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**Declaration of the generated material**

No content generated by AI technologies has been used in this assessment.

# Abstract

**Background**: Intermediate Care provides for patients who do not need to be in an acute hospital but for whom traditional home care is temporarily insufficient. The typical maximum duration is six weeks. It can be a strategic tool in service provision, particularly in older and rural populations, but its delivery in NHS Grampian is challenged by a lack of linked data analysis.

**Methods**: In the Grampian Data Safe Haven, routinely collected data for Grampian Intermediate Care patients aged 65 and over between 2018 and 2023 was analysed. Demographics, rurality, numbers of stays, deprivation, duration and discharge destinations were summarised via an analysis process of wrangling, exploration, cross-tabulating and visualising. Outputs were checked by a Safe Haven Analyst before release.

**Results**: Hospital@Home is the most common form of Intermediate Care but it is heavily skewed towards urban patients. Some hospitals are also skewed, using the Scottish Government Urban Rural 2-fold 2020 classification. Deprivation, in terms of the Scottish Index of Multiple Deprivation 2020 quintiles, is more evenly spread for urban patients’ stays than for rural ones. While most stays are short, some patients are staying for significantly longer than the typical six-week maximum. There is no noticeable difference between the discharge destination proportions for rural and urban patients.

**Conclusions**: The summary statistics presented here are intended to prompt future research questions for the ultimate continued improvement of patient outcomes, particularly regarding access to both home and hospital intermediate care for rural patients.

# Introduction

Definitions of Intermediate Care (IC) vary but typically combine three elements; the patient’s need is temporary (up to six weeks), exceeds what can be met in traditional home care and the patient is usually coming from another level of care (Age UK, 2024; Fraser *et al*, 2024; Scottish Government, 2012). In Scotland, IC is typically provided in community hospitals and the Hospital@Home scheme. The former often offer ‘step-down’ care, where a patient improves in an acute hospital such that a lower level of care is appropriate (Royal College of Nursing Scotland, 2017). Hospital@Home tends to be ‘step-up’ care, where a patient under GP care temporarily needs a higher level of care. Traditionally, this would have required admittance to an acute hospital but Hospital@Home allows the patient to stay home, with clinicians visiting them. While IC is available to all patients as clinically appropriate, need is highest in older people (Fraser *et al*, 2024). IC overlaps with social care, which is provided by Local Authorities (LA), so Health and Social Care Partnerships (HSCPs) between Health Boards and LAs are typically involved, particularly in Hospital@Home.

The potential for evidence-based decision-making in IC, and scrutiny of those decisions, is hampered by a lack of open or linked data, particularly in Scotland (Fraser *et al*, 2024; Royal College of Nursing Scotland, 2017; Pitchforth *et al*, 2017). Community hospitals, which often provide IC, tend to be more accessible for rural patients but resource constraints endanger their service continuity (Edwards 2024; East Lothian Council 2024; NHS Tayside 2021). NHS Scotland is encouraging the expansion of Hospital@Home schemes, investing £15 million since 2020 (Scottish Government 2024). However, HSCPs have encountered challenges in rural areas (Cameron 2023), including in Grampian where Hospital@Home is only operational in Aberdeen City (Healthcare Improvement Scotland 2024).

Balancing health services across rural and urban settlements is a challenge worldwide (WHO 2021; Vaughan and Edwards 2020). In Scotland, this is exacerbated by some additional factors. The rural population is older, so has more complex health needs. In 2021, 26.7% of people in the most rural category in Scottish Government Urban Rural (SGUR) 6-fold 2020 classification were aged 65 years and older. This contrasts with 16.3% in the most urban category (National Records of Scotland 2022). Most regional health boards are skewed towards urban or rural, but NHS Grampian is more balanced (NHS Grampian 2023).

NHS Grampian (NHSG) is the regional Health Board for North East Scotland and has HSCPs with Aberdeen City, Aberdeenshire and Moray councils. It covers an area of 3000 square miles. In 2021 it had a population of 586,530 people (Scottish Government, 2021). Aberdeenshire and Aberdeen City were the sixth and eighth most populous LAs in 2022, and Moray was the ninth least populous (National Records of Scotland 2024a). So, this is a valuable region in which to compare rural and urban residents’ stays in IC.

There has been no national strategy for IC in Scotland since that of 2012 (Scottish Government 2012), which acknowledges that IC needs vary regionally. This research aims to generate descriptive statistics comparing rural and urban patients’ stays in IC in NHSG, focusing on patients who are 65 years old and above and including Hospital@Home. This preliminary data analysis can inform subsequent research questions.

