) | 1.05 (0.89-1.23) | 1.05 (0.90-1.24) | 1.04 (0.88-1.23) |
| BMI: Missing | 0.80 (0.68-0.93) | 0.80 (0.69-0.94) | 0.78 (0.67-0.91) |
| Hypertension | 1.02 (0.91-1.16) | 1.01 (0.89-1.14) | 1.02 (0.90-1.15) |
| DMARD | 1.02 (0.64-1.74) | 1.01 (0.63-1.71) | 1.11 (0.69-1.90) |
| Any asthma | 1.10 (0.87-1.42) | 1.11 (0.87-1.43) | 1.13 (0.89-1.46) |
| Pregnant on eligibility date | 0.88 (0.65-1.20) | 0.91 (0.68-1.26) | 0.87 (0.64-1.20) |
| COVID +ve test before eligible | 1.19 (0.95-1.51) | 1.20 (0.95-1.52) | 1.21 (0.96-1.54) |
| COVID +ve test while eligible | 0.91 (0.73-1.15) | 0.92 (0.73-1.16) | 0.91 (0.72-1.15) |
| COVID hosp. before eligible | 1.00 (0.80-1.26) | 0.98 (0.78-1.23) | 0.97 (0.78-1.23) |
| COVID hosp. while eligible | 0.64 (0.51-0.80) | 0.63 (0.51-0.79) | 0.63 (0.50-0.79) |
| Death while eligible (COVID on cert.) | 0.79 (0.62-1.02) | 0.80 (0.63-1.04) | 0.81 (0.63-1.05) |
| Death while eligible (any cause) | 1.17 (0.92-1.51) | 1.16 (0.91-1.50) | 1.12 (0.87-1.45) |
| Deregistered while eligible | 0.89 (0.69-1.16) | 0.91 (0.71-1.19) | 0.92 (0.71-1.20) |

| Variable | GVIF | Df | GVIF $\hat{1}/(2*Df)$ |
|----------------------------|----------|----|-----------------------|
| Age group | 1.030357 | 1 | 1.015065 |
| Sex | 1.049400 | 1 | 1.024402 |
| Ethnicity | 1.102090 | 5 | 1.009768 |
| Smoking status | 1.093222 | 3 | 1.014966 |
| IMD | 1.162608 | 5 | 1.015181 |
| Rural urban classification | 1.172911 | 7 | 1.011457 |
| STP | 1.224825 | 9 | 1.011330 |
| BMI | 1.076574 | 3 | 1.012373 |
| Hypertension | 1.027262 | 1 | 1.013539 |
| DMARD | 1.029186 | 1 | 1.014488 |

| Variable | GVIF | Df | GVIF $\hat{1}/(2*Df)$ |
|---------------------------------------|----------|----|-----------------------|
| Any asthma | 1.022599 | 1 | 1.011237 |
| Pregnant on eligibility date | 1.063199 | 1 | 1.031116 |
| COVID +ve test before eligible | 1.026175 | 1 | 1.013003 |
| COVID +ve test while eligible | 1.025103 | 1 | 1.012474 |
| COVID hosp. before eligible | 1.027116 | 1 | 1.013467 |
| COVID hosp. while eligible | 1.025608 | 1 | 1.012723 |
| Death while eligible (COVID on cert.) | 1.037835 | 1 | 1.018742 |
| Death while eligible (any cause) | 1.027472 | 1 | 1.013643 |
| Deregistered while eligible | 1.031402 | 1 | 1.015580 |