Uitbraakonderzoek zangkoren, sept-okt 2020

Achtergrond

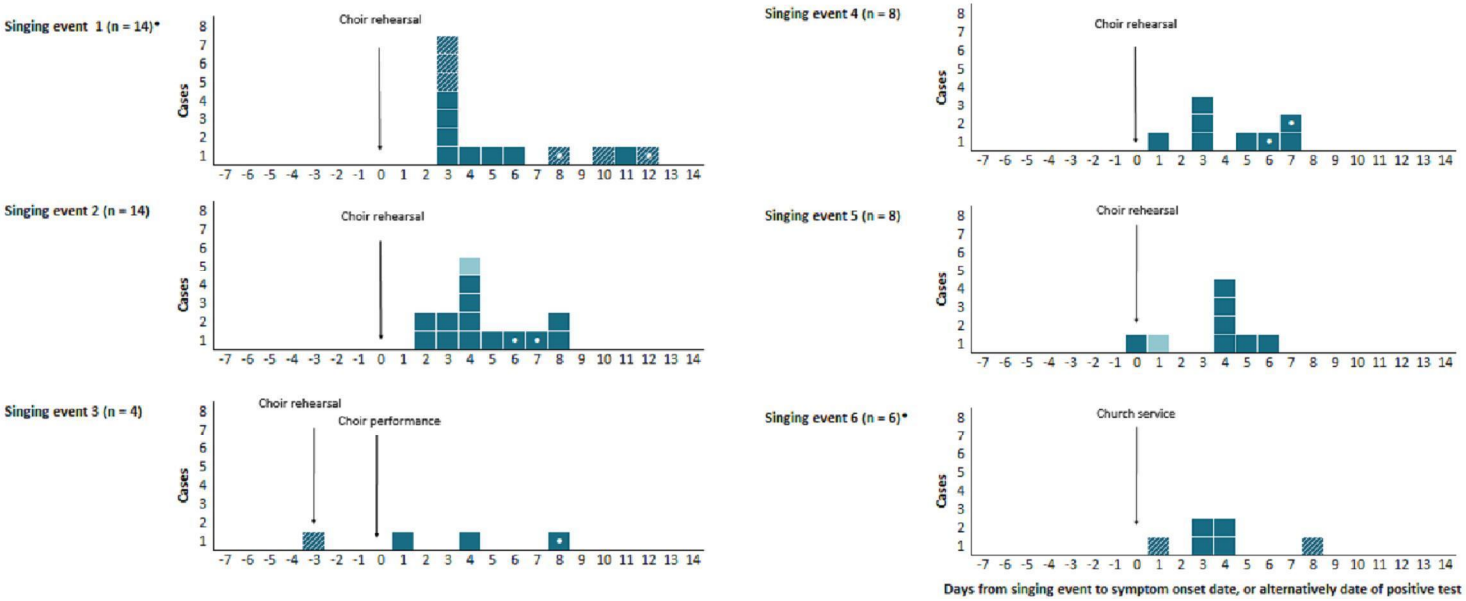
- Tijdens eerste golf, beschrijving van clusters bij koren in literatuur en media
- Onduidelijke oorzaak: nauw contact of zingen zelf
- Vanaf juni/juli zingen weer toegestaan vanwege lage incidentie, onder voorwaarden (bv. zigzag formatie)
- In september/oktober meldingen van uitbraken onder zangkoren ondanks maatregelen → uitbraakonderzoek onder zes koren

Doel onderzoek

- To investigate whether singing increased the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission during six singing events.
- To describe the outbreaks in terms of person, place and time and depict potential routes of SARS-CoV-2 transmission for each singing event.

