

Supplementary Text S1: survey questions

This study was part of a larger project which evaluates COVID-19 outbreaks and all the aspects of the infection prevention policy of nursing homes in the Netherlands during the second wave of the pandemic.

Below we present the questions of the questionnaire which are related to the research questions of the current paper.

Questions about the outbreak

Q1: How many residents are living in your nursing home?

Q2: How many units are at your nursing home?

A unit is a smaller section of the nursing home where residents live together. These residents can meet each other and have often their own team of staff. The units are separated with doors or because they are on a different floor.

Example: a nursing home has four floors. At each floor two wards with 8 residents are sharing the same staffing team and a common living area. This nursing home has 8 units.

Q3: How many residents had a positive SARS-CoV-2 test since September 15th 2020?

These are residents who are infected in the nursing home. This are not residents/patients who are with a known SARS-CoV-2 infection.

Q4: How many staff members are working at your nursing home?

- 75 or less
- 76-150
- 151-225
- 226 or over

Q5: How many staff members had a positive SARS-CoV-2 test since September 15th 2020?.

Q6: How many outbreaks of SARS-CoV-2 did your nursing home experience since September 15th 2020?

An outbreak are one or more residents with a positive SARS-CoV-2 test. They are infected in the nursing home. They are not admitted with a known SARS-CoV-2 infection.

Example: At the 20th of September a residents tests positive for SARS-CoV-2. After three weeks no new infections are identified any more. At the 15th of November another resident test positive for SARS-CoV-2. In this example two outbreaks occurred.

Q7: Did your nursing home experience an outbreak of SARS-CoV-2 in the spring or summer of 2020?

- Yes
- No
- I don't know

Policy during the most recent outbreak

The next questions are about the most recent outbreak in your nursing home. An outbreak is one or more residents with a positive SARS-CoV-2 test. The resident was not admitted with a known SARS-CoV-2 infection.

Example: At the 20th of September a residents tests positive for SARS-CoV-2. After three weeks no new infections are identified any more. At the 15th of November another resident test positive for SARS-CoV-2. In this example the questions below should be answered about the outbreak which started at the 15th of November.

Q8: When was the first infection of the most recent outbreak?

(day-month-year)

Q9: At what type of unit did the outbreak start?

- Psychogeriatric care
- Somatic care
- Psychiatric care
- Short term care/rehabilitation care/intermediate care
- Palliative care
- Other (free text space)

Q10: How many residents at this unit are approximately able to follow up instruction regarding infection prevention?

- Almost nobody (<10%)
- The minority (10-40%)
- Half (40-60%)
- The majority (60-90%)
- Almost everybody (>90%)

Q11.1: Which testing policy for residents was implemented at this outbreak? (multiple answers possible)

- We test residents with symptoms
- We test residents who had unprotected contact with a positive resident
- We test the whole unit regardless of symptoms
- We test all residents of the nursing home regardless of symptoms

If the whole unit or nursing home was tested regardless of symptoms:

Q11.2: With which frequency was the testing regardless of symptoms repeated?

- We tested residents once regardless of symptoms
- less than once per week
- once per week
- more than once per week

Q12: When was the last infection of the most recent outbreak?

(day-month-year)

Q13: How many residents were tested during the most recent outbreak?

Q14: How many residents had a positive SARS-CoV-2 test during the most recent outbreak?

Q15: At how many units was the most recent outbreak?

Q16: How many residents died of COVID-19 during the most recent outbreak?

Q17: Who tested staff during the most recent outbreak? (multiple answers possible)

- Staff is tested by the nursing home
- Staff is tested by the local public health service
- Staff is tested by an external party other than the local public health service

Q18.1: Which testing policy for staff was implemented at this outbreak? (multiple answers possible)

- We test staff with symptoms
- We test staff who had unprotected contact with a positive case
- We test staff of the whole unit regardless of symptoms
- We test all staff of the nursing home regardless of symptoms

If the whole unit or nursing home was tested regardless of symptoms:

Q18.2: With which frequency was the testing regardless of symptoms repeated?

