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A Review of the 2023 Boundary Commission for England Draft Plan

QUANTITATIVE SPATIAL SCIENCES LAB
SCHOOL OF GEOGRAPHICAL SCIENCES
UNIVERSITY OF BRISTOL

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Contributors

Alistair Anderson
Isabelle Bi
Joseph Day
Nicholas Dorward
Sean Fox
Lenka Hašová
David Manley
Emmanouil Tranos
Levi John Wolf[1]

[1] Corresponding Author: levi.john.wolf@bristol.ac.uk

Executive Summary

Redistricting a nation is no small task, and we commend the BCE for the work it has already done. However, there are a few districting decisions, such as constituency re-designations, which deserve much more thorough (and specific) justification

- Serious reductions in the *accessibility* of constituencies in Liverpool, Leeds, Manchester, and Bristol are not balanced with improvements nearby.
- Extensive changes to boundaries are concentrated in the North and London, which will disproportionately impact voters who live in those areas.
- Age-related inequalities across constituencies mean that younger voters may be packed into urban Borough constituencies that dilute their electoral power.
- Constituency designations do not align well with the stated criteria of urban/ruralness, nor better alternative measures thereof.
- In particular, the designation *changes* require better justifications and should be examined for improved consistency.
- The constituency designation *changes* may reduce competitiveness in marginal districts, increase the expense of campaigning for minor parties, and increase competitiveness in non-marginal ones. The pattern of these changes is unusual.

We encourage the BCE to take a second look at several districts. A few clear examples include:

- The re-designation of Hartlepool
- The split of Batley and Spen into Dewsbury and Batley & Hipperholme
- The inclusion of the area past Scotland Road into Liverpool Riverside
- The flip of Knowle, Easton, and Lockleaze between Bristol South & Bristol East, and Bristol North East
- Extensive changes around suburban Leicester, including Leicester East and Blaby, Oadby, and Wigston.

Although we acknowledge that the potential for change may be limited by the cascading effect that this has on other districts. Fortunately, constituency *designations* can be changed without cascading effects, and we encourage the commission to review this further. Regardless, all of the data and analysis from our lab is presented online, in a responsive map, for commissioners and the public to review at https://ljwolf.org/bcemap

Introduction

In the review consultation documentation, the Boundary Commission for England (BCE) outlines a few key points of information driving the design of Westminster Parliamentary Constituencies in the 2023 boundary review. These standards reflect the ground rules for the Commission. Notably, point 26 discusses the main criteria underlying the design of the boundary map:

> 26 *Rule 5 in Schedule 2 provides for a number of other factors that the BCE may take into account in establishing a new map of constituencies for the 2023 review, specifically:*
>
> - *Special geographical considerations, including in particular the size, shape, and accessibility of the constituency*
> - *Local government boundaries as they existed (or were in prospect) on 1 December 2020*
> - *Boundaries of existing constituencies*
> - *Any local ties that would be broken by changes in constituencies*
> - *The inconveniences attendant on such changes*

Initially, these criteria appear to provide useful grounds on which to judge the quality of the BCE's 2023 plan. Unfortunately, key terms, such as *size, shape, accessibility*, *local ties*, or *inconveniences* are left undefined for the public and therefore it is difficult to determine how these quantities ought to be measured. Further, the extent to which, say, "boundaries of existing constituencies" ought to be preserved at the expense of the "accessibility" of a constituency is unspecified.

However, we believe that these kinds of determinations may not be *specifiable* in general, and we welcome the human element in the determination of districting decisions. Algorithmic districting, while possible, is usually not desirable, in the sense that it reduces the very real and important role that political negotiation, inconsistency, and flexibility must have in the process of drawing districts *for humans*.

However, we do think that specificity is critical for *justifying* specific boundary-drawing decisions. We can then seek guidance using specific examples from previous decisions taken by the commission as well as from the academic literature. Thus, we examine specific boundaries using various definitions of these statutory criteria.