Data verzameling

- Media/GGD: 6 zangkoren → 4 repetities, 1 uitvoering, 1 kerkdienst
- Koorleider: vragenlijst omstandigheden, opstelling
- Koorleden: vragenlijst, OSIRIS
  - SARS-CoV-2 infectie: 1e ziektedag, symptomen
  - Omstandigheden tijdens/rond event: 1,5m, plaats opstelling, reizen naar event
  - Contact positief persoon voor event
- Sequencing


Singing event 1 (n = 14)*
Choir rehearsal
Singing event 2 (n = 14)
Choir rehearsal
Singing event 3 (n = 4)
Choir rehearsal
Choir performance
Singing event 4 (n = 8)
Choir rehearsal
Singing event 5 (n = 8)
Choir rehearsal
Singing event 6 (n = 6)*
Church service
Cases
Days from singing event to symptom onset date, or alternatively date of positive test
Case classification
Confirmed case
Probable case
Date source
Date of symptom onset
Date of positive test (No symptoms)
Data source
Questionnaire
National Notifable Surveillance Database

	Singing event 1	Singing event 2	Singing event 3	Singing event 4	Singing event 5	Singing event 6
Characteristics of singing group members						
Attack rate*	74% (14/19)	67% (14/21)	25% (4/16)	53% (8/15)	57% (8/14)	67% (6/9)
Questionnaire response rate	58% (11/19)	95% (20/21)	69% (11/16)	73% (11/15)	100% (14/14)	78% (7/9)
Median age (range)	74 (60-89)*	62.5 (54-74)	69 (39-79)	51 (32-70)	57.5 (32-74)	41 (20-55)*
Specimens sequenced	0	0	1**	0	2	5
Characteristics of venue where singing event took place						
Venue type	Hall	Hall	Church	Hall	Hall	Church
Size of venue (l x w x h)m^3	80m^2 + roof ~8m	143	?	561 (11x8.5x6)	~320	3000 (20x15x10)
Duration of event (mins)	90	120	60	150	120	60
Duration of singing (mins)	50	~80	20	120	~90	20
Duration of break (mins)	15	5	NA	15	15	NA
Number of doors open						
Facing inside	1	2	?	1	2	2
Facing outside	1	1	?	0	0	0
Number of windows open	0	2	?	2	6	1

		Singing event 1 (n = 8)	Singing event 2 (n = 14)	Singing event 3 (n = 3)	Singing event 4 (n = 8)	Singing event 5 (n = 8)	Singing event 6 (n = 6)
Kept 1.5m distance during the rehearsal/ performance	Yes	8	14	3	7	8	6
	No	0	0	0	1	0	0
Kept 1.5m distance during the break	Yes	?	?	NA	6	8	NA
	No	?	?	NA	2	0	NA
Had contact before/after the rehearsal/ performance	Yes	2	2	0	3	2	2
	No	6	12	3	5	6	4
Kept 1.5m distance before/ after the singing event	Yes	2	2	NA	0	0	2
	No	0	0	NA	3	2	0
Travelled together to/from the singing event	Yes	3	3	0	2	5	0
	No	5	11	3	6	3	6
Kept 1.5m distance during travel	Yes	0	0	NA	0	1	NA
	No	3	3	NA	1	4	NA
Felt (cold) air flow during the singing event	Yes	2*	?*	0	4	2	1
	No	?*	?*	3	4	6	5
Toilet used during the break	Yes	?	?	0	6	1	4
	No	?	?	3	2	7	2
Sang in another singing group 14 days prior to singing event	Yes	1	1	0	0	0	1
	No	7	13	3	8	8	5
Had contact with person tested positive for SARS-CoV-2 in the 14 days prior to singing event	Yes	0	0	1	1	0	1
	No	8	14	2	7	8	5

Samenvatting

- Hoge attack rate (25-74%)
- Epicurves → cases gerelateerd aan event, behalve voor event 3
- Sequencing → weinig data
- In het algemeen hielden koren zich aan maatregelen, maar in pauze en rondom event deels niet
- Aerogene transmissie?
  - Grootte ruimte
  - Ventilatie
  - Zingen

