

Supplement to:
SARS-CoV-2 antibody prevalence and correlates
of six ethnic groups living in Amsterdam, the Netherlands:
a population-based cross-sectional study, June-October 2020

Authors

Liza Coyer^{1,2}, Anders Boyd^{1,3}, Janke Schinkel⁴, Charles Agyemang⁵, Henrike Galenkamp⁵, Anitra D M Koopman⁵, Tjalling Leenstra¹, Eric P Moll van Charante^{5,7}, Bert-Jan H van den Born⁸, Anja Lok⁹, Arnoud Verhoeff^{10,11}, Aeilko H Zwinderman¹², Suzanne Jurriaans⁴, Lonneke A van Vught^{7,13,14}, Karien Stronks⁵, Maria Prins^{1,2}

Affiliations

¹Department of Infectious Diseases, Public Health Service of Amsterdam, Amsterdam, the Netherlands

²Amsterdam UMC, Department of Infectious Diseases, Amsterdam Infection and Immunity (All), University of Amsterdam, Amsterdam, the Netherlands

³Stichting HIV Monitoring, Amsterdam, the Netherlands

⁴Amsterdam UMC, Department of Medical Microbiology, University of Amsterdam, Amsterdam, the Netherlands

⁵Amsterdam UMC, Department of Public and Occupational Health, Amsterdam Public Health Research Institute, University of Amsterdam, Amsterdam, the Netherlands

⁶Amsterdam UMC, Department of Epidemiology and Biostatistics, Amsterdam Public Health Research Institute, VU University Amsterdam, Amsterdam, the Netherlands

⁷Amsterdam UMC, Department of General Practice, Amsterdam Public Health Research Institute, University of Amsterdam, Amsterdam, the Netherlands

⁸ Amsterdam UMC, Department of Vascular Medicine, Amsterdam Cardiovascular Sciences, University of Amsterdam, Amsterdam, the Netherlands

⁹ Amsterdam UMC, Department of Psychiatry, Amsterdam Public Health Research Institute, Center for Urban Mental Health, University of Amsterdam, Amsterdam, the Netherlands

¹⁰ Department of Epidemiology, Health Promotion & Healthcare Innovation, Public Health Service of Amsterdam, Amsterdam, the Netherlands

¹¹ Department of Sociology, University of Amsterdam, Amsterdam, the Netherlands

¹² Amsterdam UMC, Department of Clinical Epidemiology, Biostatistics and Bioinformatics, University of Amsterdam, Amsterdam, the Netherlands

¹³ Amsterdam UMC, Center for Experimental Molecular Medicine, University of Amsterdam, Amsterdam, the Netherlands

¹⁴ Amsterdam UMC, Department of Intensive Care Medicine, University of Amsterdam, Amsterdam, the Netherlands

Contact details corresponding author

Liza Coyer, ORCID: 0000-0001-5830-2982

Nieuwe Achtergracht 100

1018 WT Amsterdam

Phone: +31 20 555 3873

Email: lcoyer@ggd.amsterdam.nl

Content	Page
Information on seroprevalence estimation corrected for sampling, post-stratification and adjusting for differences in age, sex and calendar time between ethnic groups.	4
Figure S1 Flowchart depicting the selection of HELIUS participants in the COVID-19 study, Amsterdam, the Netherlands, 24 June - 9 October 2020	5
Table S1. Characteristics of three inclusion groups (invited and included in SARS-CoV-2 serological study invited not included not invited) within the HELIUS population (N=16889), Amsterdam, the Netherlands, 24 June - 9 October 2020	6
Figure S2 Inclusion numbers and test results per month by ethnicity, Amsterdam, the Netherlands, 24 June - 9 October 2020	8
Figure S3 Distribution of qualitative signal-to-cutoff (S/CO) ratios for positive test results (N=226) by ethnicity, Amsterdam, the Netherlands, 24 June - 9 October 2020	9
Supplementary Table S2. SARS-CoV-2-related characteristics of the HELIUS participants included in the COVID-19 study, by ethnicity (N=2497), Amsterdam, the Netherlands, 24 June - 9 October 2020	10
Supplementary Table S3. Univariable analysis of correlates of SARS-CoV-2 seropositivity per ethnic group, Amsterdam, the Netherlands, 24 June - 9 October 2020	12

Information on seroprevalence estimation corrected for sampling, post-stratification and adjusting for differences in age, sex and calendar time between ethnic groups.

For sampling, the probability of being invited for the COVID-19 substudy (as the proportion of participants invited among those in active follow-up in the parent study) was calculated, as was the conditional probability of participating in the COVID-19 substudy (given the participant's ethnicity, age, educational level, working status and health literacy). The product of the two probabilities was taken and the inverse of this result, standardized to one, was used as a sampling weight. For post-stratification, a weight was assigned corresponding to the proportion representing the Amsterdam population of each stratum of age (20-44, 45-54, 55-59, 60-79 years), sex (male, female) and ethnicity (Surinamese, Ghanaian, Moroccan, Turkish, Dutch). Sampling and post-stratification weights were placed in a multivariable logistic regression model with covariates ethnicity, age, sex, and calendar time. Given the weighting scheme of this study, variance was calculated with the designed-based Taylor series linearization method using the 'svy' commands in STATA. Differences between ethnic groups were tested in the model using the Wald χ^2 test.

Figure S1. Flowchart depicting the selection of HELIUS participants in the COVID-19 study, Amsterdam, the Netherlands, 24 June - 9 October 2020