# Methods

## The population

The patient population is 11577 patients aged 65 years and older at the time of admission. This group had 20372 admissions to NHSG IC hospitals between 1st July 2018 and 30th June 2023.

The hospital population comprises 17 IC facilities. These are: Aboyne Hospital, Glen O’Dee Hospital, Inverurie Hospital, Insch & District War Memorial Hospital, Peterhead Community Hospital, Fraserburgh Hospital, Jubilee Hospital, Turriff Cottage Hospital, Chalmers Hospital, Ugie Hospital, Seafield Hospital, Stephen Cottage Hospital, Turner Memorial Hospital, Fleming Cottage Hospital, Kincardine Community Hospital, Rosewell House (NHS Wards) and Hospital@Home.

## Data

NHS Scotland uses the TrakCare patient administration system. Following ethics approval from the North Node Privacy Advisory Committee, data from this system for inpatients and hospital changes was linked with deprivation data and rural/urban classification data by Data Analysts in the Grampian Data Safe Haven (DaSH) which is an accredited Scottish Government Safe Haven (University of Aberdeen 2024). They de-identified the data before making it accessible to researchers in a secure virtual environment. Deprivation levels are captured in the Scottish Index of Multiple Deprivation (SIMD) 2020v2, which categorises every postcode in Scotland into population-weighted quintiles (1 = most deprived; 5 = least deprived). Urban and rural classification is from the Scottish Government Urban Rural (SGUR) 2020 Classification which applies to settlements. It is available in folds of two, three, six and eight (category 1 = most urban on all folds) (Scottish Government 2022).

Spatial data used open government data for SGUR 2-fold 2020 (Scottish Government 2022), NHSG borders (Scottish Government 2019) and hospital locations (Spatial Hub Scotland 2021).

All the variables used for this study are listed in Table 1.

A patient can be transferred between hospitals within a single admission, meaning that an IC hospital can be any of the admission hospital, the discharging hospital, or an intervening hospital. Admission data was joined with hospital changes data to allow analysis of all stays in IC hospitals, irrespective of whether it was the admission, discharge or other hospital. This is also why “stays” is used to refer to the period spent in the IC hospital, rather than “admissions”.

## Analysis

Data manipulation and analysis were done in R Studio version 4.4.0. All data work was done within the Grampian Data Safe Haven, except for figure 1 which only uses publicly available data. The analysis workflow consisted of data wrangling (including plausibility checking and joining), exploratory data analysis, cross-tabulation, visualisation and write-up. Demographics, rurality, numbers of stays, deprivation, stay duration and discharge destinations were examined. Counts of <5 were suppressed to remove the risk of inadvertently re-identifying patients and all outputs were checked by a DaSH Analyst before release from the secure virtual environment.

Table 1.

| Variable name | Description | Source |
| --- | --- | --- |
| Dash611\_study\_Num | Pseudonymised patient identifier | TrakCare Inpatient |
| DaSH611\_paadm\_admno\_uid | Pseudonymised admission identifier | TrakCare Inpatient |
| age\_on\_admission | Patient age in years on date of admission | TrakCare Inpatient |
| gender | Patient sex. Male or Female. | TrakCare Inpatient |
| hospital\_desc | Name of the hospital (which can be one of multiple in a single admission) | TrakCare Hospital Changes |
| hosp\_start\_final\_date | Date of start of stay in hospital (which can be one of multiple hospitals in a single admission) | TrakCare Hospital Changes |
| hospital\_end\_final\_date | Date of end of stay in hospital (which can be one of multiple hospitals in a single admission) | TrakCare Hospital Changes |
| discharged\_trans\_to\_desc | Type of location to which the patient is discharged | TrakCare Inpatient |
| urban\_rural2fold2020 | Urban / Rural classification. 1 – urban, 2 – rural. | Demographics |
| UR2Name | As above | Urban Rural Classification – Scotland (Open data) |
| national\_simd\_2020\_quintile\_at\_adm | Deprivation quintile on date of admission. 1 = most deprived, 5 = least deprived. | Demographics |
| HBName | Health Board name | NHS Health Boards – Scotland (Open data) |
| Hosp\_name | Hospital name | NHS Hospitals – Scotland (Open data) |

*Table 1. The variables used for this study.*

# Results

Summary statistics on the number of stays in each NHSG IC hospital are shown in Table 2. There is a total of 20920 stays for the period. We can see that Hospital@Home has the highest number (3130), by a significant margin.