AIR-CoV model Z&O

	Scenario				Cumulative dose (virus RNA copies) /person				Illness risk/person/event			
	m^3	Q	T	C	Mean	5%	50%	95%	Mean	5%	50%	95%
1	80	0	30	9	200	52	160	490	13%	3.6%	11	29%
2	80	1	30	9	170	44	140	420	11%	3%	9.2%	26%
3	80	6	30	9	95	24	76	230	6.3%	1.7%	5.2%	15%
4	80	0	60	9	740	190	590	1800	37%	13%	34%	71%
5	80	1	60	9	560	140	450	1300	30%	9.6%	27%	61%
6	80	6	60	9	230	59	180	550	14%	4%	12%	32%
7	80	0	120	9	2500	650	2000	6100	73%	37%	75%	99%
8	80	1	120	9	1600	410	1300	3800	59%	25%	58%	93%
9	80	6	120	9	500	130	400	1200	27%	8.6%	24%	57%
10	*80*	*0*	*120*	*6*	*2.5*	*0*	*2*	*7*	*0.18%*	*0%*	*0.14%*	*0.49%*
11	800	0	30	9	20	4	16	50	1.4%	0.28%	1.1%	3.4%
12	800	1	30	9	17	4	14	44	1.2%	0.28%	0.98%	3.0%
13	800	6	30	9	9.6	1	8	24	0.67%	0.07%	0.56%	1.7%
14	800	0	60	9	76	19	60	190	5.1%	1.3%	4.1%	12%
15	800	1	60	9	57	14	45	140	3.9%	0.98%	3.1%	9.2%
16	800	6	60	9	23	5	18	57	1.6%	0.35%	1.3%	3.9%
17	800	0	120	9	260	66	210	630	16%	4.5%	14%	36%
18	800	1	120	9	160	42	130	390	10%	2.9%	8.6%	24%
19	800	6	120	9	50	12	40	120	3.4%	0.84%	2.8%	8.2%
20	*800*	*0*	*120*	*6*	*0.27*	*0*	*0*	*1*	*0.019%*	*0%*	*0%*	*0%*

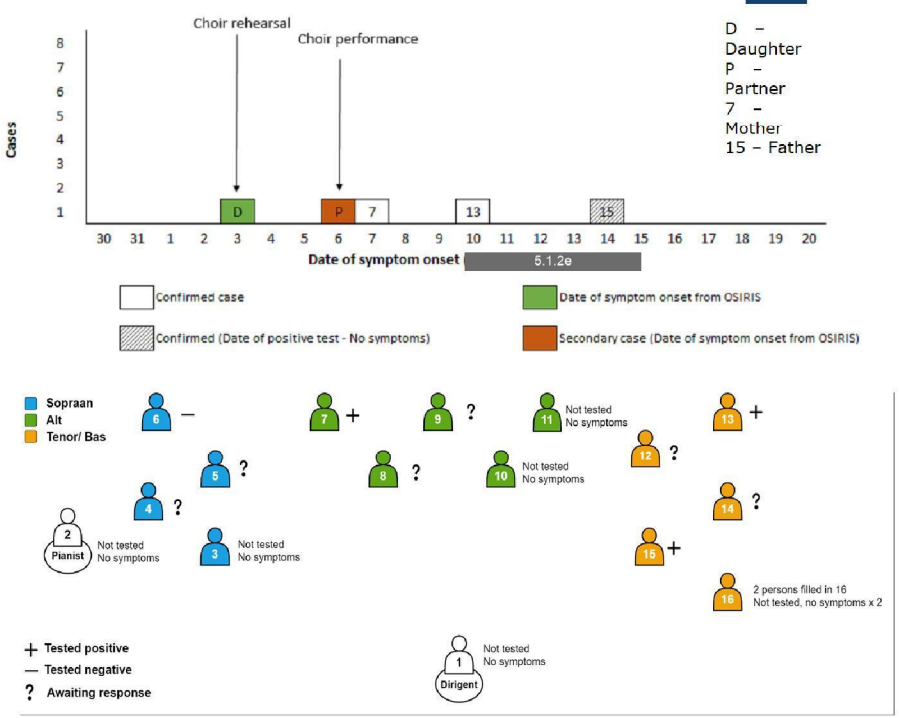
Conclusie

- Verschillende transmissieroutes kunnen hebben bijgedragen
  - Niet mogelijk om aandeel verschillende routes vast te stellen
- Transmissie binnen 1,5m (direct/droplet) en indirect contact transmissie mogelijk, maar niet waarschijnlijk dat dit hoge attack rate verklaart
- Aerogene transmissie
  - Aerosol transmissie volgens model mogelijk indien superspreader of meerdere index cases aanwezig
  - Luchtstromen door ventilatie zouden kunnen hebben bijgedragen aan droplet transmissie over >1,5m

