

Letters

RESEARCH LETTER

Secondary Attack Rates for Omicron and Delta Variants of SARS-CoV-2 in Norwegian Households

The new SARS-CoV-2 B.1.1.529 Omicron variant has spread rapidly throughout the world,¹⁻³ including in countries such as Norway with 90% primary vaccination and increasing booster vaccination coverage.^{4,5} To enable alignment of infection control measures with the risk posed by the new variant and avoid excessive strain on health systems, estimates of the transmissibility of the Omicron variant are needed.^{3,4} We assessed the secondary attack rate of Omicron and B.1.617.2 Delta variants in households in Norway.



Supplemental content

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Methods | We used individual-level registry data from the Norwegian emergency preparedness register (eTable in the Supplement).⁶ All Norwegian residents were tracked from December 1, 2021, to January 8, 2022, the period when the Omicron variant increased from less than 5% to greater than 85% of all variant-classified isolates in Norway.⁴ We excluded single-person households and households with simultaneous index cases or a case in the 3 months before December. The registry includes every polymerase chain reaction (PCR) test performed in Norway. Secondary cases were identified by a positive PCR test result for SARS-CoV-2. Variant analysis by PCR or sequencing was performed for isolates of most index cases. Secondary attack rate was defined as the number of nonindex household members with

Table. Polymerase Chain Reaction–Confirmed Secondary COVID-19 Cases in Nonindex Household Members Within 7 Days After Index Case Patient Sampling Date^a

Index case characteristics	No./total	SAR, % (95% CI) ^b	Logistic regression, OR (95% CI) ^c	
			Unadjusted	Adjusted
Overall	15 961/80 957 ^d	19.7 (19.4-20.0)		
Variant				
Delta	7960/41 015	19.4 (19.0-19.8)	1 [Reference]	1 [Reference]
Omicron	2926/11 643	25.1 (24.4-25.9)	1.39 (1.31-1.49)	1.52 (1.41-1.64)
Not classified	5075/28 299	17.9 (17.5-18.4)	0.91 (0.86-0.96)	0.93 (0.88-0.98)
Age group, y				
<18	6730/33 662	20.0 (19.6-20.4)		1 [Reference]
18-30	1838/15 695	11.7 (11.2-12.2)		0.57 (0.52-0.63)
31-40	2718/11 291	24.1 (23.3-24.9)		1.45 (1.32-1.58)
41-50	2448/10 301	23.8 (23.0-24.6)		1.49 (1.35-1.63)
>50	2227/10 008	22.3 (21.4-23.1)		1.39 (1.26-1.52)
Sex				
Female	7311/39 441	18.5 (18.2-18.9)		1 [Reference]
Male	8650/41 516	20.8 (20.4-21.2)		1.14 (1.09-1.20)
Vaccinated				
No	8889/43 503	20.4 (20.1-20.8)		1.39 (1.29-1.50)
Yes	7072/37 454	18.9 (18.5-19.3)		1 [Reference]
Week of positive test result				
48	1156/6136	18.8 (17.9-19.8)		1 [Reference]
49	4480/22 901	19.6 (19.1-20.1)		1.02 (0.93-1.12)
50	4206/22 717	18.5 (18.0-19.0)		0.93 (0.85-1.03)
51	3084/16 619	18.6 (18.0-19.2)		0.94 (0.85-1.04)
52	3035/12 584	24.1 (23.4-24.9)		1.28 (1.15-1.43)
Constant			0.24 (0.23-0.25)	0.17 (0.15-0.19)

Abbreviations: OR, odds ratio; SAR, secondary attack rate.

^a Including all nonindex household members of all multiperson households in Norway, in which 1 index household member was identified by a positive polymerase chain reaction test result for SARS-CoV-2 between December 1, 2021, and January 1, 2022 (percentage and ORs with 95% CIs, and absolute numbers).

