Impact of shielding on care homes during wave 2: Considerations for Omicron

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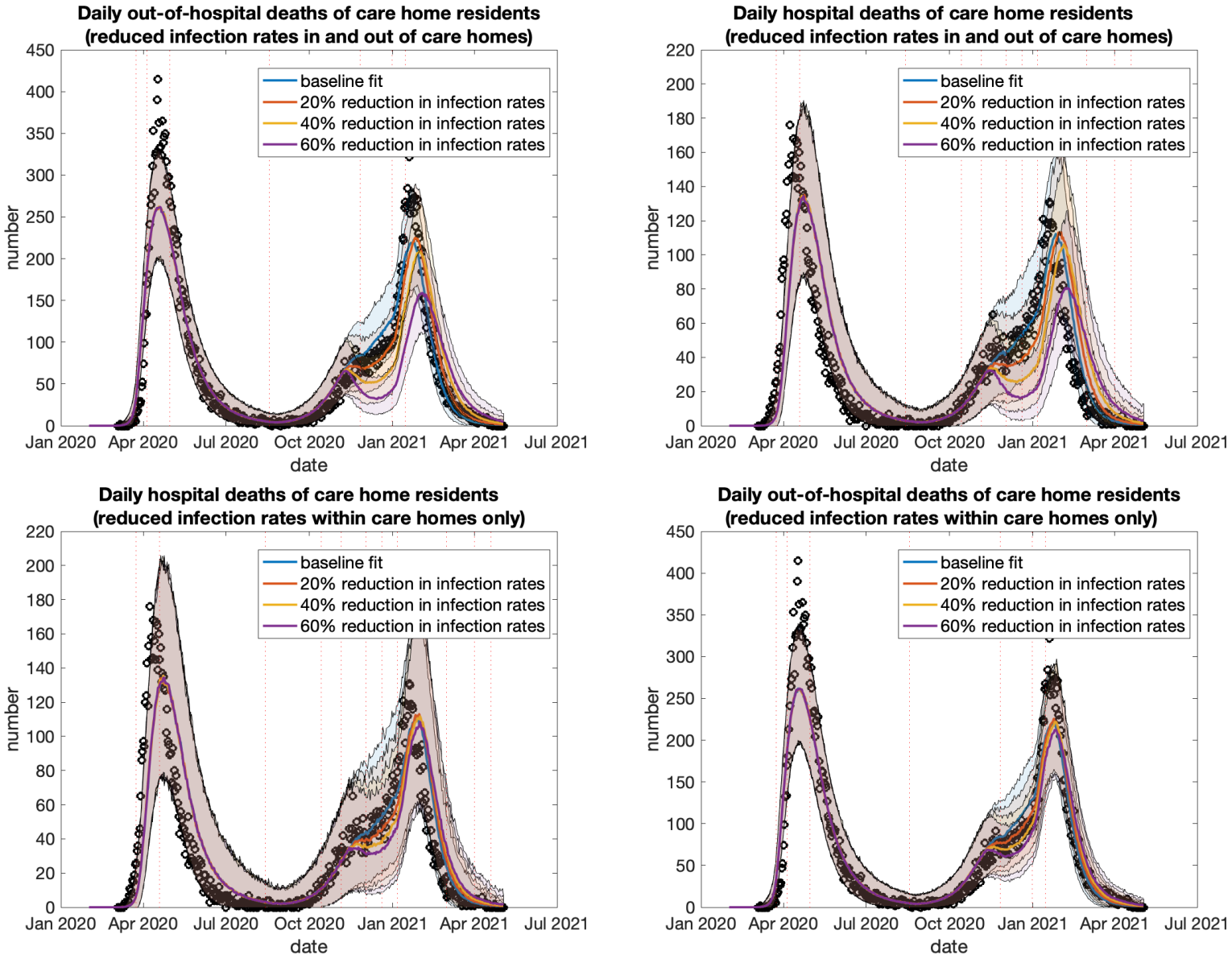
Executive summary:

