Supplemental Methods, Tables, and Figures for:

Durability of protection and immunogenicity of AZD1222 (ChAdOx1 nCoV-19) COVID-19 vaccine over 6 months

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Supplemental Methods

Randomization and masking
Participants were randomized to receive AZD1222 or saline placebo in a 2:1 ratio, with central assignment via an interactive response technology (IRT) that was used to generate and implement the random allocation sequence and generate dose-tracking numbers.

Qualifying symptoms for triggering participants to report to study sites for illness visits
Participants with fever, shortness of breath, or difficulty breathing, of any duration, and/or with chills, cough, fatigue, muscle aches, body aches, headache, new loss of taste, new loss of smell, sore throat, congestion, runny nose, nausea, vomiting, or diarrhea lasting ≥2 days were to contact their study site.

Illness visits
All participants with qualifying symptoms underwent scheduled illness visits for up to 28 days, including site visits on days 1, 14, 21, and 28 for collection of nasopharyngeal swabs for reverse transcriptase (RT)-PCR testing and for sequencing (days 1 and 14 only; sequencing was performed on the first available RT-PCR-positive sample), and serum samples for exploratory immunogenicity assessments (days 1, 14, 28). Participants received a digital health device and illness eDiary on which to record symptoms. In the US, saliva samples for assessment of viral shedding and SARS-CoV-2 sequencing were collected at all site visits and by the participants at home on days 3, 5, 8, and 11. Once SARS-CoV-2 RT-PCR results were available, only participants who were positive continued with the illness visits.

SARS-CoV-2 variant identification
Next-generation sequencing (NGS) of viral spike protein from nasopharyngeal swabs was done to assess individual amino acid changes. The full-length SARS CoV-2 spike gene was amplified and sequenced using a validated GenoSure SARS-CoV-2 spike NGS assay (Monogram Biosciences, South San Francisco, CA) and assessed at a consensus allele fraction of ≥25%. To assign a lineage, a spike-only version of Pangolin COVID-19 lineage assigner (2) (https://github.com/aineniamh/hedgehog, version 1.0.2) was used to classify SARS-CoV-2 spike sequences to current Pango lineages (v.1.2.6) (3) or sets of lineages. To provide supportive SARS-CoV-2 genotypic analyses, whole genome sequencing (WGS) data from saliva samples were additionally assessed as previously described (1) using the Illumina COVIDSeq Test and software to identify SARS-CoV-2 lineage and clade (3, 4).

Safety monitoring
The safety of all AstraZeneca clinical studies is closely monitored on an ongoing basis by AstraZeneca representatives in consultation with Patient Safety. Issues identified are addressed; for instance, this could involve amendments to the Clinical Study Protocol and letters to investigators. A Protocol Safety Review Team (PSRT) comprised of AstraZeneca, COVID-19 Prevention Network, Biomedical Advanced Research and Development Authority, and NIAID medical officers oversaw blinded safety surveillance of participants during the study. A COVID-19 Vaccine Data Safety Monitoring Board (DSMB) organized by the National Institutes of Health, National Institute for Allergy and Infectious Diseases, comprised of independent experts, was convened to provide oversight, and to ensure safe and ethical conduct of the study. The COVID-19 Vaccine DSMB facilitated the interim analysis for safety and efficacy and had the responsibility of evaluating cumulative safety and other clinical study data at regular intervals and making appropriate recommendations based on the available data. During the study, the benefit/risk assessment was continuously monitored by the COVID-19 Vaccine DSMB to ensure that the balance remained favorable. For example, events of potential vaccine-associated enhanced respiratory disease were evaluated by periodic reviews of COVID-19 cases by the DSMB. Harm for severe COVID-19 cases was any vaccine efficacy (VE) ≤ 0 for which Fisher’s exact test (1-sided) was statistically significant at the 5% level. This assessment began after 8 cases of severe COVID-19 had accrued in the study and was performed in real time as events occurred. Harm monitoring included all COVID-19 cases and all severe COVID-19 cases from day 1 for participants in the full analysis set. Harm monitoring for overall COVID-19 cases used the same boundary as severe COVID-19 cases (i.e., VE ≤ 0 for which Fisher’s exact test [1-sided] was statistically significant at the 5% level) but was performed on a weekly basis. An independent Neurological Adverse Events of Special Interest (AESI) Expert Committee was available to review and provide advice to the PSRT and the COVID-19 Vaccine DSMB on request about the diagnosis and causality assessment of selected neurologic AESIs occurring in the AZD1222 clinical development program.

Definition of ‘symptomatic’ for the primary efficacy endpoint
For the primary efficacy endpoint, ‘symptomatic’ was defined as: i) one or more of: pneumonia diagnosed by chest x-ray or computed tomography scan; oxygen saturation of ≤94% on room air or requiring either new
initiation or escalation in supplemental O2; new or worsening dyspnea/shortness of breath; or ii) two or more of: fever >100°F (>37.8°C) or feverishness; new or worsening cough; myalgia/muscle pain; fatigue that interferes with activities of daily living; vomiting and/or diarrhea; anosmia and/or ageusia.

**Definition of ‘severe or critical’ COVID-19**

‘Severe or critical COVID-19’ was defined as SARS-CoV-2 RT-PCR-positive symptomatic illness plus any of: clinical signs at rest indicative of severe systemic illness (respiratory rate ≥30 breaths per minute, heart rate ≥125 beats per minute, oxygen saturation ≤93% on room air at sea level, or partial pressure of oxygen to fraction of inspired oxygen ratio <300 mmHg); respiratory failure (defined as needing high-flow oxygen, noninvasive ventilation, mechanical ventilation, or extracorporeal membrane oxygenation); evidence of shock (systolic blood pressure <90 mm Hg, diastolic blood pressure <60 mmHg, or requiring vasopressors); significant acute renal, hepatic, or neurologic dysfunction; admission to an intensive care unit; death.

**Immunogenicity data: conversion to WHO International Standard**

The validated multiplexed electrochemiluminescence-based serology assay for measuring spike-binding antibodies was analyzed utilizing a standard of pooled convalescent sera as described previously (1) in its own scale. A bridging experiment was performed to convert spike-binding units in arbitrary units per milliliter (AU/mL) to the WHO international standard (NIBSC 20/136) binding units (BAU/mL). The following formula may be applied to convert spike-binding titers from AU/mL to BAU/mL: (BAU/mL) = AU/mL * 0.00645. Therefore, 1000 BAU/mL = 155,039 AU/mL.

