

Estimation of the hospital burden of Human metapneumovirus-associated respiratory tract infections in older adults in Scotland: a retrospective analysis

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INTRODUCTION AND STUDY CONTEXT

- Human metapneumovirus (hMPV)** is a virus commonly associated with **respiratory tract infections (RTIs)** in older adults.
- There are no existing studies estimating the hospital burden of hMPV-associated RTIs in older adults in Scotland.
- The population of Scotland was approximately 5.4 million ($\geq 60y$ population ≈ 1.5 million) in 2023.
- Lothian represents one of the fourteen NHS Health Boards in Scotland**, serving the second-largest residential population in Scotland, approximately 0.9 million ($\geq 60y$ population ≈ 0.2 million) in 2023, from the councils of the City of Edinburgh, East Lothian, Midlothian, and West Lothian.
- The population in Lothian is relatively younger ethnically diverse, and with relatively lower levels of deprivation overall than in other health boards.
- Scotland has a universal, publicly funded healthcare system.
- This study aimed to **estimate the hospital burden of hMPV-associated RTIs in older adults in Scotland**.

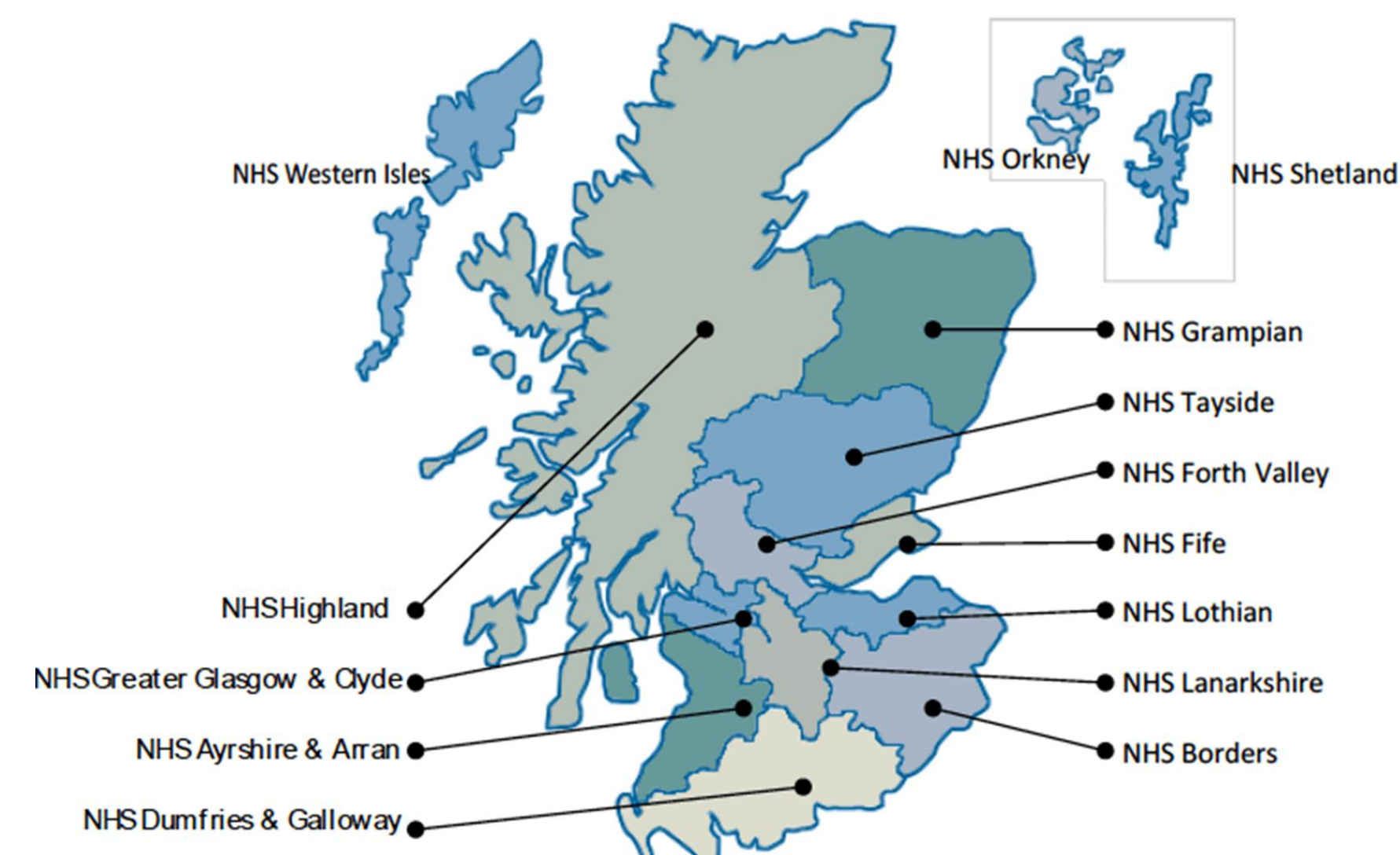


Figure 1: Scottish Health Boards

METHODS

- We estimated the **annual laboratory and extrapolated hospital incidence of hMPV RTIs in older adults (aged $\geq 60y$)** in Scotland over six seasons (2017-2023) using national hospital and laboratory data.
- A season was defined as the period between 1 July of a year and 30 June of the next year.
- Hospital incidence in Scottish health boards other than Lothian, where testing practices were uncertain, was extrapolated using **Lothian's comprehensive laboratory data and local RTI hospital admission data**.
- We calculated the hMPV proportion positive among all RTI-associated hospital admissions in Lothian, stratified by age bands ($60-74y$ and $\geq 75y$) and month of admission during each annual season.
- We applied these to the corresponding RTI admissions in other health boards.
- The corresponding estimates for each age band and month, in each annual season, for Lothian and other health boards were summed to generate hospital incidence estimates for the annual season (Figure 2).
- We also reported the **proportion of laboratory-confirmed episodes having pathogen-specific diagnosis codes**.

