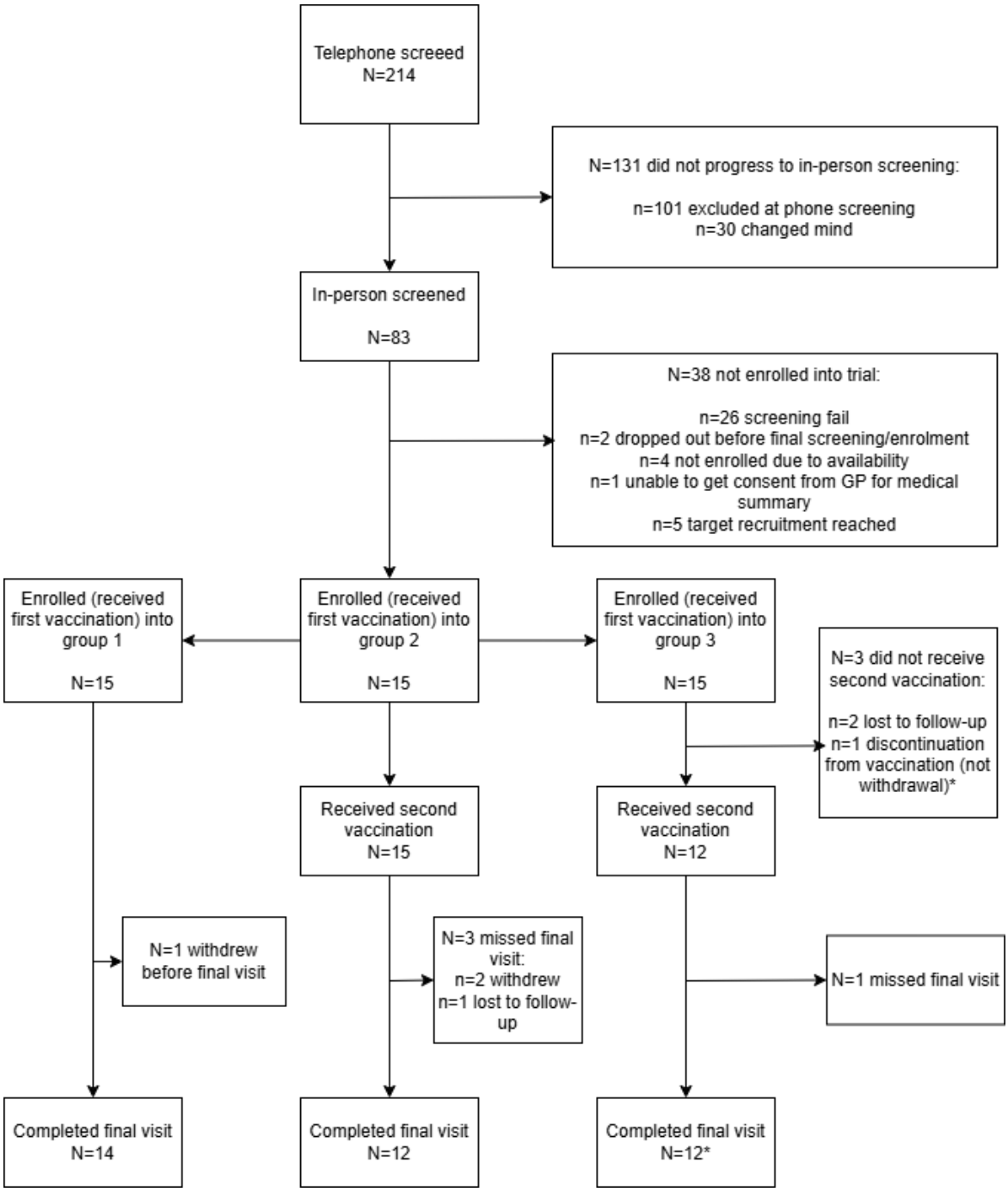
# A phase I study to assess the safety and immunogenicity of a recombinant adenovirus-based vaccine against plague (PlaVac): Basic Results Summary

## Participant flow




**PlaVac (UK) CONSORT diagram**. Group 1, single dose, Group 2 D0+D56 dosing, Group 3 D0+D182 dosing. Withdrawals in Groups 1 & 2 were not related to study procedures. Loss-to-follow-up in group 2: participant completed to D210. Loss-to-follow-up in group 3: one participant completed to D84, the other D28. *One participant in Group 3 not given second vaccination due to meeting temporary exclusion and unable to be vaccinated within window.

