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## Article

### Introduction

In this article we provide unique insight into primary care prescribing patterns for care home patients aged 65 years and over in England during 2020/21, 2021/22 and 2022/23.

Patient address classification is based on experimental data linkage work. We welcome feedback, collaboration, and refinement of the methodology to see if it can be used in NHSBSA information systems in the future and how we can develop additional analyses.

### Key findings

The estimated number of care home patients aged 65 years and over who received prescribing increased each financial year, from 2020/21 to 2022/23. The number of prescription items and associated drug cost also increased.

We estimated a monthly average **of 301,000 care home patients aged 65 years** and over receiving prescriptions in 2022/23. They received an estimated 37 million prescription items at a drug cost of £361 million during 2022/23.

As might be expected, **care home patients aged 65 years and over received a higher rate of prescribing** than non-care home patients, including prescribing of drugs associated with a falls risk. Care home patients also received a different range of medicines to non-care home patients and were more likely to receive prescribing of Vitamin D and for pain relief. They received less prescribing of medicines associated with kidney injury compared with non-care home patients.

Almost two-thirds of care home patients aged 65 years and over who received prescriptions were female. Just over 4 in 10 were females aged 85 years and over. Monthly prescribing costs and volumes varied by age, gender, care home type and geography.

### Methodology

Prescribing estimates are based on a sophisticated methodology which includes linking primary care prescription address data to care home addresses in [AddressBase Plus](https://www.ordnancesurvey.co.uk/business-government/products/addressbase) and [CQC data](https://anypoint.mulesoft.com/exchange/portals/care-quality-commission-5/4d36bd23-127d-4acf-8903-ba292ea615d4/cqc-syndication-1/). The address matching method has been made available as an R package named [{addressMatchR}](https://github.com/nhsbsa-data-analytics/addressMatchR). In addition, the R package [{nhsbsaR}](https://github.com/nhsbsa-data-analytics/nhsbsaR) is used. Many of the functions within the {nhsbsaR} and {addressMatchR} packages are scripted to work specifically with an Oracle database. The source code behind these functions may have to be edited for different database architectures, for them to work correctly.

This analysis addresses a key gap in knowledge and gives valuable insights which can inform the use and management of medicines in care homes to help improve health outcomes, quality of care and ensure value. Points to note:

* Patient count estimates are of care home residents aged 65 years and over **receiving prescriptions**. A care home resident that received no prescriptions would not appear in this data, meaning care home patient count estimates will be lower than the monthly actual care home population. These monthly estimates will be higher than 2021 Census estimates which are based on occupancy on Census day.
* Prescribing patterns will be impacted by the COVID-19 pandemic and beyond. The pandemic started in March 2020 and included a series of national lockdowns during 2020/21.
* There are numerous published sources of data on Adult Social Care home resident numbers that have differing coverage and scope. The data in this publication relate to residents receiving prescriptions and therefore will differ from other estimates. See the [Annex](http://127.0.0.1/Annex#) for further sources of data available on the care home population.
* Drug costs are particularly influenced by prices which have been rising rapidly over the past year due to price concessions and possibly general inflation.

See the [Address Matching](http://127.0.0.1/Address_Matching#) page for further details or the methodology described in full on a [blog post on RPubs](https://rpubs.com/nhsbsa-data-analytics/methodology).

### Overall prescribing for care home patients aged 65 and over

**The number of patients aged 65 years and over who received prescription items in care homes increased each year, as did the number of prescription items and drug cost.**

There was an estimated monthly average of 301,000 care home patients aged 65 years and over receiving at least one prescription item in 2022/23. They received around 37 million prescription items at a drug cost of £361 million.

This accounts for around **6.2%** of all items prescribed to patients aged 65 years and over and around **7.8%** of the drug cost. This represents increases from 2020/21, where there was a monthly average of 289,000 patients, 35 million prescription items and a drug cost of £324 million.

The total number of care home patients who received at least one prescription item in 2022/23 was 481,000. The difference in the monthly average and annual estimates is explained by two key factors.