Discussie

- Zelfs met maatregelen en goede ventilatie (?) werden deze clusters gezien
  - Maatregelen inderdaad goed nageleefd?
  - Ventilatie adequaat of misschien zelfs te veel waardoor luchtstroom ontstond wat mogelijk transmissie heeft verhoogd?
- Onder hoge infectiedruk, kans op superspreaders, en daardoor zijn dit soort clusters waarschijnlijk?
  - Versterkt door zingen wat meer aerosolen geeft dan praten (dit is nu niet duidelijk gemaakt in model uitkomsten)

5.1.2e

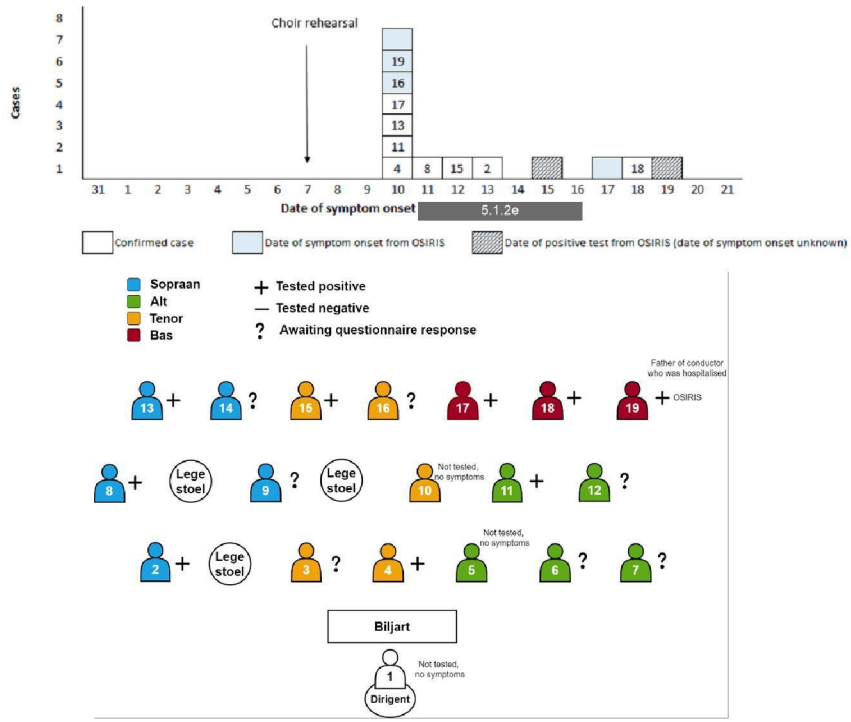


*Information on doors and windows missing

Performance date	5.1.2e
Size of room	Missing
Choir members attended	16
Duration of performance	60 minutes
Duration of singing	20 minutes
Duration of break	No break
Response rate	11/16 (69%)
Attack rate (confirmed cases)	4/11 (36%)
Laboratory specimens sequenced	2 (Mother [7] & partner of daughter identical)

Possible index case:	D Daughter [symptom onset 3 Sept)
Possible modes of transmission:	

5.1.2e



*2 doors open – a door to the hallway was open (in the hallway the entrance door to outside was open), and an emergency exit was open to outside – exact placement unknown

Rehearsal date	5.1.2e
Size of room	14x14x2.6
Choir members attended	19
Duration of rehearsal	90 minutes
Duration of singing	50 minutes
Duration of break	15 minutes
Response rate	11/19 (58%)
Attack rate (confirmed cases)	14/19 (74%)
Laboratory specimens sequenced	0

Possible index case: Unknown

Possible mode of transmission:

Direct transmission

3 x 2 choir members travelled together:
- Car 1: [6, no questionnaire] + [8, positive]
- Car 2: [19, positive] + [1, not tested] [father and son]
- Car 3: [18, positive] + [4, positive] [couple] – [18] likely became infected from [4]
- In break, one member [5, not tested, no symptoms] brought coffee to the conductor outside, kept >1.5m [1, not tested, no symptoms]