Baseline characteristics

**Table 1. Baseline characteristics, PlaVac (UK) participants. SD = single dose**

| **Demographics** | **PlaVac (UK)** | | | |
|---|---|---|---|---|
| | Group 1: SD (n=15) | Group 2: 0+56 (n=15) | Group 3: 0+182 (n=15) | Total (n=45) |
| **Sex (female)** | 4 (27%) | 5 (33%) | 6 (40%) | 15 (33%) |
| **Age (years), median [IQR]** | 48 [33-51] | 31 [23-46] | 32 [26-41] | 38 [26-48] |
| **BMI, median [IQR]** | 27 [25-29] | 26 [23-26] | 24 [22-28] | 26 [23-28] |
| **Ethnicity** | | | | |
| **White English/Welsh/Scottish/Northern Irish/British** | 15 (100%) | 13 (87%) | 14 (93%) | 42 (93%) |
| **Any other Mixed/Multiple ethnic background** | 0 (0%) | 2 (13%) | 1 (7%) | 3 (7%) |
| **Black African** | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| **Received ≥1 dose of any COVID-19 vaccine prior to enrolment** | 15 (100%) | 15 (100%) | 15 (100%) | 45 (100%) |
| **Oxford/AstraZeneca (ChAdOx1 nCoV-19)** | 8 (53%) | 6 (40%) | 8 (53%) | 22 (49%) |
| **Pfizer (BNT162b2)** | 7 (47%) | 9 (60%) | 6 (40%) | 22 (49%) |
| **Moderna (mRNA1273)** | 0 (0%) | 0 (0%) | 1 (7%) | 1 (2%) |

Outcome measures

**Table 2. Summary of adverse events occurring within 28 days post-vaccination, by study group**

| Group | Participants with ≥1 AE within 28 days post-vaccinations | AEs within 28 days post-vaccinations | AEs within 28 days post-first dose | AEs within 28 days post-second dose | Causality | | | | AEs of severity grade ≥3 | SAEs |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No relationship | Possible | Probable | Definite | | |
| 1 (n=15) | 10 (67%) | 24/86 (28%) | 24/65 (37%) | 0/21 (0%) | 21/24 (88%) | 3/24 (12%) | 0/24 (0%) | 0/24 (0%) | 3/24 (12%) | 0 |
| 2 (n=15) | 15 (100%) | 39/86 (45%) | 23/65 (35%) | 16/21 (76%) | 31/39 (79%) | 8/39 (21%) | 0/39 (0%) | 0/39 (0%) | 7/39 (18%) | 0 |
| 3 (n=15) | 12 (80%) | 23/86 (27%) | 18/65 (28%) | 5/21 (24%) | 18/23 (78%) | 2/23 (9%) | 0/23 (0%) | 3/23 (13%) | 5/23 (22%) | 0 |
| All (n=45) | 37 (82%) | 86 | 65/86 (76%) | 21/86 (24%) | 70/86 (81%) | 13/86 (15%) | 0/86 (0%) | 3/86 (3%) | 15/86 (17%) | 0 |

**Table 3. Geometric mean titres (GMT) of serum IgG to vaccine antigens LcrV and F1.** Shown by study, group, and timepoint. N is shown where the number of samples was lower than the total number of participants in the respective group. *Median (IQR) reported in addition to GMT (95% CI) where >30% results fall below the lower limit of quantification (LLOQ) for the respective timepoint in at least one of the study groups within each trial. SD = single dose.