Population, Places, and Communities

In this section, we explore the criteria of *shape*, *accessibility*, *existing constituency boundaries* and *local ties* as critical elements in the restriction process to examine how effectively these goals are met within the draft plan. Of course, without fine-grained knowledge about what the BCE considers important and why, decisions about specific constituency boundaries reflect an unknown mixture of the statutory criteria outlined above. No algorithmic process would be suitable in this instance, as it is often the case that too-rigid apolitical processes still have serious partisan implications.

Northern constituencies (and London) are extensively re-drawn

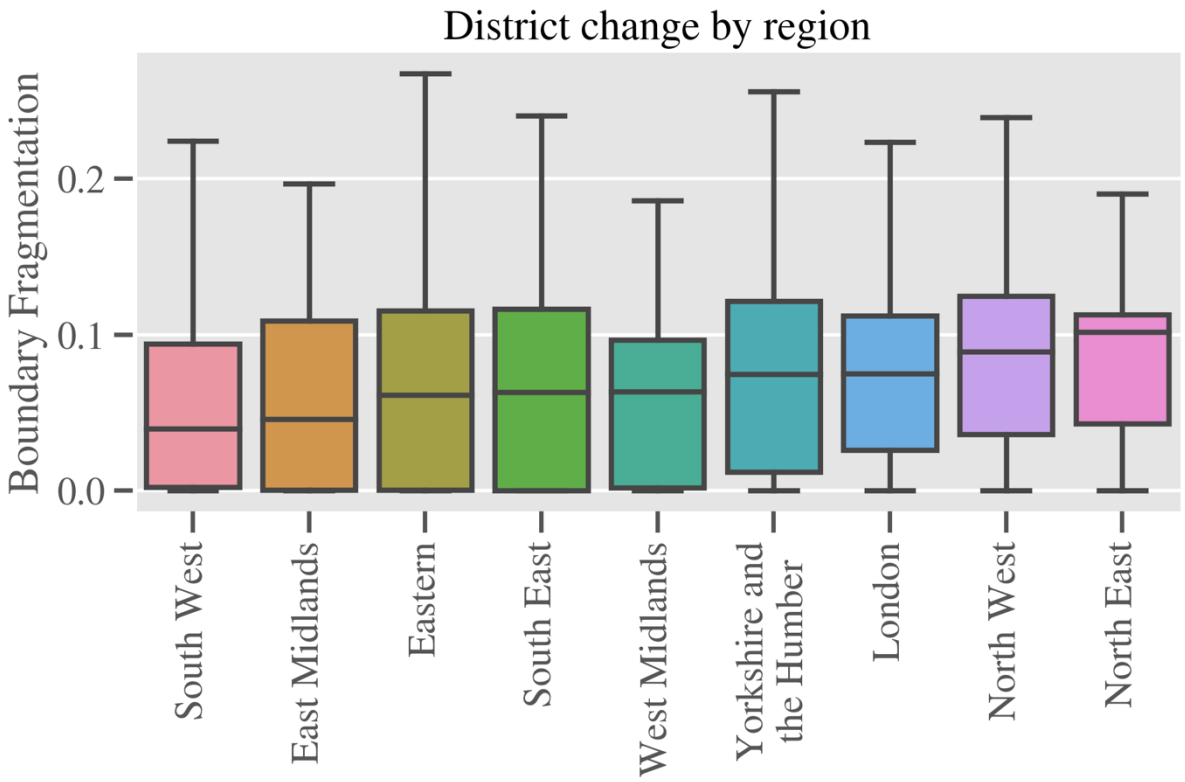


Figure 1: Boundary fragmentation in constituency boundaries by region.

While BCE notes that "boundaries of existing districts" are an important statutory principle of constituency design, some constituencies are preserved better than others, and some areas of the country experience much more extensive change than others. This is important, since the breakup of a longstanding constituency, while possibly necessary to improve the "fit" of boundaries to the underlying population, has the potential to make constituencies more competitive and increase turnout (Pattie et al.,

2012), as well as reduce incumbent advantage. Since increasing marginality and reducing incumbent advantage have partisan consequences, it is important to examine the extent to which lines are re-drawn as extensively across England.

