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Space standards in affordable housing in England

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ABSTRACT

This paper examines the state of affordable housing in England, with a focus on regional variations in space standards and standardized dwelling layouts widely used by volume housebuilders. Space standards are not statutory and therefore adopted inconsistently across development types or building typologies in England. The study draws on data obtained from planning applications, analysing 153 housing developments and 9876 newly constructed affordable housing units from different regions in England that were completed and marketed in 2021. Based on this, the study compares space standards and their effectiveness as well as the use of standardized unit types.

The analysis reveals that apart from London, the most recent Nationally Described Space Standard (2015) is not yet widely used. Instead, Housing Quality Indicators that preceded the new national standards continue to be the norm for houses built outside of London. The findings demonstrate that there is a high level of standardization in affordable housing in terms of dwelling size and layout, with widely used standard house types often determining the design and size of dwellings more than space standards.

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KEYWORDS
Affordable housing; space standards; standardized unit types; regional differences; housing supply

Introduction

This paper studies recent space standards in affordable housing in England, considering their implications for local and regional differences in housing outcomes. The analysis draws on data obtained from the planning applications of 153 new housing developments, comprising 9876 affordable housing units completed in 2021.

In 2015, on the conclusion of the government's housing standards review, the current Nationally Described Space Standard (NDSS; DCLG, 2015) was created in an attempt to consolidate existing standards and guidance. Unlike many countries that incorporate space standards into their building regulations, England has historically implemented space standards largely as a condition for receiving housing subsidies (Ozer & Jacoby, 2022). But compliance with the NDSS is no longer obligatory to qualify for government housing subsidies. In part, this shift can be explained by the introduction of the NDSS coinciding with a significant change in the supply of affordable housing. The number of affordable homes obtained through planning obligations imposed on new private developments now exceeds the number of homes built using affordable housing subsidies (DLUHC, 2022a). As a result, affordable housing is now increasingly designed and provided by the private sector. This study evaluates the outcomes of these changes in recently completed affordable housing, with a particular focus on space standards, space provision and housing typologies.

Space standards and dwelling size in England

Space standards prescribe minimum dwelling and room sizes based on the spaces deemed necessary for typical domestic activities. The minimum floor areas and dimensions derive from anthropometric measurements, standard furniture dimensions, activity zones associated with the use of furniture and daily activities, and circulation areas as well as the space needed for the general accessibility of dwellings (e.g. Mayor of London, 2010; MHLG, 1963). They are widely seen by regulators and the housing sector as a reliable measure of dwellings being usable and fit for their intended purpose. Dwelling size not only determines usability but also has a significant long-term impact on the diversity, flexibility, and adaptability of housing, and small dwellings in particular can have a negative effect on the health and well-being of occupants (Carmona et al., 2010).

In England, various space standards were implemented in public housing from 1919 until 1981

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(Clifford & Ferm, 2021; Park, 2017). After more than two decades of deregulation and subsequent problems related to dwelling size (Karn & Sheridan, 1994), space standards were re-introduced in 2005 for the subsidized housing sector as a grant condition for affordable homes.

Affordable housing is defined by the UK government as social rented, affordable or intermediate rented, and shared ownership housing and tends to be designed to the smallest permissible dwelling sizes to reduce construction and land costs. As local authorities (LAs) allocate housing and housing benefits according to the household size and number of required bedrooms to avoid under-occupancy – with the Bedroom Standard defining full occupancy as one bedroom for every adult couple, for every single person older than 21 years, and for every 2 boys and girls older than 10 years – affordable rental housing tends to have maximum occupancy levels. Space standards are therefore put into place to ensure that dwellings are fully usable when occupied at the maximum capacity.

The Housing Corporation (Homes England since 2018) introduced the Housing Quality Indicators (HQIs; Housing Corporation, 2000, 2005, 2008) as a funding requirement for its 2008–2011 and 2011–2015 Affordable Housing Programmes.[1] The HQIs were based on the count of bedspaces rather than the number and type of bedrooms, with minimum dwelling sizes defined in ranges instead of fixed thresholds. In 2011, London's boroughs implemented the space standards recommended in the *London Housing Design Guide* (LHDG; Mayor of London, 2010), which unlike the HQIs set out specific gross internal areas (GIAs) for different numbers of floors, bedrooms, and bedspaces. These larger space standards of the LHDG were largely adopted by the NDSS.

The furniture schedules and access and activity zones in the HQI and LHDG are nearly identical in terms of the number, type, and dimension of furniture given for each room.[2] However, when compared to the HQIs, the recommended GIAs in the NDSS are more than 3 m² larger for flats and more than 4 m² larger for two-storey houses (Table 1). The NDSS is generally aligned with space standards in other countries that use similar definitions (per bedroom or bedspace). For instance, the space standard for a two-bedroom flat is 61 m² for 3 bedspaces and 70 m² for 4 bedspaces in the NDSS, whereas a two-bedroom standard is 65 m² in Australia, 66 m² in Canada, 63–73 m² in Ireland, 61–73.5 m² in Scotland and 45–65 m² in Switzerland (Ozer & Jacoby, 2022a, pp. 8–11).

The average usable floor area of dwellings in England has been increasing since 1996 (Gleeson, 2021) and has reached 97 m² in 2021 (DLUHC, 2022b). In 2010, the UK had the fourth-highest usable floor area per person compared to countries in the European Union (MIKR, 2010, p. 51). Despite this, research has continuously identified significant shortcomings in the size of dwellings in the existing housing stock. Comparing dwelling size data from the English Housing Survey 2010 (which is based on a sample taken across all housing sectors and built periods) to LHDG standards, Morgan and Cruickshank (2014) found that 55% of dwellings failed to meet the recommended dwelling sizes for the levels of occupancy homes were designed for. However, when actual occupancy rates were considered, only 21% of homes were found to be deficient in their space provision due to common under-occupancy. Özer and Jacoby (2022b) similarly found that 61% of dwellings in London failed to meet the recommended dwelling sizes by the LHDG according to the maximum occupancy they were designed for and that in 88% of dwellings, at least one of the recommended minimum internal dimensions was not met.

Such shortcomings were found to persist also in new-built housing. A study conducted by the Royal Institute of British Architects found that one-bedroom flats built in 2010–2015 fell 4 m² and three-bedroom houses 8 m²

Table 1. Comparison of space standards in the Housing Quality Indicators (HQI; Housing Corporation, 2008, p. 27), London Housing Design Guide (LHDG; Mayor of London, 2010, p. 48) and Nationally Described Space Standard (NDSS; DCLG, 2015, p. 5) – only selected common dwelling types are provided. Key – B: bedroom; P: person/bedspace.