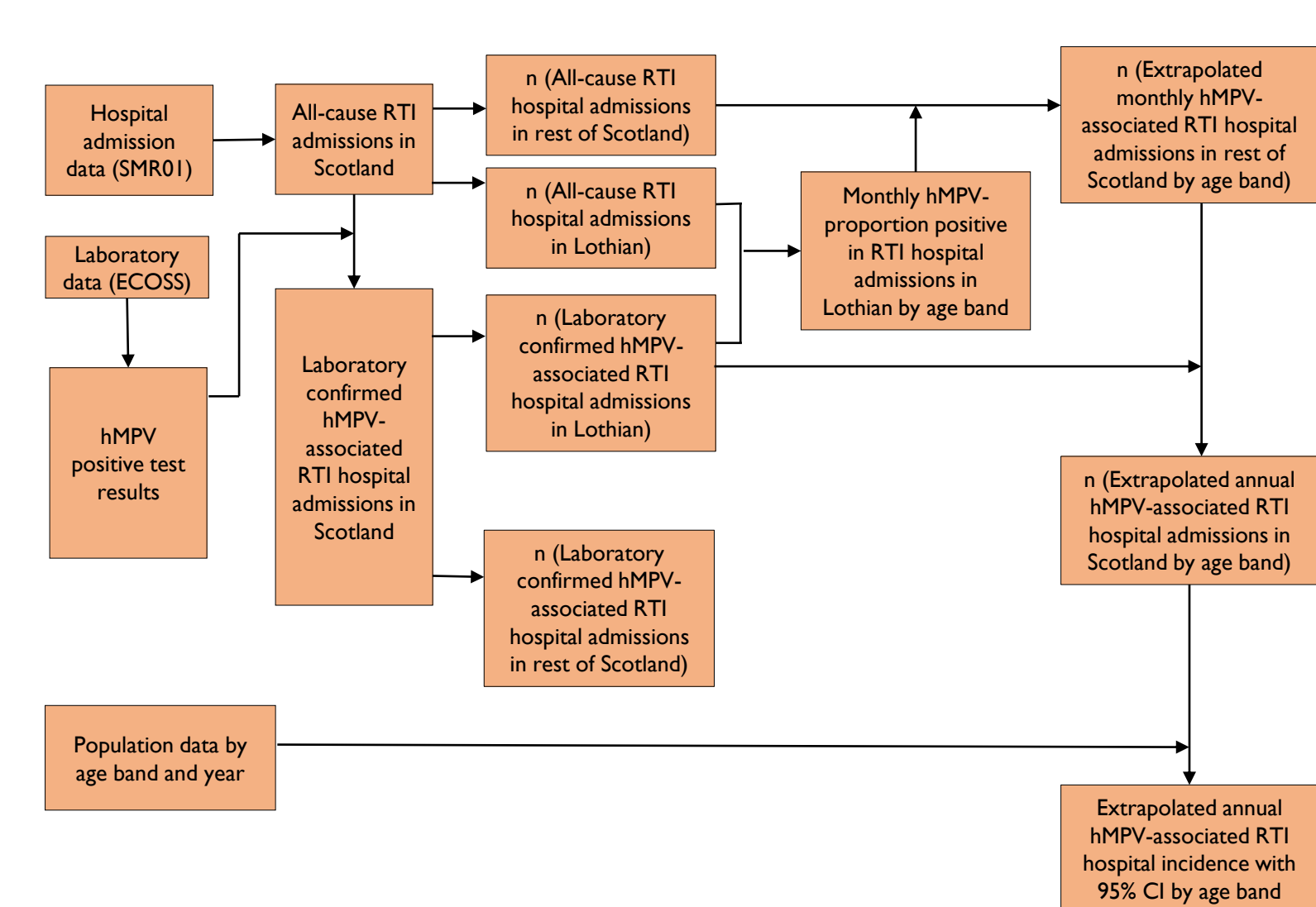


Figure 2: Illustration of the extrapolation method

RESULTS

- This analysis included **626 unique laboratory-confirmed hMPV hospital episodes** between 1 July 2017 and 30 June 2023 in older adults in Scotland.
- The extrapolated annual hMPV hospital incidence ranged from **3.57/100,000 to 49.53/100,000 in adults aged $\geq 60y$ in Scotland**, and the **extrapolated incidence was 1.27 to 3.78 times higher** than the incidence of laboratory-confirmed data (Figure 3).
- Extrapolated incidence estimates could not be developed for the 2020/2021 season due to the lack of laboratory-confirmed episodes in Lothian during this season in older adults.
- The laboratory-confirmed and extrapolated hospital incidence were **higher in $\geq 75y$ than in $60-74y$** across all seasons.
- hMPV incidence **dropped substantially during the COVID-19 pandemic**.
- Only 175 (28%) of the laboratory-confirmed hMPV episodes were **clinically coded**.