The results of the pseudovirus neutralization assay performed at Monogram Biosciences are reported as an ID$_{50}$ titer (1/dilution). Calibration factors to enable conversion from ID$_{50}$ to the WHO international standard (NIBSC 20/136) in IU/mL were derived in a calibration study. The following formula may be applied to convert neutralizing antibody titers from ID$_{50}$ to IU/mL: (IU/mL) = ID$_{50}$ * 0.1428. Therefore, 1000 IU/mL = 7001.3 ID$_{50}$. 
Table 1. Dates of emergency use authorization (EUA) of COVID-19 vaccines in the United States, Chile, and Peru during the course of the phase 3 trial.

| Country  | Vaccine          | Date of EUA       | Source          |
|----------|------------------|-------------------|-----------------|
| United States | BNT162b2          | December 11, 2020 | FDA             |
|           | mRNA-1273        | December 18, 2020 | FDA             |
|           | Ad26.COV2.S      | February 27, 2021 | FDA             |
| Chile    | BNT162b2         | December 16, 2020 | Reuters         |
|           | CoronaVac        | January 20, 2021  | Reuters         |
|           | AZD1222          | January 27, 2021  | Chile Reports   |
|           | Ad5-nCoV         | April 7, 2021     | Reuters         |
|           | Ad26.COV2.S      | June 10, 2021     | Reuters         |
|           | Sputnik V        | July 21, 2021     | Reuters         |
| Peru     | BNT162b2         | February 2, 2021  | Reuters         |
|           | BBIBP-CorV       | January 27, 2021  | Reuters         |
|           | AZD1222          | September 1, 2021 | Peru DigeMid    |
|           | Ad26.COV2.S      | July 6, 2021      | Peru DigeMid    |
|           | mRNA-1273        | Not applicable    | RPP Peru        |
Table 2. Participant demographics and clinical characteristics, safety population.

|                                | AZD1222 (n = 21,587) | Placebo (n = 10,793)* |
|--------------------------------|-----------------------|-----------------------|
| Median age at screening, years (IQR) | 51.0 (38–63)          | 51.0 (38–63)          |
| Age ≥18–64 years, no. (%)          | 16,759 (77.6)         | 8,382 (77.7)          |
| Age ≥65 years, no. (%)            | 4,828 (22.4)          | 2,411 (22.3)          |
| **Sex, no. (%)**                  |                       |                       |
| Male                            | 12,010 (55.6)         | 6,004 (55.6)          |
| Female                          | 9,577 (44.4)          | 4,789 (44.4)          |
| **Race, no. (%)**                |                       |                       |
| White                           | 17,062 (79.0)         | 8,523 (79.0)          |
| Black or African American        | 1,793 (8.3)           | 892 (8.3)             |
| Asian                           | 947 (4.4)             | 482 (4.5)             |
| American Indian or Alaska Native| 853 (4.0)             | 428 (4.0)             |
| Native Hawaiian or Other Pacific Islander | 60 (0.3) | 21 (0.2) |
| Multiple                        | 511 (2.4)             | 257 (2.4)             |
| Unknown or Not reported          | 361 (1.7)             | 190 (1.8)             |
| **Hispanic or Latinx ethnicity, no. (%)** |          |                       |
| Yes                             | 4,771 (22.1)          | 2,451 (22.7)          |
| No                              | 16,475 (76.3)         | 8,202 (76.0)          |
| Unknown or not reported         | 341 (1.6)             | 140 (1.3)             |
| **Country, no. (%)**             |                       |                       |
| United States                   | 19,145 (88.7)         | 9,573 (88.7)          |
| Chile                           | 1,470 (6.8)           | 729 (6.8)             |
| Peru                            | 972 (4.5)             | 491 (4.5)             |
| **Baseline SARS-CoV-2 serostatus, no. (%)** |          |                       |
| Negative                        | 20,688 (95.8)         | 10,352 (95.9)         |
| Positive                        | 624 (2.9)             | 293 (2.7)             |
| Missing or not done             | 275 (1.3)             | 148 (1.4)             |
| **Baseline comorbidities, no. (%)** |                       |                       |
| Yes                             | 12,939 (59.9)         | 6,498 (60.2)          |
| No                              | 8,646 (40.1)          | 4,294 (39.8)          |
| Missing                         | 2                    | 1                     |
| **COVID-19 exposure risk category (OSHA) , no. (%)** | |                       |
| Very high                       | 1,367 (6.4)           | 704 (6.6)             |
| High                            | 4,796 (22.4)          | 2,271 (21.3)          |
| Medium                          | 8,982 (42.0)          | 4,485 (42.0)          |
| Lower                           | 6,220 (29.1)          | 3,208 (30.1)          |
| Missing                         | 222                  | 125                   |
| **Median dosing interval, days (IQR)†** | n = 20,774           | n = 9,950             |
| Overall                         | 29.0 (29–30)          | 29.0 (29–30)          |
| Participants randomized prior to clinical hold | n = 516           | n = 259               |
|                                | 60.0 (57–63)          | 59.0 (57–62)          |
| Participants randomized after clinical hold | n = 20,258         | n = 9,691             |
|                                | 29.0 (29–30)          | 29.0 (29–30)          |

*1 participant was not included in the primary analysis (1) due to record deactivation but has been reinstated at this analysis.
†Because the trial was placed on clinical hold due to an event of transverse myelitis in a different study of AZD1222 (5), 775 participants received their second dose after a longer dosing interval (1).
IQR, interquartile range; OSHA, Occupational Safety and Health Administration.
Table 3. Summary of unsolicited AEs reported within 28 days of first, second, or either dose, safety population (per intervention received, with censoring at unblinding or receipt of non-study COVID-19 vaccination).

| AE, no. (%) | AZD1222 post dose 1 (n = 21,587) | AZD1222 post dose 2 (n = 20,774) | AZD1222 post either dose (n = 21,587) | Placebo post dose 1 (n = 10,793) | Placebo post dose 2 (n = 9,950) | Placebo post either dose (n = 10,793) |
|-------------|----------------------------------|----------------------------------|--------------------------------------|---------------------------------|---------------------------------|-------------------------------------|
| Any AE      | 9,315 (43.2)                     | 5,270 (25.4)                     | 11,167 (51.7)                        | 2,695 (25.0)                    | 1,881 (18.9)                    | 3,798 (35.2)                        |
| Any AE related to trial intervention | 7,615 (35.3)                     | 3,787 (18.2)                     | 8,937 (41.4)                        | 1,546 (14.3)                    | 1,015 (10.2)                    | 2,177 (20.2)                        |
| Severity    |                                  |                                  |                                      |                                 |                                 |                                     |
| Mild        | 5,762 (26.7)                     | 3,222 (15.5)                     | 6,681 (30.9)                        | 1,305 (12.1)                    | 866 (8.7)                       | 1,804 (16.7)                        |
| Moderate    | 1,743 (8.1)                      | 547 (2.6)                        | 2,129 (9.9)                         | 228 (2.1)                       | 140 (1.4)                       | 352 (3.3)                           |
| Grade ≥3    | 110 (0.5)                        | 18 (<0.1)                        | 127 (0.6)                           | 13 (0.1)                        | 9 (<0.1)                        | 21 (0.2)                            |
| Any SAE     | 59 (0.3)                         | 50 (0.2)                         | 109 (0.5)                           | 39 (0.4)                        | 18 (0.2)                        | 57 (0.5)                            |
| Any SAE related to trial intervention | 1 (<0.1)                        | 0                               | 1 (<0.1)                           | 1 (<0.1)                        | 0                               | 1 (<0.1)                            |
| Any AE leading to discontinuation from trial intervention | 266 (1.2)                       | 1 (<0.1)                        | 267 (1.2)                          | 160 (1.5)                       | 0                               | 160 (1.5)                           |
| Any related AE leading to discontinuation from trial intervention | 22 (0.1)                        | 1 (<0.1)                        | 23 (0.1)                           | 6 (<0.1)                        | 0                               | 6 (<0.1)                            |
| Any AE leading to discontinuation from trial | 2 (<0.1)                        | 1 (<0.1)                        | 3 (<0.1)                           | 5 (<0.1)                        | 0                               | 5 (<0.1)                            |
| Any MAAE    | 800 (3.7)                        | 724 (3.5)                        | 1,474 (6.8)                         | 406 (3.8)                       | 324 (3.3)                       | 705 (6.5)                           |
| Any AESI    | 318 (1.5)                        | 138 (0.7)                        | 453 (2.1)                           | 185 (1.7)                       | 144 (1.4)                       | 325 (3.0)                           |
| Any AESI related to trial intervention | 42 (0.2)                        | 22 (0.1)                        | 62 (0.3)                            | 17 (0.2)                        | 12 (0.1)                        | 26 (0.2)                            |
| Any AE with outcome of death | 2 (<0.1)                        | 1 (<0.1)                        | 3 (<0.1)                           | 5 (<0.1)                        | 0                               | 5 (<0.1)                            |