House Type	Rooms	Bedspaces	Floors	HQI v4 (2007) (m^2)	LHDG (2010) (m^2)	NDSS (2015)(m^2)
1B1P	1	1	1	30–35	37(39)	37
1B2P	1	2	1	45–50	50	50
2B3P	2	3	1	57–67	61	61
			2		–	70
2B4P	2	4	1	67–75	70	70
			2		83	79
3B4P	3	4	2	67–75	87	84
3B5P	3	5	2	82–85	96	93
3B6P	3	6	2	95–100	–	102

short of the LHDG standards (2011, p. 5; RIBA, 2015). Another study by Finlay et al. (2012) revealed that some residents of new housing developments found the size of their bedrooms too small for their intended use. Analysing the dimensions and layouts of typical private sector housing for four common household scenarios, West and Emmitt (2004) found that they were only 'adequate' in functional terms when the dwellings were occupied below their maximum capacity.

Under-occupancy is widely expected in privately owned homes, and essential to the usability and acceptance of otherwise 'substandard' homes if compared to space standards. Approximately 85% of private homes are not occupied to their maximum capacity, hence under-occupied (ONS, 2023). However, occupancy levels are higher in the affordable housing sector, with 55% of households on social rents fully occupying all their bedrooms, and 9% living in overcrowded conditions (ONS, 2023). In London, the space per person in owner-occupied homes is 41 m², whereas, in the social rented sector, it is only 26 m² (Gleeson & Finnerty, 2021, p. 28).

In the social rented sector, the average dwelling size is 67 m², which is small compared to 111 m² in owner-occupied and 75 m² in the private rented sectors (DLUHC, 2022b). It is, however, important to note that these sizes are influenced by the distribution of dwelling types, with a higher percentage of flats found in the social rented sector, as well as the number of bedrooms, with dwellings in the owner-occupied sector often having more bedrooms (DLUHC, 2022b). However, research into the dwelling sizes of affordable housing has been limited so far (Karn & Sheridan, 1994). Due to space standards having been a funding requirement and most affordable homes having received subsidies until recently (DLUHC, 2022a), it is reasonable to assume that the existing affordable housing stock complies with these standards.

Adoption of the NDSS

Instead of committing to statutory space standards, the UK government introduced the NDSS as a technical guidance within the planning system (cf. Goodchild, 2021). An exception to this is the inclusion of some minimum dimensions pertaining to the access and use of dwellings in the Building Regulations as mandatory requirements. The Approved Document M (2015), now incorporates minimum dimensions for circulation spaces, bathrooms, WCs, kitchens, and bedrooms according to three categories: M4(1) visitable (applicable to all dwellings), M4(2) accessible and adaptable, and M4(3) wheelchair user dwellings.

The NDSS is a national planning tool applicable to all housing tenures. If local authorities want to adopt the NDSS, they must first provide an assessment of the need for and economic viability of incorporating the NDSS (RIBA, 2015). This is to prevent space standards from creating additional construction and land costs that are unsustainable in a local housing market, which can negatively impact housing affordability and supply. In England, house prices are predominantly based on the number of bedrooms and less on dwelling size, as evident from the marketing conventions by real estate agents. Larger dwellings without an increase in the number of bedrooms can thus reduce the profit of developers (Plymouth City Council, 2015). In addition, in areas with low investment in housing and low house prices, increased standards (and other onerous planning requirements) can prevent new housing developments (Ferm & Raco, 2020).

There is currently no readily available data on how many local authorities have adopted the NDSS. Adoption also does not necessarily mean that all new homes will meet the NDSS, as developers can negotiate planning requirements and compliance with space standards, especially if site constraints or local housing market conditions would otherwise render their developments financially unviable (Ferm & Raco, 2020; Sayce et al., 2017). In the following, new affordable housing is assessed against both mandatory and voluntary space standards, in particular the NDSS.

Affordable housing in England

The wider uptake of the NDSS has been hindered by a change in how affordable housing is supplied, with a significant shift away from social landlords and public housebuilders towards private developers. This is consequently changing both the design and affordability of housing, with mixed-tenure developments becoming the norm.

In England, there are in principle three types of affordable housing, each with its distinct tenure, characteristics and eligibility criteria. The first is homes for 'social rent', which represent the traditional affordable housing tenure. These homes are directly allocated by local authorities, even if housing associations own and manage the properties. Strict allocation criteria are followed that prioritize the most disadvantaged members of society. Being the most affordable housing model, the rent is calculated using a formula that considers average rents in England, local income levels, the number of bedrooms in the property and a property's value.[3]

The second type is homes with an 'affordable rent', which are allocated by housing providers based on the

same criteria as homes for social rent. However, the affordable rent can be up to 80% of local market rents in the area, which in less affordable areas means that they can exceed the median national income.[4] In comparison to the average social rent, the average affordable rent is 44% higher (RSH, 2022). This can thus result in housing that is by definition unaffordable to low-income groups. Similar to 'affordable rent', homes with an 'intermediate rent' can be as high as 80% of local market rents. However, the purpose of intermediate rent housing is to help households to save up for a deposit to purchase a home.

The third type of affordable housing is homes for 'shared ownership', which allows individuals to buy a share of their home, typically a minimum of 25%, with the option to increase and eventually gain full property ownership over time. Rent is paid on the remaining portion, along with a full service charge, which can make shared ownership expensive in the long term.

These definitions mean that much of what is described or marketed as affordable housing is not affordable to low-income groups who are most in need of subsidized housing. For instance, the average affordable rent in England, which is currently £136.29 per week (RSH, 2022), equates to 46% of the median household income of £15,382 per year for the poorest fifth in the UK (ONS, 2023). As a result, there are growing calls for what is referred to as 'genuinely' affordable housing, where rents are expected to be 30% or less of household incomes.

The current definitions also mean that the target groups or eligibility for affordable housing and levels of affordability can vary between regions since they link affordability to local market rents and property prices. London, the South East and the East of England have the highest social rent levels, with social rents in London peaking at 23% above the national average, whereas the North East, Yorkshire and the Humber, and East Midlands have the lowest (RSH, 2022).

Wallace (2019) likewise found that shared ownership serves first-time buyers with household incomes above the local median in London, where the problem of housing affordability is greatest. However, according to their data from 2016 to 2017, in other regions, household incomes of shared ownership buyers are below the local median.

In 2010, public funding for new social housing was discontinued in parallel with a reduction of funding for affordable homes (NHF, n.d.). This funding change coincided with the promotion of affordable rental and shared ownership as the preferred models for new affordable housing under government housing policies. Accordingly, in 2020–2021 the mix of tenures in newly completed affordable housing in England was 54% affordable and intermediate rent, 33% shared ownership and 12% social rent units (DLUHC, 2022a).

Affordable housing in England is owned and managed by registered providers, with housing associations comprising the majority, along with a smaller number of local authorities and for-profit companies. 96% of all social housing stock in England is owned and managed by only 234 large providers (RSH, 2022).[5]

New affordable housing in England is funded and supplied according to three pathways: (1) by housing associations supported by subsidies from Homes England and the Greater London Authority, (2) by housing associations using income generated from their activities in the private housing sector (cross-subsidies) and (3) through planning obligations imposed on new developments by the private sector. With public funding significantly reducing since 2010, housing associations had to increasingly find ways of cross-subsidizing affordable housing by expanding their involvement in the shared-ownership market and, more recently, in the private sales and rental markets (Crook & Kemp, 2018; Manzi & Morrison, 2018).