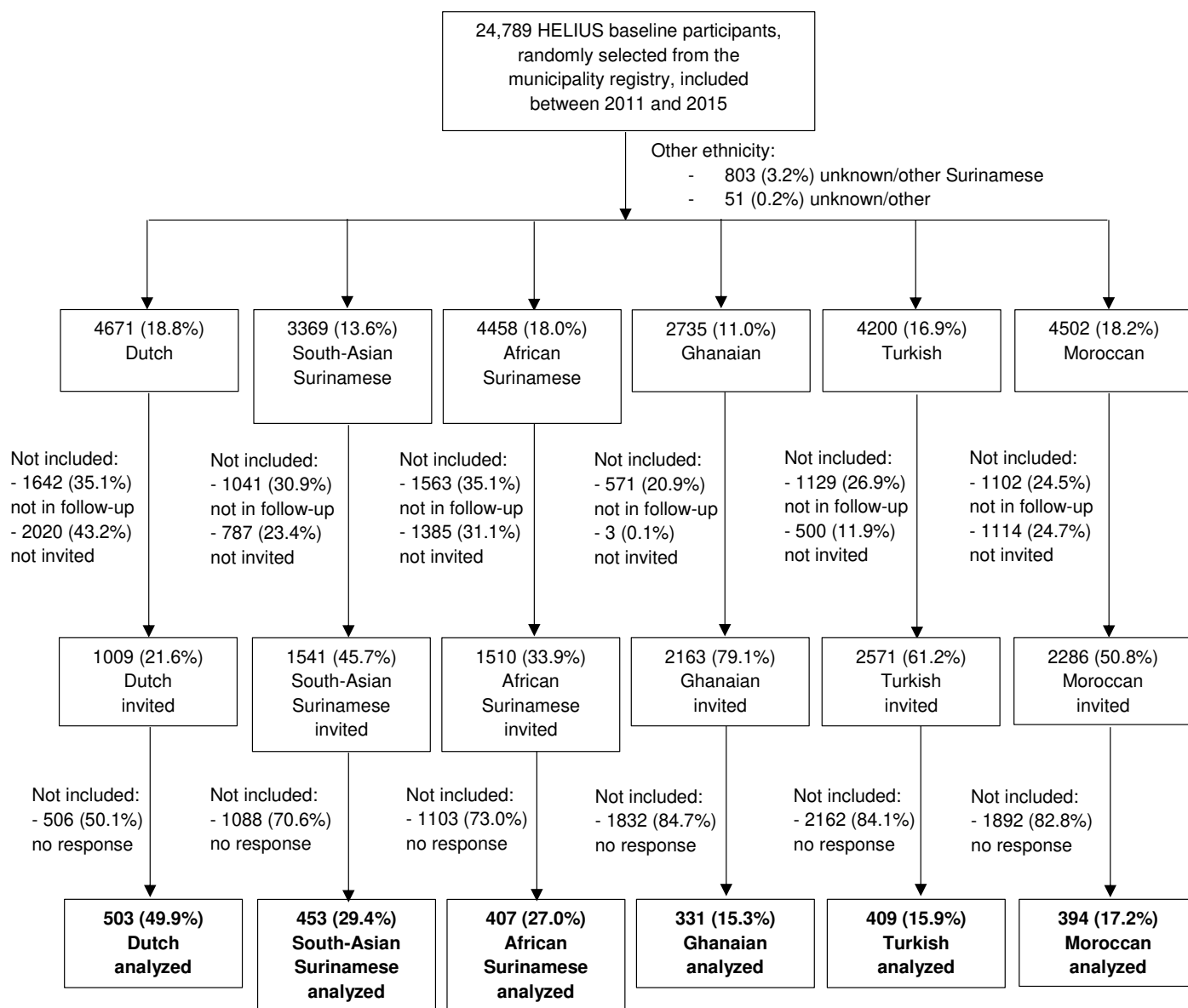


Table S1. Characteristics of three inclusion groups (invited and included in COVID-19 study invited not included not invited) within the HELIUS population (N=1688g), Amsterdam, the Netherlands, 24 June - 9 October 2020

To identify potential selection bias among HELIUS participants who were still in active follow-up, demographic, socio-economic factors and access to health care indicators were compared between those who were invited versus not invited for the COVID-19 substudy. To assess the reasons for nonresponse among invited HELIUS participants, these variables were also compared between those who participated versus not participated in the COVID-19 substudy. Pearson's χ^2 or Fisher exact test were used for categorical data and Kruskal-Wallis rank test for continuous variables.

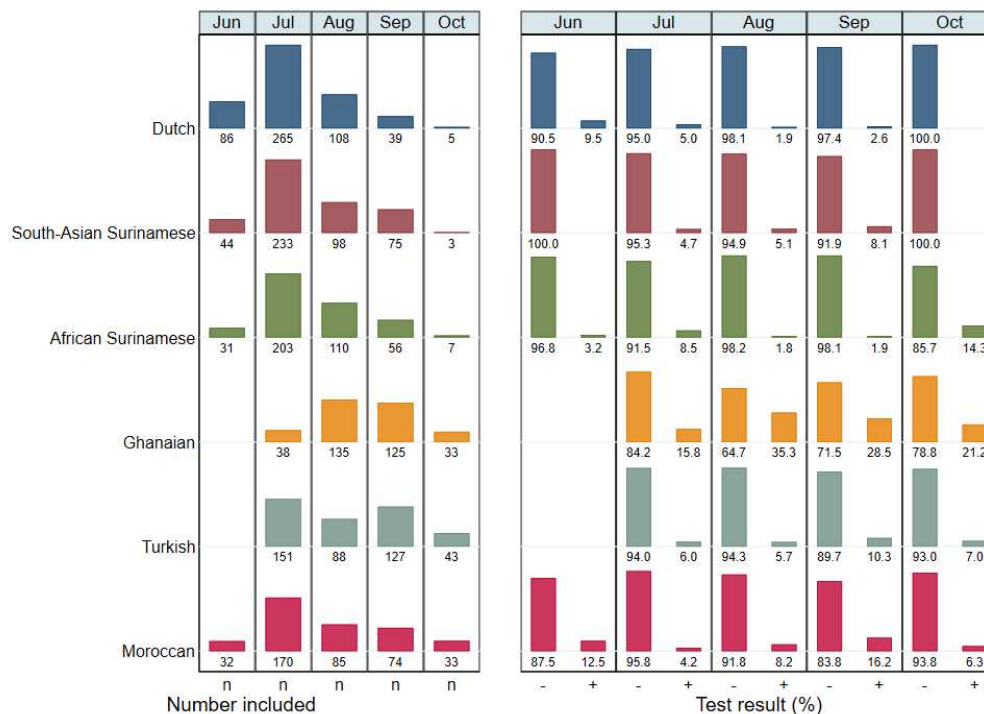
Characteristic	All HELIUS participants in follow-up* (N= 1688g)	Invited included (n=2497)	Invited not included (n=8583)	Not invited (n=5809)	Invited and included vs. invited not included	Invited (included and not included) vs. not invited
	n (%)	n (%)	n (%)	n (%)	P-value [‡]	P-value [‡]
Ethnicity					<0.001	<0.001
Dutch	3029 (17.9%)	503 (20.1%)	506 (5.9%)	2020 (34.8%)		
South-Asian Surinamese	2328 (13.8%)	453 (18.1%)	1088 (12.7%)	787 (13.5%)		
African Surinamese	2895 (17.1%)	407 (16.3%)	1103 (12.9%)	1385 (23.8%)		
Ghanaian	2166 (12.8%)	331 (13.3%)	1832 (21.3%)	3 (0.1%)		
Turkish	3071 (18.2%)	409 (16.4%)	2162 (25.2%)	500 (8.6%)		
Moroccan	3400 (20.1%)	394 (15.8%)	1892 (22.0%)	1114 (19.2%)		
Sex					0.095	0.94
Male	7077 (41.9%)	1083 (43.4%)	3562 (41.5%)	2432 (41.9%)		
Female	9812 (58.1%)	1414 (56.6%)	5021 (58.5%)	3377 (58.1%)		
Age in years on 1 January 2020					<0.001	<0.001
Median [IQR]	52 [41-61]	54 [44-61]	51 [39-59]	54 [42-63]		
Migration generation					<0.001	<0.001
N.A. (Dutch group)	3029 (17.9%)	503 (20.1%)	506 (5.9%)	2020 (34.8%)		
1 st	10978 (65.0%)	1656 (66.3%)	6339 (73.9%)	2983 (51.4%)		
2 nd	2882 (17.1%)	338 (13.5%)	1738 (20.2%)	806 (13.9%)		
City district^b					<0.001	<0.001
Centre	781 (4.6%)	140 (5.6%)	222 (2.6%)	419 (7.2%)		
East	2550 (15.1%)	422 (16.9%)	1,302 (15.2%)	826 (14.2%)		
West	2356 (13.9%)	294 (11.8%)	1,203 (14.0%)	859 (14.8%)		
South	1381 (8.2%)	245 (9.8%)	525 (6.1%)	611 (10.5%)		
New-West	4897 (29.0%)	606 (24.3%)	2572 (30.0%)	1719 (29.6%)		
Southeast	4794 (28.4%)	760 (30.4%)	2718 (31.7%)	1316 (22.7%)		
Other	20 (0.1%)	6 (0.2%)	8 (0.1%)	6 (0.1%)		
Missing	110 (0.7%)	24 (1.0%)	33 (0.4%)	53 (0.9%)		
Educational level[†]					<0.001	<0.001
No school/elementary school	3286 (19.5%)	327 (13.1%)	2175 (25.3%)	784 (13.5%)		
Lower vocational/ lower secondary school	4324 (25.6%)	612 (24.5%)	2358 (27.5%)	1354 (23.3%)		
Intermediary vocational/ intermediary secondary school	4715 (27.9%)	700 (28.0%)	2393 (27.9%)	1622 (27.9%)		