To do this, we can estimate how well a new constituency in the 2023 draft plan matches an existing constituency. The plot in Figure 1 shows this with a geographical measure of *fragmentation*,[2] where scores close to zero indicate that constituencies are nearly the same as a current constituency, while increasingly larger scores indicate that the new constituency boundaries are increasingly less aligned with current constituency boundaries. This is also visualised in the online map accompanying this report using the "Boundary Fragmentation" layer. The distributions below show that some regions, such as the South West and East Midlands, have constituencies that largely follow the same boundaries as before. Their median fragmentation scores are well below .05, and 75% of the constituencies in the South West are below .1.

In contrast, the North East and North West see dramatic change to constituency boundaries, with the *median* constituency score for the North East being greater than the 75th percentile of the South West constituencies. This means that the constituencies in the North East/West are much more poorly associated with constituencies in the previous plan, whereas the South West, having set records for population growth, sees the most cohesive mappings between old and new constituencies. Of particular note, longstanding/stable constituencies in the North (such as, for example, Batley and Spen) that are radically changed and/or split into two in this draft plan stand to possibly see higher turnout, weaker incumbent advantage, and tighter electoral margins.

One objection to the measure of boundary fragmentation used above is that it focuses on the *area* of reassignment, rather than the *populations* that get reassigned. While we will examine the properties of the populations that get re-assigned later in this report, it is sufficient to note two things. First, as detailed in Figure 2, we can change the measure of interest from the concordance between the boundaries between the current and draft constituencies to that between the *populations* contained in old and new constituencies and see the same pattern. This is also contained in the "Population

[2] Details of this measure are provided in a methodological appendix.

Fragmentation" layer of the online map. Our population fragmentation measure is large when the *population* of a new district are all coming from many distinct current constituencies, and is zero when the populations of a district come from exactly one previous district, but large when populations of a district are drawn evenly from many different districts. Again, the units of this measure are arbitrary, but can be compared on a relative scale. Our results are consistent: people in the North and London see dramatic changes in their reassignments, whereas the refinements to constituencies in the South West largely keep populations that were in the same constituencies together.