In addition, housing developments with mixed tenure are promoted by housing policy and planning to 'deconcentrate poverty' and create tenure-blind and more balanced and inclusive communities (Lupton & Fuller, 2009). According to the National Planning Policy Framework (MHCLG, 2019), in developments with more than 10 dwellings, generally, at least 10% of units must be for affordable homeownership, which includes homes offered via shared ownership and equity loans.[6] While the percentage of affordable rental tenures is determined through negotiations, the proportion of new affordable housing resulting from planning obligations in private developments made up 51% of the total new affordable housing supply in 2019–2020 (DLUHC, 2022b). A shift to private sector housing supply means that incentivizing and controlling affordable housing and its design is more difficult, as it has become a by-product of speculative developments. Consequently, the design of affordable housing is influenced to a greater extent by the preferences of the private sector and its concern for profit.

The private housing sector is highly standardized and dominated by an even smaller number of developers than the social housing sector. The top 10 volume housebuilders are responsible for 59% of new private homes in Britain (DCLG, 2017, p. 47). They extensively use standardized unit types in their developments, in particular in the lower end of the housing market where properties are designed to meet minimum regulatory and market requirements (Leishman & Warren,

2006; Leopold & Bishop, 1983a, 1983b; Nicol & Hooper, 1999). While economic considerations are the primary motivation for standardizing unit types, this is also encouraged by the planning framework that offers house type approval schemes.

Nicol and Hooper (1999) found that the number of standardized house types used by 90% of the largest volume housebuilders in 1995 (each producing more than 2000 units) could be as little as 20 and sometimes more than 100. Their study revealed that the unit portfolios of these developers were based on various standardized dwelling sizes that targeted different markets, including so-called starter homes, trade-up homes and high-end homes. Besides the number and type of rooms, key differences in the house types were their size and internal layout or organization. For lower-end market housing, layouts were prioritized that maximize habitable space rather than circulation space, thus, resulting in overall smaller dwelling sizes.

Like housing associations, private volume housebuilders are likely to have developed specific house types for affordable homes, as some design decisions are influenced by housing tenure. For example, designing for long-term maintenance is a key problem in social and affordable rental housing because registered social housing providers are responsible for their maintenance. Many housing associations have therefore developed their standards for affordable housing to reduce maintenance costs, and many local plans encourage developers to follow the standards of their housing association partners. However, housing associations are not always involved at the start of a development and most new affordable housing gained through planning obligations are sold on 'off-plan' or 'off-the-shelf', i.e. they are already fully designed and specified by the time they are handed over to housing associations (NHF, 2019). The following assesses space standards in recently completed affordable housing in relation to regional differences in planning standards and regulation.

Methods

The data used in this paper were collected from a sample of 153 housing developments in England that included affordable housing owned or managed by 15 of the largest housing associations and were completed or marketed for sale in 2021.

The sampling of the developments was done in two steps. In the first step, nine housing associations with the largest (in terms of new housing stock in 2020–2021) affordable housing stock in every geographical region and the three largest housing associations with activity across England were selected. Capturing developments from different geographical regions in England was important to compare regional and local differences in the type and tenure of housing provision, the household types and sizes homes are designed for, and variations in local planning requirements.

To identify the location and size of their new affordable housing stock, online searches were conducted on the websites of the largest 50 housing associations in England in 2021 according to *Inside Housing* (Mccabe, 2021), since no readily available public data exists on this. The searches included both housing association-led developments and private developments from which the housing associations purchased their units. Some housing associations provided a list of all their recent developments and purchases on their websites. For other housing associations, the online 'news' section and annual reports were used to locate their new affordable housing schemes. Moreover, all housing associations had an online 'sales' section to advertise their private sale and shared ownership homes available for purchase, which was used to identify their developments. Even though social and affordable rental properties are not advertised and directly allocated by local authorities, the policy requirement to include affordable ownership properties in larger developments enabled the identification of other affordable housing tenures.

Most of the largest 50 housing associations operated in one region or two to three neighbouring regions. For every region, the housing association with the most developments were included in the sample: L&Q (Greater London), Vivid (South East), LiveWest (South West), Orbit (East of England), Bromford (West Midlands), EMH Group (East Midlands), Yorkshire Housing (Yorkshire), Karbon (North East) and Torus (North West). Second, three housing associations that operated nationally (developing and purchasing new units in more than six regions), Clarion, Stonewater and the Home Group were also included. For these chosen 12 housing associations, a total of 258 developments with affordable housing were recorded.

In the second stage of sampling, online planning archives by local councils were searched for the planning applications of these 258 developments to find the proposed site and unit plans as well as detailed information on housing types and tenure mix.[7] For 153 developments all necessary information could be found, for 101 developments the planning applications could not be accessed online, and 4 planning applications did not include all the sought information.

The analysed data in this paper is consequently based on the 153 developments for which the required data could be obtained, with the dataset including information on the name of the development and developer,

location, development type (housing association-led or private sector-led), total number of units, and number of affordable rented, social rented and shared ownership units. From these developments, information on all type plans for affordable housing was collected, including the type plan name (as used in the architectural drawings submitted to the planning department), the number of times each type is repeated in a development, the housing tenure, the number of floors, bedrooms and bedspaces, the gross internal floor area and the layout type. Additionally, to compare affordable housing type plans to market housing, the same information was collected for market housing units from 25 of the sampled off-plan developments built by three volume housebuilders (Bloor Homes, Persimmon and Bellway).

Statistical tests were conducted to establish the relationships of dwelling size and compliance with space standards to differences in regions, local authorities and developer types. In addition, the relationships of affordable housing ratios and tenure mixes were tested, as these are also negotiable during the planning permission process (Ferm & Raco, 2020; Murphy, 2019; Sayce et al., 2017). The results of a Shapiro–Wilk test for normality showed that the continuous dependent variables were not normally distributed. Therefore, independent, non-parametric Kruskal–Wallis tests were used to detect the differences between regions, local authorities and developer types in terms of dwelling size, affordable housing ratio and tenure mix (Salkind, 2010). Chi-squared tests were used to detect the differences in terms of compliance (categorical variable). The level of significance was set to $p < 0.05$ for all statistical tests. For each test results and significance levels are reported. The analysis was conducted using Python (version 3.7) packages Numpy, Pandas and SciPy.

Adoption of space standards

To provide context to the findings, an environmental information request was submitted to all 322 local planning authorities in England (ONS, 2023). The request sought information on whether they adopted the NDSS in their local plans or supplementary documents, as well as the timing of such adoption. Of all contacted local authorities, 79% ($n = 253$) responded: 37% of them ($n = 93$) had adopted the NDSS in their local plans and policies and a further 8% ($n = 21$) adopted them as a design guidance in the form of a Supplementary Planning Document (SPD). Of all the local authorities that had adopted the NDSS ($n = 45$), however, 40% did so after 2020, i.e. after the planning applications for the developments analysed here were submitted. Also, 28% ($n = 36$) of local authorities reported that they were planning to adopt the NDSS in the near future (Figure 1). Of the local authorities that did not adopt the NDSS, 85% ($n = 112$) reported that they used no other space standard in their local plan or planning guidance.