| | **Study day** | GMT (95% CI); Median (IQR)* | | |
|---|---|---|---|---|
| | | Group 1: SD (n=15) | Group 2: 0+56 (n=15) | Group 3: 0+182 (n=15) |
| Anti-LcrV IgG | 0 | 169 (100, 285)<br>*167 (72-459)* | 182 (97, 341)<br>*157 (72-248)* | 129 (82, 203)<br>*72 (72-224)* |
| | 28 | 6083 (1617, 22885) [n=14] | 6690 (1573, 28449) [n=14] | 6854 (2184, 21507) |
| | 56 | 3267 (782, 13657) | 5320 (1452, 19493) | 3554 (1165, 10845) [n=14] |
| | 84 | 2020 (439, 9299) [n=14] | 20890 (7588, 57512) [n=14] | 2650 (822, 8540) [n=14] |

| | | | | |
|---|---|---|---|---|
| | 182 | 1266 (294, 5456) [n=13] | 7961 (2823, 22451) [n=15] | 1471 (407, 5315) [n=13] |
| | 210 | 1160 (293, 4587) [n=14] | 6814 (2072, 22413) [n=13] | 62646 (22653, 173247) [n=13] |
| | 365 | 1181 (273, 5102) [n=14] | 2464 (644, 9430) [n=12] | 14079 (5322, 37241) [n=12] |
| Anti-F1 IgG | 0 | 152 (77, 297)<br>*124 (58-252)* | 103 (68, 155)<br>*58 (58-145)* | 158 (83, 300)<br>*133 (58-380)* |
| | 28 | 372 (161, 861) [n=14] | 340 (176, 659) [n=14] | 495 (205, 1192) |
| | 56 | 288 (130, 639)<br>*215 (90-609)* | 224 (123, 407)<br>*303 (58-479)* | 365 (150, 888)<br>*621 (58-1204)* [n=14] |
| | 84 | 199 (97, 408)<br>*149 (58-374)* [n=14] | 582 (270, 1253)<br>*666 (262-1403)* [n=14] | 278 (127, 609)<br>*330 (58-736)* [n=14] |

| | | | | |
|---|---|---|---|---|
| | 182 | 160 (78, 328)<br>*150 (58-267)* [n=13] | 265 (156, 452)<br>*207 (161-383)* | 191 (89, 412)<br>*155 (58-465)* [n=13] |
| | 210 | 150 (75, 299)<br>*86 (58-363)* [n=14] | 227 (129, 397)<br>*219 (139-338)* [n=13] | 1026 (236, 4461)<br>*2435 (58-5604)* [n=12] |
| | 365 | 137 (71, 265)<br>*89 (58-276)* [n=14] | 115 (70, 189)<br>*87 (58-242)* [n=12] | 465 (142, 1525)<br>*549 (106-1057)* [n=12] |
| Anti-LcrV IgA | 0 | 82 (56, 121)<br>*46 (46-146)* | 104 (71, 151)<br>*115 (46-181)* | 71 (51, 99)<br>*46 (46-113)* |
| | 28 | 1245 (362, 4280) [n=14] | 703 (287, 1722) [n=14] | 787 (331, 1872) |
| | 56 | 501 (176, 1426) | 353 (164, 759) | 569 (243, 1331) [n=14] |
| | 84 | 516 (174, 1527) [n=14] | 934 (390, 2236) [n=14] | 348 (138, 877) [n=14] |

| | | | | |
|---|---|---|---|---|
| | 182 | 265 (85, 826) [n=13]<br>*364 (46-836)* | 435 (196, 965)<br>*473 (207-739)* | 317 (123, 817)<br>*210 (133-483)* [n=13] |
| | 210 | 329 (127, 851) [n=14] | 386 (178, 837) [n=13] | 1569 (668, 3685) [n=12] |
| | 365 | 360 (138, 934) [n=14] | 294 (116, 746) [n=12] | 776 (305, 1975) [n=12] |

**Table 4. Geometric mean fold rise (GMFR) between peak post-vaccination timepoints, by study and dosing group.**

| | | **PlaVac (UK)** | |
|---|---|---|---|
| | | **Group 2: 0+56** | **Group 3: 0+182** |
| **Anti-LcrV IgG** | Vaccine 2+28/Vaccine 1+28 | 3.13 (1.77, 5.54) [n=13] | 7.74 (2.30, 26.01) [n=13] |
| **Anti-F1 IgG** | Vaccine 2+28/Vaccine 1+28 | 1.98 (1.07, 3.67) [n=13] | 2.13 (0.80, 5.63) [n=12] |

## Adverse events

There were no serious adverse events associated with this study.