AE, adverse event; AESI, adverse event of special interest; MAAE, medially attended adverse event; SAE, serious adverse event.
Table 4. Unsolicited AEs reported within 28 days of either dose with an incidence of ≥1% in either group, safety population (per intervention received; with censoring at unblinding or receipt of non-study COVID-19 vaccination).

| AE, no. (%)                      | AZD1222 (n = 21,587) | Placebo (n = 10,793) |
|----------------------------------|----------------------|----------------------|
|                                  | All events | Related events | All events | Related events |
| Injection site pain              | 3,571 (16.5) | 3,128 (14.5) | 478 (4.4) | 410 (3.8) |
| Headache                         | 3,382 (15.7) | 2,975 (13.8) | 962 (8.9) | 732 (6.8) |
| Fatigue                          | 2,744 (12.7) | 2,553 (11.8) | 818 (7.6) | 682 (6.3) |
| Chills                           | 2,138 (9.9)  | 2,050 (9.5)   | 238 (2.2) | 205 (1.9)  |
| Pain                             | 1,801 (8.3)  | 1,709 (7.9)   | 253 (2.3) | 211 (2.0)  |
| Myalgia                          | 1,588 (7.4)  | 1,451 (6.7)   | 265 (2.5) | 209 (1.9)  |
| Pyrexia                          | 1,126 (5.2)  | 1,077 (5.0)   | 64 (0.6)  | 39 (0.4)   |
| Body temperature increased       | 769 (3.6)    | 737 (3.4)     | 94 (0.9)  | 75 (0.7)   |
| Nausea                           | 659 (3.1)    | 523 (2.4)     | 215 (2.0) | 149 (1.4)  |
| Diarrhea                         | 552 (2.6)    | 328 (1.5)     | 243 (2.3) | 126 (1.2)  |
| Rhinorrhea                       | 494 (2.3)    | 243 (1.1)     | 256 (2.4) | 107 (1.0)  |
| Oropharyngeal pain               | 432 (2.0)    | 194 (0.9)     | 235 (2.2) | 91 (0.8)   |
| Nasal congestion                 | 350 (1.6)    | 158 (0.7)     | 223 (2.1) | 90 (0.8)   |
| Cough                            | 340 (1.6)    | 125 (0.6)     | 190 (1.8) | 68 (0.6)   |
| Injection-related reaction       | 330 (1.5)    | 326 (1.5)     | 66 (0.6)  | 66 (0.6)   |
| Reactogenicity event             | 322 (1.5)    | 317 (1.5)     | 50 (0.5)  | 49 (0.5)   |
| Pain in extremity                | 305 (1.4)    | 225 (1.0)     | 75 (0.7)  | 46 (0.4)   |
| COVID-19                         | 296 (1.4)    | 0             | 265 (2.5) | 0          |
| Malaise                          | 265 (1.2)    | 246 (1.1)     | 68 (0.6)  | 60 (0.6)   |
| Arthralgia                       | 251 (1.2)    | 156 (0.7)     | 59 (0.5)  | 17 (0.2)   |

AE, adverse event.
Table 5. Summary of unsolicited AEs reported during the entire study period prior to non-study COVID-19 vaccination; safety population (per intervention received; with censoring at receipt of non-study COVID-19 vaccination, regardless of unblinding).

| AE                                      | AZD1222 (n = 21,587) (Total follow-up: 12.19 x 1,000 person-years) | Placebo (n = 10,793) (Total follow-up: 1.47 x 1,000 person-years) |
|-----------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------|
|                                         | No. (%)   | IR*            | No. (%)   | IR*            |
| Any AE                                  | 12,062 (55.9) | 0.99    | 4,171 (38.6) | 1.19            |
| Any grade ≥3 AE                         | 611 (2.8)   | 0.05    | 213 (2.0)   | 0.06            |
| Any AE related to trial intervention    | 8,988 (41.6) | 0.74    | 2,181 (20.2) | 0.62            |
| Severity                                |            |         |            |                 |
| Mild                                    | 6,706 (31.1) | 0.55    | 1,806 (16.7) | 0.52            |
| Moderate                                | 2,151 (10.0) | 0.18    | 352 (3.3)   | 0.10            |
| Grade ≥3                                | 131 (0.6)   | 0.01    | 23 (0.2)    | <0.01           |
| Any SAE                                 | 353 (1.6)   | 0.03    | 121 (1.1)   | 0.03            |
| Any SAE related to trial intervention  | 2 (<0.1)    | <0.01  | 2 (<0.1)    | <0.01           |
| Chronic inflammatory demyelinating     | 1 (<0.1)    | <0.01  | 0           | 0               |
| polyradiculoneuropathy                  |            |         |            |                 |
| Hypoesthesia                            | 1 (<0.1)    | <0.01  | 0           | 0               |
| Neurosensory hypoacusis                 | 0           | 0      | 1 (<0.1)    | <0.01           |
| Optic ischemic neuropathy               | 0           | 0      | 1 (<0.1)    | <0.01           |
| Paresthesia                             | 1 (<0.1)    | <0.01  | 0           | 0               |
| Any AE leading to discontinuation from trial intervention | 286 (1.3)   | 0.02    | 172 (1.6)   | 0.05            |
| Any related AE leading to discontinuation from trial intervention | 23 (0.1)    | <0.01  | 6 (<0.1)    | <0.01           |
| Any MAAE                                | 3,162 (14.6) | 0.26    | 1,135 (10.5) | 0.32            |
| Any related MAAE                        | 100 (0.5)   | <0.01  | 32 (0.3)    | <0.01           |
| Any AESI                                | 932 (4.3)   | 0.08    | 528 (4.9)   | 0.15            |
| Any AESI related to trial intervention  | 63 (0.3)    | <0.01  | 27 (0.3)    | <0.01           |
| Any potentially immune-mediated condition (PIMC) | 736 (3.4) | 0.06 | 471 (4.4) | 0.13 |
| Any related                             | 5 (<0.1)    | <0.01  | 2 (<0.1)    | <0.01           |
| Any neurologic and/or neuroinflammatory AESI | 148 (0.7) | 0.01 | 51 (0.5) | 0.01 |
| Any related                             | 60 (0.3)    | <0.01  | 26 (0.2)    | <0.01           |
| Any vascular AESI                       | 68 (0.3)    | <0.01  | 14 (0.1)    | <0.01           |
| Any related                             | 0           | 0      | 0           | 0               |
| Any hematologic AESI                    | 4 (<0.1)    | <0.01  | 1 (<0.1)    | <0.01           |
| Any related                             | 0           | 0      | 1 (<0.1)    | <0.01           |
| Any AE with outcome of death            | 14 (<0.1)   | <0.01  | 8 (<0.1)    | <0.01           |
| Any related AE with outcome of death    | 0           | 0      | 0           | 0               |