→ Less likely

Indirect transmission

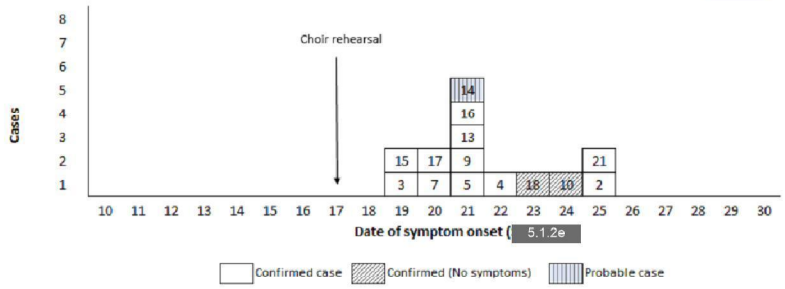
- [18, positive] prepared chairs - symptom onset quite late as rehearsal was on 7 Sept
- Everyone stayed in place during the break & staff served coffee to members

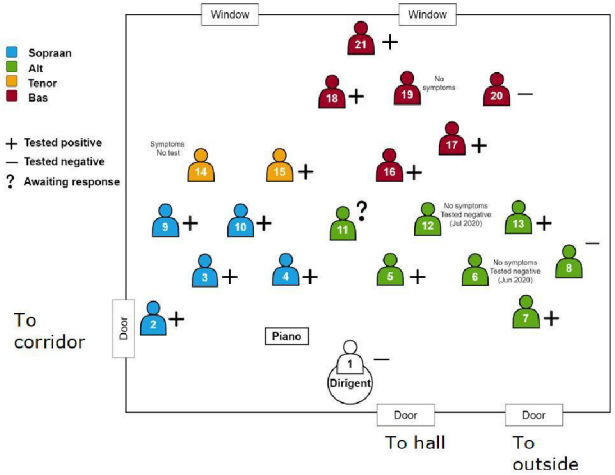
→ Less likely

Aerogenic transmission

- Cases widely dispersed
- 2 choir members [8] and [5]commented on air flow/ventilation. [5] commented there was an airflow on the side where [2],[8],[13] were.
- Supply of air from outside. Indoor air expelled to the

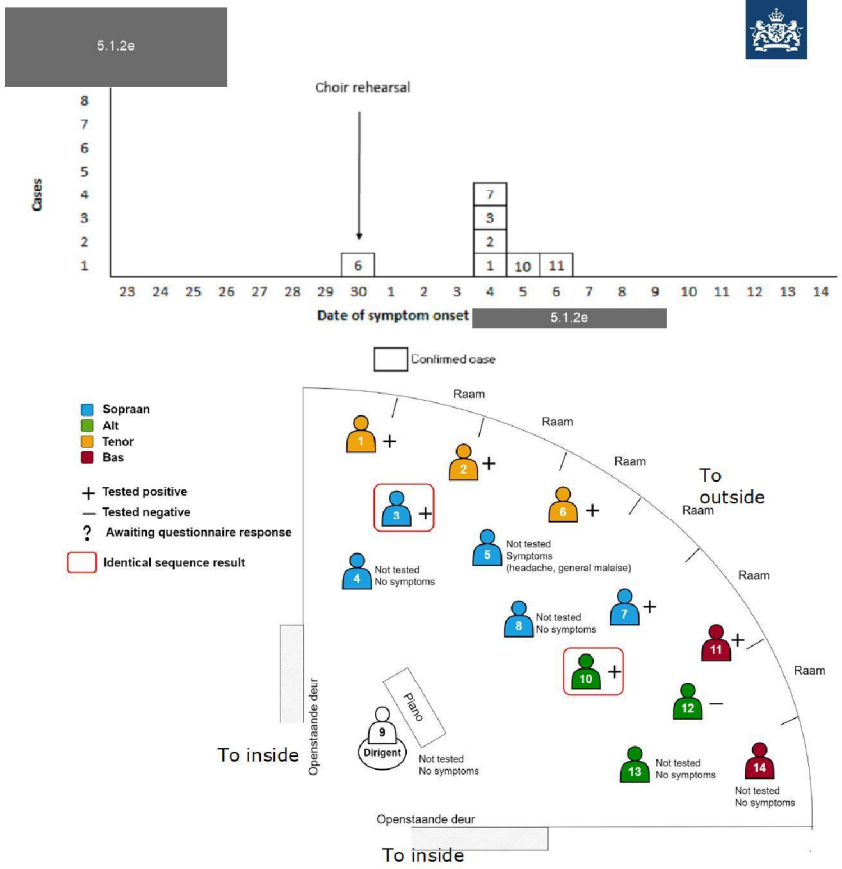
5.1.2e





Rehearsal date	5.1.2e
Size of room	143m³
Choir members attended	21
Duration of rehearsal	120 minutes
Duration of singing	~80 minutes
Duration of break	5 minutes
Response rate	20/21 (95%)
Attack rate (confirmed and probable cases)	14/21 (67%)
Laboratory specimens sequenced	0