* The population is not stable – some patients turn 65 years old during the year, some move in or out of the care home and others may die.
* Not all care home patients receive a prescription in every month they are in a care home.

For this reason most [Metrics](http://127.0.0.1/Metrics#prescribing-metrics) were calculated on a [patient-month](http://127.0.0.1/Metrics#prescribing-per-patient-month-ppm) basis.

The number of patients who received prescriptions in a care home peaked in April 2020, at 314,000 patients which was at the start of the COVID-19 pandemic. April 2020 also had the highest number of care home prescription items, at 3.3 million items.

These numbers dropped during the pandemic then steadily rose again from March 2021. Since the last national lockdown, November 2022 had the greatest number of patients, prescription items and drug cost, before seeing a slight decline from December 2022 onwards. There may be some seasonality, with a declining care home population during and around winter months.

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### Demographic estimates for care home patients aged 65 years and over receiving prescriptions

**Age and gender were consistent across the three financial years. Around two thirds of care home patients aged 65 years and over were female and 6 in 10 were aged 85 years and over.**

The number of care home patients increases with age, with the highest age band (90+) typically having the greatest number of care home patients. At some geographic levels lower age bands (such as 85-89) had higher patient counts than the highest (90+) age band.

There were more females than males at all geographic levels and age bands. Females aged 90+ was nearly always the largest group.

The age and gender profile of care home patients is broadly comparable to [ONS Estimates of care home patients from April 2020](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/adhocs/12215carehomeandnoncarehomepopulationsusedinthedeathsinvolvingcovid19inthecaresectorarticleenglandandwales). The care home patient profile is shown in the chart below at an overall level and can be explored by NHS region, Local Authority and Integrated Care System (ICS) across three financial years. The non-care home patient profile is shown alongside for context.

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**There was some slight variation in the number of care home patients aged 65 years and over across deprivation deciles.**

Care home patient prescriptions were allocated an [Index of Multiple Deprivation (IMD)](https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019) decile based on the area ([Lower Layer Super Output Area](https://www.datadictionary.nhs.uk/nhs_business_definitions/lower_layer_super_output_area.html#:~:text=Description,statistics%20in%20England%20and%20Wales)) where the care home was located. There was some variation in patient numbers, with the most and least deprived deciles having lower numbers of patients.

It is possible many residents changed LSOA when they moved into a care home, so this analysis provides information on the types of areas in which care homes are located rather than providing a measure of the deprivation levels of the areas from which residents came. Decisions on the locations of care homes will be influenced by many factors including the local demand for residential care but also by supply side factors such as local property costs and the availability and cost of the care workforce required.

**Similar proportions of care home patients aged 65 years or over live in residential homes and nursing homes.**

On average each month, we estimate similar proportions of care home patients aged 65 years or over living in residential homes (44.5%) and nursing homes (42.5%). A small percentage (2.1%) appear in both settings each month. There were 10.9% which we were unable to link to the [CQC dataset](https://anypoint.mulesoft.com/exchange/portals/care-quality-commission-5/4d36bd23-127d-4acf-8903-ba292ea615d4/cqc-syndication-1/) in order to attribute to a residential or nursing home, due to incomplete address information.

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### Estimated prescribing metrics for care home vs non-care home patients aged 65 years and over

In this section, we compare general prescribing volumes as well as established prescribing metrics including multiple medicines to a patient (polypharmacy), medicines associated with acute kidney injury (DAMN) and medicines associated with impaired cognition and falls (ACB). We also consider some new metrics associated with patient falls. See [Metrics](http://127.0.0.1/Metrics#) for more details.

**Care home patients aged 65 years and over had higher levels of prescribing than non-care home patients across most metrics. Care home patients in nursing homes had higher levels of prescribing than those in residential homes.**

The drug cost per patient-month (PPM) for care home patients aged 65 years and over was nearly double that of non-care home patients. The number of prescription items PPM was around one and half times that of non-care home patients.

Care home patients received a greater number of unique medicines PPM and the proportions of patients on 6+ and 10+ unique medicines were higher among care home patients compared to non-care home patients.

