

Admin-based statistics for property floor space, feasibility research: England and Wales

Early research demonstrating measures of property size (floor space) from Valuation Office Agency data, which statistics can be generated from these data, what they can and cannot be used for, and a request for feedback on their usefulness.

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1 . Disclaimer

These Research Outputs and the linked Valuation Office Agency (VOA) data included in these analyses are not official statistics on the residential floor space in England and Wales. Rather they are published as potential alternative statistics complementing widely used and collected measures on living conditions such as [number of bedrooms \(XLS, 867KB\)](#). These Research Outputs should not be used for policy- or decision-making.

It is important that the information and research presented are read alongside the analysis to aid interpretation and avoid misunderstanding. These analyses must not be reproduced without this disclaimer and warning note.

2 . Summary

We are exploring the use of administrative data on housing to supplement or replace information collected on censuses and surveys. This is our third publication examining the potential use of Valuation Office Agency (VOA) data to enhance the census with information on property type, size and number of rooms, following our commitment to explore administrative housing data as set out in the 2021 Census White Paper, [Help Shape Our Future: The 2021 Census of Population and Housing in England and Wales \(PDF, 967KB\)](#). This output focuses on the topic of floor space.

Until now, published information about floor space has been produced through surveys such as the [English Housing Survey](#). However, because of sample size, analysis of floor space for sub-regional geographies has been limited. VOA data offer the opportunity for additional insight into floor space as they can provide information down to small geographies across England and Wales, because they are not based on a sample. This enables housing policymakers to better understand the characteristics of the dwelling stock in their areas and therefore better meet the future housing needs of local residents.

Additionally, VOA data could be used in the future to develop a new approach to understanding living conditions in England and Wales, in particular providing alternative overcrowding measures that focus on living space available (per person) instead of just looking at number of rooms or bedrooms.

The VOA property data used within this publication measure floor space using two methods depending on the property type. Caution needs to be taken when comparing floor spaces measured by differing methods. However, floor space can be compared for properties of the same type.

For this work we successfully linked 96% of 2011 Census households to the VOA property data.

Our analysis found that floor space generally follows the expected distribution by property type, for example, detached properties are larger than those belonging to a terrace. Through looking at the regions of London and Wales we were also able to identify trends in urban and rural local authorities.

3 . Things you need to know about this release

We are transforming the way we produce population, migration and social statistics to better meet the needs of our users and to produce the best statistics from all the available data. More information about our plans to do this and how we are [progressing a programme of work](#) to put administrative data at the core of population, migration and social statistics is available.

We welcome users' feedback on these Research Outputs and the methodology used to produce them, including how they might be improved and potential uses of the data. Please email your feedback to admin.based.characteristics@ons.gov.uk. Please include "Housing" in the subject line of your response.

This is early research to demonstrate the potential of administrative data to supplement data collected by surveys and censuses. Currently information on accommodation floor space is not widely collected by surveys. The [English Housing Survey \(EHS\)](#) does collect the floor space as does the [Royal Institute of British Architects \(PDF, 3.41KB\)](#) but only allow for limited analysis of sub-regional geographies because of small sample sizes. The [Welsh Housing Conditions Survey](#) 2017 to 2018 collected this information, but it is not available below national level because of sample size.

Our research uses Valuation Office Agency (VOA) data, which provide information on housing characteristics. The VOA property data cover domestic properties (dwellings) in England and Wales. More information about the VOA data can be found in the [source overview](#).

The VOA measures floor space differently depending on the type of property being measured. Reduced Coverage Area (RCA) is used to measure houses and bungalows whilst Effective Floor Area (EFA) is used for flats and maisonettes ([see Section 12 for more information on these definitions](#)).

To produce these research outputs, VOA property data have been linked to 2011 Census data. This allows us to produce information and analyses of "occupied household spaces" and exclude unoccupied dwellings so that analysis reflects dwellings that people are living in.

4 . Background

In the Census White Paper, [Help Shape Our Future: The 2021 Census of Population and Housing in England and Wales \(PDF, 967KB\)](#), we outlined our desire to transform our population, migration and social statistics system. This included a commitment to explore the feasibility of supplementing census with [Valuation Office Agency \(VOA\)](#) data on property type, size and rooms.