- We fit an age-stratified transmission model to UK hospital data streams and deaths in and out of hospital, distinguishing care home residents and not. On 5 November 2020, we explore scenarios of what could have been achieved with extra reductions in overall infection rates, within-care homes only (e.g., through improved testing or staffing), or both within-care homes and between care homes and the rest of the population (called hereafter “in-and-out", and achieved for example by reduction of ingress of infection into care homes through improved testing, infection control during visits etc.). These extra reductions are considered “on top” of the reductions effectively achieved during the second wave (baseline scenario = data fit).
- Data indicates about 2/3 of all deaths of care home residents occur outside hospital.
- Reducing only within-care home infection rates has limited effect on mortality. To achieve a visible effect, additionally shielding care homes from the rest of the population (by reducing in-and-out care home contacts) is needed.
- Reducing in-and-out care home infection rates by 60% results in a ~25% reduction in care home deaths (both in and out of hospital), against a <7% if only within-care homes contacts are reduced. While these do not amount to a full shielding of the vulnerable, in the context of an Omicron wave where the primary aim is to reduce impact, such benefits may be worth the short-term costs of implementation (and indeed may already be partially instantiated in improved testing since Wave 2). Note however that hospitalisation and death rates are from wave 2, and might differ substantially for Omicron.
- Ultimately, the most effective way to reduce the deaths in care homes remains to limit prevalence in the general population.

Results:



<u>Figure 1</u>: Data, model fit and scenarios, for the daily deaths of care home residents in hospital (top) and out of hospital (bottom rows). Scenarios assume that the infection rates estimated to have been achieved during the second wave (baseline) would be further reduced by 20, 40 and 60%, from the 5 November onwards.

	baseline fit	20% reduction in infection rates	40% reduction in infection rates	60% reduction in infection rates
Hospital deaths (reduced infection rates in and out of care homes)	7450	7260	6820	5730
Out-of-hospital deaths (reduced infection rates in and out of care homes)	14480	14110	13240	11080
Hospital deaths (reduced infection rates within care homes only)	7450	7360	7200	6960
Out-of-hospital deaths (reduced infection rates within care homes only)	14480	14310	13990	13500

Table 1: Cumulative deaths of care home residents from 5 November 2020 to 3 May 2021, in and out of hospital, for the different scenarios explored.