Higher vocational/university	3993 (23.6%)	792 (31.7%)	1243 (14.5%)	1958 (33.7%)		
Missing	571 (3.4%)	66 (2.6%)	414 (4.8%)	91 (1.6%)		
Labor participation[†]					<0.001	<0.001
Employed	9585 (56.8%)	1659 (66.4%)	4274 (49.8%)	3652 (62.9%)		
Not in workforce	2992 (17.7%)	309 (12.4%)	1645 (19.2%)	1038 (17.9%)		
Unemployed/on benefits	2372 (14.0%)	300 (12.0%)	1416 (16.5%)	656 (11.3%)		
Disabled	1309 (7.8%)	151 (6.0%)	792 (9.2%)	366 (6.3%)		
Missing	631 (3.7%)	130 (3.1%)	774 (8.7%)	154 (2.7%)		
Occupational level[†]					<0.001	<0.001
Elementary occupations	2454 (14.5%)	323 (12.9%)	1739 (20.3%)	392 (6.7%)		
Lower occupations	4177 (24.7%)	537 (21.5%)	2280 (26.6%)	1360 (23.4%)		
Intermediary occupations	3549 (21.0%)	599 (24.0%)	1515 (17.7%)	1435 (24.7%)		
Higher occupations	2565 (15.2%)	500 (20.0%)	783 (9.1%)	1282 (22.1%)		
Scientific occupations	928 (5.5%)	202 (8.1%)	223 (2.6%)	503 (8.7%)		
Missing	3216 (19.0%)	336 (13.5%)	2043 (23.8%)	837 (14.4%)		
Difficulty with Dutch language[†]					<0.001	<0.001
N.A. (Dutch group)	3029 (17.9%)	503 (20.1%)	506 (5.9%)	2020 (34.8%)		
No	7467 (44.2%)	1148 (46.0%)	3751 (43.7%)	2568 (44.2%)		
Yes	5891 (34.9%)	782 (31.3%)	3950 (46.0%)	1159 (20.0%)		
Missing	502 (3.0%)	64 (2.6%)	376 (4.4%)	62 (1.1%)		
Difficulty with Dutch language[†] (excluding Dutch group)					<0.001	<0.001
No	7467 (53.9%)	1148 (57.6%)	3751 (46.4%)	2568 (67.8%)		
Yes	5891 (42.5%)	782 (39.2%)	3950 (48.9%)	1159 (30.6%)		
Missing	502 (3.6%)	64 (3.2%)	376 (4.7%)	62 (1.6%)		
Health literacy (SBSQ)[†]					<0.001	<0.001
Adequate	13547 (80.2%)	2164 (86.7%)	6187 (72.1%)	5196 (89.4%)		
Low	2837 (16.8%)	274 (11.0%)	2019 (23.5%)	544 (9.4%)		
Missing	505 (3.0%)	59 (2.4%)	377 (4.4%)	69 (1.2%)		

Abbreviations: HELIUS Healthy Life in an Urban Setting; IQR interquartile range; N.A. not applicable; SBSQ Set of Brief Screening Question

* Excluding participants not belonging to one of the six ethnic groups included in the COVID-19 study † Measured at baseline (2011-2015) ‡ Pearson's χ^2 or Wilcoxon rank-sum test, as appropriate.

