

## Supplementary figures and tables

### Proximity to livestock farms and COVID-19 in the Netherlands, 2020-2021

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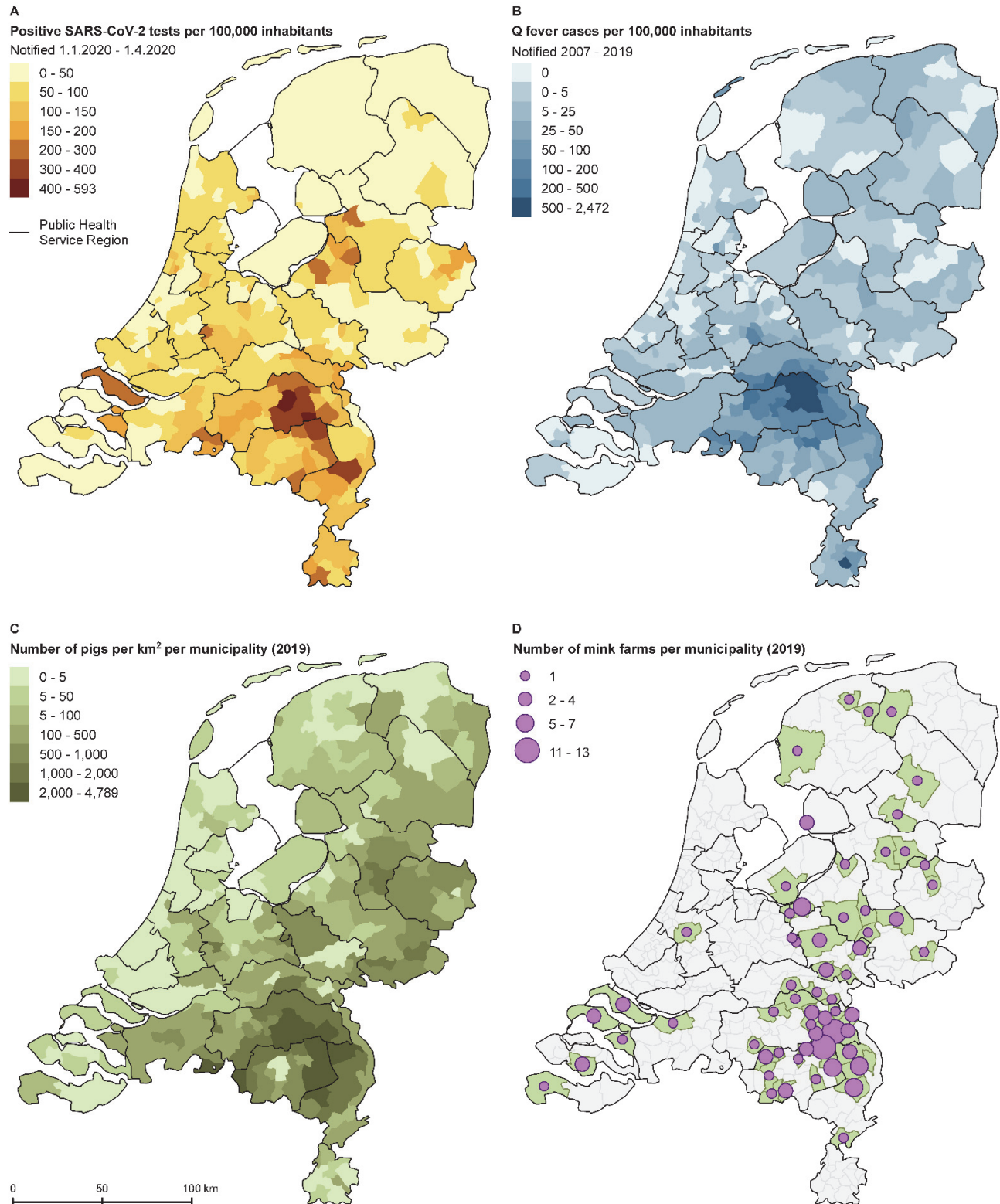


Figure S1. Panel plot with maps of the Netherlands, illustrating the spatial patterns that triggered societal discussion about the relation between COVID-19 and livestock farming (panel A-D). A: Notified COVID-19 deaths per municipality between 31 January and 5 April 2020. B: Notified Q fever cases per municipality during 2007 – 2009. C: Number of pigs per km<sup>2</sup> per municipality in 2019. D: Number of mink farms per municipality in 2019.