Prescribing of two or more DAMN medicines was the only metric where non-care home patients had higher values than care home patients. Prescribing of two or more ACB medicines was the only metric where values decreased year on year in all four settings.

Age can be restricted to 85 and over in the chart. This subgroup shows similar but much less pronounced differences between care home and non-care home patients than the comparisons for all older people.

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**The estimated average drug cost and prescribing volumes per patient-month are highest for care home patients aged 65 to 69 years.**

The drug cost for care home patients aged 65 to 69 years was around 3 times higher than non-care home patients of the same age, and the number of prescription items was around double. Younger care home patients also received more prescribing, at a higher drug cost than older care home patients. The Office for National Statistics (ONS) [report](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/articles/lifeexpectancyincarehomesenglandandwales/2021to2022) that care home residents aged 65 to 69 years also have the largest difference in life expectancy from non-care home residents, with a difference of 16.3 and 13.9 years between the female and male populations, respectively. They suggest that this difference may be because those entering care homes at younger ages are more likely to have conditions or diseases which limit their lives.

Prescribing metrics were closest amongst care home and non-care home patients aged 90+, where life expectancy differences were reported to be smallest by the ONS.

Except for prescribing of DAMN medicines, prescribing was higher among care home patients than non-care home patients across all age groups.

Male and female care home patients in a given age band had broadly similar prescribing metric values. The same was true for non-care home patients.

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**London has higher estimated drug costs and overall prescribing volumes per patient-month.**

The chart and map show prescribing metrics by NHS region, ICS, and Local Authority.

All prescribing metrics other than prescribing of two or more DAMN medicines are higher across all geographical breakdowns and years for care home patients, compared to non-care home patients.

The average drug cost and number of prescription items per patient-month was highest in the London NHS region for both care home and non-care home patients. The London NHS region was also highest among care home patients for polypharmacy unique medicines metrics and highest for DAMN medicines in non-care home patients.

There were large variations in care home prescribing by Local Authority and ICS. Further ICS and Local Authority trends, at both a care home and non-care home-level, can be discovered through exploration of the chart.

inst/markdown/07\_ch\_flag\_drug.md

### Care home prescribing drug profile

**The profile of medicines prescribed to patients aged 65 years and over differs between care home and non-care home.**

The [British National Formulary](https://bnf.nice.org.uk/) (BNF) groups medicines together based on their primary therapeutic indication. The BNF has multiple levels. Here we consider prescribing at four levels starting with the largest grouping called chapters, followed by sections, paragraphs and chemical substances.

The chart below shows the 20 most common medicines at each BNF level for care home patients. This can be viewed by drug cost and number of prescription items per patient-month and annually. Non-care home values are included for comparison.

Overall, care home patients aged 65 and over were more likely to receive drugs in the Central Nervous System Chapter than non-care home patients, whereas non-care home patients were more likely to receive drugs in the Cardiovascular chapter.

In 2022/23, at a chemical substance level, Colecalciferol (Vitamin D) was the most prescribed drug to care home patients followed by Paracetamol. For non-care home patients it was Atorvastatin (typically used to lower cholesterol). By drug cost, it was Apixaban (which helps prevent blood clots) among both care home and non-care home patients.

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**The profile of medicines prescribed to care homes patients aged 65 years and over varied by geography**

The chart allows exploration of drug cost and prescription item metrics for care home patients within a selected drug group, year, and geography. Geographies can be selected at NHS region, ICS, or Local Authority level.

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## Metrics

### Prescribing per patient-month (PPM)

‘Patient-months’ is used in all prescribing metrics. The *Patient-months example* table displays the total number of prescription items and unique medicines prescribed per patient per month within a given financial year:

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There are 10 patient-months (from 3 patients) in this sample. Over the 10 patient-months, 70 items were prescribed. The mean number of items prescribed per patient-month (PPM) was therefore 70 / 10 = 7 items. This metric uses the sum of all items as the numerator and the total number of patient-months as the denominator.