Table 2.

| **Hospital Name** | **Age Bands** | | | | | **Sex** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **65-69** | **70-79** | **80-89** | **90+** | **Total** | **Female** | **Male** | **Total** |
| Hospital@Home | 88 | 620 | 1618 | 804 | **3130** | 1877 | 1253 | **3130** |
| Peterhead Community Hospital | 270 | 823 | 738 | 184 | **2015** | 924 | 1091 | **2015** |
| Rosewell House | 35 | 291 | 881 | 502 | **1709** | 1053 | 656 | **1709** |
| Glen O Dee Hospital | 108 | 632 | 612 | 178 | **1530** | 722 | 808 | **1530** |
| Chalmers Hospital | 168 | 510 | 634 | 210 | **1522** | 869 | 653 | **1522** |
| Kincardine Community Hospital | 149 | 619 | 533 | 200 | **1501** | 788 | 713 | **1501** |
| Seafield Hospital | 221 | 509 | 503 | 190 | **1423** | 854 | 569 | **1423** |
| Fraserburgh Hospital | 106 | 512 | 578 | 205 | **1401** | 716 | 685 | **1401** |
| Inverurie Hospital | 144 | 515 | 522 | 185 | **1366** | 730 | 636 | **1366** |
| Jubilee Hospital | 103 | 483 | 399 | 212 | **1197** | 594 | 603 | **1197** |
| Aboyne Hospital | 138 | 361 | 459 | 182 | **1140** | 602 | 538 | **1140** |
| Turriff Community Hospital | 122 | 335 | 412 | 174 | **1043** | 551 | 492 | **1043** |
| Turner Memorial Hospital | 66 | 182 | 340 | 118 | **706** | 390 | 316 | **706** |
| Stephen Cottage Hospital | 136 | 180 | 265 | 75 | **656** | 296 | 360 | **656** |
| Insch Hospital | 47 | 93 | 90 | 29 | **259** | 115 | 144 | **259** |
| Fleming Hospital | 33 | 66 | 52 | 19 | **170** | 66 | 104 | **170** |
| Ugie Hospital | 8 | 54 | 75 | 15 | **152** | 93 | 59 | **152** |

*Table 2. The number of stays for patients aged 65+ in each NHSG IC hospital between 1st July 2018 and 30th June 2023, broken down by sex and age band. These are not cross-tabulated to avoid creating categories of <5 members.*

Table 2 also shows that Rosewell House and Hospital@Home have the highest proportions of stays in the 80+ age group. Both also have considerably more women than men. Several of the hospitals discharge more men than women, including Peterhead Community Hospital, which has the second highest number of overall stays in the dataset.

Figure 1 is a map of the NHSG area, showing SGUR 2-fold 2020 categories and the positions of IC hospitals. It shows that most IC hospitals are in urban pockets, surrounded by large rural areas. It also shows that Aberdeen City has no actual IC hospitals (though it has multiple other hospitals, Rosewell House and Hospital@Home).

Figure 2 shows the percentage of stays within each hospital for SGUR 2-fold 2020 Classification. We can see that of the 17 IC hospitals in NHSG, 13 have more stays in the urban category. Aboyne, Stephen Cottage, Insch and Fleming Hospitals have a majority in the rural category. From Table 2, Stephen Cottage, Insch and Fleming are three of the smallest hospitals, by numbers of stays.