- We tested residents once regardless of symptoms
- less than once per week
- once per week
- more than once per week

Q19: How many staff members were tested during the most recent outbreak?

Q20: How many staff members had a positive test during the most recent outbreak?

Questions about the building

Q21: Do residents share a bedroom or bathroom? (multiple answers possible)

- bedroom
- bathroom
- all residents have their own bedroom and bathroom

Q22: Were common areas in use during the outbreak? (multiple answers possible)

- Restaurant
- Living room
- Fitness area
- Other
- None

Q23: Does your nursing home have a COVID-19 cohort ward?

- Yes
- Not at our nursing, but at another location of our health care organization
- No, and also no COVID-19 cohort ward available at another location

Barriers and facilitators to mitigate an outbreak

Which barriers did you experience in the mitigation of the outbreak?

Which facilitators did you experience in the mitigation of the outbreak?

Supplementary Table S1: COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

The schedule below provides information on the performed study according to the COREQ Checklist. If information is also provided in the main text of the article, the location is provided.

Topic	Guide Questions/Description	Answer
Domain 1: Research team and reflexivity		
<i>Personal Characteristics</i>		
Interviewer/facilitator	Which author/s conducted the interview or focus group?	JB, LT, MSp (<i>Methods, Data collection</i>)
Credentials	What were the researchers's credentials?	JB, MD LT, BSc MSp, Bsc (<i>Title page</i>)
Occupation	What was their occupation at the time of study?	JB: PhD Student LT and MSp: research assistant
Gender	Was the researcher male or female?	JB, LT and MSp are females.
Experience and training	What experience or training did the researcher have?	JB was trained to perform qualitative research and interviews and conducted and published qualitative studies before. LT and MSp were trained by JB. The majority of the interviews and all the focus groups were conducted by JB.
<i>Relationship with participants</i>		
Relationship established	Was a relationship established prior to study commencement?	No.
Participant knowledge of interviewer	What did the participants know about the researcher?	The occupation of the researcher.
Interviewer characteristics	What characteristics were reported about the interviewer/facilitator?	JB is a PhD student and an experienced qualitative researcher. Before her PhD, she has worked as a medical doctor for five years (geriatrics, internal medicine, neurology). During medical school she worked for six years in a nursing home as a health care aid. MSp is a medical student and LT is a psychology student. Both completed their bachelor's degree and worked as a research assistant for the project. They were trained by JB.

Domain 2: Study design		
<i>Theoretical framework</i>		
Methodological orientation and Theory	What methodological orientation was stated to underpin the study?	We used thematic analysis according to Braun (<i>Methods, Data analysis</i>)
<i>Participant selection</i>		
Sampling	How were participants selected?	Purposive sampling.
Method of approach	How were participants approached?	Health care organizations providing nursing home care were approached by email. (<i>Methods, recruitment and participant</i>) The nursing home would distribute the invitation to their employees for participation in the interviews or focus groups.
Sample size	How many participants were in the study?	31 nursing home staff members participated in the interviews. 21 nursing home staff participated in the focus groups (<i>Results, Table 2</i>) 2 managers and one elderly care physician participated in the interviews as well as in the focus groups.
Non-participation	How many people refused to participate or dropped out? Reasons?	A flow chart about participant inclusion is provided in <i>supplementary 6</i> .
<i>Setting</i>		
Setting of data collection	Where was the data collected?	Data was collected with (video) calling. (<i>Method, Data collection</i>) Participants could be at home or at the workplace.
Presence of non-participants	Was anyone else present besides the participants and the researchers?	No.
Description of sample	What are the important characteristics of the sample?	Gender, profession and work experience is provided in <i>Table 2</i> in the <i>Results</i> section.
<i>Data collection</i>		
Interview guide	Where questions, prompts, guides provided by the authors? Was it pilot tested?	Provided briefly in the <i>Method</i> section <i>interview and focus group design</i> . Complete guides and questions are provided in <i>supplementary 4 and 5</i> . The interview guide was pilot tested in the summer of 2020