Presently, the Office for National Statistics (ONS) collects data and produces outputs on housing statistics that are widely used across central and local government to understand the characteristics of the housing stock as well as living conditions in England and Wales. The 2011 Census collected information on accommodation type and number of rooms to meet this need.

Our [user needs \(PDF, 1.59MB\)](#) consultation for the 2021 Census shows that measuring and understanding overcrowding is an area of interest. Within this consultation, it was noted that overcrowding is seen as a fundamental indicator of housing deprivation and living in such conditions is associated with [adverse personal and health effects](#).

The ONS used the [bedroom standard](#) to produce estimates of overcrowding and under-occupancy in the 2011 Census. The bedroom standard assigns the number of bedrooms theoretically required by the residents¹ at an address and compares it with the actual bedrooms available, as recorded in the 2011 Census. This gives an occupancy rating where a value of minus 1 or less implies that a household is overcrowded, whereas a rating of plus 1 or more implies it is under-occupied.

However, this method of deriving an indicator of overcrowding has limitations. When properties that have the same numbers of bedrooms² and occupancy are compared, they may have different space available despite the apparent similarity. Comparatively, using measures based on floor space could be one way to better reflect the diversity of living conditions and offer an opportunity for international comparison. The use of number of bedrooms or rooms for international comparison of living conditions is challenging as different countries have different standards and approaches to property building such that a room in one country might be quite different to one in another country. Floor space could be used for more equal international comparisons.

Notes for: Background

1. The “bedroom standard”, provides a notionally recommended number of bedrooms for each household based on its size and the age, sex, marital status and relationship among members of the household.
2. For more information on the definition of bedrooms, please see our previous publication on [Number of rooms and bedrooms](#).

5 . Statistical quality and coverage of VOA data

The data provided to the Office for National Statistics (ONS) by the Valuation Office Agency (VOA) contain information on all properties liable for domestic Council Tax in England and Wales. However, some of these properties are empty and some contain populations that are not defined as [usual residents](#). In comparison, the 2011 Census gathered information on properties containing households of one or more usual residents.

Most residential addresses in England and Wales are used by a single household, but we identified 1% of households had a duplicate address (from the unique property reference number (UPRN)), which may be because there was more than one household at an address. It is not currently possible to clearly identify multiple households¹ at an address from administrative data alone.

Overall, 96% of 2011 Census households were successfully linked to the VOA data. The linkage rate for England was 96% and Wales was 94%. For more information on our linkage method, please [see Section 12](#).

The linkage rate varied by VOA property type. Overall, the bungalows and houses groupings ([see Section 13 for property type groupings](#)) had higher levels of linkage. Following this were the maisonettes and flats groupings whilst the other grouping had the lowest linkage rate. This is likely because of higher levels of missing UPRNs, which are unique identifiers for every address in Great Britain, allocated by local government and the Ordnance Survey.

As outlined in our publication on [property type](#), it is found that the rate varies by local authority with the highest linkage being 99% of households in a local authority and the lowest linkage being 60%.

In this publication, we use “property type” as recorded on the VOA data when distinguishing between different types of accommodation, for example, houses and flats. The more detailed VOA property type can be mapped onto and agrees with census accommodation type for the majority of cases. There is no equivalent to the census category of “a flat, maisonette or apartment that is in a commercial building” in the VOA property types. A more detailed discussion on the topic of property type can be found in our [publication](#) comparing VOA property type and 2011 Census accommodation type.

Notes for: Statistical quality and coverage of VOA data

1. For the 2011 Census a Household was defined as:
 - one person living alone; or
 - a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room or sitting room or dining area

6 . VOA definitions of floor space

The Valuation Office Agency (VOA) has two distinct ways of measuring floor space depending on the type of property being measured.

For houses, bungalows and chalet-style properties, the size of the dwelling is measured using Reduced Covered Area (RCA). The RCA takes its name from the approach of recording the whole dwelling area (including external walls) and then reducing it by subtracting a range of areas that fall outside of the measure. A breakdown of what is included and what is excluded when measuring using RCA is available in [Section 12](#).

