Supplementary Information: Increased household transmission and immune escape of SARS-CoV-2 Omicron compared to Delta variants

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Supplementary Methods

S1: Data sources

We used data from the Norwegian COVID-19 pandemic preparedness registry, Beredt C19 containing individual level information from Norwegian health registries. The following Beredt C19 data sources were used in this study:

- **Norwegian vaccination registry (SYSVAK)**
  - Vaccination date
  - Vaccine type

- **Norwegian Surveillance System for Communicable Diseases (MSIS)**
  - Test date
  - Positive test result for SARS-CoV-2, either by RT-PCR or antigen rapid test.
  - Virus variant, detected through whole genome sequencing (WGS) or PCR variant screening.

- **Norwegian Population Registry**
  - Age
  - Birth
  - Gender

- **Municipal contact tracing data (KS Fiks Smittesporing)** from 64 Norwegian municipalities in 11 different counties. Only data from 57 municipalities fulfilled the inclusion criteria and were included in the study.
  - Linkage between index cases and their corresponding close contacts, identified through manual contact tracing by trained personnel in the municipalities.

- **Statistics Norway (SSB)**
  - Household ID key
S2: Definitions

**Household primary case:** The person in a household that initiated the contact tracing in that household and who has a positive-result test date for SARS-CoV-2 in the period from 14 December 2021-13 January 2022. The person that initiated the contact tracing is identified by only being registered as an index case in the KS Fiks Smittesporing system and not registered as a contact.

**Household member:** All individuals registered in the same dwelling, based on Statistics Norway (SSB) household data.

**Household contact:** Contacts identified by the contact tracing team, registered in the contact tracing system, and matched with Statistics Norway (SSB) to determine that they belong to the same household as the primary case.

**Test date:** Test date of SARS-CoV-2 infection according to the Norwegian Surveillance System for Communicable Diseases (MSIS), including test results from Norwegian test centers. Individuals who had both an antigen test and a PCR test are registered with the test date of the PCR test.

**Household secondary case:** An individual registered as a contact of the primary case by the municipal contact tracing teams, living in the same household and who had a positive-result test date within and including ten days after the test date of the primary case.

**Household secondary attack rate (SAR):** The probability that an infectious person infects a person in the same household during his or her infectious period. We considered the infectious period of the primary cases as ten days from their positive test dates.

**Variant identification:** The variant was determined by the PCR screening, whole genome sequencing (WGS), or both methods.
### Table S1: Omicron households: age and vaccination status of primary cases and contacts

| Age group | Unvacc. | % | 1-dose | % | 2-doses | % | 3-doses | % | Total | % |
|-----------|---------|---|--------|---|---------|---|---------|---|-------|---|
| **Primary cases** | | | | | | | | | | |
| 0-15 years | 109 | 71.2 | 43 | 28.1 | 1 | 0.7 | NA | 0.0 | 153 | 100.0 |
| 16+ years | 42 | 8.2 | 26 | 5.1 | 371 | 72.2 | 75 | 14.6 | 514 | 100.0 |
| Total | 151 | 69 | 372 | 75 | 667 | | | | |
| **Household contacts** | | | | | | | | | | |
| 0-15 years | 278 | 78.1 | 78 | 21.9 | NA | 0.0 | NA | 0.0 | 356 | 100.0 |
| 16+ years | 44 | 4.7 | 43 | 4.6 | 654 | 69.4 | 202 | 21.4 | 943 | 100.0 |
| Total | 322 | 121 | 654 | 202 | 1299 | | | | |

### Table S2: Delta households: age and vaccination status of primary cases and contacts

| Age group | Unvacc. | % | 1-dose | % | 2-doses | % | 3-doses | % | Total | % |
|-----------|---------|---|--------|---|---------|---|---------|---|-------|---|
| **Primary cases** | | | | | | | | | | |
| 0-15 years | 141 | 87.6 | 20 | 12.4 | NA | 0.0 | NA | 0.0 | 161 | 100.0 |
| 16+ years | 61 | 20.7 | 15 | 5.1 | 204 | 69.4 | 14 | 4.8 | 294 | 100.0 |
| Total | 202 | 35 | 204 | 14 | 455 | | | | |
| **Household contacts** | | | | | | | | | | |
| 0-15 years | 236 | 82.2 | 49 | 17.1 | 2 | 0.7 | NA | 0.0 | 287 | 100.0 |
| 16+ years | 61 | 10.5 | 13 | 2.2 | 443 | 76.0 | 66 | 11.3 | 583 | 100.0 |
| Total | 297 | 62 | 445 | 66 | 870 | | | | |
Table S3: Numbers of contacts/infected contacts of primary cases infected with Omicron and Delta variants, stratified by age, vaccination status, gender and time since infection.