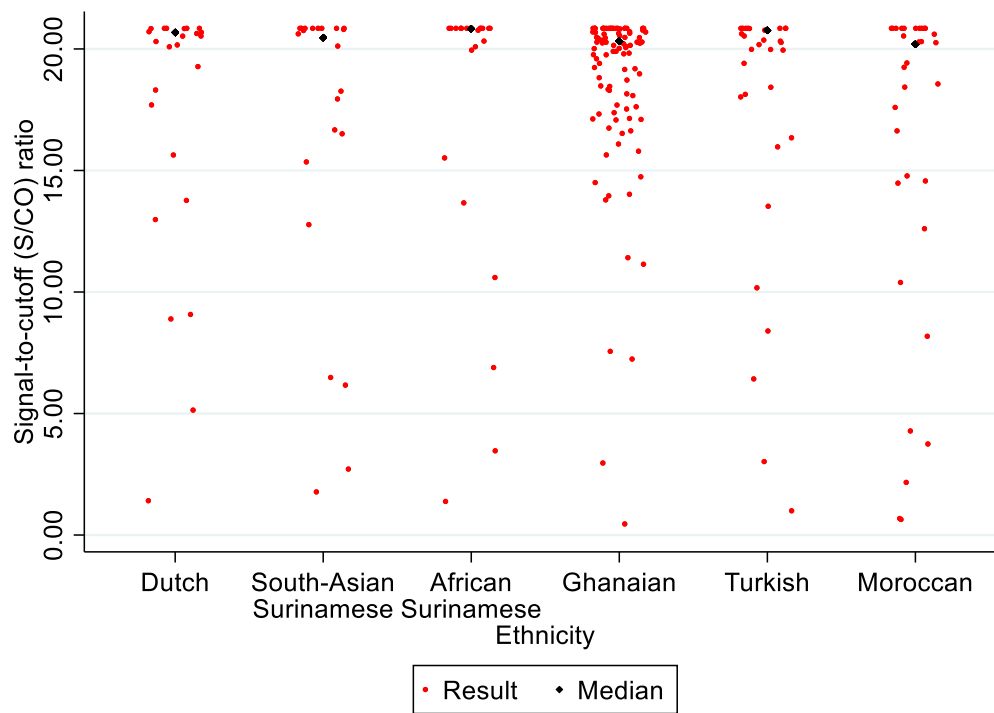
Figure S2 Inclusion numbers and test results per month by ethnicity, Amsterdam, the Netherlands, 24 June - 9 October 2020



The left side of the graph shows the number of individuals included in the substudy per month by ethnic group. The right side of the graph shows the distribution of test results per inclusion month by ethnic group, excluding people without a test result ($n=14$) or equivocal test result ($n=8$).

We tested whether the seroprevalence changed over months in survey-weighted logistic regression models per ethnic group. Odds of a positive test did not change in the Dutch ($P=0.22$), Ghanaian ($P=0.33$), Turkish ($P=0.67$) and Moroccan groups ($P=0.15$), but increased in the South-Asian Surinamese group (OR=1.87 per month increase, 95%CI=1.12-3.12, $P=0.016$) and decreased in the African Surinamese group (OR=0.56 per month increase, 95%CI=0.34-0.94, $P=0.028$).

Figure S3 Distribution of signal-to-cutoff (S/CO) ratios for positive test results (N=225) by ethnicity, Amsterdam, the Netherlands, 24 June - 9 October 2020



Kruskall Wallis test for difference between ethnic groups: $P=0.57$

Supplementary Table S2. SARS-CoV-2-related characteristics of the HELIUS participants included in the COVID-19 study, by ethnicity (N=2497), Amsterdam, the Netherlands, 24 June - 9 October 2020

Characteristic	Dutch	South-Asian	African	Ghanaian	Turkish	Moroccan	P-value*
	(n=503)	Surinamese (n=453)	Surinamese (n=407)	(n=331)	(n=409)	(n=392)	
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Do you think you have been infected? (among all respondents)							
Yes, this was confirmed by a PCR test	1 (0.2%)	4 (0.9%)	5 (1.2%)	2 (0.6%)	5 (1.2%)	9 (2.3%)	<0.001
Yes, this was confirmed by a Ab test	6 (1.2%)	1 (0.2%)	1 (0.2%)	0 (0.0%)	1 (0.2%)	2 (0.5%)	
Yes, but this was not confirmed by a test	67 (13.3%)	46 (10.2%)	51 (12.5%)	16 (4.8%)	63 (15.4%)	68 (17.3%)	
No, this was confirmed by a PCR test	28 (5.6%)	22 (4.9%)	22 (5.4%)	14 (4.2%)	26 (6.4%)	17 (4.3%)	
No, this was confirmed by a Ab test	6 (1.2%)	4 (0.9%)	5 (1.2%)	2 (0.6%)	5 (1.2%)	9 (2.3%)	
No, I do not think so, but this was not confirmed by a test	178 (35.4%)	181 (40.0%)	139 (34.2%)	90 (27.2%)	112 (27.4%)	108 (27.4%)	
No, I know for certain, because I did not have any symptoms	178 (35.4%)	152 (33.6%)	144 (35.4%)	182 (55.0%)	134 (32.8%)	144 (36.5%)	
I do not know	39 (7.8%)	41 (9.1%)	40 (9.8%)	25 (7.6%)	61 (14.9%)	36 (9.1%)	
Missing	0 (0.0%)	2 (0.4%)	0 (0.0%)	0 (0.0%)	2 (0.5%)	1 (0.3%)	
Do you think you have been infected? (among SARS-CoV-2 antibody positive individuals)							<0.001
No/do not know	5 (20.8%)	9 (40.9%)	4 (18.2%)	86 (90.5%)	11 (36.7%)	13 (40.6%)	
Yes	19 (79.2%)	13 (59.1%)	18 (81.8%)	9 (9.5%)	19 (63.3%)	19 (59.4%)	
Thinks household member/steady partner was infected							<0.001
N.A.	93 (18.5%)	89 (19.6%)	104 (25.6%)	40 (12.1%)	50 (12.2%)	58 (14.7%)	
No	352 (70.0%)	321 (70.9%)	270 (66.3%)	275 (83.1%)	310 (75.8%)	281 (71.3%)	
Yes	53 (10.5%)	38 (8.4%)	33 (8.1%)	15 (4.5%)	46 (11.2%)	51 (12.9%)	
Missing	5 (1.0%)	5 (1.1%)	0 (0.0%)	1 (0.3%)	3 (0.7%)	4 (1.0%)	
Household member hospitalized for COVID-19							<0.001
N.A.	93 (18.5%)	89 (19.6%)	104 (25.6%)	40 (12.1%)	50 (12.2%)	58 (14.7%)	
No	401 (79.7%)	356 (78.6%)	302 (74.2%)	290 (87.6%)	352 (86.1%)	329 (83.5%)	
Yes	4 (0.8%)	3 (0.7%)	1 (0.2%)	0 (0.0%)	4 (1.0%)	3 (0.8%)	