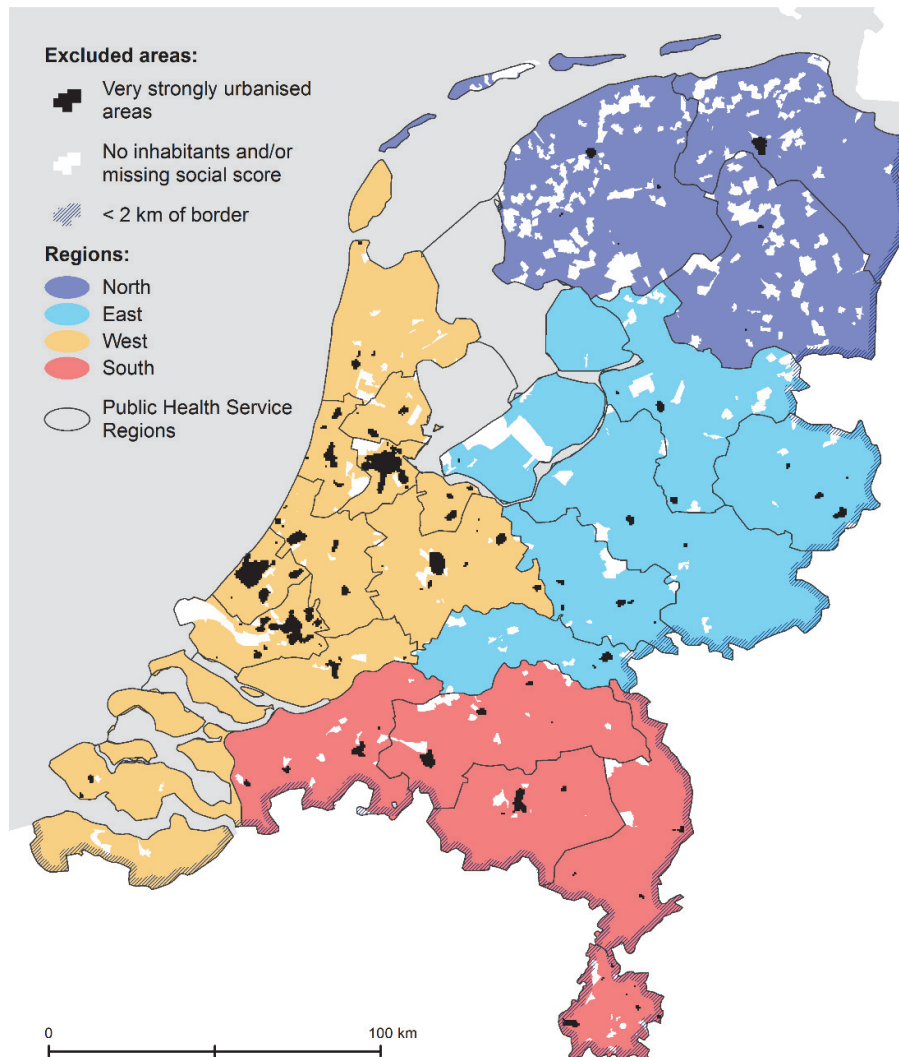


Figure S2. Map of the Netherlands illustrating the 25 regional catchment areas of Public Health Services, the four regions, and the very strongly urbanised areas ( $\geq 2,500$  addresses per km<sup>2</sup>), the area within two kilometres of the border with Belgium or Germany, and areas with no inhabitants and/or a missing social score. Areas with presence of a nursing home were too small in size to be shown.

