# SARS-CoV-2 seroreversion and all-cause mortality in nursing home residents and staff post-primary course vaccination in Belgium between February and December 2021

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## Highlights

- Infection naive residents were most likely to serorevert after COVID-19 vaccination.

- After COVID-19 vaccination, a 14% (95% CI 12–16%) mortality rate was observed among residents

- 2% of the mortality cases were COVID-19 related.

# Abstract

## Background

During COVID-19 vaccine implementation, information on the persistence of antibody response and impact on mortality in nursing home residents was limited, as they were underrepresented in vaccine clinical trials and real-world data was lacking.

## Objectives

(1) Measure the persistence of the SARS-CoV-2 antibody response and predictors for seroreversion after primary course COVID-19 vaccination in nursing home residents compared to staff and (2) assess all-cause mortality and predictors in nursing home residents after primary COVID-19 vaccination.

## Methods

Seroprevalence and mortality data were collected within a national serosurveillance study in 1640 residents and 1368 staff from 69 nursing homes proportionally spread across Belgium between February and December 2021. To assess the persistence of the antibody response, parametric exponential survival models with interval censoring were fitted, reported with the percentage of seroreverters 120 and 140 days post-primary course vaccination. Furthermore, all-cause mortality rate was calculated and COVID-19 mortality was descriptively reported. Predictors of seroreversion and all-cause mortality were estimated using Cox proportional hazards model.

## Results

Nursing home residents were 47% more likely to serorevert in the 10 months after COVID-19 vaccination than staff. Infection naïvety, older age and high resident care dependency level were found as predictors for seroreversion. The all-cause mortality rate in vaccinated residents over 10 months was 14% (95% CI 13–16%) (*n*=229). In 2 % of cases, COVID-19 infection was the reported cause of death. Older age, being male, having severe renal, lung, or cardiac disease, or active cancer, and high care dependency level were identified as predictors for all-cause mortality, irrespective of history of SARS-CoV-2 or breakthrough infection.

## Conclusion/practical implication

Future COVID-19 vaccination strategies should prioritize (infection naïve) nursing home residents, as they fail to mount a durable antibody response after primary course vaccination. Nevertheless, COVID-19 mortality remained low, representing only

2 % of the all-cause mortality rate.

This study was registered on ClinicalTrials.gov ↗ (NCT04738695 ↗).

## Section snippets

## Background

During the first year of the SARS-CoV-2 pandemic, nursing homes (NH) in Belgium experienced severe COVID-19 attack rates and burden [1,2]. For this reason, when COVID-19 vaccines were implemented, nursing home residents (NHR) and nursing home staff (NHS) were prioritized in the vaccination campaign. Between January and March 2021, the majority of NHR and NHS in Belgium got vaccinated with a two-dose regimen of the BNT162b2 (Pfizer-BioNTech) vaccine, administered with a 3-week interval schedule [ …

## Study design and sample size

In this study, we report longitudinal data collected within the SCOPE study (Sars-COv-2 seroPrEvalence study), a national sero-epidemiological surveillance study that has been described previously [10,11]. The SCOPE study assessed the prevalence of SARS-CoV-2 antibodies in Belgian NHR and NHS bimonthly between February and December 2021. A sample of NH, evenly spread across Belgium, was recruited within strata defined by regions and provinces, proportionally to the population and the number of …

## Participation

In the SCOPE study, 3008 (1640 NHR; 1368 NHS) participants were recruited. The participant flow is shown in Supplementary Fig. 2. …

## Cohort characteristics at baseline

Participant characteristics are described in Supplementary Table 1. Participant characteristics, separated for survivors and non-survivors (mortality analysis) and seroreverters and non-seroreverters (seroreversion analysis), are shown in Supplementary Table 2. …

## SARS-CoV-2 seroreversion in NHR vs. NHS after primary course COVID-19 vaccination

The SARS-CoV-2 antibody response after COVID-19 vaccination among NHR and NHS is shown in Fig. 1, reported …

## Main findings

In this study, we found that NHR were 47% more likely to serorevert within 10 months after COVID-19 vaccination, compared to NHS, who are generally younger and healthier. Notably, infection naïve NHR/NHS, NHR/NHS of older age and NHR with a high care dependency level were more likely to serorevert. The most substantial difference was observed between infection naïve and previously infected NHR, where 61% of infection naïve NHR seroreverted 240 days post-vaccination, compared to 10% …

## Conclusion

NHR were 47% more likely to serorevert after COVID-19 vaccination, compared to NHS.

Specifically, infection naïve NHR/NHS, NHR/NHS of older age and NHR with a high care dependency level were more at risk to serorevert. The all-cause mortality rate among NHR was 14%, which was associated with high age, being male, having severe renal/lung/cardiac disease, having active cancer or high care dependency level. …

## Sponsors role

Sciensano was involved in the design of this study, result interpretation and manuscript review. …

## Ethics approval

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of the Ghent University Hospital on December 11th, 2020 (BC-08719). …

## Consent to participate

Each participant signed an informed consent form after being informed about the goal

of the study and the sampling procedures. For participants who were incapable of signing the consent form, such as nursing home residents with dementia, consent was given by their legal representative. …

## Consent for publication

Not applicable. …

## Funding

## CRediT authorship contribution statement

**Eline Meyers:** Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Liselore De Rop:** Writing – original draft, Visualization, Project administration, Investigation, Formal analysis, Data curation. **Ellen Deschepper:** Writing – review & editing, Visualization, Formal analysis, Data curation. **Els Duysburgh:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, …

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. …

## Acknowledgements

Recommended articles

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