**Table 5. Maximum severity of solicited adverse events during days 0-7 after first vaccination, all participants.**

| Solicited adverse event | None | Mild | Moderate | Severe | Any occurrence |
|---|---|---|---|---|---|
| Redness | 26 (58%) | 19 (42%) | 0 (0%) | 0 (0%) | 19 (42%) |
| Hardness | 36 (80%) | 7 (16%) | 1 (2%) | 1 (2%) | 9 (20%) |
| Swelling | 35 (78%) | 9 (20%) | 1 (2%) | 0 (0%) | 10 (22%) |
| Pain | 24 (53%) | 16 (36%) | 4 (9%) | 1 (2%) | 21 (47%) |
| Warmth | 34 (76%) | 11 (24%) | 0 (0%) | 0 (0%) | 11 (24%) |
| Itch | 43 (96%) | 2 (4%) | 0 (0%) | 0 (0%) | 2 (4%) |
| Tenderness | 16 (36%) | 24 (53%) | 4 (9%) | 1 (2%) | 29 (64%) |
| Feverish | 26 (58%) | 13 (29%) | 3 (7%) | 3 (7%) | 19 (42%) |
| Fever ≥ 37.6°C | 36 (80%) | 7 (16%) | 1 (2%) | 1 (2%) | 9 (20%) |
| Chills | 33 (73%) | 6 (13%) | 3 (7%) | 3 (7%) | 12 (27%) |
| Rash | 45 (100%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Joint pain | 33 (73%) | 10 (22%) | 2 (4%) | 0 (0%) | 12 (27%) |
| Muscle ache | 21 (47%) | 17 (38%) | 5 (11%) | 2 (4%) | 24 (53%) |
| Fatigue | 24 (53%) | 13 (29%) | 6 (13%) | 2 (4%) | 21 (47%) |
| Headache | 18 (40%) | 18 (40%) | 8 (18%) | 1 (2%) | 27 (60%) |

| Solicited adverse event | None | Mild | Moderate | Severe | Any occurrence |
|---|---|---|---|---|---|
| Malaise | 27 (60%) | 11 (24%) | 5 (11%) | 2 (4%) | 18 (40%) |
| Nausea | 37 (82%) | 7 (16%) | 0 (0%) | 1 (2%) | 8 (18%) |
| Vomiting | 45 (100%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |

**Table 6. Unsolicited adverse events to D28 post each-vaccination.** Presented by participant code and group, shown as MedDRA preferred term and code.