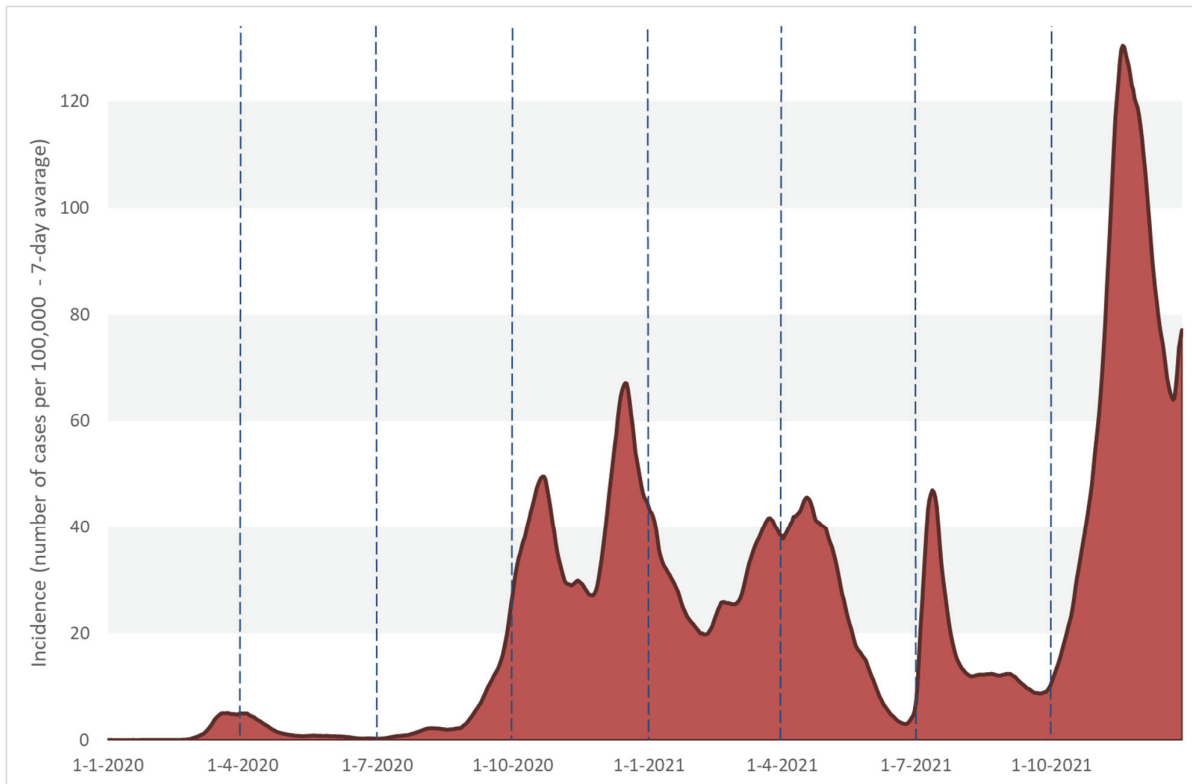


Figure S3. Rolling 7-day average incidence of reported positive SARS-Cov-2 tests by date of disease onset in 2020-2021, shown for the study population. Testing upon symptoms became available to the general public on 1 June 2020.