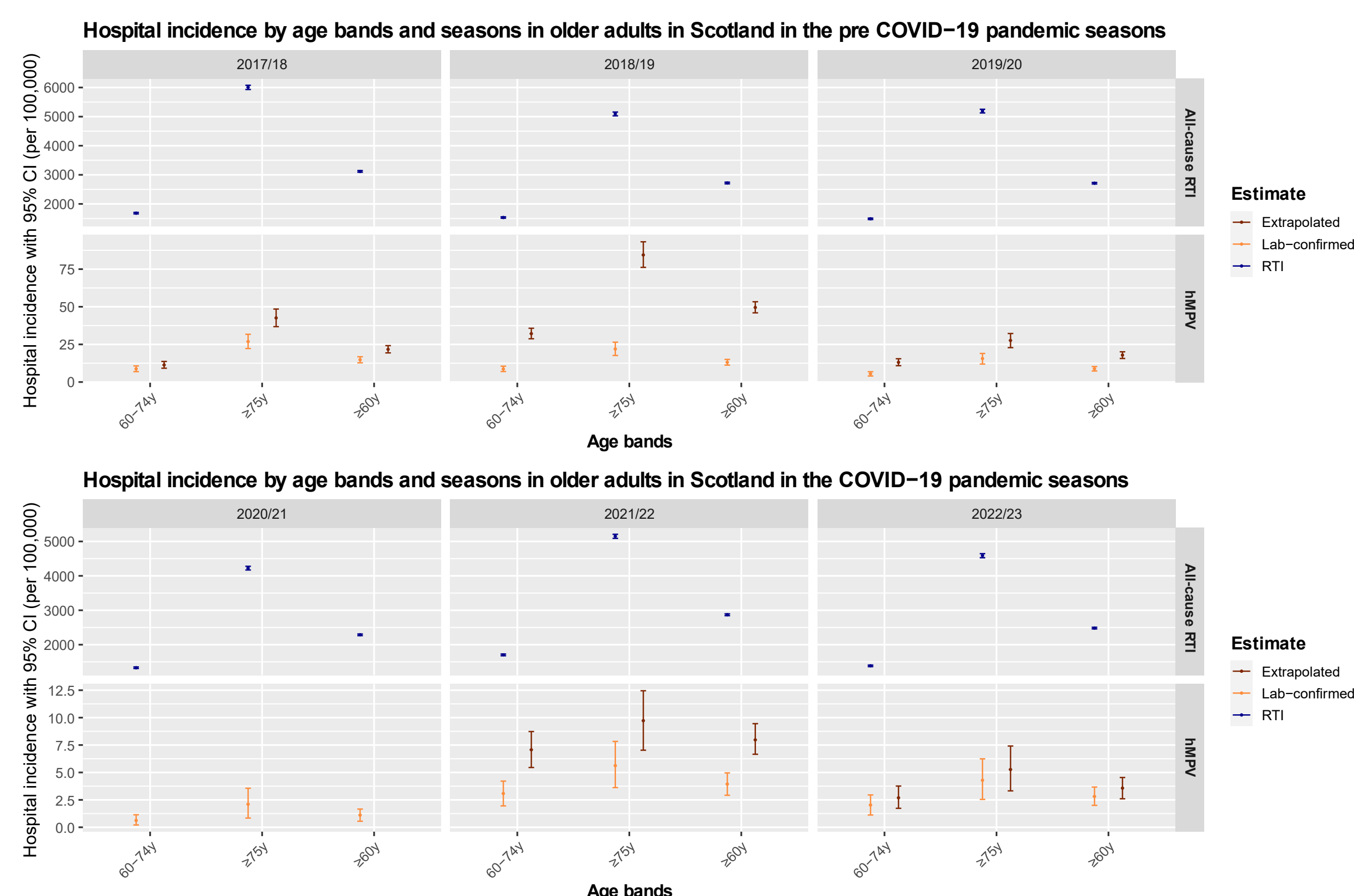


Figure 3: hMPV hospital incidence by age bands and seasons in older adults in Scotland (2017-2023)

DISCUSSION

- Overall, we believe that the **hospital burden estimates are underestimates** even after extrapolation due to several factors. (Figure 4).
- Reliance on clinically coded data substantially underestimates** the true hospital burden of hMPV-associated RTIs in Scotland.
- The hMPV hospital (incidence) burden estimates **seemed to be lower than RSV or Influenza A** in older adults in Scotland.