^b Secondary attack rate was calculated as the number of nonindex household members who tested positive within 7 days after the date when the index household member tested positive, divided by all nonindex household

members and multiplied by 100. The 95% CIs around the SAR were calculated with the Wilson method.

^c Multivariable logistic regression models were clustered at the household level (Huber-White sandwich estimator). The adjusted model included the indicated covariates of characteristics of the index person.

^d The 80 957 nonindex household members came from 31 220 multiperson households, implying that the households comprised in total (index and nonindex members) 112 177 members, with on average 3.6 members in each household.

a positive test result within 7 days after the sample date of the index case, divided by the total number of nonindex household members. It was calculated separately for households in which the index case had the Omicron, Delta, or nonclassified variant. The percentage of household members tested within 7 days was calculated with the same method. Logistic regression models were used to estimate odds ratios (ORs) for secondary infection or testing among nonindex household members in households in which the index case had Omicron (Delta reference), adjusted for the index case's age, sex, vaccination status, and sampling week. For robustness we estimated the model with additional adjustment for these characteristics of nonindex household members.

The Regional Committees for Medical Research Ethics South East Norway confirmed that external ethical board review was not required. Statistical significance was defined as a 95% CI that excluded 1. Stata version 16 (StataCorp) software was used.

Results | There were 31 220 households with 1 index case (mean age, 30 years; 51% male), comprising 80 957 nonindex members (mean age, 31 years; 50% male), of whom 11 643, 41 015, and 28 299 belonged to a household in which the variant of the index case was Omicron, Delta, or nonclassified, respectively. The mean age of nonindex members of households in which the index case had the Omicron variant was 33 years, and 49% were male, compared with 31 years and 50% for Delta.

Secondary attack rate was 25.1% (95% CI, 24.4%-25.9%) when the variant of the index case was Omicron, 19.4% (95% CI, 19.0%-19.8%) when it was Delta, and 17.9% (95% CI, 17.5%-18.4%) when it was nonclassified (Table). In the adjusted logistic regression model, the OR of nonindex household members testing positive was 1.52 (95% CI, 1.41-1.64) when the variant of the index case was Omicron and 0.93 (95% CI, 0.88-0.98) when it was nonclassified compared with Delta.

Odds ratios were higher for men, unvaccinated individuals, and those older than 30 years, and in week 52. Adjusting also for characteristics of nonindex household members yielded similar ORs (OR, 1.55 [95% CI, 1.44-1.68] for Omicron; OR, 0.93 [95% CI, 0.89-0.98] for nonclassified compared with Delta). Testing of nonindex household members was lower when the index case had the Omicron variant (48.6%; 95% CI, 47.7%-49.5%) than the Delta variant (55.6%; 95% CI, 55.1%-56.1%), but it was higher in the adjusted model (OR, 1.09; 95% CI, 1.02-1.16).

Discussion | Secondary attack rate of SARS-CoV-2 in Norwegian households was moderately higher when the index case had the Omicron variant rather than the Delta variant.

A strength of the study is the use of nationwide individual-level household data from mandatory reporting on all PCR tests in Norway. A limitation is that data on home tests were not available, and that test activity differed between groups. However, the national regulation prescribed that all positive-result home tests be confirmed by a PCR test, and this is also required to obtain an immunity certificate. Thus, most posi-

tive test results are probably recorded. Some Omicron cases could go undetected because of milder symptoms. Sampling for variant analysis of index cases was not random, but similar results for Delta and nonclassified variants suggest that selection bias was limited. Also, household members may have been infected by a third-party source, but such potential bias should be similar across variants.

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Myocarditis Following a Third BNT162b2 Vaccination Dose in Military Recruits in Israel

Vaccination has limited SARS-CoV-2 spread and prevented major illness and death during the COVID-19 pandemic.¹ However, certain adverse events, such as an increased incidence of myocarditis, particularly in young men, have been associated with vaccination with the BNT162b2 mRNA vaccine (Pfizer-BioNTech).^{2,3}