Out of the 10 patient-months, only two of them had 10 or more unique medicines prescribed. Therefore, the percentage of patient-months with 10 or more unique medicines prescribed is 2 / 10 = 20%. This metric uses a count of patient-months satisfying a condition as a numerator and the total number of patient-months as the denominator.

This analysis uses nine key prescribing metrics. Four of these calculate the mean value across patient-months, like the first example. Five of these see how many patient-months satisfy a condition out of all (or a selection of) patient-months, like the second example.

All prescribing metric definitions are described in the *Prescribing metric definitions* table. Two metrics relate to cost and volume. Five polypharmacy metrics are based on metrics developed nationally and used in the NHSBSA [ePACT2 polypharmacy dashboard](https://www.nhsbsa.nhs.uk/access-our-data-products/epact2/dashboards-and-specifications/medicines-optimisation-polypharmacy). Two of the metrics were generated from [research around medicines](https://www.nice.org.uk/guidance/cg161) associated with falls risk in elderly people. The required additional information to fully understand these metrics is presented below.

The PPM metrics were calculated only using data from months where a patient received prescribing. If a patient was a care home resident for a given month yet received no prescribing, this month would not contribute towards PPM calculations. A care home resident with periodic repeat prescriptions could potentially have a drug allocation covering more than one month. Prescribing would only be allocated to the dispensing month.

### Polypharmacy metrics

#### Patients prescribed 6+ or 10+ unique medicines

The percentage of patients prescribed 6+ or 10+ unique medicines are patient-month variations of metrics from the NHSBSA ePACT2 Polypharmacy dashboard. These metric calculations only consider prescription items from BNF chapters 1-4 and 6-10. The [rationale (PDF format)](https://www.nhsbsa.nhs.uk/sites/default/files/2018-02/PolyPharmacy%20Specification%20v1%200%20July%202017_0.pdf) for the selection of BNF chapters is that the comparators are intended to help practices to focus on mostly orally taken medicines, prescribed for long term conditions. This can then exclude, for example, incidental prescribing related to infections. In general, these are the medicines that have been found in studies to increase the risks associated with taking multiple medicines.

#### Anticholinergic burden (ACB)

Anticholinergic medicines should be prescribed with caution as elderly patients are more likely to experience side effects such as constipation, urinary retention, dry mouth/eyes, sedation, delirium, falls and reduced cognition (which may be wrongly diagnosed as dementia).

This analysis uses a patient-month version of the NHSBSA [ePACT2 Polypharmacy dashboard ACB metric](https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.nhsbsa.nhs.uk%2Fsites%2Fdefault%2Ffiles%2F2021-02%2FACB1_specification_MH_v1.1_Feb2021.docx&wdOrigin=BROWSELINK). Rather than generating an ACB score, the percentage of patient-months with anticholinergic prescribing, in which at least two medicines of moderate to high anticholinergic burden were prescribed has been calculated.

#### Medicines likely to cause kidney damage (DAMN)

Patients in the community with chronic kidney disease and patients with normal renal function who are treated with an angiotensin converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB) are at increased risk of acute kidney injury (AKI) if they develop an illness associated with hypovolaemia and hypotension. The temporary cessation of certain medications may induce, exacerbate, and complicate AKI. These drugs can be remembered by the mnemonic DAMN (diuretics, ACEi/ ARBs, metformin, NSAIDs).

This analysis uses a patient-month version of the NHSBSA [ePACT2 Polypharmacy dashboard DAMN metric](https://www.nhsbsa.nhs.uk/sites/default/files/2018-02/PolyPharmacy%20Specification%20v1%200%20July%202017_0.pdf), which is the percentage of patients prescribed two or more unique medicines during a single month that are likely to induce, exacerbate or complicate AKI (DAMN medicines), out of the months where patients was prescribed at least one such drug.