*Exposure-adjusted incidence rate, per person-years. AE, adverse event; AESI, adverse event of special interest; IR, incidence rate; MAAE, medically attended adverse event; PIMC, potentially immune-mediated condition; SAE, serious adverse event.
Table 6. Related MAAEs by system organ class and preferred term reported during the entire period of the study prior to non-study COVID-19 vaccination; safety population (per intervention received; with censoring at receipt of non-study COVID-19 vaccination, regardless of unblinding).

| Related MAAEs                                      | AZD1222 (n = 21,587) | Placebo (n = 10,793) |
|---------------------------------------------------|-----------------------|----------------------|
|                                                   | (Total follow-up: 12.19 x 1,000 person-years) | (Total follow-up: 1.47 x 1,000 person-years) |
|                                                   | No. (%) | IR* | No. (%) | IR* |
| Any                                               | 100 (0.5) | <0.01 | 32 (0.3) | <0.01 |
| Blood and lymphatic system disorders              | 0 (0.0) | 0.0 | 0 (0.0) | 0.0 |
| Immune thrombocytopenia                           | 0 (0.0) | 0.0 | 1 (0.0) | <0.01 |
| Cardiac disorders                                 | 2 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Palpitations                                      | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Tachycardia                                       | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Ear and labyrinth disorders                       | 4 (<0.1) | <0.01 | 2 (<0.1) | <0.01 |
| Tinnitus                                          | 2 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Vertigo                                           | 2 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Deafness bilateral                                | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Neurosensory hypoacusis                           | 0 (0.0) | 0.0 | 1 (<0.1) | <0.01 |
| Sudden hearing loss                               | 0 (0.0) | 0.0 | 1 (<0.1) | <0.01 |
| Eye disorders                                      | 0 (0.0) | 0.0 | 2 (<0.1) | <0.01 |
| Eye swelling                                       | 0 (0.0) | 0.0 | 1 (<0.1) | <0.01 |
| Optic ischemic neuropathy                         | 0 (0.0) | 0.0 | 1 (<0.1) | <0.01 |
| Gastrointestinal disorders                        | 11 (<0.1) | <0.01 | 4 (<0.1) | <0.01 |
| Diarrhea                                          | 4 (<0.1) | <0.01 | 1 (<0.1) | <0.01 |
| Vomiting                                          | 4 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Paresthesia oral                                  | 2 (<0.1) | <0.01 | 1 (<0.1) | <0.01 |
| Nausea                                            | 2 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Abdominal pain upper                              | 0 (0.0) | 0.0 | 1 (<0.1) | <0.01 |
| Bowel movement irregularity                       | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Gastro-esophageal reflux disease                  | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Lip swelling                                       | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Parotid gland enlargement                         | 0 (0.0) | 0.0 | 1 (<0.1) | <0.01 |
| Stomatitis                                        | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| General disorders and administration site conditions | 35 (0.2) | <0.01 | 5 (<0.1) | <0.01 |
| Fatigue                                           | 9 (<0.1) | <0.01 | 1 (<0.1) | <0.01 |
| Pyrexia                                           | 9 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Pain                                              | 7 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Chills                                            | 6 (<0.1) | <0.01 | 1 (<0.1) | <0.01 |
| Injection site pain                               | 3 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Influenza-like illness                            | 2 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Injection site erythema                           | 2 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Reactogenicity event                              | 1 (<0.1) | <0.01 | 1 (<0.1) | <0.01 |
| Asthenia                                          | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Chest pain                                        | 0 (0.0) | 0.0 | 1 (<0.1) | <0.01 |
| Discomfort                                        | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Feeling abnormal                                  | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Feeling hot                                       | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Injection site paresthesia                        | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Injection site pruritus                           | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Injection site reaction                           | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Injection site swelling                           | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Injury associated with device                      | 0 (0.0) | 0.0 | 1 (<0.1) | <0.01 |
| Non-cardiac chest pain                            | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Peripheral swelling                               | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Swelling                                          | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Immune system disorders                            | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Drug hypersensitivity                             | 1 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Infections and infestations*                       | 7 (<0.1) | <0.01 | 1 (<0.1) | <0.01 |
| Herpes zoster                                      | 4 (<0.1) | <0.01 | 0 (0.0) | 0.0 |
| Related MAAEs                                      | AZD1222 (n = 21,587) | Placebo (n = 10,793) |
|--------------------------------------------------|-----------------------|----------------------|
|                                                  | (Total follow-up: 12.19 x 1,000 person-years) | (Total follow-up: 1.47 x 1,000 person-years) |
|                                                  | No. (%)               | IR*                  | No. (%)               | IR*                  |
| Cellulitis                                       | 1 (<0.1)              | <0.01                | 0                      |
| Injection site cellulitis                        | 1 (<0.1)              | <0.01                | 0                      |
| Nasopharyngitis                                  | 0                      | 0                    | 1 (<0.1)               | <0.01                |
| Oral herpes                                      | 1 (<0.1)              | <0.01                | 0                      |
| **Injury, poisoning and procedural complications**| 3 (<0.1)              | <0.01                | 2 (<0.1)               | <0.01                |
| Injection-related reaction                       | 0                      | 0                    | 2 (<0.1)               | <0.01                |
| Chilblains                                       | 1 (<0.1)              | <0.01                | 0                      |
| Seroma                                           | 1 (<0.1)              | <0.01                | 0                      |
| Skin laceration                                  | 1 (<0.1)              | <0.01                | 0                      |
| **Investigations**                               | 3 (<0.1)              | <0.01                | 0                      |
| Body temperature increased                       | 3 (<0.1)              | <0.01                | 0                      |
| **Metabolism and nutrition disorders**           | 2 (<0.1)              | <0.01                | 0                      |
| Dehydration                                      | 1 (<0.1)              | <0.01                | 0                      |
| Hyperlactacidemia                                | 1 (<0.1)              | <0.01                | 0                      |
| Hypokalemia                                      | 1 (<0.1)              | <0.01                | 0                      |
| **Musculoskeletal and connective tissue disorders** | 13 (<0.1)             | <0.01                | 6 (<0.1)               | <0.01                |
| Myalgia                                          | 3 (<0.1)              | <0.01                | 1 (<0.1)               | <0.01                |
| Arthralgia                                       | 3 (<0.1)              | <0.01                | 0                      |
| Back pain                                        | 0                      | 0                    | 3 (<0.1)               | <0.01                |
| Muscle fatigue                                   | 0                      | 0                    | 1 (<0.1)               | <0.01                |
| Muscle spasms                                    | 1 (<0.1)              | <0.01                | 0                      |
| Muscular weakness                                | 1 (<0.1)              | <0.01                | 0                      |
| Musculoskeletal pain                             | 1 (<0.1)              | <0.01                | 0                      |
| Neck pain                                        | 1 (<0.1)              | <0.01                | 0                      |
| Pain in extremity                                | 1 (<0.1)              | <0.01                | 0                      |
| Pain in jaw                                      | 0                      | 0                    | 1 (<0.1)               | <0.01                |
| Polymyalgia rheumatic                            | 1 (<0.1)              | <0.01                | 0                      |
| Rheumatoid arthritis                             | 1 (<0.1)              | <0.01                | 0                      |
| Tendonitis                                       | 1 (<0.1)              | <0.01                | 0                      |
| **Nervous system disorders**                     | 30 (0.1)              | <0.01                | 6 (<0.1)               | <0.01                |
| Headache                                         | 10 (<0.1)             | <0.01                | 3 (<0.1)               | <0.01                |
| Paresthesia                                      | 9 (<0.1)              | <0.01                | 2 (<0.1)               | <0.01                |
| Dizziness                                        | 4 (<0.1)              | <0.01                | 1 (<0.1)               | <0.01                |
| Hypoesthesia                                     | 4 (<0.1)              | <0.01                | 1 (<0.1)               | <0.01                |
| Syncope                                          | 2 (<0.1)              | <0.01                | 0                      |
| Ageusia                                          | 1 (<0.1)              | <0.01                | 0                      |
| Chronic inflammatory demyelinating              | 1 (<0.1)              | <0.01                | 0                      |
| polyradiculoneuropathy                           |                       |                      |                        |
| Facial paralysis                                 | 1 (<0.1)              | <0.01                | 0                      |
| Guillain-Barré syndrome                          | 1 (<0.1)              | <0.01                | 0                      |
| Migraine                                         | 1 (<0.1)              | <0.01                | 0                      |
| Occipital neuralgia                              | 1 (<0.1)              | <0.01                | 0                      |
| Tremor                                           | 1 (<0.1)              | <0.01                | 0                      |
| **Psychiatric disorders**                        | 2 (<0.1)              | <0.01                | 0                      |
| Anxiety                                          | 1 (<0.1)              | <0.01                | 0                      |
| Depression                                       | 1 (<0.1)              | <0.01                | 0                      |
| Insomnia                                         | 1 (<0.1)              | <0.01                | 0                      |
| **Respiratory, thoracic and mediastinal disorders** | 9 (<0.1)              | <0.01                | 4 (<0.1)               | <0.01                |
| Nasal congestion                                 | 3 (<0.1)              | <0.01                | 1 (<0.1)               | <0.01                |
| Oropharyngeal pain                               | 2 (<0.1)              | <0.01                | 2 (<0.1)               | <0.01                |
| Cough                                            | 2 (<0.1)              | <0.01                | 1 (<0.1)               | <0.01                |
| Dyspnea                                          | 2 (<0.1)              | <0.01                | 1 (<0.1)               | <0.01                |
| Sinus congestion                                 | 1 (<0.1)              | <0.01                | 0                      |
| Sneezing                                         | 0                      | 0                    | 1 (<0.1)               | <0.01                |
| **Skin and subcutaneous tissue disorders**       | 8 (<0.1)              | <0.01                | 6 (<0.1)               | <0.01                |
| Dermatitis allergic                              | 1 (<0.1)              | <0.01                | 1 (<0.1)               | <0.01                |
| Related MAAEs          | AZD1222 (n = 21,587) (Total follow-up: 12.19 x 1,000 person-years) | Placebo (n = 10,793) (Total follow-up: 1.47 x 1,000 person-years) |
|------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
|                        | No. (%) | IR* | No. (%) | IR*                                         |
| Rash maculo-papular    | 1 (<0.1) | <0.01 | 1 (<0.1) | <0.01                                       |
| Seborrheic dermatitis  | 2 (<0.1) | <0.01 | 0        | 0                                           |
| Urticaria              | 2 (<0.1) | <0.01 | 0        | 0                                           |
| Dermatitis             | 0        | 0    | 1 (<0.1) | <0.01                                       |
| Hyperhidrosis          | 0        | 0    | 1 (<0.1) | <0.01                                       |
| Idiopathic urticaria   | 1 (<0.1) | <0.01 | 0        | 0                                           |
| Neurodermatitis        | 0        | 0    | 1 (<0.1) | <0.01                                       |
| Petechiae              | 0        | 0    | 1 (<0.1) | <0.01                                       |
| Pruritus               | 1 (<0.1) | <0.01 | 0        | 0                                           |
| **Vascular disorders** | 2 (<0.1) | <0.01 | 0        | 0                                           |
| Hypertension           | 2 (<0.1) | <0.01 | 0        | 0                                           |