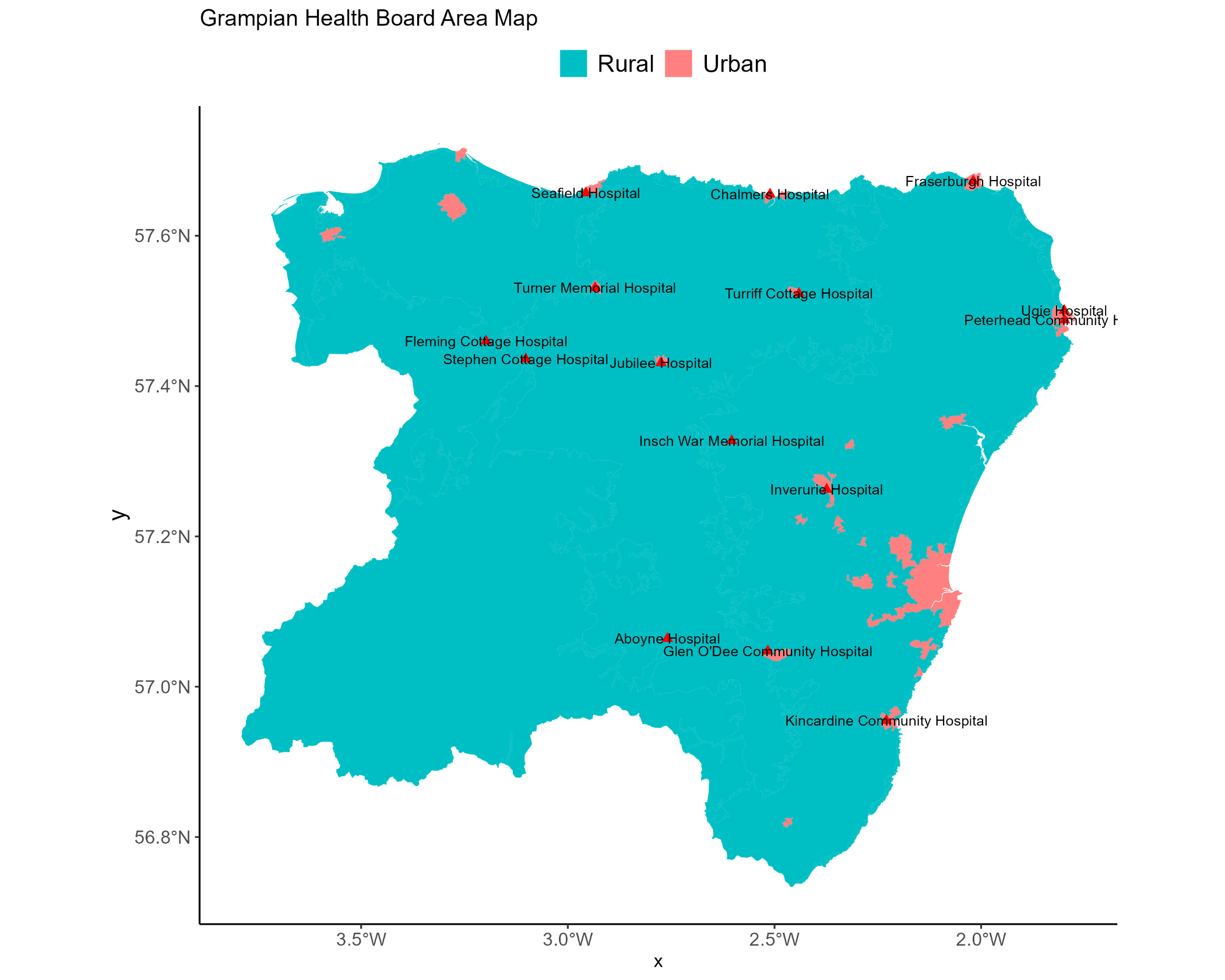
Figure 2 also shows that Hospital@Home and Rosewell House both had large majorities of stays for urban patients.

Figure 1.

*Figure 1.* *NHS Grampian area map, colour-coded by SGUR 2-fold 2020 categories and with IC hospital locations marked.* *Note that Rosewell House is not classed as a hospital so is not marked but it is in Aberdeen City. Hospital@Home has no location.*

A red square with black text

Description automatically generated



**ABERDEEN CITY**

Figure 2.

**Percentage of urban and rural stays per hospital**

A graph of a number of people

Description automatically generated

*Figure 2.* *The percentage of stays for patients aged 65+ in each NHSG IC hospital between 1st July 2018 and 30th June 2023, broken down by SGUR 2-fold 2020 classification.*

Figure 3 shows the number of stays across all hospitals, broken down by deprivation and rurality levels. This shows that the largest quintile for urban patients is also the least deprived quintile (5). The next three deprivation levels (4, 3 and 2) show similar numbers of stays for urban patients. In contrast, the largest quintile for rural patients is the second least deprived quintile (4), and numbers drop away significantly outside quintiles 3 and 4. So, deprivation is more evenly spread in urban patients than it is in rural patients. The NHS Grampian region contains no datazones that are both rural and in the most deprived quintile (National Records of Scotland, 2024b; Scottish Government, 2022).

Figure 3.