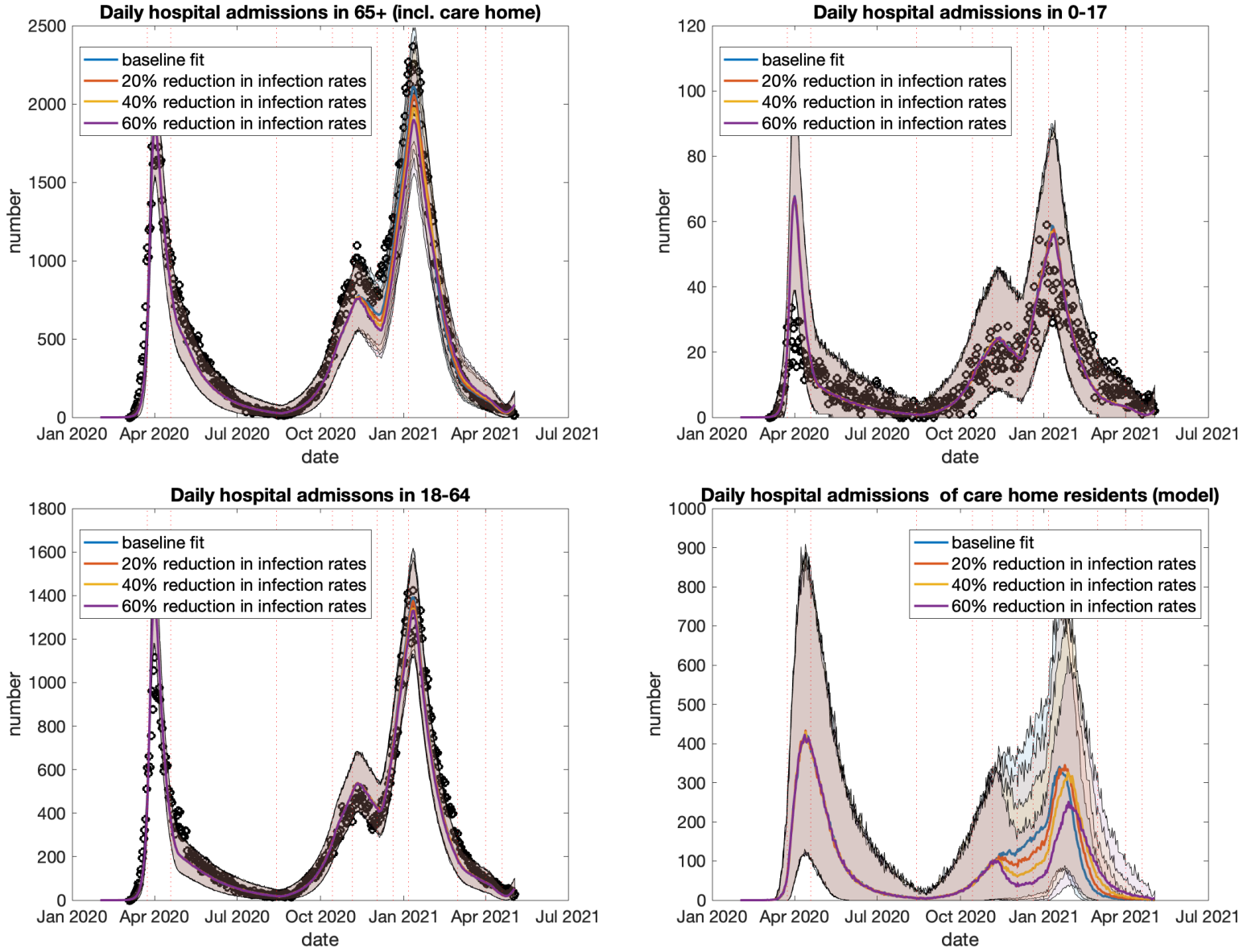


Figure 2: Data, model fit and scenarios for hospital admissions in each age group considered, only in the case of "in-and-out" reduction in infection rates. The control policies applied to care homes have visible impact only on the care home population (bottom right), which only represents a small fraction of the 65+ (450k, out of 12m, bottom left).