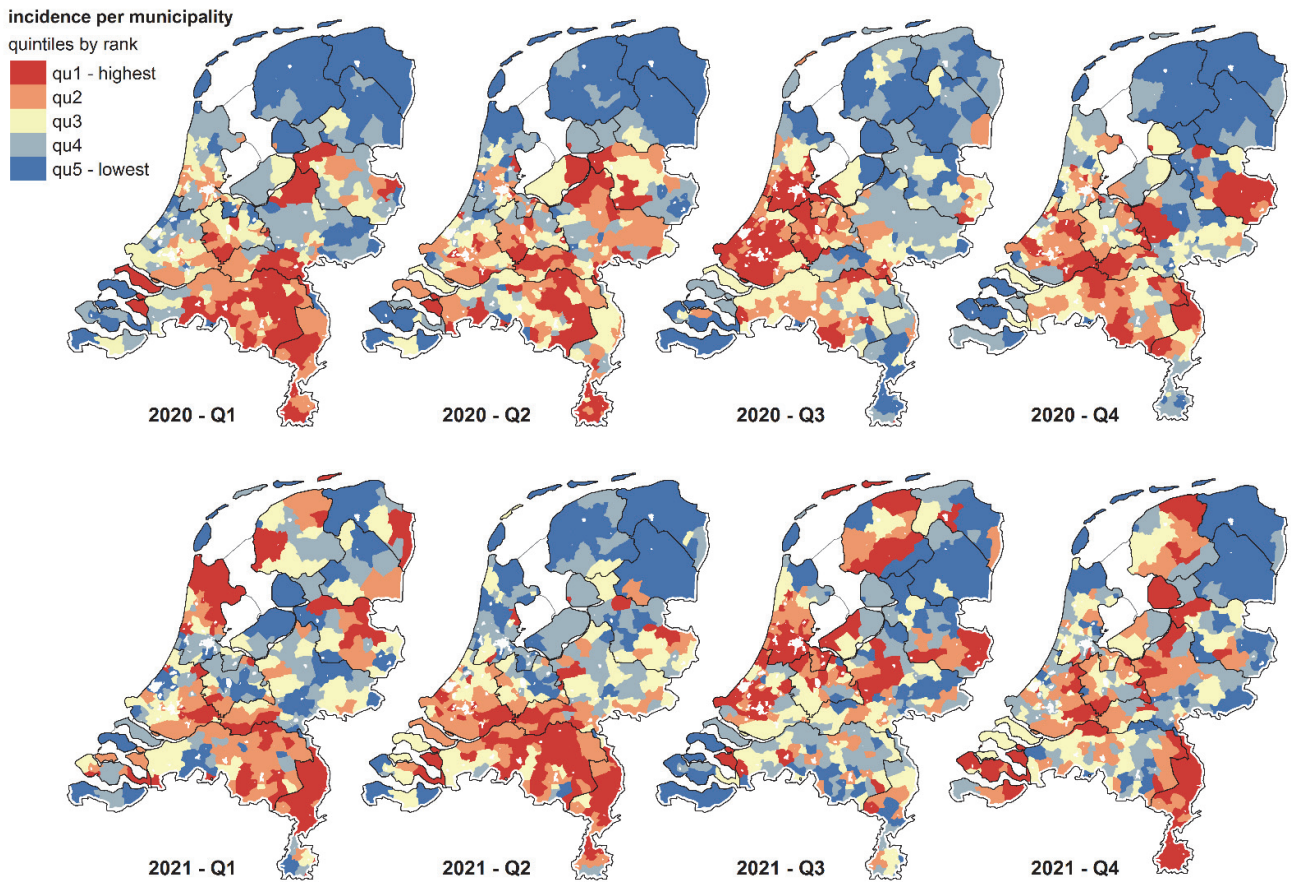


Figure S4. Eight-Panel plot illustrating notified positive SARS-CoV-2 tests per 100,000 study population per municipality for eight phases of the COVID-19 epidemic (quarters 1 – 4 of 2020 and 2021). For each phase, municipalities were ranked according to the proportion of individuals with a positive test, and categorised in five quintiles (qu1 – qu5). Areas in white indicate the excluded border areas and very strongly urbanised areas. Areas excluded due to a missing social score or presence of a nursing home are not shown.

Tabel S1. Upper and lower bounds of quintiles of distance of residential address to the nearest livestock farm in kilometres, per type of farm.

Type of farm	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Livestock of any type	[0,0.421]	(0.421,0.682]	(0.682,0.975]	(0.975,1.42]	(1.42,6.48]
Cattle	[0,0.52]	(0.52,0.836]	(0.836,1.19]	(1.19,1.73]	(1.73,7.44]
Goat	[0,2.48]	(2.48,3.6]	(3.6,4.81]	(4.81,6.67]	(6.67,10]
Sheep	[0,0.841]	(0.841,1.4]	(1.4,1.98]	(1.98,2.83]	(2.83,10]
Horse	[0,1.25]	(1.25,1.86]	(1.86,2.49]	(2.49,3.36]	(3.36,10]
Pig	[0,1.28]	(1.28,2.14]	(2.14,3.28]	(3.28,5.3]	(5.3,10]
Poultry	[0,1.7]	(1.7,2.76]	(2.76,4.07]	(4.07,6.04]	(6.04,10]
Rabbit	[0,4.1]	(4.1,6.01]	(6.01,7.39]	(7.39,8.71]	(4.07,6.04]
Mink	[0,3.35]	(3.35,5.11]	(5.11,6.58]	(6.58,8.33]	(8.33,10]

Table S2. Odds ratios (95% confidence interval) for categories of distance to nearest livestock farm (0-250, 250-500, 500-750, 750-1000 m, and over 1000 m) for being notified with a positive SARS-CoV-2 test. Sensitivity analyses with different combinations of covariates, for different study populations (including borders areas, including postal codes with nursing homes and stratified by urbanisation level), and for the period July 2020 – December 2021.