Findings

The analysed 153 developments were located in 93 different local planning authorities and showed a great variation in size (Table 2). Their size ranged from 8 to 1780 dwelling units, with all sites providing a total of 25,671 private and affordable units.

Affordable housing ratios

The proportion of affordable housing in the studied developments varied from 11% to 100%, supplying a total of 9876 affordable housing units. Affordable housing ratios differed significantly between regions, $\chi^2(8) = 17.02$, $p = 0.03$, and between development types, $\chi^2(1) = 29.14$, $p < 0.01$. Overall, they were generally lower in Southern regions, e.g. 37% in London, than in Northern regions, e.g. 56% in the North West. In private sector-led developments, the affordable housing ratio ranged from 11% to 55%, with an average of 33%. In comparison, the average affordable housing ratio was 67% in housing association-led developments. At 45%, almost half of housing association-led developments provided exclusively affordable housing. However, in some housing association-led developments, the provision could also be as low as 11%, comparable to that in private sector-led developments (national planning target of 10%).

Housing tenures

On average, affordable housing tenure in the sample was divided into 44% affordable rent, 40% shared ownership and 16% social rent (Table 3). While there were no significant differences between housing association-led and private sector-led developments, $\chi^2(1) = 0.41$, $p = 0.52$, the mix of affordable tenures differed significantly between regions.[8] For instance, compared to the national average, the ratio of shared ownership dwellings was higher in London and its neighbouring regions, the East of England and the South East.

Building and dwelling typologies

In the studied sample, it was found that 55% of the affordable dwellings were houses and 45% were flats (Table 5). However, 95% of affordable housing units in London were flats, compared to only 30% of units

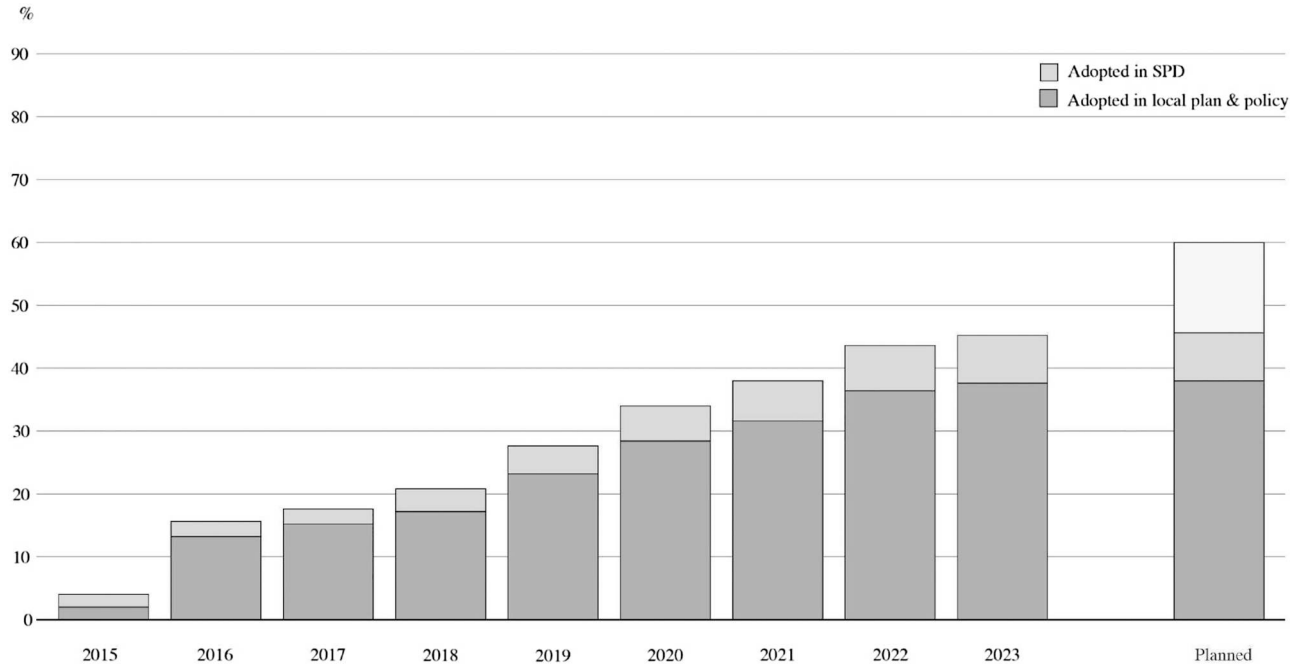

Figure 1. The percentage of local planning authorities who adopted the Nationally Described Space Standard.

Table 2. Numbers of developments, developers and housing associations sampled per region and the ratio and number of affordable housing units in sampled developments. m: mean, M: median; HA: Housing Association.

	Number of developments	Number of developers	Number of HAs	Affordable housing ratio						Total number of affordable units
				m	min	25%	M	75%	max	
Region										
East Midlands	12	8	3	0.30	0.11	0.17	0.23	0.35	1.00	458
East of England	15	7	4	0.36	0.19	0.25	0.35	0.35	1.00	699
London	19	10	3	0.37	0.12	0.22	0.34	0.47	1.00	2562
North East	7	3	2	0.63	0.13	0.15	1.00	1.00	1.00	333
North West	9	7	2	0.56	0.20	0.30	0.50	0.89	1.00	733
South East	27	18	3	0.46	0.11	0.32	0.40	0.49	1.00	1726
South West	20	9	3	0.53	0.11	0.27	0.35	1.00	1.00	739
West Midlands	29	11	3	0.56	0.22	0.35	0.40	1.00	1.00	1666
Yorkshire	15	10	4	0.53	0.20	0.34	0.40	0.70	1.00	960
Development type										
HA-led	66	18	12	0.67	0.11	0.35	0.78	1.00	1.00	3933
Private sector-led	87	36	12	0.33	0.11	0.25	0.35	0.40	1.00	5943
Total	153	52	12	0.48	0.11	0.29	0.37	0.52	1.00	9876

Table 3. Affordable housing tenure distribution by geographical region and development type.