### Fall metrics

#### Medicines associated with falls risk in older people

Falls and falls-related injuries are a common and serious problem for older people. Whilst there are many contributing factors, [certain medications (PDF format)](https://pubmed.ncbi.nlm.nih.gov/29396189/) are recognised as a major and modifiable risk factor for falls. The human cost of falling includes distress, pain, injury, loss of confidence, loss of independence and mortality. Financially, falls are estimated to cost the NHS more than £2.3 billion per year. Falls in older people, including those living in care homes, [impact both quality of life and healthcare costs](https://www.nice.org.uk/guidance/cg161).

To support clinicians in the management of falls and to facilitate the deprescribing process, a group of clinicians developed the [Screening Tool of Older Persons Prescriptions in older adults with high fall risk](https://academic.oup.com/ageing/article/50/4/1189/6043386) (STOPPFall).

This analysis uses the broad medicine groups outlined by STOPPFall to define a list of medicines associated with falls risk. The medicine groups were converted into a list of chemical substances, collating the chemical substances within several BNF sections, paragraphs and sub-paragraphs most closely aligned with the STOPPFall medicine groups.

The list of chemical substances within the broad STOPPFall medicine groups was validated for associated falls risk by Heather Smith, Consultant Pharmacist: Older People at NHS West Yorkshire Integrated Care Board and David Alldred, Professor of Medicines Use and Safety at the University of Leeds. A small number of medicines were considered exceptions and removed. For example, antihistamines are a STOPPFall medicine group yet not every single antihistamine has a falls risk.

The end-result is a list of 304 combinations of BNF paragraphs and chemical substances (as a single chemical substance can appear in multiple paragraphs and some of which are not relevant). The formation of this list is summarised by the *Falls risk medicine groups* table, taking all the BNF paragraph-chemical substance combinations resulting from multiple BNF level filters.

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### Prescribing metrics

The *Prescribing metric definitions* table describes the name of each metric as it appears in the analysis, together with the numerator and denominator when calculating each metric, and a longer description of each metric.

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Metric calculations are adapted for charts with many factors. For example, in the *BNF-level prescribing analysis by geography* chart the Adur Local Authority in 2022/23 had a ‘Mean prescription items PPM’ value of 0.25 for the Lansoprazole chemical substance. There were 1,199 Lansoprazole items prescribed in care homes in Adur in 2022/23, which is the numerator in this calculation. There were 4,828 care home patient-months in Adur in 2022/23, which is the denominator in this calculation. 1,199 / 4,828 = 0.25 to a single decimal place, as displayed in the chart.

The *BNF-level prescribing analysis by geography* chart also has two metrics not using patient-months as a denominator. These are ‘% of total annual number of prescription items’ and ‘% of total annual drug cost’. These calculations also consider many factors. For example, the Allerdale Local Authority in 2022/23 had a ‘% of total annual number of prescription items’ value of 0.55% for the Salbutamol chemical substance. There were 431 Salbutamol items prescribed in care homes in Allerdale in 2022/23, which is the numerator in this calculation. There were 77,771 total items prescribed in care homes in Allerdale in 2022/23, which is the denominator in this calculation. 100 \* (431 / 77,771) = 0.55% to a single decimal place, as displayed in the chart.

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## Datasets

### Prescriptions data

Analysis is based on primary care prescription data collected by the NHS Business Services Authority. The data are collected for the operational purpose of reimbursing and remunerating dispensing contractors for the costs of supplying drugs and devices, along with essential and advanced services, to NHS patients. This excludes:

* prescriptions that were issued but not presented for dispensing
* prescriptions that were not submitted to the NHSBSA for processing and reimbursement
* prescriptions issued and dispensed in prisons, hospitals, and private prescriptions
* prescription batches submitted late

Prescription data relates to prescription batches submitted to the NHSBSA for payment between April 2020 and March 2023. The part month in NHSBSA data relates to the dispensing month for which the prescription batch was submitted. This is generally but not always the month in which the prescription was dispensed. This means there may be dispensing for given patients that has not been submitted to the NHSBSA for payment and is therefore not included. There may also be prescriptions included for a patient that were dispensed prior to the dispensing month.