| Stratification                  | Omicron Contacts (N) | Infected Contacts (n) | %  | Delta Contacts (N) | Infected Contacts (n) | %  |
|--------------------------------|----------------------|-----------------------|----|--------------------|-----------------------|----|
| Overall                        | 1299                 | 662                   | 51.0 | 870                | 315                   | 36.2 |
| Age of contacts                |                      |                       |     |                    |                       |    |
| <16 years                      | 356                  | 206                   | 57.9 | 287                | 120                   | 41.8 |
| 16+ years                      | 943                  | 455                   | 48.3 | 583                | 195                   | 33.4 |
| Age of primary cases           |                      |                       |     |                    |                       |    |
| <16 years                      | 354                  | 188                   | 53.1 | 353                | 123                   | 34.8 |
| 16+ years                      | 945                  | 473                   | 50.1 | 517                | 192                   | 37.1 |
| Vacc. status, contacts         |                      |                       |     |                    |                       |    |
| Unvacc.                        | 322                  | 190                   | 59.0 | 297                | 138                   | 46.5 |
| 1-dose                         | 121                  | 69                    | 57.0 | 62                 | 21                    | 33.9 |
| 2-doses                        | 654                  | 326                   | 49.8 | 445                | 143                   | 32.1 |
| 3-doses                        | 202                  | 76                    | 37.6 | 66                 | 13                    | 19.7 |
| Vacc. status, primary cases    |                      |                       |     |                    |                       |    |
| Unvacc.                        | 329                  | 187                   | 56.8 | 420                | 158                   | 37.6 |
| 1-dose                         | 154                  | 64                    | 41.6 | 71                 | 28                    | 39.4 |
| 2-doses                        | 713                  | 363                   | 50.9 | 360                | 127                   | 35.3 |
| 3-doses                        | 103                  | 47                    | 45.6 | 19                 | 2                     | 10.5 |
| Vacc. Status, contacts 16+ years |                    |                       |     |                    |                       |    |
| Unvacc.                        | 44                   | 30                    | 68.2 | 61                 | 34                    | 55.7 |
| 1-dose                         | 43                   | 23                    | 53.5 | 13                 | 5                     | 38.5 |
| 2-doses                        | 654                  | 326                   | 49.8 | 443                | 143                   | 32.3 |
| 3-doses                        | 202                  | 76                    | 37.6 | 66                 | 13                    | 19.7 |
| Vacc. Status, primary cases 16+ years |                |                       |     |                    |                       |    |
| Unvacc.                        | 51                   | 23                    | 45.1 | 61                 | 29                    | 47.5 |
| 1-dose                         | 44                   | 20                    | 45.5 | 17                 | 8                     | 47.1 |
| 2-doses                        | 499                  | 235                   | 47.1 | 235                | 70                    | 29.8 |
| 3-doses                        | 83                   | 37                    | 44.6 | 12                 | 1                     | 8.3 |
| Gender                         |                      |                       |     |                    |                       |    |
| Female                         | 513                  | 259                   | 50.5 | 294                | 97                    | 30.0 |
| Male                           | 430                  | 196                   | 45.6 | 289                | 98                    | 33.9 |
| Time since last vacc., contacts w.2-doses 16+ years | | 45 | 20 | 44.4 | 46 | 10 | 21.7 |
| ≤ 6 months                     | 609                  | 306                   | 50.2 | 397                | 133                   | 33.5 |


**S4: Sensitivity analysis: using five days between the infected contacts’ test dates and their primary cases’ test dates**