	Number of affordable units	Tenure distribution		
		Social rent	Affordable rent	Shared ownership
Region				
East Midlands	458	9%	62%	29%
East of England	699	11%	42%	47%
London	2562	16%	29%	55%
North East	333	14%	79%	7%
North West	733	9%	57%	34%
South East	1726	11%	42%	47%
South West	739	27%	38%	35%
West Midlands	1666	21%	50%	29%
Yorkshire	960	18%	55%	28%
Development type				
HA-led	3933	18%	44%	38%
Private sector-led	5943	14%	44%	41%
Total	9876	16%	44%	40%

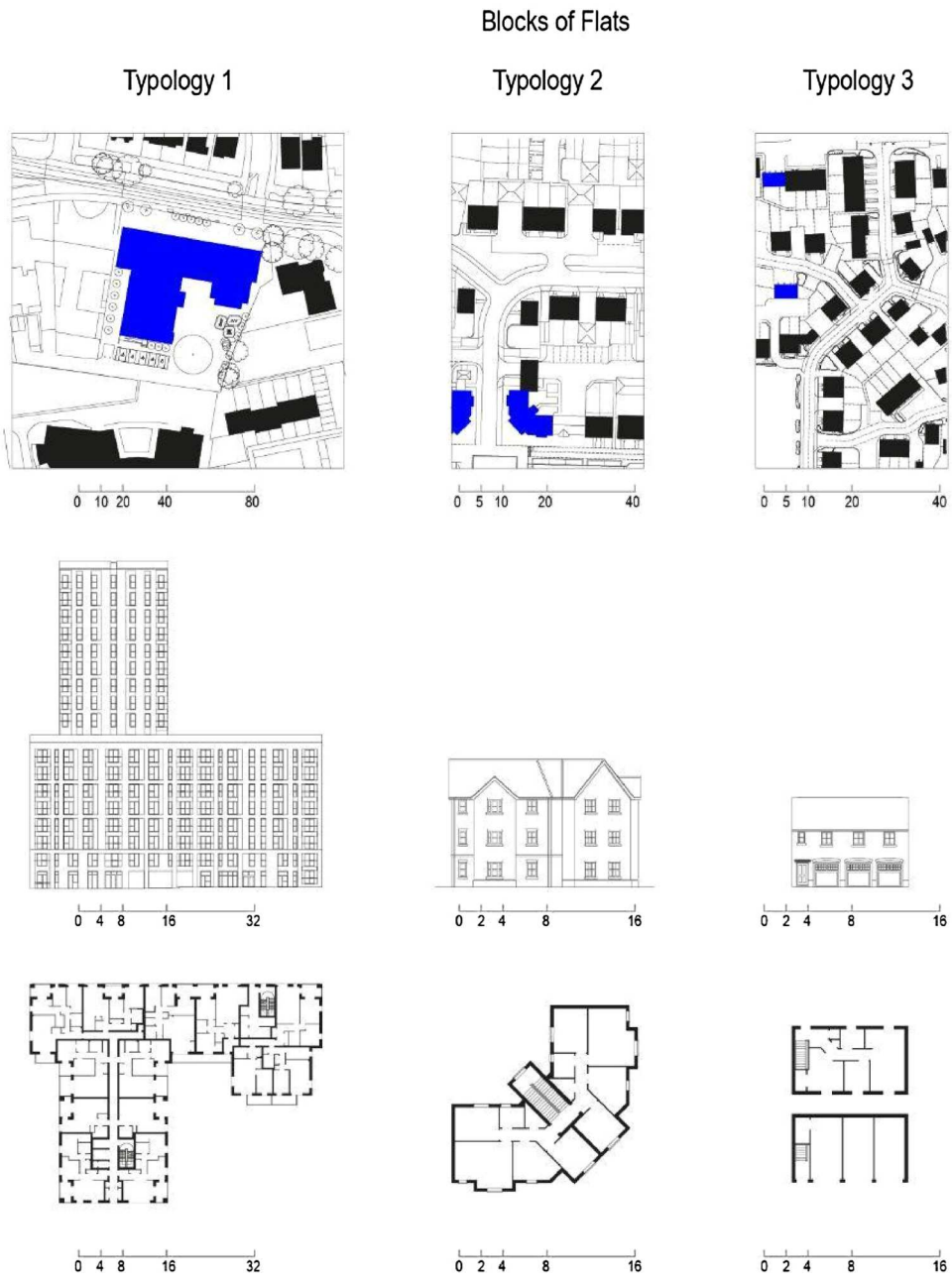

Figure 2. Common block typologies observed. Redrawn by the authors based on the planning applications for dwellings for L&Q and LiveWest and submitted to Croydon, South Gloucestershire and Cornwall planning authorities.

outside London. The types of flats developed in and outside London also differed (Figure 2 and Table 4). In London, 96% of flats were in large mid- to high-rise blocks (more than three storeys) that have multiple cores and double-loaded corridors leading to single-aspect flats (Typology 1). Outside London, 72% of flats were in low-rise blocks (up to three storeys) that have single cores serving dual- or triple-aspect flats (Typology 2). A further 16% were cottage flats, which are two-storey buildings with the appearance of terraced houses, with a flat per floor and a separate ground-level

Table 4. Distribution of flats per block typologies per region.

	T1	T2	T3
Region			
East Midlands	0%	69%	31%
East of England	15%	51%	35%
London	96%	4%	0%
North East	0%	33%	67%
North West	0%	85%	15%
South East	18%	80%	2%
South West	12%	73%	15%
West Midlands	0%	55%	45%
Yorkshire	0%	75%	25%
Total	58%	35%	7%

Table 5. Dwelling type distribution by geographical region and development type.

	Dwelling typologies & number of bedrooms								
	Number of bedrooms: Houses					Number of bedrooms: Flats			
	1	2	3	4+	Total	1	2	3	Total
Region									
East Midlands	10%	39%	32%	5%	84%	6%	9%	0%	16%
East of England	1%	38%	32%	4%	74%	14%	12%	0%	25%
London	0%	2%	3%	1%	6%	29%	45%	20%	95%
North East	0%	30%	49%	7%	86%	6%	7%	0%	14%
North West	8%	25%	32%	7%	65%	19%	10%	0%	26%
South East	1%	20%	18%	6%	45%	16%	36%	2%	55%
South West	1%	28%	29%	6%	63%	17%	19%	0%	36%
West Midlands	2%	42%	31%	8%	78%	7%	7%	2%	15%
Yorkshire	1%	49%	42%	3%	95%	3%	2%	0%	5%
Total	2%	26%	23%	5%	53%	16%	23%	6%	45%

entrance door, or, a garage on the ground floor and a flat on the first floor (Typology 3).

Affordable housing is designed to accommodate different household types and sizes, which determine the required number of bedrooms (B) and bedspaces (P). The most common dwelling types were: 2B4P (23%) and 3B5P (19%) two-storey houses and 1B2P (16%), 2B3P (10%), and 2B4P (14%) flats. These five types made up 88% of all affordable housing in the analysed sample (Table 5).

The mix of dwelling types (number of bedrooms) differed across regions but did not differ between housing association-led and private sector-led developments in the same region. The proportion of two-bedroom units was similar across different regions, making up around half of all affordable units. However, one-bedroom units were more common in London (29%) and the South East (27%) and less common in Northern regions. In contrast, three-bedroom units were more common in the North East (49%) and Yorkshire and the Humber (42%) and less common in Southern regions.

Dwelling sizes

For each common dwelling type, a wide variation in dwelling size was observed (Figure 3). For instance, 2B4P flats ranged from 60.2 to 110.2 m². Despite this, the gross internal areas of units were tightly clustered around the median. 72% of 1B2P, 66% of 2B3P, and 65% of 2B4P flats, as well as 51% of 2B4P and 62% of 3B5P houses were within 5% of the median GIA (±2.5 m² in a 1B2P flat to ±4 m² in a 3B5P house).