Patients may receive prescription items that have not been prescribed to them personally and will not be accounted for. This may occur in the case of high-volume vaccines such as flu vaccines, and in the case of bulk prescribing of products, which can be bought in a pharmacy or supermarket such as Lactulose syrup and small volumes of Paracetamol. There is no means of quantifying the extent of this in NHSBSA data.

The NHSBSA do not capture the clinical indication of a prescription and therefore do not know the reason why a prescription was issued, or the condition it is intended to treat. Many drugs have multiple uses, and although classified in the BNF by their primary therapeutic use may be issued to treat a condition outside of this.

Due to manual processes involved in the processing of prescriptions there may be inaccuracies in capturing prescription information which are then reflected in the data. NHS Prescription Services have a variety of validation streams throughout prescription processing to support accurate capture of the data. In addition, a retrospective sample is completed in the month following reimbursement to identify the accuracy of prescription processing information. The check includes the accuracy of prescriber, practice, and drug information, but does not include the personal details of the patient. The reported Prescription Processing Information Accuracy for the 12-month rolling period ending March 2023 was 99.9%. The sample may not be representative at a more granular level; as such the level of accuracy is undetermined for specific groups such as drugs, geographies, and time periods. It should also be noted that the identification of errors in the accuracy checking sample does not result in amendments to data held in NHSBSA systems. Further details of Prescription Processing Information Accuracy can be found on our [website](https://www.nhsbsa.nhs.uk/pharmacies-gp-practices-and-appliance-contractors/payments-and-pricing/how-we-process-prescriptions).

### Patient data

A single age was attributed to each patient for each financial year, to enable aggregations for multiple charts within the analysis. The maximum age recorded across all prescription forms for a patient, within each financial year, was taken as their age.

The analysis focuses on prescriptions for older patients aged 65 years and over at the time of prescribing. Patient age was determined using a mixture of patient information from prescription forms and the [Personal Demographics Service](https://digital.nhs.uk/services/demographics) (PDS). Further details on the process of [patient age determination (PDF format)](https://www.nhsbsa.nhs.uk/sites/default/files/2018-02/180115%20Age%20Logic%20Summary%20Flow%20Chart%20-%20Revised%20Layout.pdf) can be found on our website.

A single gender was attributed to each patient. The most recent gender recorded against a patient was taken as their gender. Patient gender was sourced from the PDS, which includes four categories: (1) Male, (2) Female, (3) Not known, (4) Not specified. Category (3) consists of patients where gender has not been recorded; category (4) consists of patients who could not be classified as either male or female.

Patient prescription forms were labelled as being from a care home or not based on address matching described in the [Methodology](https://rpubs.com/nhsbsa-data-analytics/methodology). Of 248 million prescription forms issued to patients aged 65 years and over in 2022/23, 17 million could be categorised as being from a care home.

[Ordnance Survey AddressBase](https://www.ordnancesurvey.co.uk/business-government/products/addressbase) (AB) is a product that is in a continual state of refinement. While the AB epochs used in the analysis were the closest to the end of each financial year, there would still be instances where the information in AB did not mirror actual patient address details at the time of prescribing.

A selection of AB building classification types were removed from the lookup data, such as street records, objects of interest, car parks, garages and others. Some incorrect matches may have occurred through not excluding other building classification types.

The analysis required that every prescription form had a patient address recorded. Addresses were available for all electronic prescriptions. Address information was not captured directly from paper prescriptions and therefore a process was derived to generate these addresses using a mix of information from the Personal Demographic Service (PDS) and electronic prescriptions across a range of months This is described in [Section 2.3 of the Methodology](https://rpubs.com/nhsbsa-data-analytics/methodology). Although accurate, this is not as robust as directly sourced patient address information from electronic prescriptions.

For the 2022/23 financial year, patient addresses could be allocated for 99.9% of paper prescription forms where the patient’s NHS number could be identified, and the patient was aged 65 years and over.

Prescription forms with known non-English patient address information were removed from the analysis. Records with an unknown or missing postcode were included.

The analysis only includes patients with an NHS number and date of birth verified by PDS.