*A graph of a number of people

Description automatically generatedFigure 3. The number of stays for patients aged 65+ in all NHSG IC hospitals between 1st July 2018 and 30th June 2023, broken down by SIMD 2020 Quintile and SGUR 2-fold 2020 classification. Quintile 1 = most deprived, 5 = least deprived.*

Figure 4 shows the frequencies of lengths of stay in IC. The most common duration is zero days, for both urban (3073) and rural (2664) stays. The long tail of the graph shows that some patients are staying in IC for periods significantly longer than the usual six-week maximum. Counts of <5 have been omitted so the tail is actually truncated. We can also see that the decline in the number of stays as the duration increases is closer to linear for rural patients, after the spike of 0 day stays. The decline is somewhat more curved for rural patients. There is also a suggestion of roughly weekly peaks in lengths of stay, up to around 40 days, and this is possibly a little more evident in rural patients.

Figure 4.

A graph of a number of patients

Description automatically generated

Figure 4. *Frequencies of lengths of stays for patients aged 65+ in all NHSG IC between 1st July 2018 and 30th June 2023, broken down by SGUR 2-fold 2020 classification. Counts of <5 have been removed.*

Figure 5 shows counts of discharge destination categories for urban and rural patients. No particular difference is evident between the two patient groups. We can see that some patients are being discharged from IC to Accident and Emergency (A&E) wards. Checking the reasons for admissions for these patients, most are emergency admissions.

Figure 5.

**Count of Discharge Destinations by SGUR 2-fold 2020 Classification**A graph of a number of people

Description automatically generated with medium confidence

*Figure 5. Counts of destinations after discharge for patients aged 65+ in all NHSG IC between 1st July 2018 and 30th June 2023, broken down by SGUR 2-fold 2020 classification. Destinations have been classified into the groups shown from the 44 destinations in the original data.*

# Discussion

Though Health Board, HSCP and charity documents about or touching on IC are plentiful, actual research on IC and rurality is limited. The focus tends to be on rurality and acute care, or intermediate care and acute care (e.g. Garasen, Windspoll and Johnsen, 2007), and no summary or aggregate statistical reports were found. Rural access to care is often differentiated at only primary or secondary care level (Ridge *et al,* 2022), with IC access unclear. Terminology and scopes are varied with possible alternative terms including step-up/ step-down/ transitional/ sub-acute/ post-acute care, community hospital, cottage hospital, GP-beds and GP-hospitals (Pitchforth *et al,* 2017). Ridge *et al* (2022) found that in addition to practical access disadvantages, lifestyle, behavioural and environmental factors disproportionately increased potentially preventable hospitalisations for rural residents. While this was not a study on IC, given that step-up care is intended to avoid hospitalisation, it may have a role in future efforts in this area. In a study of over two million hospitalisations, Harlan *et al* (2024) found higher mortality for mechanically ventilated IC patients in rural care compared to urban care, though this treatment might not qualify as IC in all jurisdictions. There is some qualitative research on intermediate care, particularly exploring patients’ feelings towards it, which are generally more positive than towards acute care (Pitchforth *et al*, 2017). By not forcing helplessness (as acute care can), and by focusing on reablement, IC is perceived as a means of prolonging independence and delaying any eventual move to long-term nursing home care (Trappes-Lomax and Hawton 2022).

It is evident in the data presented here that IC facilities vary in their urban and rural balance of patients. One of the advantages of IC is that it is usually ‘closer to home’ than acute facilities, an important factor for rural patients. However, cost and staffing issues are common in community hospitals (and beyond), with closures an ongoing risk in some areas. For example, Fleming Hospital was temporarily closed for in-patients for a period in 2019 due to staffing issues (Anderson 2019). Community hospitals are a sensitive issue for communities, who might consider local access to be a “self-evident good” and service withdrawal to be unfair (Vaughan and Edwards 2020). The data shows that IC hospitals with smaller numbers of stays tend to have more rural patients, but not always. Peterhead Community Hospital is the second largest in numbers of stays, over 40% (830) of which are rural patients. As the data does not include closure dates, bed numbers, or non-IC occupancy, the number of stays is not a measure of hospital size or occupancy.

The urban skews and large numbers of stays in Hospital@Home and Rosewell House are attributable to their provision being largely under the Aberdeen City HSCP, though Aberdeenshire HSCP had 10 beds in Rosewell House for a period (Cameron 2023). Aberdeenshire HSCP attempted to mirror the city’s model of Hospital@Home but deemed it unsuitable due to staffing issues and the rural geography (ibid). However, other sources show Aberdeenshire and Moray HSCPs as running Hospital@Home schemes in this time (Healthcare Improvement Scotland 2022; Health and Social Care Moray, 2021) but not in the next year (Healthcare Improvement Scotland 2024). So, clarity on whether a service is planned, piloting or operational at a given point could be improved. Our data does not include which HSCP a patient is under so we cannot determine if all the Hospital@Home stays were from Aberdeen City. Instead of Hospital@Home, Aberdeenshire HSCP plans to advance its Virtual Community Wards (VCW) scheme and Community Hospitals (Cameron 2023). The scheme started in 2016 and is “a means by which people are assessed by a team of professionals in order to identify community supports that can meet their health and social care needs, thus avoiding being admitted to hospital” (Aberdeenshire HSCP 2017). It conducted over 1000 patient assessments in 2016-17, so may have numbers on a similar scale to Hospital@Home, and its definition has similarities. Thus, access to Hospital@Home-like care outside urban areas may not be as limited as the data presented here implies, particularly for short stays which we know are already numerous in our data.