The mean dwelling sizes of 1B2P, 2B3P and 2B4P flats were 1.2 to 3 m² above the recommended GIAs given in the NDSS (Table 6). In comparison, the mean sizes of 2B4P and 3B5P houses were below the standard GIAs by 6 and 7.8 m² respectively. As a result, while 71% of flats met the NDSS, only 18% of houses did (Table 7).

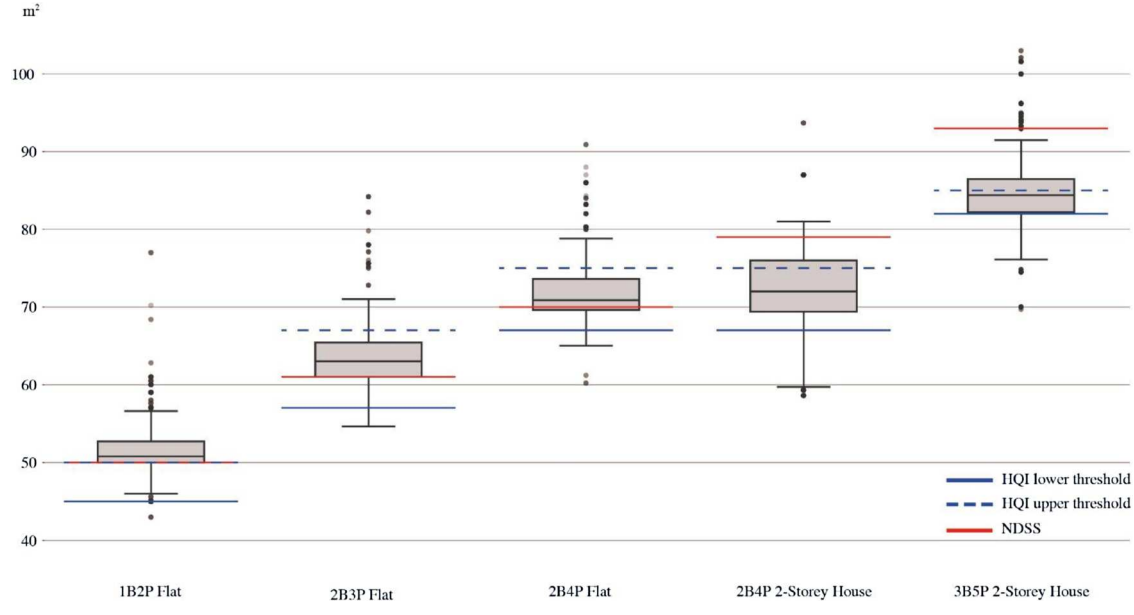

Figure 3. Dwelling size distribution per dwelling type.

Table 6. Average (mean) dwelling sizes per dwelling type broken down per region and development type.

	1B2P		2B3P		2B4P		2B4P		3B5P	
	n	Mean	*n*	Mean	*n*	Mean	*n*	Mean	*n*	Mean
Region										
East Midlands	27	51.0	37	60.2	0	–	167	69.6	127	84.3
East of England	81	50.3	27	60.4	45	70.4	249	73.3	177	83.8
London	746	51.5	273	66.2	831	73.6	52	87.0	36	103.0
North East	21	51.3	24	63.7	0	–	95	72.1	135	84.7
North West	128	52.1	37	62.4	29	65.1	172	72.4	200	80.9
South East	258	51.2	290	63.5	302	71.3	336	75.6	260	90.6
South West	119	49.7	102	64.6	24	72.3	179	78.0	146	88.2
West Midlands	74	48.5	89	62.0	5	65.7	558	71.8	456	83.5
Yorkshire	12	58.4	20	61.0	0	–	339	69.7	274	83.6
Development Type										
HA-led	552	51.3	466	64.0	474	71.9	911	73.4	809	85.1
Private sector-led	914	51.1	433	64.0	762	73.1	1236	72.6	1002	85.2
Total	1466	51.2	899	64.0	1236	72.7	2147	73.0	1811	85.2

Compared with the HQIs, in which the lower thresholds of the GIA ranges are 2–9 m² smaller than the corresponding NDSS, the overall compliance rates were similar between flats and houses. Overall, 87% of flats and 80% of houses complied with the HQI standards.

Mean dwelling sizes for the same types of housing varied from 6 m² (in 2B3P flats) to 22 m² (in 3B5P houses) across different regions (Table 6). They were consistently higher in London, the South East, and the South West and lowest in the East of England, East Midlands, West Midlands and Yorkshire. Consequently, the compliance rates with the NDSS were highest in London (80%) and the South East (65%) and lowest in the East Midlands (8%) and West Midlands (13%).

Unsurprisingly, a chi-squared test of independence showed a significant association between the adoption of the NDSS and compliance with the recommended GIAs, X^2 (1, $N = 6402$) = 644.3, $p < 0.01$. In local planning authorities where the NDSS was adopted, compliance with the space standard was overall higher (69% compared to 29%), but still, many dwellings were below the standard.

Statistical tests for mean dwelling sizes between different development types showed no significant differences, except for 2B4P flats, $\chi^2(1) = 12.3$, $p < 0.01$, and houses $\chi^2(1) = 4.55$, $p = 0.03$.

Standardized units

The analysed sample showed frequent use of standardized house types within and across developments. The standard house types were often given distinct names in planning applications as well as in later marketing information. A total of 4074 2B4P and 3B5P houses in the sample were made up of 244 type plans. However, some units developed by different developers were also similar in size and layout. When they were

Table 7. Compliance with space standards per dwelling type broken down to geographical region, development type and the adoption of NDSS into local plans.

	All Dwellings			Flats			Houses		
	n	**NDSS**	**HQI**	***n***	**NDSS**	**HQI**	***n***	**NDSS**	HQI
Region									
East Midlands	458	8%	80%	73	31%	94%	385	4%	78%
East of England	699	23%	77%	175	47%	80%	517	16%	81%
London	2562	80%	94%	2434	79%	95%	154	86%	86%
North East	333	17%	65%	47	69%	100%	286	10%	66%
North West	733	17%	65%	191	60%	81%	476	2%	67%
South East	1726	65%	85%	949	78%	91%	777	46%	83%
South West	739	45%	83%	266	57%	86%	466	39%	87%
West Midlands	1666	13%	63%	250	25%	80%	1299	12%	67%
Yorkshire	960	19%	84%	48	50%	67%	912	2%	89%
Development type									
HA-led	3933	49%	81%	1643	84%	93%	2097	21%	78%
Private sector-led	5943	40%	80%	2790	63%	83%	3175	19%	82%
Adoption of NDSS*									
Adopted	3607	69%	88%	2814	74%	90%	793	47%	87%
Not Adopted	4758	29%	78%	1261	68%	83%	3497	13%	78%
Total	9876	43%	81%	4433	71%	87%	5272	20%	80%

*The date of the planning application is controlled against the date NDSS adopted in the LPA the development is located. Developments in LPAs for which this information could not be gathered are excluded.