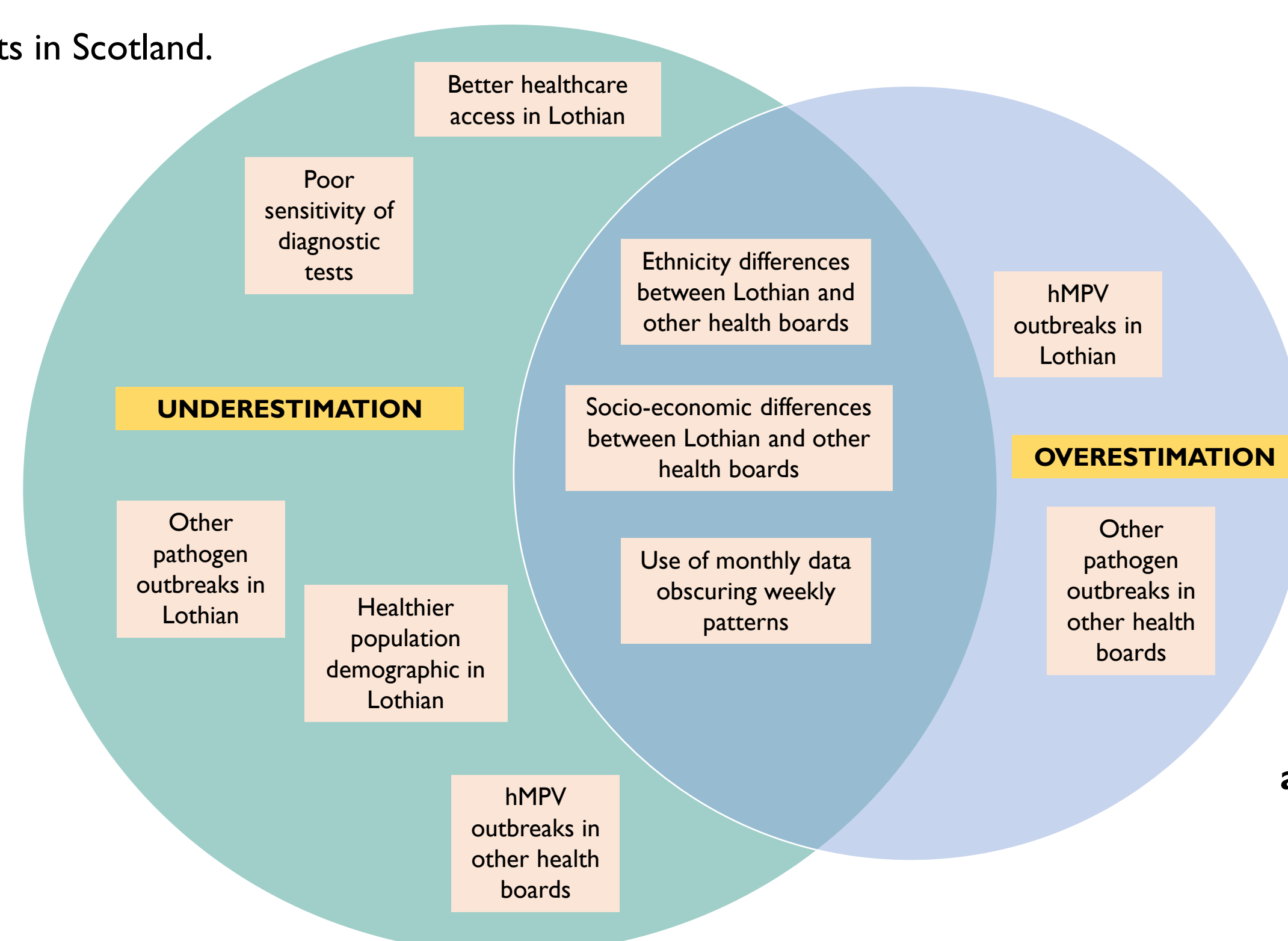


Figure 4: Factors underestimating and overestimating the extrapolated incidence

CONCLUSIONS

- hMPV RTIs pose a substantial hospital burden in older adults** in Scotland.
- Adults aged $\geq 75y$ reported higher hMPV incidence than those aged $60-64y$, indicating **increased associated morbidity in the very old**.
- There is a **considerable year-on-year variation** in hMPV hospital incidence, and the **COVID-19 pandemic was associated with a substantial drop** in hMPV incidence in older adults in Scotland.
- The differences between clinically coded, laboratory-confirmed and extrapolated estimates highlight the need for improved surveillance, diagnosis and coding practices to develop robust burden estimates.

REFERENCES

- Scottish Government. NHS Scotland assets and facilities 2016: annual report 2017 [Available from: <https://www.gov.scot/publications/annual-state-nhsscotland-assets-facilities-report-2016/pages/5/>].
- National Records of Scotland. Ethnic group, national identity, language and religion 2025 [Available from: <https://www.scotlandscensus.gov.uk/search-the-census/#/topics/list?topic=Ethnic%20group,%20national%20identity,%20language%20and%20religion&categoryId=1>].
- Public Health Scotland. Deprivation: data 2025 [Available from: <https://www.scotpho.org.uk/wider-determinants/deprivation/data/>].
- National Records of Scotland. Life Expectancy in Scotland 2021-2023 2024 [Available from: <https://www.nrscotland.gov.uk/publications/life-expectancy-in-scotland-2021-2023/>].
- NHS 24. Scotland's Service Directory 2025 [Available from: <https://www.nhsinform.scot/scotlands-service-directory/hospitals>].
- Fowlkes A, Giorgi A, Erdman D, Temte J, Goodin K, Di Leonardo S, et al. Viruses associated with acute respiratory infections and influenza-like illness among outpatients from the Influenza Incidence Surveillance Project, 2010-2011. The journal of infectious diseases. 2014;209(11):1715-25.
- Shi T, Denouel A, Tietjen AK, Campbell I, Moran E, Li X, et al. Global disease burden estimates of respiratory syncytial virus-associated acute respiratory infection in older adults in 2015: a systematic review and meta-analysis. The journal of infectious diseases. 2020;222(Supplement_7):S577-S83.