For flats and maisonettes, the size of the dwelling is measured using Effective Floor Area (EFA)¹. The EFA measures the useable area of the rooms within a dwelling measured to the internal face of the walls of those rooms. A breakdown of what is included and what is excluded when measuring using EFA is also available in [Section 12](#).

When comparing RCA with EFA, it is important to keep in mind that the former includes external walls, hallways, landings and passages while the latter does not.

Notes for: VOA definitions of floor space

1. The Royal Institution of Chartered Surveyors Code of Measuring Practice “special use definitions” state specifically that EFA is used for Council Tax banding for flats and maisonettes.

7 . Floor space for different property types

Houses and bungalows

Houses ([see Section 13 for property groupings](#)) are the most common property type, with 16 million records, or 71% of linked records, falling in this grouping. The floor space of houses is measured using Reduced Coverage Area (RCA) by the Valuation Office Agency (VOA).

Across all classifications within the houses group, the median¹ floor space was 99 square metres (sqm). Exploring this further, we found that detached and semi-detached properties have a larger median floor space than those that are in a terrace (including end of terrace) or a cluster².

Overall, detached houses have the largest median floor size at 136sqm but also have the largest variation³. This would be expected for this VOA classification, which contains stately and country homes as well as smaller, two- and three-bedroom detached houses. Weight is given to this when looking at the 99th percentile⁴ of the detached house classification, of 409sqm, which is the largest figure across all groupings.

The median floor space of all property classifications belonging to the bungalows grouping was 81sqm. Similar to the trend observed for houses, bungalows belonging to a terrace are found to have a smaller median floor space than those that do not.

Another parallel can be drawn when looking at detached bungalows as these properties have both the largest median value, 95sqm, and the largest interquartile range, suggesting a higher level of diversity in this group. However, comparative with the houses grouping, bungalows in a cluster have a larger median floor space. Mid- and end of terrace bungalows are the smallest type of bungalow and have the smallest interquartile range, suggesting more of a uniformed size compared with other bungalows as well as other properties in the houses grouping. These findings highlight that whilst there is a degree of overlap between the patterns observed in the houses and bungalows categories, both do have unique trends.

Flats and maisonettes

As was outlined in [Section 6](#), the floor space of flats and maisonettes⁵ is measured using Effective Floor Area (EFA), which is different to the way that houses and bungalows are measured.

The median floor space of all classifications belonging to the flat's grouping was 43sqm. Across all comparative subcategories, the median floor space of flats is found to be smaller than houses, bungalows and maisonettes. Flats in a terrace have a smaller floor space compared with those that are within either semi- or fully-detached properties. This is the same pattern we have seen for houses and bungalows.

The median value for purpose-built flats is larger than for non-purpose-built⁶. Purpose-built flats also have a smaller variance in contrast to non-purpose-built properties.

For the maisonette grouping, the median floor space was 57sqm. We observed that purpose-built maisonettes have smaller median values than those that are not purpose-built or are converted former commercial and industrial premises. A reason for this could be that these properties may be conversions from larger dwellings. Support to this argument is given as the 75th percentile across all categories is larger for those that are not purpose-built properties.

Other property type

There are a number of properties that do not fit within the house, bungalow, flat or maisonette groupings. This group includes annexes, caravans, other mobile homes and house boats. Overall, the classifications in this grouping have a median floor space of 45sqm. Annexes are the largest classification within this grouping with a median of 53sqm. Beyond this, mobile homes and house boats have a median value of 45sqm whilst caravans, at 38sqm, are found to have the smallest median floor space of all property types found across all groupings.