		in a smaller study in the region of Amsterdam about outbreaks experienced in the first wave and was the basis for the study of outbreaks in the second wave. The focus group guide design was discussed and designed by the whole research team. After the first focus group the process was evaluated, but no adjustments to the guide were conducted.
Repeat interviews	Were repeat interviews carried out?	No. Sometimes participants provided additional information about details of their infection prevention protocols by mail after the interview. This was never about experienced barriers and facilitators.
Audio/visual recording	Did the research use audio or visual recording to collect data?	Interviews were recorded by audio, focus groups were recorded visually (<i>Methods, Data collection</i>). Of two interviews the audio recording failed. Of these interviews field notes were analyzed.
Field notes	Were field notes made during and/or after the interview or focus groups?	During the interview brief field notes were made, also to structure the interview and to give the participant space to tell their story without interruptions. The field notes were used to ask additional questions and clarifications. Since the interviews and focus groups were almost all recorded, field notes were not analyzed.
Duration	What was the duration of the interviews and focus groups?	Interviews lasted between 30-60 minutes, focus groups lasted 2,5 hours.
Data saturation	Was data saturation discussed?	Data saturation was reached after the 17 th interview. Other interviews were already planned according to the study protocol and completed.
Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No.

Domain 3: analysis and findings		
<i>Data analysis</i>		
Number of data coders	How many data coders coded the data?	Three: JB, LT, MSp.
Description of the coding tree	Did authors provide a description of the coding tree?	The coding scheme reflected the different levels of the framework: organizational, environmental and individual factors. Also, the experiences and policy choices were coded separately for the different infection prevention measures (preparation phase, testing, cohorting and use of personal protective equipment). <i>(Method, data analysis)</i>
Derivation of themes	Where themes identified in advance or derived from the data?	Both: theoretical frameworks and previous literature was used to identify the possible barriers and facilitators. However, questions were open ended and designed to explore also other barriers and facilitators. <i>(Method, interview and focus group design, data collection and data analysis)</i>
Software	What software if applicable, was used to manage the data?	MAXQDA 2020 (VERBI Software) <i>(Methods, data analysis)</i>
Participant checking	Did participants provide feedback on the findings?	No.
<i>Reporting</i>		
Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified?	Yes.
Data and findings consistent	Was there consistency between the data presented and the findings?	Yes.
Clarity of major themes	Were major themes clearly presented in the findings?	<i>Results Table 4: Barriers and facilitators.</i>
Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	In the main text <i>(Results, barriers and facilitators)</i> exceptions or diverse cases within the major themes are discussed.

Derived from Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International journal for quality in health care*, 19(6), 349-357.

Supplementary Table S2: framework interview and focus groups barriers and facilitators for implementation of weekly testing for SARS-CoV-2 during a nursing home outbreak

Components of Houghton¹	Components framework Grol&Wensing²
<u>Organizational factors</u> <ul style="list-style-type: none"> - Safety climate - Specific health and safety programs - Availability of training programs 	<u>Social context</u> <ul style="list-style-type: none"> - Opinion of colleagues - Culture of the network - Collaboration - Leadership
	<u>Organizational context</u> <ul style="list-style-type: none"> - Organization of care processes - Staff - Capacities - Resources - Structures
	<u>Economic and political context</u> <ul style="list-style-type: none"> - Financial arrangements - Regulations - Policies
<u>Environmental factors</u> <ul style="list-style-type: none"> - Physical environment - Availability of personal protective equipment 	<u>Innovation</u> <ul style="list-style-type: none"> - Advantages in practice - Feasibility - Credibility - Accessibility - attractiveness
<u>Individual factors</u> <ul style="list-style-type: none"> - Individual knowledge - Individual attitudes - Individual beliefs - Discomfort of testing 	<u>Individual</u> <ul style="list-style-type: none"> - Awareness - Knowledge - Attitude - Motivation to change - Behavioral routines
	<u>Patient</u> <ul style="list-style-type: none"> - Knowledge - Skills - Attitude - Compliance