*Exposure-adjusted incidence rate, per person-years
IR, incidence rate; MAAE, medically attended adverse event.
Table 7. Related AESIs by system organ class and preferred term reported during the entire period of the study prior to non-study COVID-19 vaccination; safety population (per intervention received; with censoring at receipt of non-study COVID-19 vaccination, regardless of unblinding).

| Related AESIs | AZD1222 (n = 21,587) | Placebo (n = 10,793) |
|---------------|---------------------|---------------------|
|               | (Total follow-up: 12.19 x 1,000 person-years) | (Total follow-up: 1.47 x 1,000 person-years) |
|               | No. (%)  | IR*   | No. (%)  | IR*   |
| Any | 63 (0.3) | <0.01 | 27 (0.3) | <0.01 |
| Any neurologic and/or neuroinflammatory | 60 (0.3) | <0.01 | 26 (0.2) | <0.01 |
| Hematologic | 0 | 0 | 1 (<0.1) | <0.01 |
| Immune thrombocytopenia | 0 | 0 | 1 (<0.1) | <0.01 |
| Neurologic | 59 (0.3) | <0.01 | 26 (0.2) | <0.01 |
| Paresthesia | 37 (0.2) | <0.01 | 16 (0.1) | <0.01 |
| Hypoesthesia | 15 (<0.1) | <0.01 | 4 (<0.1) | <0.01 |
| Muscular weakness | 7 (<0.1) | <0.01 | 1 (<0.1) | <0.01 |
| Dysesthesia | 0 | 0 | 3 (<0.1) | <0.01 |
| Hyperesthesia | 3 (<0.1) | <0.01 | 0 | 0 |
| Chronic inflammatory demyelinating polyradiculoneuropathy | 1 (<0.1) | <0.01 | 0 | 0 |
| Guillain-Barré syndrome | 1 (<0.1) | <0.01 | 0 | 0 |
| Neuritis | 0 | 0 | 1 (<0.1) | <0.01 |
| Neuropathy peripheral | 1 (<0.1) | <0.01 | 0 | 0 |
| Polyneuropathy | 0 | 0 | 1 (<0.1) | <0.01 |
| Sensory disturbance | 0 | 0 | 1 (<0.1) | <0.01 |
| Potentially immune-mediated conditions (PIMC) | 5 (<0.1) | <0.01 | 2 (<0.1) | <0.01 |
| PIMC – Musculoskeletal disorders | 2 (<0.1) | <0.01 | 0 | 0 |
| Polymyalgia rheumatica | 1 (<0.1) | <0.01 | 0 | 0 |
| Rheumatoid arthritis | 1 (<0.1) | <0.01 | 0 | 0 |
| PIMC – Neuroinflammatory disorders† | 2 (<0.1) | <0.01 | 1 (<0.1) | <0.01 |
| Chronic inflammatory demyelinating polyradiculoneuropathy | 1 (<0.1) | <0.01 | 0 | 0 |
| Facial paralysis | 1 (<0.1) | <0.01 | 0 | 0 |
| Guillain-Barré syndrome | 1 (<0.1) | <0.01 | 0 | 0 |
| Polyneuropathy | 0 | 0 | 1 (<0.1) | <0.01 |
| PIMC – Vasculitides | 1 (<0.1) | <0.01 | 0 | 0 |
| Vasculitis | 1 (<0.1) | <0.01 | 0 | 0 |
| PIMC – Others | 0 | 0 | 1 (<0.1) | <0.01 |
| Immune thrombocytopenia | 0 | 0 | 1 (<0.1) | <0.01 |

*Exposure-adjusted incidence rate, per person-years
†The PTs in this category are included in the neurologic and potential immune-mediated conditions category of neuroinflammatory events.