Missing	5 (1.0%)	5 (1.1%)	0 (0.0%)	1 (0.3%)	3 (0.7%)	4 (1.0%)	
Number of times left home in the past week							<0.001
0-7	59 (11.7%)	144 (31.8%)	145 (35.6%)	122 (36.9%)	106 (25.9%)	101 (25.6%)	
8-11	82 (16.3%)	134 (29.6%)	99 (24.3%)	120 (36.3%)	97 (23.7%)	90 (22.8%)	
12-16	141 (28.0%)	103 (22.7%)	80 (19.7%)	58 (17.5%)	103 (25.2%)	88 (22.3%)	
17+	221 (43.9%)	70 (15.5%)	83 (20.4%)	30 (9.1%)	101 (24.7%)	113 (28.7%)	
Missing	0 (0.0%)	2 (0.4%)	0 (0.0%)	1 (0.3%)	2 (0.5%)	2 (0.5%)	
Number of unique visitors at home in the past week							
0	216 (42.9%)	218 (48.1%)	192 (47.2%)	239 (72.2%)	207 (50.6%)	209 (53.0%)	<0.001
1	89 (17.7%)	80 (17.7%)	84 (20.6%)	43 (13.0%)	48 (11.7%)	45 (11.4%)	
2-4	146 (29.0%)	120 (26.5%)	97 (23.8%)	41 (12.4%)	110 (26.9%)	102 (25.9%)	
5+	49 (9.7%)	30 (6.6%)	32 (7.9%)	6 (1.8%)	41 (10.0%)	34 (8.6%)	
Missing	3 (0.6%)	5 (1.1%)	2 (0.5%)	2 (0.6%)	3 (0.7%)	4 (1.0%)	

Abbreviations: HELIUS, Healthy Life in an Urban Setting * Pearson's χ^2 test

Supplementary Table S3. Univariable analysis of correlates of SARS-CoV-2 seropositivity per ethnic group, Amsterdam, the Netherlands, 24 June - 9 October 2020

Characteristic	Dutch	South-Asian Surinamese	African Surinamese	Ghanaian	Turkish	Moroccan
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Sex						
Male	1	1	1	1	1	1
Female	1.50 (0.53-4.21)	1.13 (0.34-3.77)	0.76 (0.20-2.98)	1.25 (0.69-2.29)	1.23 (0.53-2.90)	2.26 (0.87-5.86)
Per year increase in age in years on 1 January 2020	0.98 (0.94-1.01)	0.98 (0.95-1.02)	0.94 (0.88-1.00)	1.02 (0.99-1.05)	0.97 (0.93-1.01)	1.00 (0.96-1.03)
Migration generation[†]						
1 st	-	1	1	Omitted	1	1
2 nd	-	1.68 (0.56-5.05)	3.97 (1.11-14.28)	Omitted	1.67 (0.71-3.89)	1.74 (0.71-4.25)
COVID-19 substudy visit after 15 August 2020*	0.58 (0.13-2.68)	2.53 (0.80-7.97)	0.28 (0.06-1.30)	1.37 (0.69-2.74)	1.18 (0.49-2.82)	2.24 (0.96-5.25)
City district[†] (other= omitted)						
Centre	1	Omitted	1	Omitted	1	1
East	1.13 (0.21-6.08)	1	0.91 (0.10-8.55)	1	Omitted	0.84 (0.15-4.78)
West	1.11 (0.26-4.69)	Omitted	0.25 (0.02-4.31)	1.02 (0.19-5.38)	0.89 (0.28-2.82)	1.82 (0.31-10.61)
South	1.49 (0.46-4.81)	1.05 (0.09-12.53)	2.10 (0.12-36.43)	3.75 (0.52-26.98)	0.39 (0.06-2.77)	0.32 (0.03-2.99)
New-West	0.42 (0.08-2.17)	1.44 (0.25-8.30)	0.90 (0.09-9.34)	1.49 (0.27-8.34)	0.25 (0.09-0.71)	0.34 (0.06-1.99)
Southeast	0.55 (0.07-4.62)	2.85 (0.57-14.27)	2.03 (0.22-18.94)	3.32 (1.00-11.07)	0.89 (0.28-2.82)	Omitted
Has obesity (BMI\geq30.0)[†]						
No	1	1	1	1	1	1
Yes	0.84 (0.23-3.07)	0.58 (0.10-3.42)	0.92 (0.30-2.81)	0.90 (0.45-1.81)	1.50 (0.58-3.92)	1.03 (0.37-2.90)
Educational level[†]						
No school/elementary school	Omitted	1	1	1	1	1
Lower vocational/ lower secondary school	Omitted	2.64 (0.53-13.21)	2.66 (0.24-28.99)	0.70 (0.33-1.50)	1.41 (0.41-4.85)	1.30 (0.34-5.00)
Intermediary vocational/ intermediary secondary school	1	1.41 (0.22-9.14)	1.54 (0.16-14.82)	0.39 (0.18-0.86)	1.17 (0.36-3.83)	1.47 (0.48-4.47)
Higher vocational/university	2.48 (0.33-18.66)	2.06 (0.28-14.89)	1.22 (0.12-12.53)	0.75 (0.23-2.47)	1.39 (0.38-5.06)	1.39 (0.41-4.72)
Missing	Omitted	Omitted	Omitted	0.58 (0.19-1.77)	Omitted	8.52 (1.92-37.78)
Labor participation[†]						