| Pseudo-ID^ | Group | Days to onset from first dose | Days to onset from second dose | Duration of AE (days) | AE severity grade | Causality to study vaccine | MedDRA preferred term | MedDRA code |
|---|---|---|---|---|---|---|---|---|
| **2** | Group 1 | 23 | - | 26 | 2 | No relationship | Lower respiratory tract infection | 10024968 |
| **2** | Group 1 | 26 | - | 15 | 2 | No relationship | COVID-19 | 10084268 |
| **5** | Group 1 | 10 | - | 0 | 3 | No relationship | Joint dislocation | 10023204 |
| **6** | Group 1 | 9 | - | 0 | 1 | No relationship | Headache | 10019211 |
| **6** | Group 1 | 25 | - | 2 | 1 | No relationship | Arthropod sting | 10003402 |
| **6** | Group 1 | 28 | - | 0 | 1 | No relationship | Hangover | 10019133 |
| **7** | Group 1 | 13 | - | 4 | 3 | No relationship | Cellulitis | 10007882 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **9** | Group 1 | 1 | - | 49 | 1 | Possible | Rhinitis | 10039083 |
| **9** | Group 1 | 10 | - | 0 | 1 | No relationship | Abdominal pain | 10000081 |
| **9** | Group 1 | 10 | - | 2 | 2 | No relationship | Arthralgia | 10003239 |
| **9** | Group 1 | 21 | - | 13 | 1 | No relationship | Upper respiratory tract infection | 10046306 |
| **9** | Group 1 | 23 | - | 1 | 1 | No relationship | Headache | 10019211 |
| **9** | Group 1 | 26 | - | 7 | 2 | No relationship | Upper respiratory tract infection | 10046306 |
| **10** | Group 1 | 0 | - | 89 | 1 | No relationship | Microcytic anaemia | 10027538 |
| **12** | Group 1 | 5 | - | 6 | 1 | No relationship | Oral herpes | 10067152 |
| **12** | Group 1 | 25 | - | 0 | 1 | Possible | Headache | 10019211 |
| **14** | Group 1 | 16 | - | 7 | 1 | No relationship | COVID-19 | 10084268 |
| **14** | Group 1 | 24 | - | | 2 | No relationship | Post-acute COVID-19 syndrome | 10085503 |
| **19** | Group 1 | 13 | - | 4 | 1 | No relationship | Upper respiratory tract infection | 10046306 |
| **25** | Group 1 | 1 | - | 208 | 1 | No relationship | Back pain | 10003988 |
| **25** | Group 1 | 6 | - | 203 | 2 | No relationship | Muscle strain | 10050031 |
| **25** | Group 1 | 10 | - | 0 | 1 | Possible | Headache | 10019211 |
| **25** | Group 1 | 12 | - | | 2 | No relationship | Headache | 10019211 |
| **25** | Group 1 | 20 | - | 214 | 3 | No relationship | Upper respiratory tract infection | 10046306 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **4** | Group 2 | 63 | 7 | 7 | 2 | Possible | Thrombocytopenia | 10043554 |
| **4** | Group 2 | 27 | - | 22 | 1 | Possible | Leukopenia | 10024384 |
| **13** | Group 2 | 78 | 22 | 27 | 2 | No relationship | Neck pain[$] | 10028836 |
| **13** | Group 2 | 81 | 25 | | 1 | No relationship | Dizziness | 10013573 |
| **13** | Group 2 | 5 | - | 30 | 3 | Possible | Neck pain | 10028836 |
| **15** | Group 2 | 75 | 19 | 6 | 1 | No relationship | COVID-19 | 10084268 |
| **15** | Group 2 | 22 | - | 7 | 1 | No relationship | Cough | 10011224 |
| **18** | Group 2 | 70 | 12 | 1 | 3 | No relationship | Immunisation reaction* | 10021432 |
| **18** | Group 2 | 7 | - | 7 | 1 | No relationship | Vessel puncture site bruise | 10063881 |
| **18** | Group 2 | 8 | - | 1 | 1 | No relationship | Upper respiratory tract infection | 10046306 |
| **20** | Group 2 | 65 | 7 | 0 | 2 | Possible | Malaise | 10025482 |
| **20** | Group 2 | 5 | - | 25 | 3 | No relationship | Otitis media | 10033078 |
| **23** | Group 2 | 7 | - | 20 | 4 | No relationship | Hypokalaemia | 10021015 |
| **23** | Group 2 | 27 | - | 16 | 2 | Possible | Neutropenia | 10029354 |
| **24** | Group 2 | 64 | 8 | 21 | 3 | No relationship | Blood urea increased | 10005851 |
| **28** | Group 2 | 69 | 11 | 1 | 1 | No relationship | Immunisation reaction* | 10021432 |
| **28** | Group 2 | 76 | 18 | 0 | 1 | No relationship | Abdominal pain | 10000081 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **28** | Group 2 | 1 | - | 0 | 1 | No relationship | Eructation | 10015137 |
| **28** | Group 2 | 8 | - | 0 | 1 | No relationship | Headache | 10019211 |
