



Health Protection Surveillance Centre
Lárionad Faire um Chosaint Sláinte

Protocol for an updated analysis of factors associated with outbreaks of SARS-CoV-2 in nursing homes in Ireland

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Purpose and aim

In May 2020, the National Public Health Emergency Team (NPHE) recommended the establishment of an expert panel on nursing homes to examine the complex issues surrounding the management of COVID-19 among this particularly vulnerable cohort. The COVID-19 Nursing Homes Expert Panel was appointed by the Minister for Health in May 2020 and reported back with recommendations in light of the expected ongoing impact of COVID-19 over the subsequent 12-18 months.

One recommendation relating to data analysis (recommendation 6.7) was outlined as:

“HPSC, HSE and HIQA should produce a detailed epidemiological analysis comparing both risk and protection factors associated with having an outbreak or not at all in HIQA regulated facilities.”

Health Information and Quality Authority (HIQA) and the Health Protection Surveillance Centre (HPSC) collaborated on an analysis of the potential risk and protective factors associated with outbreaks of SARS-CoV-2, which have occurred in HIQA-regulated designated centres for older persons (nursing homes). The report was published in May 2021 and the analysis included outbreaks from the first and second waves of COVID-19 in Ireland. The first wave encompassed the period 1 March 2020 to 1 August 2020; the second wave was from 2 August 2020 to 21 November 2020.

In July 2021, HIQA and the HPSC were requested to extend the analysis to include data from the third wave of COVID-19 in Ireland. The third wave started on 22 November 2020. This protocol details the process to be undertaken by HIQA and the HPSC to extend the analysis of the potential risk and protective factors associated with outbreaks of SARS-CoV-2 which have occurred in HIQA-regulated designated centres for older persons (nursing homes).

1.0 Protocol for research question

Three distinct steps in the process have been identified for this analysis. These are listed below and described in more detail in sections 1.1-1.3.

1. Collect the data.
2. Analyse the data.
3. Summarise the findings.

The scope for the original analysis was limited to a quantitative analysis using readily available data on outbreaks and nursing homes.⁽¹⁾ The intention was to estimate the relative importance of different risk factors in relation to the occurrence and extent

of nursing home outbreaks of COVID-19. A qualitative analysis of the context for outbreaks in individual homes was beyond the scope of this work, as the necessary data to support such analyses were not available. The scope for this updated analysis is to extend the original analysis to include outbreaks that occurred in the third wave of COVID-19 in Ireland. The third wave commenced on 22 November 2020. On 14 May 2021, the HSE was subjected to a major ransomware cyberattack causing major disruption to data collection. For the purposes of the analysis proposed here, the third wave will be defined as the period from 22 November 2020 to 12 May 2021.

1.1 Collect data

To update the analysis, it will be necessary to gather data on outbreaks in nursing homes during the third wave of COVID-19 in Ireland (22 November 2020 to 12 May 2021). The data on outbreaks comprises the dates of the first and last cases in an outbreak, and the total number of residents and staff affected by each outbreak. In addition, data on the incidence of COVID-19 in the locality of each nursing home are needed. As there is an important temporal component to the occurrence of an outbreak and localised incidence, the data will be required by nursing home for each day during the third wave of the epidemic.

The additional data required for the updated analysis include:

- Outcome – whether or not an outbreak occurred in a nursing home, and the number of cases included in the outbreak.
- Incidence in locality of nursing home (expressed as 14 day incidence in the administrative area the home is in, or within a radius of the home).
- Degree of vaccine coverage. In the absence of individual home-level data, national data will be used as a proxy for local vaccine coverage.

Data on COVID-19 outbreaks from the HPSC will be provided to HIQA on the basis of a data sharing agreement that stipulates the secure transfer, conditions of use and disposal of data on completion of the analysis. The sharing of data will comply with data protection legislation.

There are additional data describing the characteristics of each nursing home that were collected for the original analysis:

- size of nursing home (expressed as bed capacity)
- nursing home classification (that is to say, whether a home is publicly [HSE] or privately provided [non-HSE])
- proximity to other nursing homes (for example, homes within 5km)
- proximity to hospitals (for example, distance to nearest public acute hospital)

- urban-rural status and or population density of local area
- socio-economic status of local area (for example, average deprivation score).

Data on the physical structure of the home (for example, the number of single-occupancy rooms) and resources (for example, staffing levels) were not available for inclusion in the previous analysis. While the structure of the homes was recorded, it was not in a format that could be extracted in a reasonable timeframe. Furthermore, without data on occupancy of specific rooms, structural data may be challenging to incorporate into an analysis.

1.2 Data analysis

The approach for this updated analysis will repeat the approach of the previous report but include the data for the third wave of COVID-19 in Ireland. This section gives a brief description of the analytical approach used previously, which will be replicated with inclusion of the additional data.

The analysis considered two issues: factors associated with the occurrence of confirmed outbreaks, and factor associated with the extent of outbreaks.

The probability of an outbreak was estimated using a repeated measures logistic regression. In order to calculate the probability of an (incident) outbreak on any given day, the outbreak status (the dependent variable) for each home was defined for each individual day of the analysis in the form of a binary variable ('outbreak' versus 'no outbreak'). Days on which outbreaks were ongoing, as opposed to the first day of an outbreak, were excluded from the analysis to avoid double counting of the probability of an outbreak, as it is not possible to have overlapping outbreaks within a facility. Following the inclusion of the explanatory variables in the logistic regression model, the analysis estimates the probability of an outbreak commencing on a certain day, given the conditions at the time (for example, local incidence, whether the home had experienced an outbreak previously) and the fixed characteristics of the home (for example, number of beds, type of home). A series of interaction terms were further included in the model to allow the relationship between the dependent variable and the relevant explanatory variable to vary by subgroup. In this analysis, subgroups were defined by nursing home type (publicly or privately operated) and by wave. This is particularly important as the association between outbreaks and nursing home size, for example, was considered likely to differ in the first and second waves.

The goodness-of-fit was assessed using Akaike's Information Criterion (AIC), the Hosmer-Lemeshow test, and the area under the curve (AUC). The McFadden's pseudo-R² is also reported as a crude measure of the variance explained by the

model, accepting that it may be misleading for a logistic regression. Preference was given to retaining all plausible explanatory variables.

The analysis of factors associated with the extent of an outbreak was performed using a negative binomial model, due to evidence of overdispersion in the outcome data. In count data models, the total number of beds can be included as an offset which allows the outputs to be expressed as a rate, or as an explanatory variable (as per the analysis of probability of outbreaks). Here, the number of beds was included as a covariate to enable an assessment of whether nursing home size is important in the extent of outbreaks. As a sensitivity analysis, the model was estimated with number of beds as an offset and as an explanatory variable, with models compared using AIC. As the model estimated the number of cases in a home, the outputs are presented as incidence ratios.

1.3 Summarise findings

A descriptive report of the data and analysis will be prepared by HIQA and the HPSC as an addendum to the original report. We will consider whether the findings of the new analysis substantively modify the findings of the original analysis. The addendum will be presented to HIQA's COVID-19 Expert Advisory Group (EAG) for clinical input and interpretation. Feedback from the EAG will be incorporated into the addendum which will be shared with the COVID-19 Nursing Homes Expert Panel, highlighting any changes to the findings since the first analysis.

References

1. Health Information and Quality Authority and Health Protection Surveillance Centre. Analysis of factors associated with outbreaks of SARS-CoV-2 in nursing homes in Ireland. Dublin, Ireland: HIQA & HPSC, 2021.

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