Employed	1	1	1	1	1	1
Not in workforce	1.57 (0.44-5.54)	0.84 (0.10-6.77)	8.09 (1.85-35.42)	0.51 (0.09-3.08)	1.68 (0.63-4.46)	1.48 (0.49-4.47)
Unemployed/on benefits	Omitted	2.66 (0.56-12.59)	0.41 (0.09-2.02)	1.34 (0.61-2.95)	1.23 (0.37-4.09)	1.03 (0.3-3.48)
Disabled	Omitted	0.55 (0.07-4.38)	1.26 (0.25-6.47)	0.80 (0.32-2.01)	0.82 (0.10-6.71)	1.01 (0.19-5.5)
Unknown/missing	Omitted	3.43 (0.37-31.95)	Omitted	1.01 (0.39-2.58)	Omitted	9.20 (2.68-31.54)
Elementary occupation[†]						
No	1	1	1	1	1	1
Yes	Omitted	1.19 (0.30-4.69)	1.83 (0.38-8.82)	1.29 (0.68-2.44)	2.08 (0.61-7.15)	1.49 (0.45-4.99)
Missing	3.11 (0.67-14.43)	0.12 (0.02-0.98)	6.64 (1.25-35.31)	0.75 (0.31-1.81)	1.41 (0.54-3.66)	4.69 (1.93-11.43)
Difficulty with Dutch language[†]						
No	-	1	1	1	1	1
Yes	-	1.45 (0.52-4.04)	0.36 (0.07-1.78)	3.21 (1.32-7.78)	1.02 (0.42-2.46)	1.53 (0.65-3.62)
Health literacy (SBSQ)[†]						
Adequate	-	1	1	1	1	1
Low	-	0.93 (0.11-7.8)	1.03 (0.10-10.43)	1.12 (0.58-2.15)	1.07 (0.43-2.66)	1.39 (0.54-3.58)
Job setting^{*,§}						
No job / caretaker only	1	1	1	1	1	1
Job with no contact within 1.5 meter	0.94 (0.13-6.88)	0.27 (0.03-2.42)	0.21 (0.02-1.93)	1.66 (0.69-3.99)	1.01 (0.27-3.69)	0.82 (0.27-2.47)
Other job with contact within 1.5 meter	6.22 (1.25-30.86)	3.35 (0.99-11.32)	2.20 (0.48-10.06)	1.56 (0.71-3.43)	0.87 (0.30-2.57)	0.15 (0.03-0.63)
Child care/schools/higher education	8.23 (1.26-53.64)	1.19 (0.12-11.38)	0.31 (0.03-2.78)	1.93 (0.25-15.1)	1.02 (0.14-7.45)	2.16 (0.68-6.85)
Bar/restaurant	2.51 (0.20-32.41)	1.28 (0.12-13.30)	Omitted	1.49 (0.44-4.96)	0.99 (0.10-10.17)	0.88 (0.1-8.25)
Hospital/long-term care facility/Care worker elsewhere	8.51 (1.37-52.99)	0.46 (0.08-2.61)	3.09 (0.81-11.7)	1.11 (0.37-3.28)	1.18 (0.32-4.38)	0.13 (0.02-1.1)
Caretaker[*]						
No	1	1	1	1	1	1
Yes	0.66 (0.21-2.12)	0.27 (0.03-2.42)	0.85 (0.23-3.14)	0.80 (0.25-2.59)	2.63 (0.9-7.67)	1.59 (0.52-4.90)
Number of people in household[†]						
1 (Lives alone)	1	1	1	1	1	1
2	0.84 (0.24-2.99)	4.55 (0.53-39.15)	12.95 (2.21-76.01)	1.85 (0.63-5.50)	1.45 (0.19-11.11)	0.24 (0.03-2.26)
3	0.10 (0.01-0.90)	16.85 (1.99-142.58)	17.30 (2.45-122.24)	1.88 (0.62-5.70)	2.17 (0.37-12.65)	0.56 (0.11-2.76)
4	0.78 (0.18-3.37)	2.96 (0.30-29.11)	6.26 (1.11-35.42)	2.86 (0.96-8.48)	2.71 (0.53-13.80)	1.47 (0.39-5.51)
≥5	4.79 (0.59-38.62)	1.69 (0.10-28.05)	8.09 (1.19-55.04)	5.02 (1.59-15.86)	4.11 (0.82-20.64)	1.20 (0.34-4.17)
Lives with other people[*]	0.65 (0.19-2.25)	1.91 (0.57-6.46)	2.19 (0.43-11.24)	0.94 (0.47-1.91)	1.00 (0.26-3.77)	1.09 (0.32-3.72)
Partner	0.66 (0.22-1.99)	1.11 (0.35-3.47)	0.78 (0.23-2.66)	1.28 (0.68-2.39)	0.98 (0.40-2.38)	0.84 (0.33-2.10)

Children up to 3 years old	0.41 (0.05-3.20)	0.91 (0.11-7.49)	2.09 (0.38-11.54)	2.54 (1.00-6.46)	1.46 (0.40-5.32)	1.19 (0.41-3.44)
Children 4 through 12 years old	0.59 (0.13-2.76)	Omitted	0.12 (0.01-0.95)	1.17 (0.59-2.33)	0.67 (0.23-2.00)	1.16 (0.47-2.84)
Children 13 through 17 years old	Omitted	0.68 (0.14-3.24)	0.32 (0.07-1.58)	1.97 (1.02-3.80)	0.92 (0.32-2.66)	1.07 (0.45-2.55)
Children 18+ years old	0.25 (0.03-1.98)	0.85 (0.30-2.42)	1.22 (0.41-3.64)	1.52 (0.84-2.73)	1.29 (0.55-3.00)	0.95 (0.42-2.17)
Parents or parents-in-law	Omitted	2.03 (0.50-8.19)	1.63 (0.3-9.04)	Omitted	0.76 (0.21-2.81)	1.76 (0.36-8.71)
Other adults	2.45 (0.3-20.27)	Omitted	9.34 (1.7-51.41)	1.08 (0.51-2.30)	1.58 (0.32-7.89)	2.99 (0.74-12.07)
Household member/steady partner with suspected infection*						
N.A./No	1	1	1	1	1	1
Yes	7.53 (2.52-22.47)	7.05 (2.07-24.04)	20.08 (4.98-80.9)	1.20 (0.30-4.78)	9.15 (3.7-22.63)	5.17 (2.08-12.87)
Number of times left home in the past week*,*						
0-7	1	1	1	1	1	1
8-11	4.22 (0.42-42.42)	2.12 (0.64-6.98)	1.52 (0.32-7.21)	0.90 (0.45-1.77)	1.69 (0.51-5.57)	0.20 (0.06-0.66)
12-16	4.51 (0.44-46.04)	0.18 (0.04-0.94)	0.40 (0.08-2.07)	1.07 (0.43-2.63)	0.92 (0.25-3.40)	0.32 (0.11-0.95)
17+	7.10 (0.89-56.58)	0.49 (0.09-2.56)	0.34 (0.05-2.27)	0.67 (0.24-1.89)	1.20 (0.33-4.37)	0.28 (0.08-1.01)
In the past week, left home to*:						
Work	2.44 (0.85-7.02)	0.62 (0.19-2.09)	2.51 (0.81-7.73)	1.91 (1.01-3.60)	1.59 (0.66-3.83)	0.47 (0.17-1.30)
Do groceries	1.47 (0.31-6.96)	1.28 (0.25-6.56)	0.22 (0.05-1.00)	1.29 (0.54-3.09)	2.21 (0.56-8.73)	0.40 (0.12-1.37)
Visit family or friends	3.18 (0.87-11.70)	1.01 (0.34-3.03)	2.53 (0.86-7.43)	0.40 (0.21-0.78)	1.14 (0.48-2.67)	0.50 (0.21-1.19)
Walk the dog or go outside with kids	0.97 (0.33-2.84)	0.55 (0.07-4.46)	0.68 (0.13-3.55)	2.27 (0.87-5.95)	0.41 (0.13-1.27)	0.96 (0.30-3.08)
Walk or exercise outside	1.81 (0.53-6.11)	1.86 (0.68-5.03)	0.08 (0.03-0.26)	0.75 (0.40-1.40)	3.53 (1.41-8.83)	1.03 (0.44-2.43)
Take care of someone	1.27 (0.44-3.67)	0.23 (0.03-1.79)	0.35 (0.07-1.74)	1.22 (0.36-4.08)	2.07 (0.66-6.46)	0.86 (0.29-2.57)
Pick up prescription medicines or visit doctor	2.98 (0.99-8.94)	1.77 (0.57-5.54)	0.90 (0.28-2.95)	0.82 (0.39-1.74)	1.38 (0.53-3.61)	1.26 (0.44-3.60)
Attend religious service	Omitted	0.73 (0.09-6.09)	1.26 (0.23-6.86)	2.76 (1.49-5.11)	0.73 (0.26-2.10)	0.59 (0.12-2.84)
Visit cultural place	1.41 (0.43-4.64)	0.89 (0.10-7.57)	0.29 (0.03-2.49)	0.51 (0.04-5.91)	3.81 (0.77-18.83)	Omitted
Visit bar or restaurant	1.37 (0.49-3.81)	0.48 (0.06-3.79)	0.17 (0.05-0.67)	0.35 (0.11-1.15)	0.76 (0.29-2.02)	0.90 (0.33-2.44)
Indoor sports	1.79 (0.46-7.02)	1.26 (0.29-5.47)	0.75 (0.15-3.72)	0.79 (0.30-2.10)	1.81 (0.58-5.67)	1.34 (0.29-6.18)
Visit recreational park	1.23 (0.43-3.54)	1.45 (0.31-6.76)	0.65 (0.12-3.47)	0.79 (0.14-4.45)	0.97 (0.35-2.68)	0.54 (0.19-1.56)
Frequency of using public transportation in the past week*						
0 days	1	1	1	1	1	1
1-2 days	0.74 (0.20-2.72)	0.81 (0.20-3.26)	0.29 (0.08-1.04)	0.73 (0.31-1.72)	2.76 (1.01-7.51)	0.40 (0.14-1.11)
3-4 days	0.97 (0.17-5.69)	Omitted	0.44 (0.10-1.98)	1.01 (0.40-2.56)	3.35 (0.64-17.39)	0.59 (0.16-2.21)
5-7 days	Omitted	1.06 (0.25-4.42)	1.88 (0.27-13.04)	0.91 (0.43-1.93)	2.72 (0.47-15.72)	0.21 (0.03-1.68)