Figure 4. Standardized private and affordable house types from different private sector-led developments. Redrawn by the authors based on the planning applications for dwellings built by Bloor Homes and submitted to Solihull, Coventry and Cheshire East planning authorities.

classified according to their size and layout, the number of house types could be further reduced to a mere 129.

The house types used in the affordable housing sector were generally different from those intended for the open market. Only 6% of affordable house types in the sample were also used for market housing. Analysing affordable and market house types in 25 developments by three major housebuilders revealed three key characteristics. First, the private house types used by the same developer were less likely to change across their different developments than affordable house types. While affordable house types were used on average in two developments, in comparison private house types were used across three.

Second, while all three developers had affordable house types that seem to be designed to just meet either the older and lower HQI space standards (2B4P: 67; 3B5P: 82) or the new, higher NDSS (2B4P: 79; 3B5P: 93), they also had house types that do not even meet the HQI standards. In developments where affordable

house types that meet the HQI or NDSS standards were used, the types for private sale with the same number of bedrooms and bedspaces were often smaller (Figure 4).

Third, affordable and market house types did not greatly differ in principle in layout. However, while the number of bathrooms is kept to a minimum in affordable homes – a downstairs toilet and an upstairs bathroom – an en-suite to the first bedroom (in addition to the provision of a separate full bathroom) is commonly provided in private house types, aligned with buyers' preferences (Leishman & Warren, 2006). The additional bathrooms are usually provided at the cost of a smaller bedroom size. Similarly, parts of the kitchen, dining and living area in the private sector are frequently used to create a utility room that is not provided in affordable homes.

The use of standardized unit types is not only specific to house types but could also be observed in low-rise blocks and cottage flats, where units were repeated without variation within and across developments. While similarities were evident in the layout and size of units in mid- to high-rise developments, they were not as standardized as in other building typologies. The size and footprint shape of units varied even within the same building, depending on the building's footprint and the location of access and service cores.

Discussion

With affordable housing supply increasingly cross-subsidized through the sale of private homes by housing associations or resulting from planning obligations on private developments, the quality and quantity of affordable housing are now significantly regulated through planning policies that are formalized in local plans. While 45% of local authorities included space standards in their local plan (37%, $n = 93$) or planning guidance (8%, $n = 21$), meeting space standards and the affordable housing supply targets remain negotiable for each development.

Tenure mix

Due to housing policy and planning preferences, new affordable housing in England is largely found in mixed-tenure developments (79%). Nevertheless, recent research has found that planning agreements for private developments often include affordable housing provisions inconsistent with policy requirements (Ferm & Raco, 2020; Murphy, 2019; Sayce et al., 2017). Planning obligations are extensively negotiated and policy requirements might be bypassed if standard policy-based contributions are not economically viable for developers (Lord et al., 2022; Morrison & Burgess, 2014).

Within the sample, developments had a minimum 11% affordable housing ratio, which meets the National Planning Policy Framework's stipulation of a minimum of 10% affordable housing in developments of more than 10 units. However, due to the sampling method used, developments with very few or no affordable housing were not included in this study.

The data analysed indicated that some housing association-led developments had very low affordable housing ratios. As government subsidies decrease, housing associations turn to private for sale and rental sectors to cross-subsidize their new and existing affordable housing (Crook & Kemp, 2018). Simultaneously, they are increasingly adopting a 'commercial logic' (Manzi & Morrison, 2018), but the impact of this on their design practices has not yet been fully studied.

Despite policy promoting tenure blindness in mixed-tenure housing, most developments were segregated into areas, blocks and access – and sometimes even amenities – for affordable or social rent housing and market housing, with better site locations and orientations given to the latter (Burgess et al., 2011). An important observation is hereby that flats are exclusively used in the provision for social and affordable rent in mixed housing estates outside London. While these were low-rise flats and cottage flats that are designed to appear as terraced or free-standing houses similar to the market housing on the same site, with similar exteriors and roofs, the predominant provision of affordable rental housing as flats reinforces negative associations between social housing and flats (Baxter, 2017). This also reduces the necessary diversity in the affordable housing stock. Flats had higher compliance rates with the NDSS compared to houses, suggesting that they potentially have more adequate space provision. However, the amenities, levels of privacy and access to outdoor spaces in flats are limited and may not be suitable for all household types (Kerr et al., 2020).

Local policies also usually demand a mix of dwelling types based on the local projected housing needs. However, dwelling types in these policy documents often refer only to the number of bedrooms, not dwelling typologies such as houses or flats. The findings showed significant variation in the distribution of the number of bedrooms across regions, suggesting that dwelling mix policies are widely implemented. For example, one-bedroom dwellings were more common in Southern regions, particularly in London (29% of all affordable dwellings), and three-bedroom dwellings were predominantly found in Northern regions. This also suggests that local authorities can help diversify the typologies in

the affordable housing sector by adopting standards on the mix of housing typologies.

According to the *UK Housing Review* (CIH, 2022), the supply of affordable housing has increased in Southern regions and decreased in Northern regions. While this indicates regional inequalities in affordable housing supply, it is also important to note that not all housing classified as affordable is genuinely affordable. Consistent with other studies (Wallace, 2019; ONS, 2023; DLUHC, 2022a), the findings showed significant regional differences in the mix of affordable housing tenures, with the proportion of shared ownership housing significantly higher in Southern areas. This raises questions about the extent to which new affordable housing supply meets the needs of low-income groups. As Wallace (2019) found, in Southern regions, the shared ownership sector serves young, high-income and first-time buyers rather than those on low incomes.

Space standards

The study found that 57% of new-built affordable housing meets the recommended space standards of the NDSS and 81% of those in the HQIs. While flats had a high compliance rate with both standards (NDSS: 71%, HQI: 87%), houses only showed similar levels of compliance with the lower HQI standards (NDSS: 18%, HQI: 80%).

The findings indicated a significant association between the adoption of the NDSS and compliance with the recommended GIAs. Space standards comparable to the NDSS were already adopted in the London Plan 2011 and applied to all tenures and developments in the metropolitan region, not only projects funded by the Greater London Authority. In contrast, only 28% of local authorities nationally had adopted the NDSS according to responses to an environmental information request as part of this study in 2023. This not only explains the higher compliance rate in London (79% compared to an average of 31% in other regions) but also the higher compliance rate in flats, as 95% of affordable dwellings in London are provided as flats (compared to an average of 30% in the rest of the country, cf. DLUHC, 2022b), making up 55% of flats in the sample.

Nevertheless, the differences in how flats and houses meet the space standards were persistent. The overall compliance rate of flats was 74% in areas where the NDSS was adopted and 68% where it was not, compared to 47% and 13% for houses. These findings suggest that there might be different industry standards for flats and houses, with the standard flat sizes more aligned with the NDSS and standard houses with the HQI but also typological differences that depend on regional housing markets and the availability of land for development.