Possible index case	[no. 15] or [no. 3] ?
Possible mode of transmission:	
Direct transmission	• Everyone kept 1.5m distance during singing event. • 10 choir members travelled together: 6 cycled together [1,3,5,6,11,12] 2 pairs (2x2) travelled together by car [7 + 8], [18+2] → Not likely
Indirect transmission	• Everyone had their own sheet music. No items shared or passed on. • There was a short 5 minute toilet break, toilets were spacious. People were very alert and kept to the 1.5 meter rule. → Not likely
Aerogenic transmission	• Cases widely dispersed. • 1 member [1] commented on airflow. • No mechanical ventilation, only open windows.



Rehearsal date	5.1.2e
Size of room	80m²
Choir members attended	14
Duration of rehearsal	120 minutes
Duration of singing	~90 minutes
Duration of break	15 minutes
Response rate	14/14 (100%)
Attack rate (confirmed cases)	7/14 (50%)
Laboratory specimens sequenced	2 (No. 3 + No. 10 identical sequences)

Possible source case [No. 6]?

Possible mode of transmission:

Direct transmission

6 choirs members travelled together:
- Biked together: 2 choir members from 1 household [7, positive + 11, positive]
- Biked together: 2 choirs members [2, positive + 10, positive]
- Car: 2 choirs members [3, positive + 5, not tested, symptoms]

→ Less likely

Indirect transmission

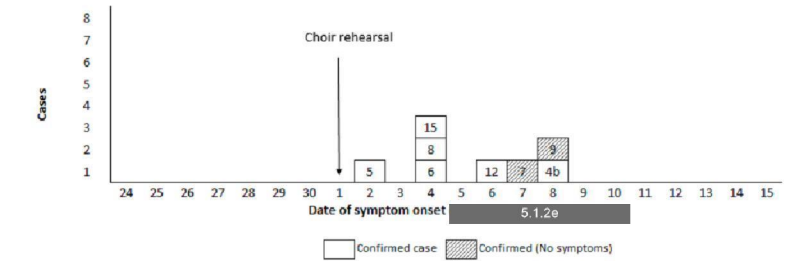
- Shared coffee machine used by touching button
- 3-4 people stacked chairs
- During the break, 1.5m kept - Shared treats but packed, they were not crowded around.

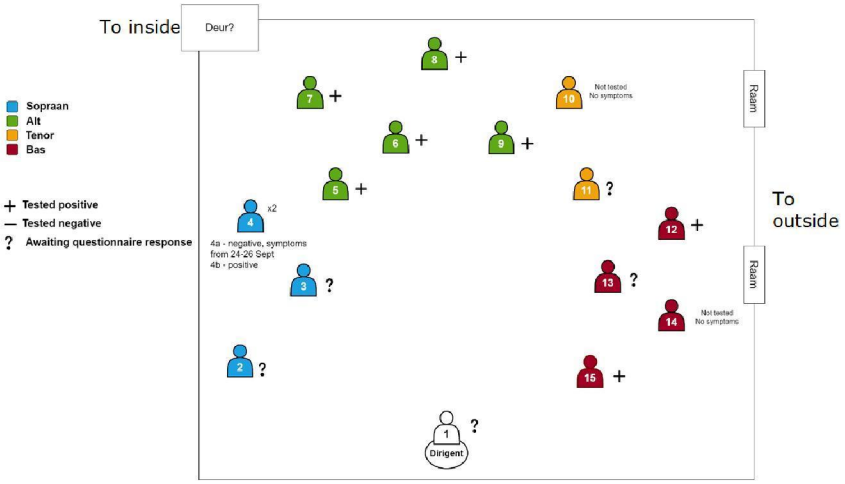
→ Possible

Aerogenic transmission

- Cases widely dispersed
- Members faced conductor throughout, except at one moment to [1] on the floor plan (it was their birthday).
- [3] and [10] have identical sequences and positioned far from each other.
- 2 members felt a (cold) air flow (1 [positive] + 5 [not tested, symptoms])