Number of unique visitors at home in the past week^{*,†}

0	1	1	1	1	1	1
1	1.64 (0.32-8.50)	0.37 (0.07-1.92)	0.54 (0.13-2.20)	0.47 (0.19-1.20)	0.09 (0.01-0.69)	0.13 (0.02-1.03)
2-4	0.98 (0.28-3.38)	1.07 (0.31-3.68)	4.68 (1.32-16.65)	0.57 (0.25-1.29)	0.96 (0.34-2.68)	1.09 (0.39-3.05)
5+	2.98 (0.75-11.92)	3.68 (0.53-25.58)	2.86 (0.54-15.15)	1.02 (0.17-5.93)	0.33 (0.09-1.25)	0.30 (0.07-1.38)
Travelled abroad in 2020[*]						
No	1	1	1	1	1	1
Yes	2.97 (1.03-8.60)	4.06 (1.40-11.76)	2.76 (0.77-9.89)	0.44 (0.22-0.88)	1.17 (0.49-2.78)	2.01 (0.86-4.70)

Abbreviations: CI, confidence interval; HELIUS, Healthy Life in an Urban Setting; N.A., not applicable; OR, odds ratio. Participants with an equivocal test result were excluded from this analysis. Some strata too few participants in order to be included in this model and were automatically omitted from the analysis.

* Measured at COVID-1 visit (2020) † Measured at baseline (2011-2015) ‡ Quartiles § Presumed higher exposure categories had priority, i.e. if someone was working in a school and as a careworker, they were categorized as a health worker. Caretakers were not included as a category because many had other jobs.

NB.

- In multivariable analysis for the Dutch group, the distribution of educational level and labor participation were skewed to mostly one group and hence were not included. The following variables were removed as they were no longer significant in the multivariable model: dichotomized household size, age, occupational level, number of times left home, living with child 18+ years old, job setting, and leaving home to pick up prescription medicine or visit doctor in the past weeks.
- In multivariable analysis for the South-Asian Surinamese group, the distribution of occupational level and number of times left home were skewed to mostly one group and hence were not included. The following variables were removed as they were no longer significant in the multivariable model: job setting, leaving home to care for someone, else dichotomized household size.
- In multivariable analysis for the African Surinamese group, the distribution of migration generation was skewed to mostly one group and hence were not included. The ORs for having a household member suspected of infection, walk or exercise outside, living with a child 4-12 years old, leaving home to visit bar or restaurant, and household size were extremely high with overinflated 95%CI, and hence were not included. The following variables were removed as they were no longer significant in the multivariable model: leaving home to work, traveling with public transport, leaving home to care for someone, visiting friends or family, occupational level, travelling abroad, leaving home to do groceries, labor participation, age, living with a child 13-17 years old.
- In multivariable analysis for the Ghanaian group, the following variables were removed as they were no longer significant in the multivariable model: living with a child 18+ years old, leaving home to visit bar or restaurant, travelling abroad, living with a child 13-17 years old, visiting friends or family, walk the dog or go outside with kids, difficulty with Dutch language, district.
- In multivariable analysis for the Turkish group, the following variables were removed as they were no longer significant in the multivariable model: visit cultural place, walk the dog or go outside with kids, being a caretaker, number of unique visitors past week, age, household size, district.
- In multivariable analysis for the Moroccan group, the distribution of district was skewed to mostly one group and hence were not included. The following variables were removed as they were no longer significant in the multivariable model: sex, living with other adults, number of unique visitors past week, leaving home to work, labor participation, visiting friends or family, education level, job setting, travelling abroad, groceries, number of time left house.