| **28** | Group 2 | 10 | - | 6 | 1 | No relationship | Upper respiratory tract infection | 10046306 |
| **28** | Group 2 | 18 | - | 366 | 1 | No relationship | Myalgia | 10028411 |
| **28** | Group 2 | 22 | - | 2 | 1 | No relationship | Fatigue | 10016256 |
| **28** | Group 2 | 22 | - | 1 | 1 | No relationship | Malaise | 10025482 |
| **28** | Group 2 | 25 | - | 1 | 2 | No relationship | Pharyngitis | 10034835 |
| **28** | Group 2 | 25 | - | 3 | 1 | No relationship | Ligament sprain | 10024453 |
| **29** | Group 2 | 74 | 16 | 1 | 1 | No relationship | Headache | 10019211 |
| **29** | Group 2 | 11 | - | 0 | 1 | No relationship | Fatigue | 10016256 |
| **30** | Group 2 | 86 | 0 | | 1 | No relationship | Eosinophilia | 10014950 |
| **30** | Group 2 | 113 | 27 | 8 | 1 | No relationship | COVID-19 | 10084268 |
| **30** | Group 2 | 27 | - | 59 | 1 | No relationship | Anaemia | 10002034 |
| **31** | Group 2 | 3 | - | 1 | 1 | Possible | Aphthous ulcer | 10002959 |
| **31** | Group 2 | 27 | - | 23 | 2 | No relationship | Lymphopenia | 10025327 |
| **33** | Group 2 | 23 | - | 1 | 3 | No relationship | Migraine | 10027599 |
| **35** | Group 2 | 91 | 7 | 0 | 2 | Possible | Migraine | 10027599 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **38** | Group 2 | 57 | 1 | 8 | 2 | No relationship | Toothache | 10044055 |
| **38** | Group 2 | 63 | 7 | 21 | 3 | No relationship | Hypokalaemia | 10021015 |
| **38** | Group 2 | 70 | 14 | 9 | 2 | No relationship | Upper respiratory tract infection | 10046306 |
| **38** | Group 2 | 8 | - | 0 | 2 | Possible | Malaise | 10025482 |
| **41** | Group 2 | 26 | - | 2 | 1 | No relationship | Injection site pain* | 10022086 |
| **8** | Group 3 | 9 | - | 1 | 1 | No relationship | Myalgia | 10028411 |
| **8** | Group 3 | 11 | - | 2 | 2 | No relationship | Headache | 10019211 |
| **16** | Group 3 | 212 | 24 | 75 | 1 | No relationship | Rhinitis allergic | 10039085 |
| **16** | Group 3 | 19 | - | 1 | 1 | No relationship | Pharyngitis | 10034835 |
| **16** | Group 3 | 27 | - | 2 | 2 | No relationship | Vessel puncture site pain | 10066951 |
| **21** | Group 3 | 191 | 8 | 7 | 2 | Possible | Haemoglobin decreased | 10018884 |
| **21** | Group 3 | 13 | - | 1 | 1 | No relationship | Headache | 10019211 |
| **22** | Group 3 | 19 | - | 3 | 1 | No relationship | Upper respiratory tract infection | 10046306 |
| **27** | Group 3 | 8 | - | 2 | 1 | Definite | Injection site pain[&] | 10022086 |
| **32** | Group 3 | 253 | 28 | 0 | 2 | No relationship | Syncope | 10042772 |
| **32** | Group 3 | 3 | - | 17 | 1 | No relationship | Upper respiratory tract infection | 10046306 |
| **32** | Group 3 | 10 | - | 4 | 3 | No relationship | C-reactive protein increased | 10006825 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **34** | Group 3 | 197 | 7 | 21 | 3 | No relationship | Influenza like illness | 10022004 |
| **34** | Group 3 | 18 | - | 8 | 3 | No relationship | Upper respiratory tract infection | 10046306 |
| **36** | Group 3 | 27 | - | 2 | 1 | No relationship | Upper respiratory tract infection | 10046306 |
| **37** | Group 3 | 1 | - | 11 | 2 | Definite | Injection site induration | 10022075 |
| **37** | Group 3 | 7 | - | 0 | 1 | No relationship | Vertigo | 10047340 |
| **37** | Group 3 | 8 | - | 3 | 1 | Possible | Rash | 10037844 |
| **37** | Group 3 | 26 | - | 2 | 2 | No relationship | Dermatitis contact | 10012442 |
| **39** | Group 3 | 14 | - | 129 | 3 | No relationship | Tonsillitis | 10044008 |
| **40** | Group 3 | 190 | 0 | 13 | 3 | Definite | Injection site reaction | 10022095 |
| **40** | Group 3 | 20 | - | 10 | 1 | No relationship | Upper respiratory tract infection | 10046306 |
| **42** | Group 3 | 17 | - | 0 | 1 | No relationship | Headache | 10019211 |

^ Participant ID anonymised
*Non-study vaccinations
$ Episode of musculoskeletal neck pain
& Injection site reaction with 4cm induration and some bruising

The full publication is in final draft and will be published in due course. This will be linked to the ISRCTN record at the time of publication.