5.1.2e





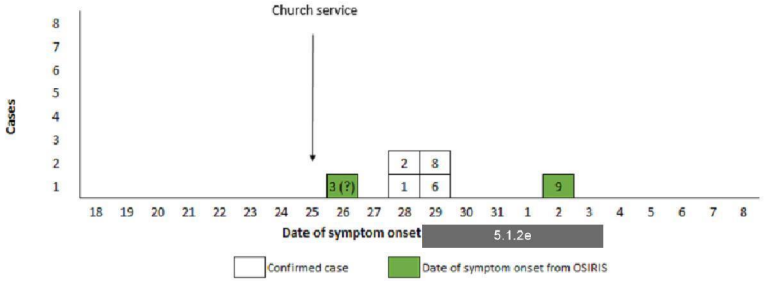
Rehearsal date	5.1.2e
Size of room	11x8.5x6
Choir members attended	15
Duration of rehearsal	150 minutes
Duration of singing	120 minutes
Duration of break	15 minutes
Response rate	11/15 (73%)
Attack rate (confirmed cases)	8/15 (53%)
Laboratory specimens sequenced	0

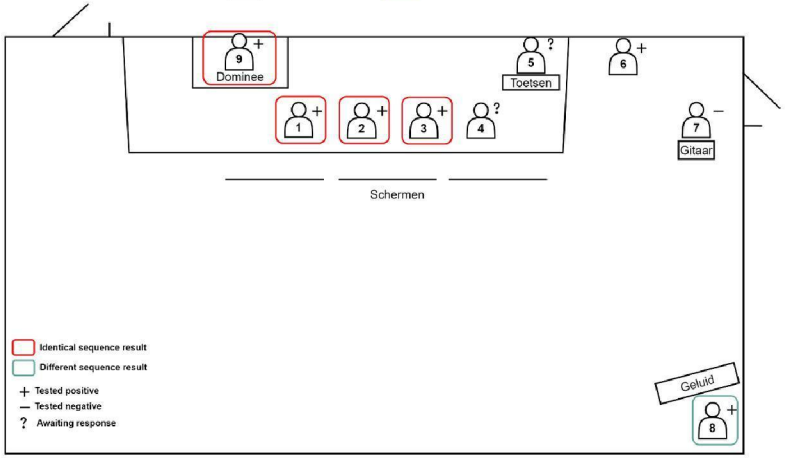
Possible index case(s)?	[No. 4]? [No. 5]? [No. 5]? (headache from 25 Sep, coughing from 2 Oct)
Possible mode of transmission:	

Direct transmission	• In the break, focal point mentions, not sure if 1.5m was kept throughout (2 members also commented in questionnaire about this too).
	• 1 member said did not keep 1.5m while entering and tidying up chairs
	• 2 pairs (2x2) travelled together by car:
	  • Car 1: [6, positive + 7, positive]
	  • Car 2: [4, negative + 10, not tested, no symptoms specified] [same household]
	
	→ Possible

Indirect transmission	• No common surfaces mentioned except for toilets which were spacious and separate for men & women. → Less likely
Aerogenic transmission	• Cases widely dispersed • 6 members said they felt a (cold) air flow • Members sang in direction of the conductor and choir members also turned around to talk/ look at each other occasionally • Ceiling ventilation system in place

5.1.2e





Church service date	5.1.2e
Size of room	20x15x10 (pointed roof)
Church service attendees	8 musical group members + 1 "dominee" + 55 attendees
Duration of church service	>60 minutes
Duration of singing	20 minutes (spread out)
Duration of break	No break
Response rate	6/9 (67%)
Attack rate (confirmed cases)	6/9 (67%)
Laboratory specimens sequenced	5/6

Possible source case	[No. 3]
Possible mode of transmission:	
Direct transmission	• [3] had contact with persons tested positive prior to singing event due to their work at a nursing home. • 2 members (No. 1 [positive] and No.8 [positive]) stated they had contact with other members before or after the church service and wore face masks. • No members travelled together to/from the church service. → Less likely
Indirect transmission	• No common objects touched. • Microphones used, they were used by the same person. throughout. Max of 3 days since last use by different person. → Less likely
Aerogenic	• 1 musical group member felt a (cold) air flow