AESI, adverse event of special interest; IR, incidence rate; PIMC, potentially immune-mediated condition.
Table 8. Participant demographics and clinical characteristics, FVAS population, double-blind period.

|                                | AZD1222 (n = 17,617) | Placebo (n = 8528) |
|--------------------------------|-----------------------|--------------------|
| **Median age at screening, years (IQR)** | 51.0 (38–63)         | 51.0 (38–63)       |
| Age ≥18–64 years, no. (%)       | 13,921 (79.0)         | 6,712 (78.7)       |
| Age ≥65 years, no. (%)          | 3,696 (21.0)          | 1,816 (21.3)       |
| **Sex, no. (%)**                |                       |                    |
| Male                           | 9,885 (56.1)          | 4,814 (56.4)       |
| Female                         | 7,732 (43.9)          | 3,714 (43.6)       |
| **Race, no. (%)**              |                       |                    |
| White                          | 13,972 (79.3)         | 6,735 (79.0)       |
| Black or African American      | 1,401 (8.0)           | 699 (8.2)          |
| Asian                          | 738 (4.2)             | 355 (4.2)          |
| American Indian or Alaska Native | 747 (4.2)            | 372 (4.4)          |
| Native Hawaiian or Other Pacific Islander | 50 (0.3)          | 15 (0.2)           |
| Multiple                       | 421 (2.4)             | 203 (2.4)          |
| Unknown or Not reported        | 288 (1.6)             | 149 (1.7)          |
| **Hispanic or Latinx ethnicity, no. (%)** |                    |                    |
| Yes                            | 4,032 (22.9)          | 2,064 (24.2)       |
| No                             | 13,315 (75.6)         | 6,347 (74.4)       |
| Unknown or not reported        | 270 (1.5)             | 117 (1.4)          |
| **Country, no. (%)**           |                       |                    |
| United States                  | 15,389 (87.4)         | 7,423 (87.0)       |
| Chile                          | 1,358 (7.7)           | 670 (7.9)          |
| Peru                           | 870 (4.9)             | 435 (5.1)          |
| **Baseline comorbidities, no. (%)** |                    |                    |
| Yes                            | 10,524 (59.7)         | 5,150 (60.4)       |
| No                             | 7,092 (40.3)          | 3,377 (39.6)       |
| **COVID-19 exposure risk category (OSHA), no. (%)** |   |           |
| Very high                      | 956 (5.5)             | 446 (5.3)          |
| High                           | 3,723 (21.4)          | 1,651 (19.6)       |
| Medium                         | 7,544 (43.3)          | 3,659 (43.4)       |
| Lower                          | 5,204 (29.9)          | 2,666 (31.7)       |
| Missing                        | 190                   | 106                |
| **Median dosing interval, days (IQR)** | n = 17,617          | n = 8,528          |
| Overall                        | 29.0 (29–30)          | 29.0 (29–30)       |
| Participants randomized prior to clinical hold | n = 500            | n = 248            |
|                                | 60.0 (57–63)          | 59.0 (57–62)       |
| Participants randomized after clinical hold | n = 17,117          | n = 8,280          |
|                                | 29.0 (29–30)          | 29.0 (29–30)       |

*Because the trial was placed on clinical hold due to an event of transverse myelitis in a different study of AZD1222 (5), 775 participants received their second dose after a longer dosing interval (1). FVAS, fully vaccinated analysis set; IQR, interquartile range; OSHA, Occupational Safety and Health Administration.
Table 9. Estimates of VE for the primary endpoint (RT-PCR-confirmed symptomatic COVID-19) by time period in the full analysis set for the double-blind period and for the period to non-study COVID-19 vaccination, and in the FVAS for the period to non-study COVID-19 vaccination; analyses are restricted to participant–time within a given time period.

| Population / Time period | Events, no./No. | Incidence rate* | VE (95% CI) |
|-------------------------|-----------------|-----------------|-------------|
|                         | AZD1222 Placebo | AZD1222 Placebo |             |
| **Full analysis set, double-blind period (censoring at unblinding or non-study COVID-19 vaccination)**† | | | |
| Any time post first dose | 374/21,583 | 370/10,797 | 59.7 | 129.3 | 53.9 (46.7–60.1) |
| <15 days post first dose | 96/21,583 | 45/10,797 | 116.9 | 109.6 | -6.7 (-11.9–25.1) |
| 15 days post first dose to second dose | 92/21,159 | 82/10,557 | 104.3 | 185.5 | 43.8 (24.3–58.3) |
| Second dose to <15 days post second dose | 36/20,131 | 49/9,878 | 48.8 | 135.9 | 64.2 (44.9–76.7) |
| ≥15 days post second dose | 143/18,384 | 189/8,889 | 37.8 | 115.8 | 67.4 (59.4–73.8) |
| ≥15 days post second dose to <6 months | 134/18,384 | 186/8,889 | 37.9 | 121.3 | 68.7 (60.9–75.0) |
| 6–12 months | 9/2736 | 3/1,034 | 36.0 | 30.3 | -18.6 (-33.7–67.7) |
| **Full analysis set, period to non-study COVID-19 vaccination (censoring at non-study COVID-19 vaccination only)**† | | | |
| Any time post first dose | 571/21,583 | 408/10,797 | 47.7 | 120.9 | 59.7 (54.2–64.5) |
| <15 days post first dose | 96/21,583 | 45/10,797 | 116.6 | 109.4 | -6.6 (-11.8–25.2) |
| 15 days post first dose to second dose | 93/21,319 | 84/10,605 | 103.6 | 188.2 | 44.9 (26.0–59.0) |
| Second dose to <15 days post second dose | 40/20,727 | 50/9,905 | 50.7 | 135.5 | 62.5 (43.2–75.2) |
| ≥15 days post second dose | 334/20,407 | 224/9,240 | 35.5 | 105.5 | 65.0 (58.5–70.5) |
| ≥15 days post second dose to <6 months | 222/20,407 | 210/9,240 | 32.7 | 114.2 | 70.3 (64.1–75.4) |
| 6–12 months | 112/16,209 | 142/0,105 | 42.7 | 49.1 | 7.7 (-61.1–47.1) |
| **FVAS population‡, period to non-study COVID-19 vaccination (censoring at non-study COVID-19 vaccination only)**† | | | |
| ≥15 days post second dose | 328/19,569 | 219/8,868 | 36.4 | 108.4 | 65.1 (58.5–70.6) |
| ≥15 days post second dose to <6 months post first dose | 218/19,569 | 205/8,868 | 33.6 | 117.0 | 70.2 (63.9–75.4) |
| ≥6 months post first dose | 110/15,514 | 14/1,896 | 43.7 | 52.2 | 11.1 (-55.2–49.1) |

*per 1,000 person-years. †Regardless of serostatus at baseline. ‡Seronegative at baseline.
FVAS, fully vaccinated analysis set; RT-PCR, reverse transcriptase-PCR; VE, vaccine efficacy.
Table 10. Participant demographics and clinical characteristics, FVAS population for analysis of period to non-study COVID-19 vaccination.