1. Houghton, C, Meskell, P, Delaney, H, et al. Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis. Cochrane Database of Systematic Reviews 2020;(4).
2. Grol, R, Wensing, M. What drives change? Barriers to and incentives for achieving evidence-based practice. Med J Aust 2004;180(S6):S57-60.

Supplementary Text S2: interview guide following questionnaire

1. Could you tell us about your profession and your work experience?
2. How were you involved in the COVID-19 outbreak in your nursing home?
3. Could you tell us about the nursing home you are working?
 - a. Which type of care is delivered?
 - b. What does the building look like?
 - i. How did the building influence the mitigation of the outbreak?
4. Could you describe the last outbreak of COVID-19 in your nursing home?

Probing questions

 - a. Where did it start?
 - b. How did the outbreak spread over the nursing home?
 - c. Check answers of questionnaire: number of positive residents and staff and units involved.
5. Testing policy: check with answer online questionnaire. Why did the nursing home choose this strategy?

Probing questions

 - a. Feasibility of weekly testing?
 - b. Availability of tests/resources?
 - c. Did financial resources influence the testing policy?
 - d. Compliance staff/residents?
 - e. Collaboration with local public health service or other health organizations?
 - f. Other barriers/facilitators?
 - g. Would you choose the same strategy in a next outbreak? Why?
6. Check with questionnaire: availability of a cohort ward for COVID-19 in the nursing home? Why did the nursing home choose this strategy?
 - a. Where was the location of the cohort ward? Outsourcing of cohort ward to other nursing home?
 - b. Feasibility of creating a cohort ward?
 - c. Did financial resources influence the creation of a cohort ward?
 - d. Compliance staff/residents?
 - e. Would you choose the same strategy in a next outbreak? Why?
7. Were visitors allowed during outbreak?
 - a. If yes, how was this made possible? Experiences?
 - b. If no, why not? Experiences?
8. Closing question: what do you need for the mitigation of a next outbreak of COVID-19?

Supplementary Text S3: focus group design

Goal: to explore the barriers and facilitators for the implementation of a weekly testing policy during a COVID-19 outbreak in nursing homes.

Method: digital focusgroups with health care staff (managers, physicians, nurses, health care assistants) of nursing homes. Participants will be from the same profession but from different nursing homes. Participants had to be involved in an outbreak of COVID-19 of their nursing home after September 15th 2020.

Moderator: JB

Observation: MSp, LT

Time schedule

Time stamp	Duration	Topic
00:00	15 min	Participants join online focus group Check technical resources: sound, vision
00:15	10 min	Start of focus group: introduction of focus group, researchers introduce themselves, check if everybody gave informed consent, introduction of program of focus group
00:25	10 min	Participants introduce themselves
00:35	25	Question 1: How do outbreaks of COVID-19 happen in nursing homes?
01:00	10	Break
01:10	25	Question 2: What do you need to control/mitigate outbreaks of COVID-19?
01:35	25	Question 3: What are your experiences with weekly testing of residents and staff regardless of symptoms?
02:00		Summary and closing of focus group

Introduction of focus group

- Thank participants for their contribution
- Introduce moderator and observants
- Introduction of background and study aim
- How to participate in a focus group, how to use digital tools (for example chat-function and raise hand)
- Program of focus group
- Check informed consent
- start video recording of focus group

Participants introduce themselves

Research question 1: How do outbreaks of COVID-19 happen in nursing homes?