Type of analysis	n	cases <sup>a</sup>	Distance of residential address to the nearest livestock farm				
			0 - 250 m OR (95% CI) <sup>b</sup>	251-500 m OR (95% CI) <sup>b</sup>	501-750 m OR (95% CI) <sup>b</sup>	751-1000 m OR (95% CI) <sup>b</sup>	1-10 km ref <sup>b</sup>
<b>Sensitivity analyses<sup>c</sup></b>							
Without all covariates	12,628,244	2,223,692	1.10 (1.10-1.11)***	1.06 (1.06-1.06)***	1.03 (1.03-1.04)***	1.01 (1.00-1.01)***	1
Without age group			1.11 (1.10-1.12)***	1.07 (1.06-1.07)***	1.04 (1.03-1.04)***	1.01 (1.01-1.02)***	1
Without PM <sub>10</sub> and NO <sub>2</sub>			1.11 (1.11-1.12)***	1.07 (1.06-1.07)***	1.04 (1.04-1.04)***	1.01 (1.01-1.02)***	1
Without social score			1.11 (1.10-1.12)***	1.07 (1.06-1.07)***	1.04 (1.03-1.04)***	1.01 (1.01-1.02)***	1
Without PM <sub>10</sub> , NO <sub>2</sub> and social score			1.11 (1.10-1.12)***	1.07 (1.06-1.07)***	1.04 (1.04-1.04)***	1.01 (1.01-1.02)***	1
Social score included as quintiles			1.11 (1.10-1.11)***	1.06 (1.06-1.07)***	1.04 (1.03-1.04)***	1.01 (1.01-1.02)***	1
PM <sub>10</sub> included as quintiles			1.11 (1.10-1.12)***	1.07 (1.06-1.07)***	1.04 (1.03-1.04)***	1.01 (1.01-1.02)***	1
NO <sub>2</sub> included as quintiles			1.10 (1.10-1.11)***	1.06 (1.06-1.07)***	1.04 (1.03-1.04)***	1.01 (1.01-1.02)***	1
<b>Study populations<sup>c</sup></b>							
With border areas	13,058,100	2,300,842	1.11 (1.10-1.11)***	1.06 (1.06-1.07)***	1.04 (1.03-1.04)***	1.01 (1.01-1.02)***	1
With nursing home postal codes	12,795,960	2,266,936	1.11 (1.10-1.11)***	1.06 (1.06-1.07)***	1.04 (1.03-1.04)***	1.01 (1.01-1.02)***	1
<b>Urbanisation level:</b>							
-Very strongly (≥2,500 addresses/km <sup>2</sup> )	3,983,302	713,296	0.97 (0.94-1.01)	0.98 (0.96-1.00)*	1.00 (0.99-1.01)	1.00 (0.99-1.01)	1
-Highly (1,500-2,499 addresses/km <sup>2</sup> )	4,206,920	736,671	1.04 (1.02-1.06)***	1.01 (1.00-1.02)**	1.01 (1.00-1.02)	1.00 (0.99-1.01)	1
-Moderate (1,000-1,499 addresses/km <sup>2</sup> )	2,850,442	496,707	1.02 (1.00-1.04)*	1.03 (1.02-1.04)***	1.01 (1.00-1.02)**	1.01 (1.00-1.02)	1
-Low (500-999 addresses/km <sup>2</sup> )	2,836,049	506,653	1.05 (1.04-1.06)***	1.03 (1.02-1.04)***	1.03 (1.02-1.04)***	1.00 (1.00-1.01)	1
-Non-urban (<500 addresses/km <sup>2</sup> )	2,734,833	483,661	1.07 (1.06-1.08)***	1.04 (1.03-1.05)***	1.03 (1.02-1.04)***	1.00 (0.99-1.02)	1
- Non-urban, low and moderate (<1,500 addresses/km <sup>2</sup> )	8,421,324	1,487,021	1.10 (1.09-1.11)***	1.06 (1.05-1.07)***	1.04 (1.03-1.04)***	1.01 (1.00-1.02)**	1
Period 1 July 2020 – 31 December 2021	12,597,444	2,192,892	1.11 (1.10-1.12)***	1.07 (1.06-1.07)***	1.04 (1.04-1.04)***	1.01 (1.01-1.02)***	

. p < 0.1, \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

<sup>a</sup> Individuals with a notified positive SARS-CoV-2 test and with estimated symptom onset before 1 January 2022, excluding those without available data on age and 6-digit postal code area.

<sup>b</sup> Model with 25 regional catchment areas of Public Health Services as random effect adjusted for age category, social status of the four-digit postal-code area, and annual average concentration of PM<sub>10</sub> and NO<sub>2</sub> in 2019 of the six-digit postal-code area (unless specified otherwise)

<sup>c</sup> Excluding residential addresses in areas with a missing social score, with presence of a nursing home, in very strongly urbanised areas, or within 2,000 meters of the border of Germany or Belgium unless specified otherwise.