|                                                | AZD1222 (n = 19,569) | Placebo (n = 8,868) |
|------------------------------------------------|----------------------|---------------------|
| **Median age at screening, years (IQR)**      | 51.0 (38–63)         | 51.0 (38–63)        |
| Aged ≥18–64 years, no. (%)                    | 15,102 (77.2)        | 6,915 (78.0)        |
| Aged ≥65 years, no. (%)                       | 4,467 (22.8)         | 1,953 (22.0)        |
| **Sex, no. (%)**                              |                      |                     |
| Male                                           | 10,826 (55.3)        | 4,974 (56.1)        |
| Female                                         | 8,743 (44.7)         | 3,894 (43.9)        |
| **Race, no. (%)**                             |                      |                     |
| White                                          | 15,594 (79.7)        | 7,022 (79.2)        |
| Black or African American                      | 1,532 (7.8)          | 718 (8.1)           |
| Asian                                          | 850 (4.3)            | 370 (4.2)           |
| American Indian or Alaska Native              | 764 (3.9)            | 376 (4.2)           |
| Native Hawaiian or Other Pacific Islander      | 54 (0.3)             | 18 (0.2)            |
| Multiple                                       | 453 (2.3)            | 210 (2.4)           |
| Unknown or Not reported                        | 322 (1.6)            | 154 (1.7)           |
| **Hispanic or Latinx ethnicity, no. (%)**      |                      |                     |
| Yes                                            | 4,311 (22.0)         | 2,102 (23.7)        |
| No                                             | 14,961 (76.5)        | 6,648 (75.0)        |
| Unknown or not reported                        | 297 (1.5)            | 118 (1.3)           |
| **Country, no. (%)**                          |                      |                     |
| United States                                  | 17,287 (88.3)        | 7,752 (87.4)        |
| Chile                                         | 1,409 (7.2)          | 680 (7.7)           |
| Peru                                          | 873 (4.5)            | 436 (4.9)           |
| **Baseline COVID-19 comorbidities, no. (%)*** |                      |                     |
| Yes                                            | 11,713 (59.9)        | 5,357 (60.4)        |
| No                                             | 7,854 (40.1)         | 3,510 (39.6)        |
| Missing                                        | 2                    | 1                   |
| **COVID-19 exposure risk category (OSHA), no. (%)** |                  |                     |
| Very high                                      | 1,171 (6.0)          | 472 (5.4)           |
| High                                           | 4,245 (21.9)         | 1,729 (19.7)        |
| Medium                                         | 8,222 (42.4)         | 3,793 (43.3)        |
| Lower                                          | 5,738 (29.6)         | 2,768 (31.6)        |
| Missing                                        | 193                  | 106                 |
| **Median dosing interval, days (IQR)**†        |                      |                     |
| Overall                                        | n = 19,569           | n = 8,868           |
| Participants randomized prior to clinical hold | 29.0 (29–30)         | 29.0 (29–30)        |
| Participants randomized after clinical hold    | n = 501              | n = 248             |
|                                                | 60.0 (57–63)         | 59.0 (57–62)        |
|                                                | n = 19,068           | n = 8,620           |
|                                                | 29.0 (29–30)         | 29.0 (29–30)        |

*COVID-19 comorbidities included chronic kidney disease, chronic obstructive pulmonary disease, lower immune health because of a solid organ transplant, history of obesity (BMI > 30), serious heart conditions, sickle cell disease, type 2 diabetes, asthma, dementia, cerebrovascular disease, cystic fibrosis, high blood pressure, liver disease, scarring in the lungs (pulmonary fibrosis), type 1 diabetes, thalassemia, history of smoking. †Because the trial was placed on clinical hold due to an event of transverse myelitis in a different study of AZD1222 (5), 775 participants received their second dose after a longer dosing interval (1).

BMI, body mass index; FVAS, fully vaccinated analysis set; IQR, interquartile range; OSHA, Occupational Safety and Health Administration.
Table 11. Sensitivity analyses for estimates of efficacy with AZD1222 versus placebo for the primary efficacy endpoint in the FVAS population for the period up to receipt of non-study COVID-19 vaccination.

| Method                                                                 | Estimate, % (95% CI) |
|-----------------------------------------------------------------------|----------------------|
| **Primary analysis without imputation**                                | 65.05 (58.46–70.60) |
| **Multiple imputation analysis that adjusts for single baseline covariate:** |                      |
| Age group at informed consent (18–64, ≥65 years)                      | 58.75 (51.99–64.56)  |
| Sex at birth (male, female)                                           | 59.40 (52.88–65.02)  |
| Race (white, black or African American, Asian, other)                 | 59.06 (52.39–64.79)  |
| Ethnicity (Hispanic or Latinx, not Hispanic or Latinx, not reported, unknown) | 59.16 (52.07–65.20)  |
| Body mass index (<40, ≥40, missing)                                   | 59.19 (52.30–65.09)  |
| Comorbidities (yes, no, missing)                                      | 59.10 (51.85–65.27)  |
| OSHA risk category (very high, high, medium, lower exposure risk, missing) | 59.51 (53.05–65.08)  |
| Region (East North Central, East South Central, Middle Atlantic, Mountain, New England, Pacific, South America, South Atlantic, West North Central, West South Central) | 58.93 (52.19–64.73)  |

*For the IPCW analyses, all results come from fitting a Cox Proportional Hazards (PH) model to the data (for the IPCW results this model is fitted to the counting process format data). All models use data only from participants with a complete set of covariate information as used in the previously described Cox PH model for right-censoring. All model results use all data up until a participant was right-censored, administratively censored, or had an infection event.

†Three versions of the IPCW method were used: IPCW using standardized weights and IPCW using unstandardized weights but truncating the weights at the 0.1% and 1% level – IPCW (0.1%) and IPCW (1%), respectively. The standardized weights are calculated as \( w_s = \frac{p_{trt}}{p} \), where \( p \) is the cumulative probability of remaining uncensored (in each subinterval) estimated from the previously described Cox model for censoring and \( p_{trt} \) is the probability of remaining uncensored (in each subinterval) estimated from an unadjusted Cox model fitted to each treatment group separately. Truncation was defined as setting any weights below the X% percentile to be equal to the X% percentile and setting any weights above the (100-X)% percentile to be equal to the (100-X)% percentile. The CIs for the IPCW models are 95% intervals using robust standard error estimates to account for multiple participant records, although these ignore the uncertainty in estimating the weights.

FVAS, fully vaccinated analysis set; IPCW, inverse probability of censoring weighting; OSHA, Occupational Safety and Health Administration.
Table 12. Identification of VoC or VoI and VE against VoC/VoI with ≥5 events (FVAS population, double-blind period).

| VoC or VoI with ≥3 events† | AZD1222 (n = 17,617) | Placebo (n = 8,528) | VE, % (95% CI) |
|---------------------------|----------------------|---------------------|----------------|
|                           | no. (%)              | IR*                 | no. (%)        | IR*            |
| All variants (all cases sequenced)‡ | 81 (0.46) | 22.53 | 115 (1.35) | 74.22 | 69.7 (59.7–77.2) |
| VoC‡                      |                      |                     |                |
| Alpha                     | 9 (0.05)             | 2.50                | 11 (0.13)      | 7.10 | 64.8 (15.0–85.4) |
| Gamma                     | 4 (0.02)             | 1.11                | 1 (0.01)       | 0.65 | -72.4 (-1442.2–80.7) |
| VoI                       |                      |                     |                |
| Epsilon                   | 7 (0.04)             | 1.95                | 7 (0.08)       | 4.52 | 56.9 (–22.9–84.9) |
| Lambda                    | 17 (0.10)            | 4.73                | 18 (0.21)      | 11.62 | 59.3 (21.0–79.0) |
| All cases not sequenced§  | 60 (0.34)            | 16.69               | 69 (0.81)      | 44.53 | 62.5 (47.0–73.5) |

*Incidence rate per 1,000 person-years. Total follow-up was 3.60 and 1.55 x 1000 person-years in the AZD1222 and placebo groups, respectively. †Includes 30 and 54 cases with A_1 lineage (IR: 8.34 and 34.85; VE: 76.1% [95% CI 62.6–84.7]), 9 and 21 with B.1 lineages (VE values not shown due to low case numbers with each individual variant), and 1 and 3 with R.1 lineage (IR: 0.28 and 1.94; VE: 85.6% [95% CI -38.4–98.5]). ‡There were also 2 cases of Beta and 2 cases of Delta in the AZD1222 group; VE could not be estimated due to low case numbers. §Not sequenced includes 1 case in each group in which sequencing was attempted but the quantity was not sufficient. FVAS, fully vaccinated analysis set; IR, incidence rate; VE, vaccine efficacy; VoC, variant of concern; VoI, variant of interest.
Figure 1. Efficacy of AZD1222 vs placebo for the prevention of COVID-19 and SARS-CoV-2 infection.