Probing questions:

- How is introduction of virus possible with the extended capacity of PPE?
- Role of management, testing, building, personnel, education, residents, family of residents?
- If you experienced an outbreak in first wave: what are the differences?

BREAK

Research question 2: What do you need to mitigate an outbreak of COVID-19?

Word cloud with menti.com. Start conversation about word cloud.

Possible probing questions:

Organizational: care processes, resources, staff

- Which care processes do you need?
 - o Communication
 - o Infection prevention
 - o Training of staff
 - o Testing
- What do you need of staff?
- Which resources do you need?
 - o Cohort ward, testing, PPE, staffing
 - o Where resources available? Why not?

Social context: Opinion of colleagues, culture of the network, collaboration, leadership

- How were you supported by the local health service and other health organizations?
- Did the safety climate/work environment influence the mitigation of the outbreak?

Innovation: Advantages in practice, feasibility, credibility, accessibility, attractiveness

- How do current guidelines support you in mitigation of outbreak? Feasibility, advantages?

Individual: knowledge, attitude, believes, motivation to change, behavioural routines

- What training do you need?
- Did you feel prepared for an outbreak?
- Knowledge of colleagues about guidelines and infection prevention?

Patient: knowledge, attitude, believes, compliance

- What do you need from residents during an outbreak?
- How did residents react to the outbreak policy?
- How was the compliance of residents for outbreak policy?

Economic and political context: Financial arrangements, regulations, policies

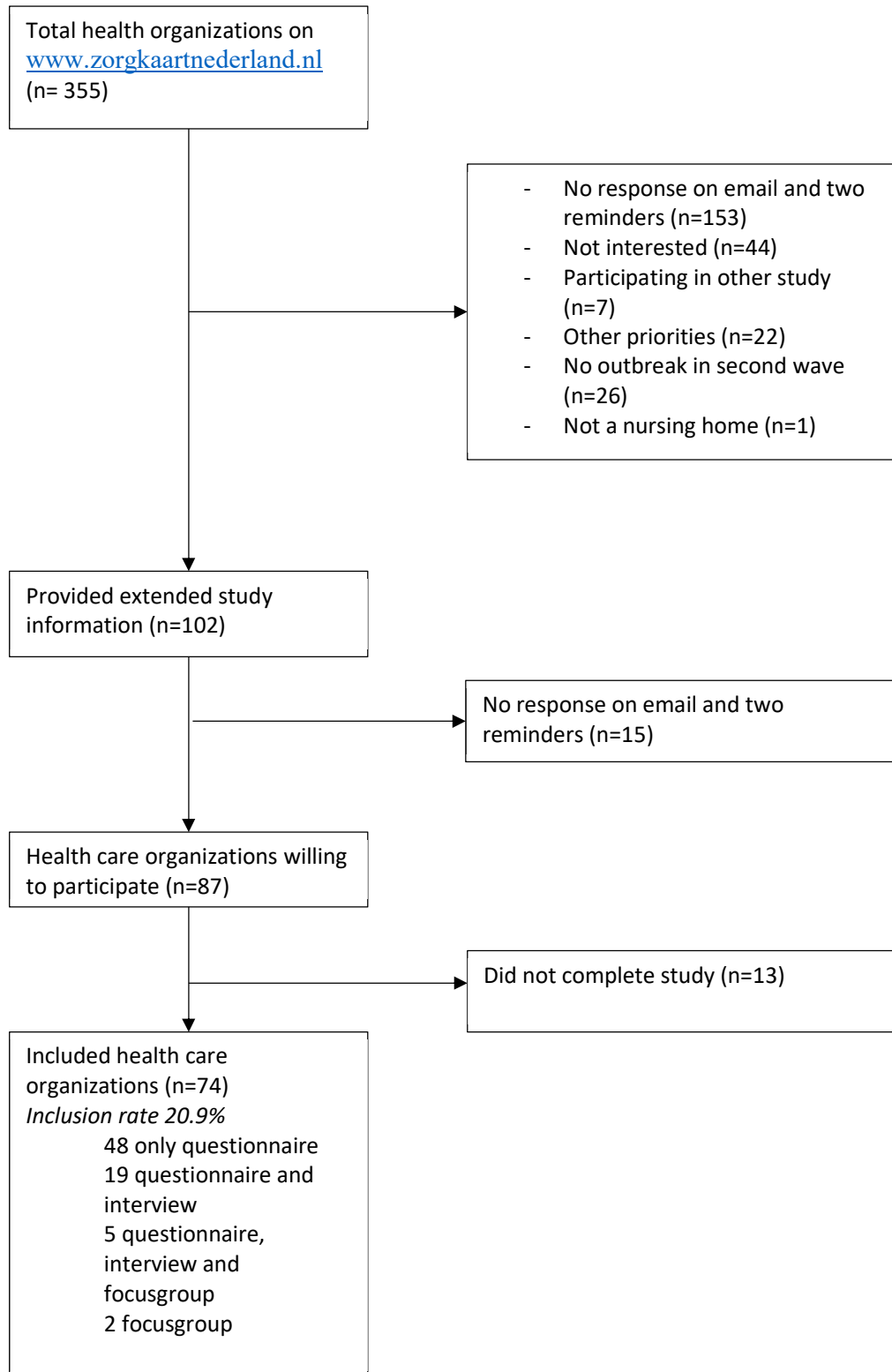
- Did you experience financial barriers?