Notes for: Floor space for different property types

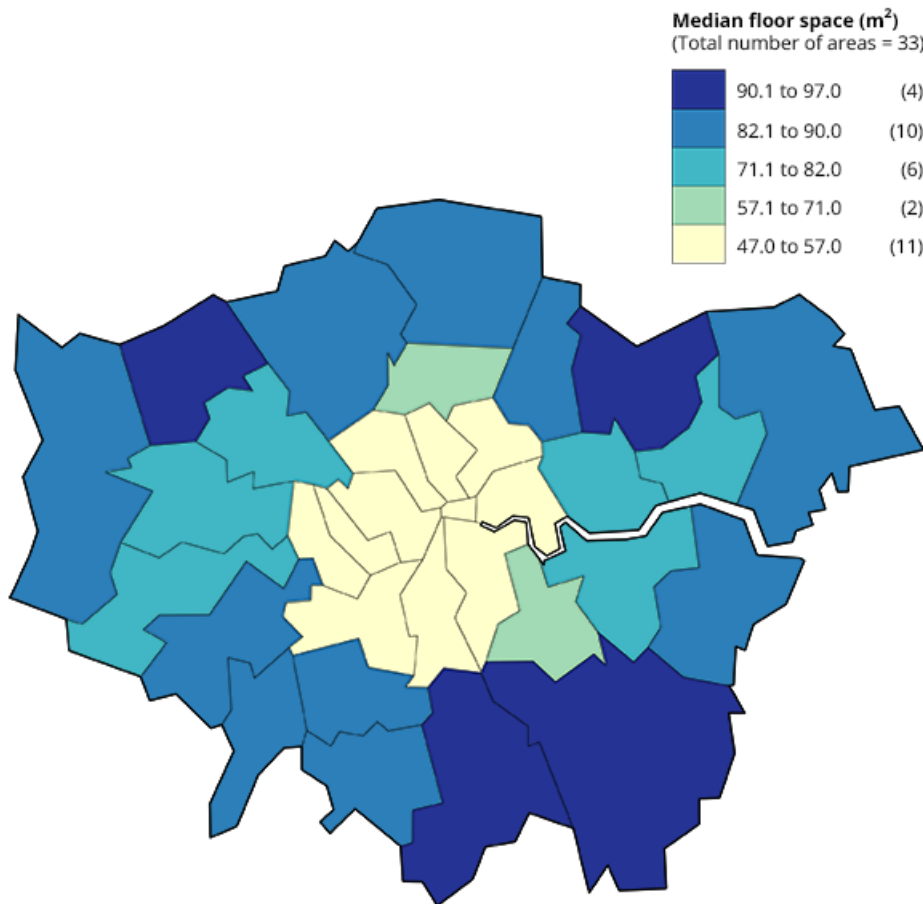
1. The median value has been used instead of the arithmetic mean as the analysed data do not follow a normal distribution and contain extreme and capped values (for instance, the largest property size available is capped at 9,999sqm).
2. The property types of “in a cluster” typically refers to a group of several houses with one or more adjoining walls that are not in a traditional terrace formation.
3. With the exception of a small sub-group of fewer than 500 houses where the exact nature of property is unknown but the interquartile range is slightly larger.
4. 99th percentile used to exclude extreme outliers and capped values.
5. Flats are properties that have communal entrances whereas maisonettes are properties that have their own private entrance.
6. Non-purpose-built properties are those that are converted or do not find themselves in the same configuration as they were when first built. Conversely, purpose-built properties are those that are the same as when built and not conversions.

8 . Geographical analysis of median floor space

Linking Valuation Office Agency (VOA) data to census records enables us to produce geographical breakdown of floor space for 96% of 2011 Census households. Caution has to be taken at this point because of the two different measures of floor space used for houses and bungalows (Reduced Coverage Area) and flats and maisonettes (Effective Floor Area).

The region with the widest range between the largest and smallest median floor spaces is London, with Bromley having a median floor space of 97 square metres (sqm) and City of London having a median value of 47sqm. This exemplifies the general data pattern of the boroughs, with the smallest floor space being situated in the centre of London with floor space increasing as you move away from the centre of London (see Figure 1).

Figure 1: Median floor space for dwellings, by London borough, London region, 2011