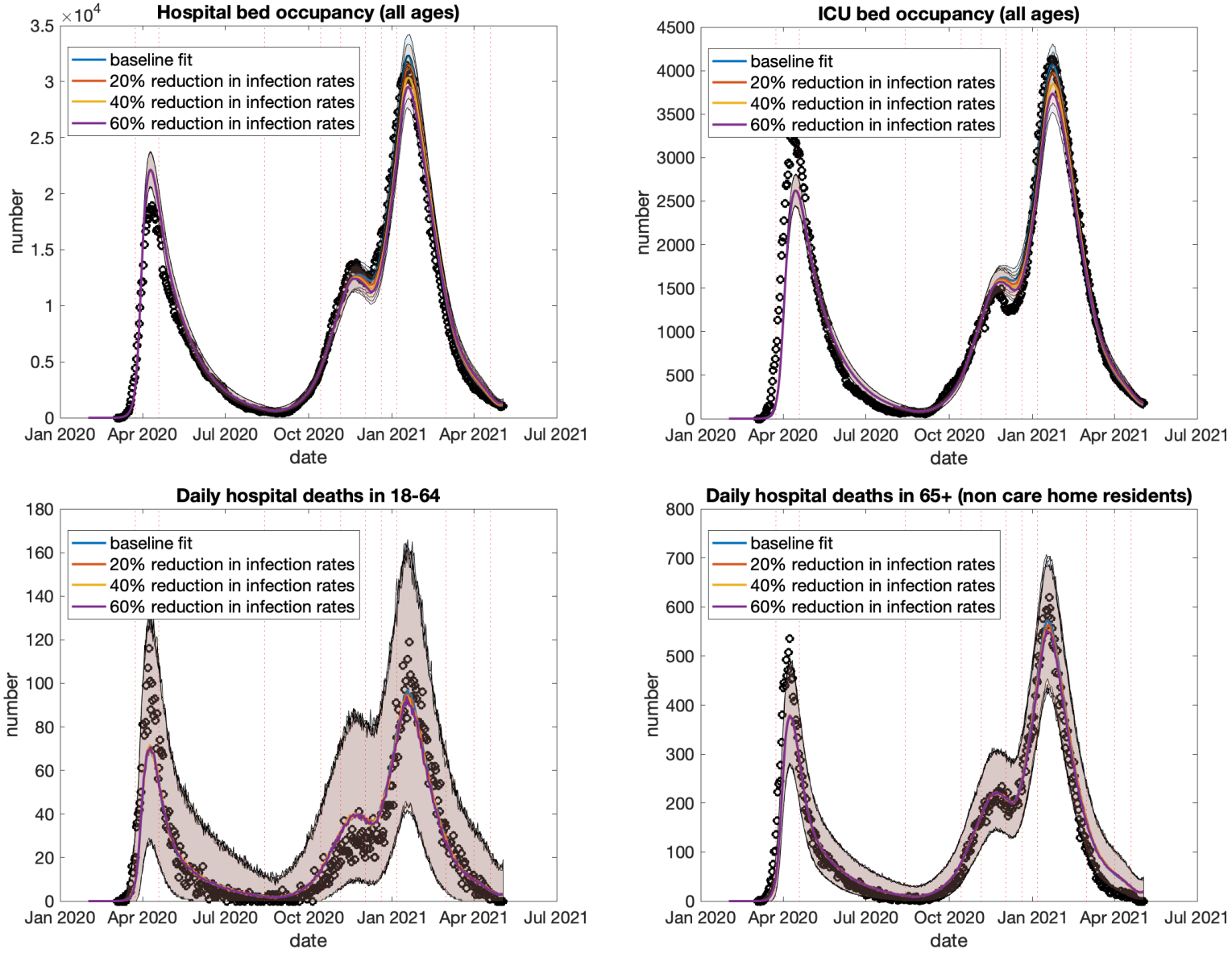


Figure 3: Data, model fit and scenarios for hospital and ICU bed occupancy (not age-stratified) and for daily deaths in the non-care home population (excluding 0-17, where deaths are extremely small), only in the case of "in-and-out" reduction in infection rates.

Methods:

- Deterministic compartmental model with Negative Binomial likelihood fitted via MCMC. The compartmental structure is similar to https://arxiv.org/abs/2110.06193
- The model has 4 groups: age group 0-17, age group 18-64 and age group 65+, split between care home residents and all others.
- The model is fitted to hospital data streams (admissions, by age; bed occupancy; ICU bed occupancy) and deaths (by age; by care home residency; and, for care home residents, by death in hospital or not), as shown in Figures 1-3.
- Mixing between age groups is parameterised by POLYMOD data.
- Transmission rates change over time to account for NPIs.
- The model ignores vaccination, but that only affects the last few months of data. In fact, this could explain the discrepancies between model and data in 2021 (model underestimating admissions in 0-17 in Figure 2 and overestimating deaths in 65+ in Figure 3).
- Hospitalisation and mortality rates are constant throughout the epidemic (rather than, e.g., separate for first and second wave), which can cause strain in the model fit and result in underestimation during the first wave and overestimation during the second.