The strong correlation between dwelling types and standards is likely a result of how these standards are generated. The NDSS recommends higher overall dwelling sizes than those in the HQI, but the two standards do not differ significantly in their reasoning of space. Both standards are based on nearly identical furniture dimensions, activity zones, and circulation space required for maximum occupancy. Even though they were not explicitly mentioned, the differences in the overall dwelling sizes are the context and dominant typologies standards taken into account. While the NDSS was adapted from the LHDG, which was written for London where the majority of new housing consists of flats, the HQIs were national and therefore had a greater concern for single-family houses. While the method for calculating overall dwelling sizes used in the LHDG is appropriate for flats (i.e. adding up minimum room sizes), terraced houses pose additional geometric problems. In terraced houses, the living room and kitchen are located on the ground floor and bedrooms and bathrooms are on the first floor. Terraced housing design thus requires balancing room sizes and layout efficiency on the identically shaped and sized ground- and first-floor levels. However, according to room-by-room calculations, the floor areas required for these spaces are not the same.

Bedroom sizes in affordable house types are generally larger, with minimum bedroom sizes defined in both the NDSS and HQIs. The tolerability of smaller bedrooms in the private sector is particularly evident in three-bedroom houses, where the smallest bedroom is often smaller than the single bedroom size recommended in the NDSS (7.5 m^2; 2.15 m minimum width) and declared as a study room, which permits smaller overall dwelling sizes and indicates important differences in expected dwelling occupation in private homes, which are commonly under-occupied (West & Emmitt, 2004).

The study also shows that the HQI standards are preferred by private housebuilders in developments that predominantly consist of houses (thus outside London). Comparing private house types by different volume housebuilders, all had sizes close to the HQI standard. In addition, in many of the planning applications analysed, the HQI scores of affordable unit types were included on submitted plans, even though they were not required. The HQIs were used as a voluntary industry standard or a measure to demonstrate the usability of housing. This not only shows that some standards are habitually used in housing organizations, but that

standards are used as a form of reassurance both at an organizational and regulatory level. Thus the prolific use of standard types creates consistency in dwelling size across affordable housing, even when space standards are not mandatory.

Conclusion

Based on the sample of 153 recently completed housing developments, much of the affordable housing continues to be built below the current space standards, with 57% of new affordable housing failing to meet the recommended gross internal floor areas of the NDSS. However, new affordable housing fares well when compared to older standards, with only 20% of new affordable housing failing to meet the HQI space standards.

Despite space standards being negotiable, where the NDSS has been adopted by local planning authorities, it has proven to be effective in increasing the dwelling size of affordable homes. But progress in the adoption of the NDSS has been slow and not all local authorities are planning to implement the standards. This will further increase regional differences in housing inequalities and affordable housing provision. Therefore, a wider implementation of the NDSS is important. Options to be considered are making minimum affordable housing provisions and space standards nationally mandatory and providing more affordable housing subsidies, even for private developments, and changing the way housing subsidies and benefits are allocated. Another important challenge is an agreed definition of affordable housing, which can provide more genuinely affordable housing that is available in the long term.

It is important to note that even though this study focused on space standards as a measure of housing quality, it did not look into how effective they are in actually achieving better housing design quality. Further research into the quality of spaces in relation to minimum space standards but also the efficient and flexible use of spaces is needed (e.g. Tervo & Hirvonen, 2020). Larger dwellings or satisfying space standards alone do not directly translate into high-quality housing (Özer & Jacoby, 2022b), which equally depends on layouts, materials, and environmental comfort. Occupants often make do with dwellings that are smaller than the GIAs recommended by current space standards (Morgan & Cruickshank, 2014; Özer & Jacoby, 2022b; Finlay et al., 2012), which does not necessarily mean that they are not fit for purpose or do not meet the needs of their inhabitants, as smaller dwellings might offer better social, environmental and economic value to residents (Karlen et al., 2022).

The study also found that different standards are widely used for different dwelling typologies. Despite being no longer officially in use, the HQIs are still commonly used when designing houses. This can be related to the context, typologies and methodologies considered when determining space standards, and to the evolution of technical standards into voluntary standards and practice norms.

Flats and houses entail different design processes, but the extent to which these are taken into account when calculating space standards is often unclear. The study evidences how technical standards become part of design practice through standard house types. Both volume housebuilders and housing associations make extensive use of standard house types in their developments. Especially the development of houses lends itself to standardization, as house types tend to change only a little over time. Therefore, older standards, even if they are no longer mandatory, can persist in practice through standard types.

In England, debates on housing quality have paid specific attention to dwelling size and space standards, which have created both layout and graphical conventions that are widely used in planning applications to demonstrate the usability of housing layouts and their compliance with regulations or at least common expectations. Conventions, therefore, have become an important driver of housing standardization.

Recent changes in the supply of housing have led to private developers and their practices and preferences increasingly determining the design of affordable housing. At the same time, due to limited housing subsidies, housing associations have expanded their portfolios into the private housing market and adopted more commercial operations. This is potentially driving greater standardization across different housing sectors. While space standards and the use of standard house types provide some insights, further (qualitative) research is needed to study more comprehensively the way design practices found in the private sector are transforming affordable housing characteristics.

The study raises questions about the indirect role that voluntary design guidelines and technical standards play in the standardization of housing, with existing industry standards often aligned with the most recent space standards, even if they are not mandatory. Voluntary sector-wide and organization-specific technical guidelines and standards, therefore, have a significant impact on housing outcomes. However, their effects may not always be immediately or directly quantifiable.

Notes

1. Homes England in its Affordable Homes Programme 2016–2021 dropped in principle space standards as a funding condition. However, the current Affordable Homes Programme 2021–2026 requires all funded homes to meet at least 85% of the NDSS.
2. When furniture schedules and circulation zones in the *London Housing Design Guide* (2010) and the Housing Quality Indicators (2007) are compared, the only difference is the inclusion of a 1050 × 500 mm PC/Laptop desk and the requirement for a chair in the living room in the LHDG and the inclusion of an occasional 600×1200 mm cot space in the HQI.
3. 'Weekly formula rent is equal to 70% of the national average rent multiplied by relative county earnings [and …] by the bedroom weight […] plus 30% of the national average rent multiplied by relative property value' (DLUHC, 2022a).
4. Unless a housing allowance rent cap is introduced by the local authority.
5. In the past two decades, public funding programmes for new housing developments prioritized high-performance housing associations. This created incentives for other associations to join consortia or to merge with housing associations identified as lead partners. Moreover, changes in subsidies and the need for scaling-up have contributed to the merging of housing associations.
6. The Help to Buy equity loan offer ended on 31 October 2022, after the period of data collection for this study.
7. In terms of tenure, a distinction between affordable and market units was deemed sufficient as an inclusion criterion for the dataset. Where distinctions between affordable rent, social rent and shared ownership were available, these were recorded, but such detailed information did not exist for all development (n = 42).
8. Tests are conducted separately for social rent, intermediate/affordable rent, and shared ownership ratios in different regions. The tests indicated no significant difference in social rent ($p = 0.48$), but in intermediate/affordable rent ($p = 0.02$) and the shared ownership sector ($p < 0.01$). For brevity, test results are given for the shared ownership sector.

Data availability statement

Data supporting this study are openly available from the Royal College of Art Research Repository at https://doi.org/10.60624/epfx-6269.

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