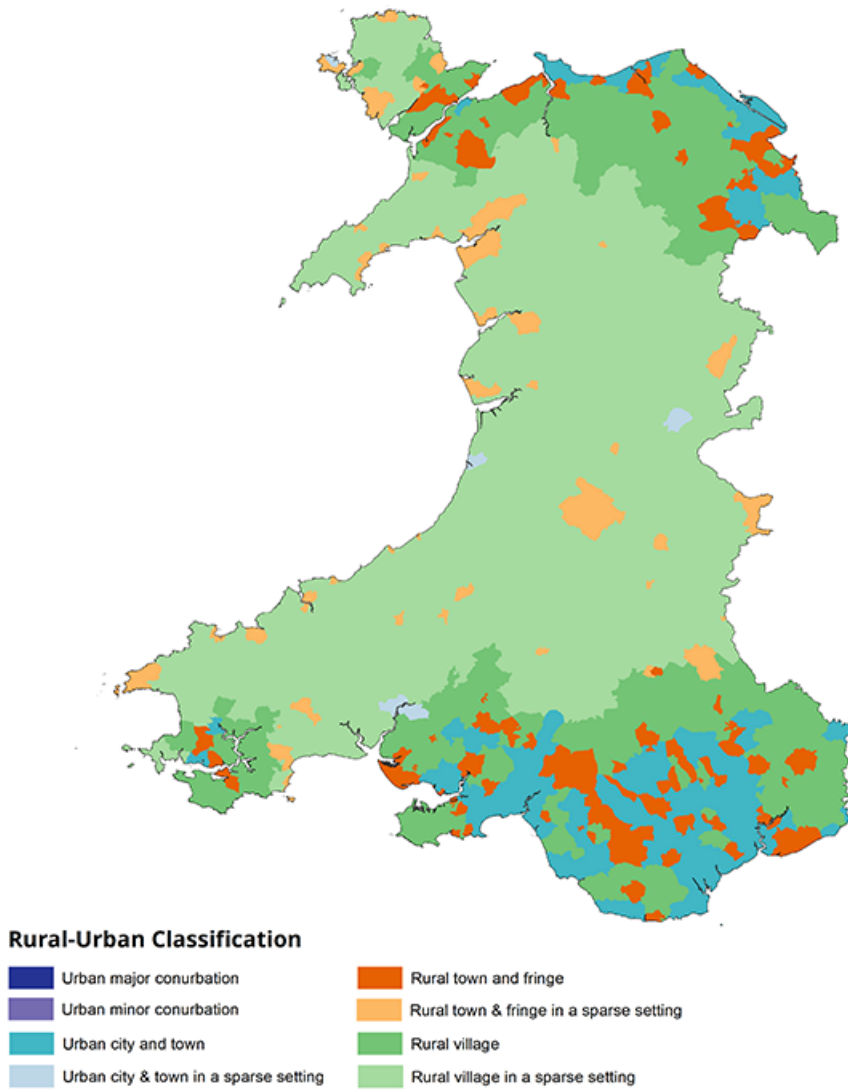
Source: Valuation Office Agency; Office for National Statistics licensed under the Open Government Licence v.3.0.
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Boroughs in London also tend to have smaller median floor space compared with local authorities found in other regions. The smallest median property size for a local authority outside of London is in Brighton and Hove at 78sqm. In London, 45% of the boroughs had a median property size smaller than 78sqm.

Looking beyond cities, we can also observe that median floor space varies between rural and urban areas. This is exemplified by looking at the [urban and rural classification of Wales](#). In previous Office for National Statistics analysis it has been found that areas in the middle and west coast of Wales constitute the majority of rural areas (see Figure 2). This can be coupled with our analysis (see Figure 3), which found that unitary authorities in these regions tend to have larger overall floor spaces whilst unitary authorities in the north and south of the country, which are more urbanised, tend to have a smaller floor space.

Figure 2: Rural-Urban Classification for Lower Layer Super Output Areas (LSOAs), Wales, 2011



The Rural-Urban Classification is a Government Statistical Service product developed by the Office for National Statistics; the Department for Environment, Food and Rural Affairs; the Department for Communities and Local Government; and the Welsh Assembly Government, in collaboration with Sheffield and Nottingham Universities.