NHS numbers are captured for 100% of electronic prescription messages. We estimate that NHS numbers are captured for 94.7% of paper prescriptions. Overall, the capture rate is over 99% of all prescriptions.

The NHSBSA periodically investigate the accuracy of NHS numbers captured from paper forms. The personal details captured (NHS number, date of birth and age) are compared against those on the prescription form for a random sample of 50,000 prescription forms. The NHS number captured typically matches that on the prescription form for over 99.9% of forms. The results represent the accuracy for all prescription items processed; as such the level of accuracy is undetermined for specific medicines, geographies, time periods and other factors. By contrast, the accuracy of captured NHS numbers in electronic prescribing is estimated to be 100%.

### Lookup address

Patient geography information was determined using the [National Statistics Postcode Lookup](https://geoportal.statistics.gov.uk/datasets/9ac0331178b0435e839f62f41cc61c16/about) (NSPL) from the [ONS Open Geography portal](https://geoportal.statistics.gov.uk/). An NHS region, Integrated Care System (ICS) or Local Authority could not be attributed to a patient address record if they had an unknown postcode, or if their postcode was not contained within the NSPL. We use 2022 boundaries for NHS regions and ICSs. For Local Authorities we use 2021 boundaries since our internal data is currently being updated.

[Ordnance Survey AddressBase](https://www.ordnancesurvey.co.uk/business-government/products/addressbase) (AB) was the foundation of the lookup address data, which was matched against patient address information. AB is available in three formats, Core, Plus and Premium. This analysis used AB Plus.

AB Plus is a product that is in a continual state of refinement, with epochs released on a six-weekly schedule. For each of the three financial years, the extract with date closest to the end of the financial year was used.

[AB building classifications (PDF format)](https://www.ordnancesurvey.co.uk/documents/product-support/tech-spec/addressbase-technical-specification.pdf) were critical to matching a patient record to an address classified as being a care home. These classifications are maintained by Ordnance Survey based on information supplied by external agencies (e.g. Care Quality Commission) and rely on accurate information being supplied to Ordnance Survey. To remove potential mismatches a selection of AB building classification types were removed from the lookup data, such as street records, objects of interest, car parks, garages, and others. However, although this reduces the scope for mismatching there may be other building classification types that could also be excluded.

[Care Quality Commission](https://www.cqc.org.uk/) (CQC) data was used to supplement the AB address information. This increased the pool of care home addresses and resulted in more accurate identification of prescriptions for care home residents.

CQC information was sourced from the [CQC API](https://anypoint.mulesoft.com/exchange/portals/care-quality-commission-5/4d36bd23-127d-4acf-8903-ba292ea615d4/cqc-syndication-1/).

As with AB, CQC data is also in a state of [continual refinement](https://www.cqc.org.uk/what-we-do/how-we-use-information/how-we-use-information), due to the changing nature of property details, and as with AB, a snapshot of the CQC data taken at a point in time was used for the matching process.

CQC data also holds additional care home definitions, including showing a distinction between nursing and residential homes. The definitions could be extended to AB records where the CQC data included a Unique Property Reference Number, although this was not available for all CQC records.

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## Address Matching

Prescribing estimates are based on a sophisticated methodology which matched primary care prescription address data to address information from Ordnance Survey [Ordnance Survey AddressBase (AB)](https://www.ordnancesurvey.co.uk/business-government/products/addressbase) and the [Care Quality Commission (CQC)](https://anypoint.mulesoft.com/exchange/portals/care-quality-commission-5/4d36bd23-127d-4acf-8903-ba292ea615d4/cqc-syndication-1/). The address matching method has been made available as an R package named [{addressMatchR}](https://github.com/nhsbsa-data-analytics/addressMatchR). Both patient and lookup addresses (AB combined with CQC data) required a Single Line Address (SLA) for the matching process. SLAs were generated by combining all address information into a single data field. There were four ways prescription forms were classified as belonging to a care home. They were performed in the following order:

1. Exact match
2. Non-exact match
3. Patient count match
4. Keyword match

### Exact match

When a prescription form SLA was matched exactly to a care home SLA.