Supplementary Table S4. Univariable analysis of potential determinants of SARS-CoV-2 seropositivity in Ghanaian participants, Amsterdam, the Netherlands, 24 June - 9 October 2020

Characteristic	OR (95% CI)	RR (95% CI) [¶]
Sex		
Male	1	1
Female	1.25 (0.69-2.29)	1.18 (0.76-1.85)
Per year increase in age in years on 1 January 2020[†]	1.02 (0.99-1.05)	1.01 (1.00-1.03)
COVID-19 substudy visit after 15 August 2020[*]	1.37 (0.69-2.74)	1.27 (0.75-2.15)
City district[†] (other=omitted)		
Centre	Omitted	Omitted
East	1	1
West	1.02 (0.19-5.38)	1.01 (0.23-4.43)
South	3.75 (0.52-26.98)	2.85 (0.64-12.55)
New-West	1.49 (0.27-8.34)	1.41 (0.32-6.20)
Southeast	3.32 (1.00-11.07)	2.62 (0.92-7.48)
Has obesity (BMI\geq30.0)[†]		
No	1	1
Yes	0.90 (0.45-1.81)	0.93 (0.55-1.56)
Educational level[†]		
No school/elementary school	1	1
Lower vocational/ lower secondary school	0.70 (0.33-1.50)	0.78 (0.46-1.32)
Intermediary vocational/ intermediary secondary school	0.39 (0.18-0.86)	0.49 (0.27-0.89)
Higher vocational/university	0.75 (0.23-2.47)	0.82 (0.35-1.90)
Missing	0.58 (0.19-1.77)	0.68 (0.30-1.55)
Labor participation[†]		
Employed	1	1
Not in workforce	0.51 (0.09-3.08)	0.62 (0.14-2.71)
Unemployed/on benefits	1.34 (0.61-2.95)	1.20 (0.70-2.06)
Disabled	0.80 (0.32-2.01)	0.82 (0.41-1.67)
Unknown/missing	1.01 (0.39-2.58)	1.19 (0.36-3.97)
Elementary occupation[†]		
No	1	1
Yes	1.29 (0.68-2.44)	1.20 (0.75-1.92)
Missing	0.75 (0.31-1.81)	0.80 (0.40-1.59)
Difficulty with Dutch language^c		
No	1	1
Yes	3.21 (1.32-7.78)	2.56 (1.19-5.46)
Health literacy (SBSQ)[†]		
Adequate	1	1
Low	1.12 (0.58-2.15)	1.08 (0.67-1.75)
Job setting^{*,§}		
No job / caretaker only	1	1
Job with no contact within 1.5 meter	1.66 (0.69-3.99)	1.46 (0.76-2.83)
Other job with contact within 1.5 meter	1.56 (0.71-3.43)	1.40 (0.76-2.57)
Child care/schools/higher education	1.93 (0.25-15.1)	1.62 (0.40-6.64)
Bar/restaurant	1.49 (0.44-4.96)	1.35 (0.55-3.33)
Hospital/long-term care facility/Care worker elsewhere	1.11 (0.37-3.28)	1.08 (0.46-2.55)
Caretaker[*]		

No	1	1
Yes	0.80 (0.25-2.59)	0.85 (0.34-2.10)
Number of people in household*		
1 (Lives alone)	1	1
2	1.85 (0.63-5.50)	1.67 (0.66-4.23)
3	1.88 (0.62-5.70)	1.70 (0.66-4.35)
4	2.86 (0.96-8.48)	2.32 (0.94-5.73)
≥5	5.02 (1.59-15.86)	3.35 (1.37-8.20)
Lives with other people*	0.94 (0.47-1.91)	0.96 (0.57-1.60)
Partner	1.28 (0.68-2.39)	1.20 (0.76-1.89)
Children up to 3 years old	2.54 (1.00-6.46)	1.87 (1.08-3.24)
Children 4 through 12 years old	1.17 (0.59-2.33)	1.12 (0.68-1.85)
Children 13 through 17 years old	1.97 (1.02-3.80)	1.61 (1.03-2.50)
Children 18+ years old	1.52 (0.84-2.73)	1.35 (0.89-2.05)
Parents or parents-in-law	Omitted	Omitted
Other adults	1.08 (0.51-2.30)	1.06 (0.61-1.83)
Household member/steady partner with suspected infection*		
N.A./No	1	1
Yes	1.20 (0.30-4.78)	1.14 (0.43-3.03)
Number of times left home in the past week**		
0-7	1	1
8-11	0.90 (0.45-1.77)	0.92 (0.56-1.53)
12-16	1.07 (0.43-2.63)	1.05 (0.55-2.00)
17+	0.67 (0.24-1.89)	0.74 (0.33-1.66)
In the past week, left home to*:		
Work	1.91 (1.01-3.60)	1.63 (1.00-2.66)
Do groceries	1.29 (0.54-3.09)	1.21 (0.62-2.39)
Visit family or friends	0.40 (0.21-0.78)	0.50 (0.29-0.84)
Walk the dog or go outside with kids	2.27 (0.87-5.95)	1.74 (0.98-3.08)
Walk or exercise outside	0.75 (0.40-1.40)	0.81 (0.51-1.28)
Take care of someone	1.22 (0.36-4.08)	1.15 (0.49-2.70)
Pick up prescription medicines or visit doctor	0.82 (0.39-1.74)	0.86 (0.49-1.53)
Attend religious service	2.76 (1.49-5.11)	2.07 (1.34-3.21)
Visit cultural place	0.51 (0.04-5.91)	0.59 (0.07-4.63)
Visit bar or restaurant	0.35 (0.11-1.15)	0.42 (0.15-1.20)
Indoor sports	0.79 (0.30-2.10)	0.83 (0.39-1.78)
Visit recreational park	0.79 (0.14-4.45)	0.83 (0.22-3.21)
Frequency of using public transportation in the past week*		
0 days	1	1
1-2 days	0.73 (0.31-1.72)	0.79 (0.42-1.51)
3-4 days	1.01 (0.40-2.56)	1.01 (0.52-1.96)
5-7 days	0.91 (0.43-1.93)	0.94 (0.54-1.62)
Number of unique visitors at home in the past week**		
0	1	1
1	0.47 (0.19-1.20)	0.56 (0.26-1.20)
2-4	0.57 (0.25-1.29)	0.65 (0.34-1.24)
5+	1.02 (0.17-5.93)	1.01 (0.29-3.49)
Travelled abroad in 2020*		
No	1	1
Yes	0.44 (0.22-0.88)	0.53 (0.30-0.92)

Abbreviations: CI, confidence interval; HELIUS, Healthy Life in an Urban Setting; OR, odds ratio; RR, relative risk ratio. Those with an equivocal test result were excluded from this analysis

* Measured at COVID-1 visit (2020) † Measured at baseline (2011-2015) ‡ Quartiles § Presumed higher exposure categories had priority, i.e. if someone was working in a school and as a careworker, they were categorized as a health worker. Caretakers were not included as a category because many had other jobs. ¶ Obtained from a log-binomial regression model.