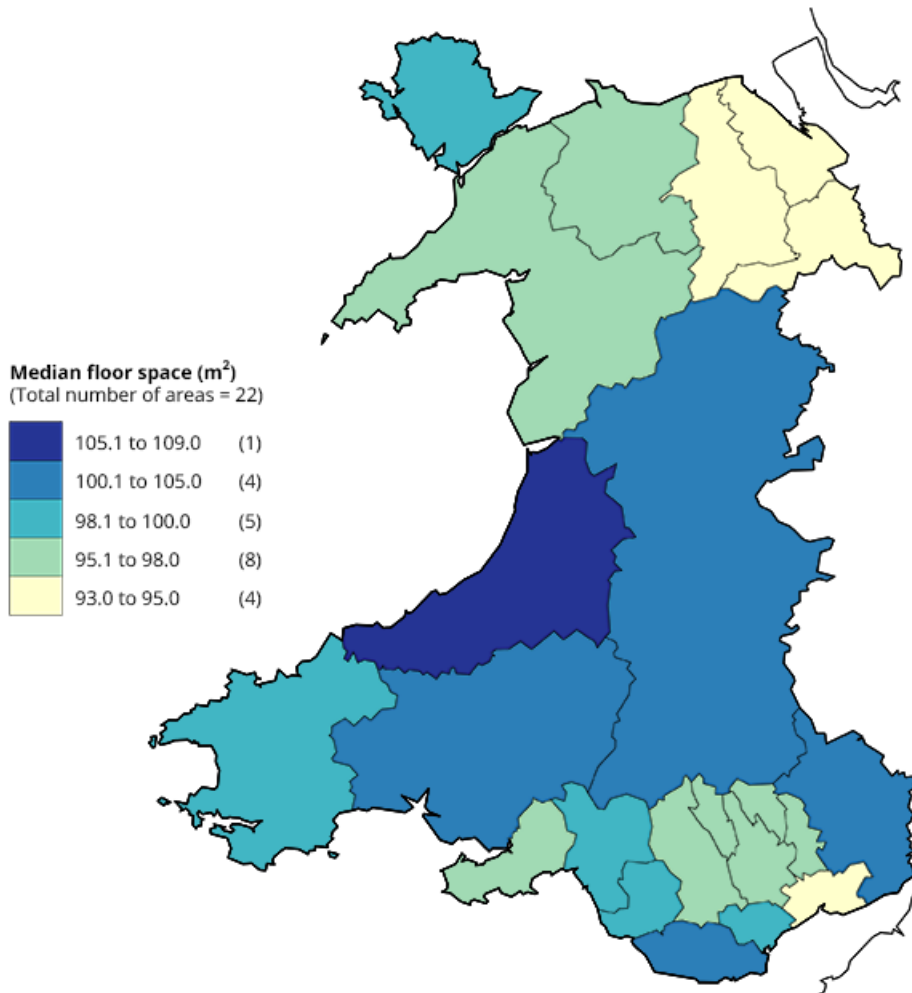
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Figure 3: Median floor space for dwellings, by unitary authority, Wales, 2011



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This work uses research datasets which may not exactly reproduce National Statistics aggregates.
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In separate research from the 2011 Census, accommodation types that are typically smaller, such as flats, were found to be [more common in built-up areas than non-built-up areas](#). Although this uses a different means of classifying areas than the urban and rural classification, the pattern of urban and rural differences in floor space that we found is in-line with this. That is to say, the median floor space in an area is influenced by the property types within the area.

The interactive tool below provides a breakdown of floor space by property type for local authorities in England and Wales. Please take caution when comparing local authorities with each other as the overall category combines the two different measures of floor space for houses and bungalows, and flats and maisonettes. So, two local authorities could have the same median floor space, but if one has a larger proportion of flats, we would likely see that houses and bungalows in this local authority have a larger median floor space area.

Figure 4: Median floor space by property grouping for local authorities, England and Wales

[Download the data](#)

9 . Next steps

This research demonstrates that Valuation Office Agency (VOA) data on floor space offer a great opportunity to provide information currently not widely collected by censuses or surveys. In the future, we will seek to explore the possibility of providing alternative measures of overcrowding and under-occupancy, such as floor space per person. Future research will address if the two different measures of floor space for houses and bungalows (Reduced Covered Area) and flats and maisonettes (Effective Floor Area), need to be aligned to meet user needs.

10 . Feedback

We are keen to get feedback on these Research Outputs and the methodology used to produce them, including how they might be improved and potential uses of the data. Please email your feedback to admin.based.characteristics@ons.gov.uk and include “Housing” in the subject line of your response. Please let us know:

- What housing information do you need to monitor the supply and demand of housing?
- What level of geographic detail do you need for housing information?
- Do you need floor space for houses and flats to be defined in the same way?
- Do you require measures of overcrowding and under-occupancy for different geographic areas?