(A) Cumulative incidence of SARS-CoV-2 RT-PCR-positive symptomatic illness occurring ≥15 days post second dose (time 0 = day 15 post second dose) in the FVAS population for the double-blind period of the study (AZD1222, n = 17,617; placebo, n = 8528). (B) Incidence of SARS-CoV-2 RT-PCR-positive symptomatic illness events and decrease in the at-risk population over time during the double-blind period. The at-risk population curves show the numbers of participants in the FVAS who have not been censored and are available for analysis at the corresponding time point. Cumulative incidence of (C) severe or critical symptomatic COVID-19 and (D) SARS-CoV-2 infection, as defined by seroconversion rate from negative at baseline to positive for SARS-CoV-2 nucleocapsid antibody at ≥15 days post second dose, regardless of symptoms, in the FVAS population for the double-blind period of the study (AZD1222, n = 17,617; placebo, n = 8528). For panels A, C and D, time to first event was from time of second dose administration, calculated as: (date of SARS-CoV-2-positive test) – (date of second dose of AZD1222 or placebo + 14 days) + 1. For censored participants, censoring time was from date of second dose of AZD1222 or placebo + 14 days to the last time observed before data cut-off (July 30, 2021). Cumulative incidence curves were truncated at the point at which <10% of the starting population remained at risk.

CI, confidence interval; FVAS, fully vaccinated analysis set; IR, incidence rate per 1000 person-years.
Figure 2. Kaplan–Meier analysis of non-study COVID-19 vaccination over time, regardless of unblinding. Occurrence of events of non-study COVID-19 vaccination stratified by arm and age group, OSHA exposure risk category or country. OSHA divides job tasks into four potential SARS-CoV-2 risk exposure levels dependent on aspects including the workplace environment, the feasibility of mask-wearing, the type of work activity, and the need for close contact with other people, including those with, or suspected to have, COVID-19 (https://www.osha.gov/coronavirus/hazards).

EUA, emergency use authorization; OSHA, Occupational Safety and Health Administration.
Figure 3. Neutralizing and spike-binding antibody responses over time in the placebo group.

Box and whisker plots showing (A) SARS-CoV-2 neutralizing antibody quantitation and (B, C) MSD spike antigen quantitation over time in the placebo group, with participants censored at (A, B) date of non-study COVID-19 vaccination, positive test for SARS-CoV-2 nucleocapsid antibodies or RT-PCR-positive SARS-CoV-2 symptomatic infection, or (C) date of unblinding, non-study COVID-19 vaccination, positive test for SARS-CoV-2 nucleocapsid antibodies, RT-PCR-positive SARS-CoV-2 symptomatic infection or last trial contact. Y-axes show 1/dilution for neutralizing antibodies or spike antigen titers in AU/mL – for conversion to the WHO International Standard, see supplemental methods (appendix, p 4). For panel A, boxes and whiskers do not appear in full due to the generally minimal level of antibodies and/or the small population size at later time points. The proportion of participants with a ≥4-fold increase from baseline in spike-binding antibodies, in the absence of a positive test for SARS-CoV-2 nucleocapsid antibodies, was 6.7% (64/957) across all post-baseline visits; this proportion was higher at later time points: 5/909 (0.6%) on day 15, 4/674 (0.6%) on day 29, 9/858 (1.0%) on day 43, 7/779 (0.9%) on day 57, 19/584 (3.3%) on day 90, and 30/139 (21.6%) on day 180.

MSD, Meso Scale Diagnostics; RT-PCR, reverse transcriptase-PCR.
Figure 4. Neutralizing antibody responses over time by baseline comorbidities and serostatus.
Box and whisker plots showing SARS-CoV-2 neutralizing antibody quantitation over time by (A) comorbidities, AZD1222 group only, and (B) serostatus at baseline, both groups. Participants were censored at the earliest date of non-study COVID-19 vaccination, positive test for SARS-CoV-2 nucleocapsid antibodies or RT-PCR-positive SARS-CoV-2 symptomatic infection. Y-axes show 1/dilution for neutralizing antibodies – for conversion to the WHO International Standard, see supplemental methods (p 4).

A

Neutralizing antibody responses in participants with comorbidities at baseline

| Day | Median | AU | 10.0 | 20.0 | 40.0 | 80.0 | 160.0 |
|-----|--------|----|------|------|------|------|-------|
| 0   | 1.214  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 14  | 1.081  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 28  | 0.803  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 35  | 0.104  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 90  | 0.956  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 180 | 0.48   | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |

B

Neutralizing antibody responses in participants who were seronegative at baseline

AZD1222, n = 1,919; Placebo, n = 946

| Day | Median | AU | 10.0 | 20.0 | 40.0 | 80.0 | 160.0 |
|-----|--------|----|------|------|------|------|-------|
| 0   | 0.976  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 14  | 0.976  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 28  | 0.976  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 35  | 0.976  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 90  | 0.976  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |
| 180 | 0.976  | 0.0| 0.0  | 0.0  | 0.0  | 0.0  | 0.0   |

AU, arbitrary units; MSD, Meso Scale Diagnostics.
Figure 5. Correlation between anti-vector immune response after first dose and ability to boost after second dose.

Comparison of anti-vector neutralizing antibodies (horizontal axis) versus MSD spike antigen quantitation (vertical axis) on days 1, 29, 57, and 180; participants were censored at the time of non-study COVID-19 vaccination, regardless of unblinding, and were excluded if they tested positive for SARS-CoV-2 nucleocapsid antibody at any time. Y-axes show spike antigen titers in AU/mL – for conversion to the WHO International Standard, see supplemental methods (p 4).
Supplemental References

1. Falsey AR, et al. Phase 3 safety and efficacy of AZD1222 (ChAdOx1 nCoV-19) Covid-19 vaccine. *N Engl J Med*. 2021;385(25):2348-2360.
2. O'Toole A, et al. Assignment of epidemiological lineages in an emerging pandemic using the pangolin tool. *Virus Evol*. 2021;7(2):veab064.
3. Rambaut A, et al. A dynamic nomenclature proposal for SARS-CoV-2 lineages to assist genomic epidemiology. *Nat Microbiol*. 2020;5(11):1403-1407.
4. Bedford T, et al. Updated Nextstrain SARS-CoV-2 clade naming strategy. Available at: https://nextstrain.org/blog/2021-01-06-updated-SARS-CoV-2-clade-naming. Last accessed 6 December 2021.
5. Voysey M, et al. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. *Lancet*. 2021;397(10269):99-111.
Supplemental Acknowledgments

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