### Table S4: five-day secondary attack rate (SAR5) of Omicron and Delta stratified by age and vaccination status

| Stratification                  | SAR (95% CI) | RR (95% CI) | Omicron vs Delta (Delta is Ref) |
|---------------------------------|--------------|-------------|---------------------------------|
|                                 | Omicron      | Delta       |                                 |
| **Overall**                     | 0.46 (0.43 - 0.49) | 0.31 (0.28 - 0.35) | 1.47 (1.30 - 1.66) |
| **Age of contacts**             |              |             |                                 |
| <16 years                       | 0.53 (0.47 - 0.58) | 0.37 (0.31 - 0.43) | 1.42 (1.17 - 1.73) |
| 16+ years                       | 0.43 (0.40 - 0.47) | 0.28 (0.245 - 0.32) | 1.53 (1.31 - 1.80) |
| **Age of primary cases**        |              |             |                                 |
| <16 years                       | 0.46 (0.42 - 0.49) | 0.28 (0.23 - 0.34) | 1.65 (1.33 - 2.07) |
| 16+ years                       | 0.47 (0.41 - 0.53) | 0.33 (0.29 - 0.37) | 1.38 (1.19 - 1.61) |
| **Vaccine status, contacts**    |              |             |                                 |
| Unvaccinated                    | 0.54 (0.48 - 0.60) | 0.43 (0.37 - 0.50) | 1.24 (1.04 - 1.49) |
| 1-dose vaccine                  | 0.53 (0.43 - 0.63) | 0.25 (0.143 - 0.37) | 2.16 (1.36 - 3.80) |
| 2-dose vaccine                  | 0.45 (0.41 - 0.49) | 0.26 (0.22 - 0.31) | 1.74 (1.44 - 2.11) |
| 3-dose vaccine                  | 0.32 (0.26 - 0.39) | 0.19 (0.107 - 0.30) | 1.69 (1.02 - 3.11) |
| **Vaccine status, primary cases**|              |             |                                 |
| Unvaccinated                    | 0.51 (0.46 - 0.57) | 0.32 (0.27 - 0.37) | 1.62 (1.34 - 1.97) |
| 1-dose vaccine                  | 0.33 (0.26 - 0.42) | 0.35 (0.24 - 0.47) | 0.96 (0.64 - 1.48) |
| 2-dose vaccine                  | 0.47 (0.43 - 0.51) | 0.31 (0.26 - 0.36) | 1.51 (1.26 - 1.81) |
| 3-dose vaccine                  | 0.40 (0.30 - 0.50) | 0.11 (0.02 - 0.29) | 3.76 (1.30 - 21.90) |

SAR: Secondary Attack Rate; CI: Confidence Interval; RR: relative risk, unadjusted
Table S5: Vaccine efficacy (VE) of Omicron and Delta by contact vacc. status (16+ years) using SAR5

| Vaccine status       | VE % (95% CI) |       |       |
|----------------------|---------------|-------|-------|
|                      | Omicron       | Delta |
| Unvaccinated         | Ref           | Ref   |
| 1-dose vaccine       | 21 (0 - 51)   | 32 (0 - 76) |
| 2-dose vaccine       | 29 (4 - 44)   | 51 (32 - 63) |
| 3-dose vaccine       | 50 (28 - 63)  | 65 (40 - 81) |

VE: Vaccine Efficacy; CI: Confidence Interval

Table S6: Relative risk of Omicron and Delta infection stratified by different covariates using SAR5

| RR within variant                  | RR (95% CI) |
|------------------------------------|-------------|
|                                    | Omicron     | Delta     |
| **Primary case vaccination status (16+)** |             |           |
| Unvaccinated                       | Ref         | Ref       |
| 1-dose vaccine                     | 0.96 (0.55 - 1.65) | 1.04 (0.46 - 1.92) |
| 2-dose vaccine                     | 1.09 (0.78 - 1.66) | **0.62 (0.42 - 0.95)** |
| 3-dose vaccine                     | 1.06 (0.69 - 1.71) | **0.20 (0.01 - 0.82)** |
| **Age of contacts**                |             |           |
| <16 years                          | 1.41 (0.99 - 2.23) | 1.30 (0.78 - 2.64) |
| 16-44 years                        | 1.29 (0.90 - 2.03) | 0.96 (0.57 - 1.97) |
| 45-64 years                        | 1.04 (0.72 - 1.65) | 1.04 (0.60 - 2.16) |
| 65+ years                          | Ref         | Ref       |
| **Gender of contacts, 16+ years**  |             |           |
| Female                             | Ref         | Ref       |
| Male                               | 0.91 (0.77 - 1.06) | 1.01 (0.77 - 1.34) |
| **Time since last vaccination, 2-dose vacc. contacts 16+ years** |   |           |
| ≤ 6 months                         | 0.98 (0.66 - 1.33) | 0.53 (0.22 - 1.03) |
| >6 months                          | Ref         | Ref       |

RR: Relative Risk, unadjusted; CI: Confidence Interval