When IC and durations of stay are researched and reported on, the focus tends to be on the consequential stays in other care settings (Mas *et al* 2017; Herfjord *et al* 2014). The data reported here shows that while most stays in IC are comfortably within the typical six-week limit, some are vastly longer. Future research questions may explore why this is and how it influences outcomes, particularly in comparison to equivalent durations of stay in other care settings. The majority of stays are very short for both urban and rural patients, with by far the most frequent duration being zero days. This warrants investigation in future, particularly in comparison to the assessment focus of Aberdeenshire HSCP’s VCW scheme, and the fact that a small but not insignificant number of patients are being discharged to A&E wards. As most of these cases are emergency admissions, they may be crises assessments.

The roughly weekly peaks in durations of stay might be further investigated in combination with expected dates of discharge, which were not included in our data. The suggestion in the data that a higher proportion of rural patients have longer stays is weak due to the small numbers for longer stays, so this warrants future investigation.

## Limitations

Given the small numbers of patients in some hospitals, only SGUR 2-fold 2020 categories could be reported; all the other folds generated several groups of fewer than five members when cross-tabulated with other variables, which is small enough to risk inadvertent re-identification of patients. Increasing the study population may resolve this, but only if the increase is proportional across rural and urban datazones. Most NHS Scotland Health Boards’ populations are skewed towards urban or rural but NHS Tayside’s population distribution is fairly similar to Grampian’s across SGUR 8-fold 2020 classification (National Records of Scotland, 2022). Thus, NHS Tayside is a candidate for merged data analysis in future.

Deprivation indices have been show to be imperfect for rural areas. They tend to neglect more rural features of deprivation such as poor access to digital services (Fecht *et al,* 2017). Rural datazones are also likely to be geographically large and socioeconomically diverse within each zone (Turner *et al* 2023) but similar zone to zone (Fecht *et al* 2017), making them seem more homogeneous than they are. After re-standardising deprivation indices across rural areas only in England, Fecht *et al* (2017) found the majority of areas were one or two quintiles more deprived than the original indices indicated. They also found ‘hidden’ deprivation inside datazones. So, the rural and urban spread of deprivation shown in Figure 3 may not reflect the true experiences of deprivation in rural datazones; deprivation may be more evenly spread in rural patients than the data implies. The rural skew of stays in some hospitals means this issue is likely to be disproportionate across hospitals.

Routinely collected data typically has some missing or implausible values that cannot be checked at source. For example, in this dataset, 21 records are missing values for deprivation and all folds of rurality. No records are missing only some of these values and half of the records with these values missing are for Hospital@Home stays, indicating that this is not the result of randomness, or not entirely. One record showed the discharge date being before the admission data. Also, one record shows an elderly patient being discharged to a neonatal unit, which is probably a data entry error. It is only identifiable through its implausibility; other errors that did not result in implausibility are likely to still be in the data. These records have been excluded from figures dependent on the missing or questionable values.

The data collection period spans the entire duration of the COVID-19 pandemic, which put unprecedented burdens on NHS Scotland. The data for this project does not include variables that would allow the impact of COVID-19 on IC to be investigated or controlled for. It also does not include, for example, bed numbers, that would allow an investigation of IC bed occupancy rates for rural and urban hospitals.

The exclusion of Aberdeenshire HSCP VCW data possibly causes this study to under-report the use of step-up IC in NHSG. The lack of a definition of what does and does not qualify as IC is a known issue (Sezgin *et al* 2020), and this will compound if data is analysed across multiple Health Boards.

## Conclusion

The aim of this research is to address a data gap by presenting summary statistics on IC stays for patients aged 65 years old and over in NHSG for the period 2018-2023. This summary can then prompt questions in NHSG and beyond, perhaps on rural access to Hospital@Home and durations of stay in IC, for the ultimate and continued improvement of patient outcomes.

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