Research question 3: What are your experiences with weekly testing of residents and staff regardless of symptoms?

Probing questions:

- Was the policy of weekly testing of residents and staff regardless of symptoms implemented in your nursing home? Why?
- What were your personal feelings about the policy?
- How did other staff experience this policy?
- How did residents experience this policy?
- How did family of residents experience this policy?
- Feasibility of the policy?
- Enough resources?
- How did you experience the leadership from management and/or physicians?
- Advantages/disadvantages of weekly testing?

Supplementary Figure S1: Flow chart of inclusion



Supplementary Table S3: responder-nonresponder analysis

	Total	Responder	Non-responder	p-value
Healthcare organizations, N	355	74	281	NA
Number of nursing homes in organization, median (IQR*)	3 (1-9)	5 (2-9)	3 (1-9)	0.095†
Provinces, N(%)				
Zuid-Holland	63 (17.7)	15 (20.3)	48 (17.1)	0.727‡
Limburg	20 (5.6)	5 (6.8)	15 (5.3)	
Overijssel	29 (8.2)	8 (10.8)	21 (7.5)	
Zeeland	10 (2.8)	2 (2.7)	8 (2.8)	
Noord-Holland	41 (11.5)	11 (14.9)	30 (10.7)	
Noord-Brabant	51 (14.4)	11 (14.9)	40 (14.2)	
Drenthe	13 (3.7)	3 (4.1)	10 (3.6)	
Flevoland	4 (1.1)	1 (1.4)	3 (1.1)	
Friesland	14 (3.9)	1 (1.4)	13 (4.6)	
Gelderland	62 (17.5)	7 (9.5)	55 (19.6)	
Utrecht	29 (8.2)	7 (9.5)	22 (7.8)	
Groningen	19 (5.4)	3 (4.1)	16 (5.7)	

*Interquartile range

† Mann-Whitney U test

‡ Chi-square test

Supplementary Table S4: Implementation of SARS-CoV-2 testing policy by nursing homes participating in surveys (N=117)

Testing policy (multiple answers possible), N (%)	For residents	For staff
Only symptomatic persons	38 (32.5)	48 (41.0)
In case of unprotected contact	33 (28.2)	24 (20.5)
Whole unit regardless of symptoms	84 (71.8)	64 (54.7)
Whole nursing home regardless of symptoms	18 (21.4)	20 (31.3)