### Non-exact match

When SLA could not be exact matched, a match score was generated using the individual words (tokens) in the patient and lookup addresses. A Non-exact match is when the highest scoring match using this method was a care home address. This was the most technical match type and the foundation of the {addressMatchR} package.

### Patient count match

Two additional methods were applied to patient addresses that could not be exact or non-exact matched. The first of these was to assign care home status according to the following criteria:

* the patient address shared a postcode with a known care home
* five or more patients received prescribing at this address in a single month
* the patient address did not include some exclusion terms, such as ‘hospital’

The threshold of five or more patients was identified through a data validation process.

### Keyword match

The final match type looked at keywords appearing in patient addresses. If a patient address contained the term ‘care home’, ‘nursing home’, ‘residential home’, or ‘rest home’, it was classified as being a care home. Each match type led to a different number of prescription forms classified as being from a care home. In 2020/21:

* 3.9m forms were exact matched to a care home
* 11.5m forms were non-exact matched to a care home
* 0.3m forms were patient-count matched to a care home
* 0.4m forms were keyword matched to a care home

A comprehensive validation exercise using the 2020/21 data estimated the overall accuracy of correctly classifying a prescription form to a care home at 99.6%. With the methodology being consistent a similar level of accuracy can be expected for the 2021/22 and 2022/23 data. The validation only focused on false-positive matches. This was where a patient address record was incorrectly labelled as being a care home. No work was done to gauge the extent of false-negatives, namely patient address records that were care homes although not labelled as such. More information around validation accuracy estimates can be found within part 6 of the full methodology. [This is described in full on a blog post on RPubs](https://rpubs.com/nhsbsa-data-analytics/methodology).

Throughout the project the NHSBSA ensured data was protected and secure and adhered to the Caldicott Guardian principles.

inst/markdown/12\_feedback.md

## Feedback

We welcome your views and input on the prescription metrics used in the analysis, along with the methodology and code. We would be interested to hear how the insight can be used and how our work can be developed further. You can contact us by email at [dall@nhsbsa.nhs.uk](mailto:dall@nhsbsa.nhs.uk).

Please take a moment to fill out the [survey](https://online1.snapsurveys.com/bsareport?rpt=5); your input will be of value.

inst/markdown/13\_annex.md

## Annex

Further sources of data on the adult care home population:

* [Care homes and estimating the self-funding population, England: 2022 to 2023](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/socialcare/articles/carehomesandestimatingtheselffundingpopulationengland/2022to2023)
* [Age and the self-funding population in care homes, England: 2022 to 2023](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/socialcare/adhocs/1300ageandtheselffundingpopulationincarehomesengland2022to2023)
* [Life expectancy in care homes, England and Wales](https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/datasets/lifeexpectancyincarehomesenglandandwales)
* [Communal establishment residents, England and Wales: Census 2021](https://www.ons.gov.uk/peoplepopulationandcommunity/housing/bulletins/communalestablishmentresidentsenglandandwales/census2021#types-of-communal-establishment)
* [Adult Social Care Activity and Finance Report](https://digital.nhs.uk/data-and-information/publications/statistical/adult-social-care-activity-and-finance-report)
* [Monthly statistics for adult social care (England)](https://www.gov.uk/government/collections/monthly-statistics-for-adult-social-care-england)
* [Estimating the size of the self-funding population in the community, England: 2022 to 2023](https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/socialcare/bulletins/estimatingthesizeoftheselffunderpopulationinthecommunityengland/2022to2023)
* [Care directory with filters](https://www.cqc.org.uk/about-us/transparency/using-cqc-data)

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### Final thoughts

This article provides estimates of primary care prescribing patterns for care home and non-care home patients aged 65 years and over in England during 2020/21, 2021/22 and 2022/23 based on experimental data linkage work.

This analysis addresses a key gap in knowledge and gives valuable insights which can inform the use and management of medicines in care homes to help improve health outcomes, quality of care and ensure value.