Please provide as much detail as you can and email your response to admin.based.characteristics@ons.gov.uk; information provided will inform our future research.

11 . Annex 1: Method for linking VOA data and 2011 Census records

To produce these outputs, two datasets were linked together. The first of these was a pre-edit and imputation 2011 Census household dataset. The Valuation Office Agency (VOA) property data were taken from July 2016. To link the data a unique property reference number (UPRN) was assigned to records in both datasets. A UPRN is a unique identifier for every address in Great Britain and is allocated by local government and the Ordnance Survey.

Properties built from 2012 onwards were removed from the VOA data prior to linkage to make these data more comparable with 2011 Census data. This linkage allows us to move from a residential base to “occupied residential properties”, meaning we were able to exclude unoccupied domestic dwellings so that analysis reflects properties that people are living in. Records were then removed if they could not be assigned a UPRN or if multiple records were assigned the same UPRN. The latter could be an indicator of multiple households at an address, which we are not able to link with full certainty.

Overall, of 23.7 million unique census addresses, 22.6 million, or 96% of cases, were successfully linked to the VOA extract.

For further information on the methodology used to link the data please see our recent output on [property type](#), which explores this topic further.

12 . Annex 2: VOA floor space definitions

In this annex is a summary of what is included and excluded in Reduced Covered Area (RCA), which is used to measure houses and bungalows, and Effective Floor Area (EFA), which is used to measure flats and maisonettes. As mentioned in Section 6, the RCA records the whole dwelling area and then reduces it by subtracting a range of areas that fall outside of the measure.

Table 1: Reduced Covered Area measurement criteria

Reduced covered area

Includes:

All covered areas within the external walls

Excludes:

Eaves overhang

Open balconies

Covered walkways

Unconverted loft areas

Attached and integral garages

Washhouses

Fuel stores and coal bunkers

Conservatories

Porches

Any extension of a temporary nature or of significant inferior quality to the main dwelling

Internal areas with a head height of below 1.5 metres are excluded. Porches over 2.5 square metres are recorded, along with conservatories and permanent outbuildings. Garden sheds and greenhouses do not need to be recorded.

Conversely, the EFA measures the useable area of the rooms within a dwelling measured to the internal face of the walls of those rooms. It does not differentiate between structural and non-structural partitioning of rooms.

Table 2: Effective Floor Area measurement criteria

Effective floor area

Includes:

The area occupied by fitted units or built in cupboards

The area of large walk-in cupboards and stores (accessed from within the dwelling)

Excludes:

Hallways, landings and passages

Cupboards opening off excluded areas

Columns

Piers

Chimney breasts

Bathrooms, toilets, showers

Areas with a headroom less than 1.5 metres

Areas covered by stud walls and partitions

13 . Annex 3: VOA property type groupings

Table 3 summarises how we grouped Valuation Office Agency (VOA) property type for the analysis of floor space for the purpose of the research carried out in these Research Outputs.

Table 3: Property groupings

Grouping	VOA classification
Bungalows	Bungalow in a cluster
	Detached bungalow
	End-terraced bungalow
	Semi-detached bungalow
	Mid-terraced bungalow
	Bungalows (unable to distinguish type)
Houses	House in a cluster
	Detached house
	End-terraced house
	Semi-detached house
	Mid-terraced house
	Houses (unable to distinguish type)
Flats	Non-purpose-built flat self-contained ¹
	Flat in two storey detached block of two
	Flat in two storey block end-terraced
	Flat with lift in converted former commercial and industrial premises
	Purpose-built flat with lift
	Flat without lift in group converted former commercial and industrial premises
	Non-purpose-built flat not self-contained
	Purpose-built flat without lift
	Flat in two storey block semi-detached
	Flat in two storey block mid-terraced
	Flat (unable to distinguish type)
Maisonettes	Non-purpose-built maisonette self-contained
	Maisonette with lift in converted former commercial and industrial premises
	Purpose-built maisonette with lift
	Maisonette without lift in converted former commercial and industrial premises
	Non-purpose-built maisonette not self-contained
	Purpose-built maisonette without lift
Other	Mobile home or house boat
	Caravan
	Annexe

Notes

1. Self-containment refers to properties having standard facilities that are not shared.