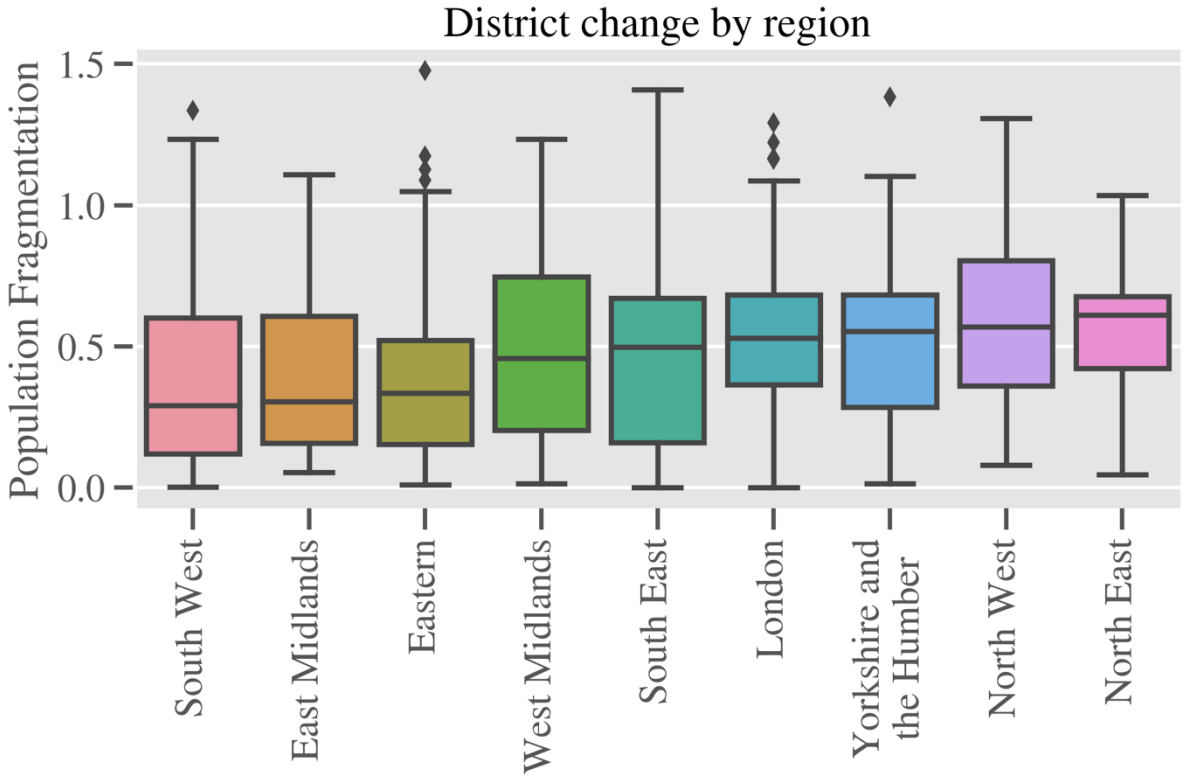


Figure 2: Fragmentation in constituency populations by region using the same approach as that taken in Figure 1.

Second, and more importantly, the correlation between the two measures of fragmentation is quite high, as shown in Figure 3. In theory, these measures correspond *better* when the areas being reassigned are evenly populated, as occurs in dense regions. These measures will *diverge* when the areas that are reassigned are extremely uneven in their population distributions, which is generally the case when small towns and their nearby rural areas are reassigned. This suggests that changes to district areas do indeed focus specifically on re-assigning target *populations*,

particularly in cities and city-peripheries, rather than re-shaping rural, sparsely-populated areas. This is critical, as we will get to the later sections on accessibility.

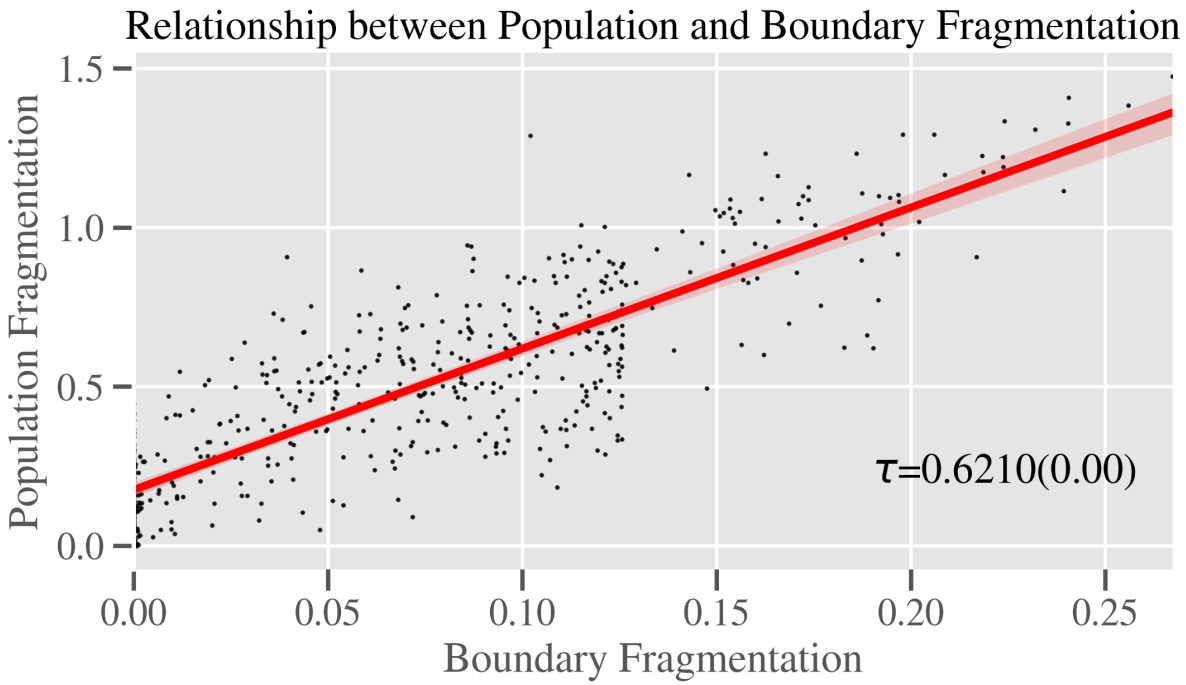
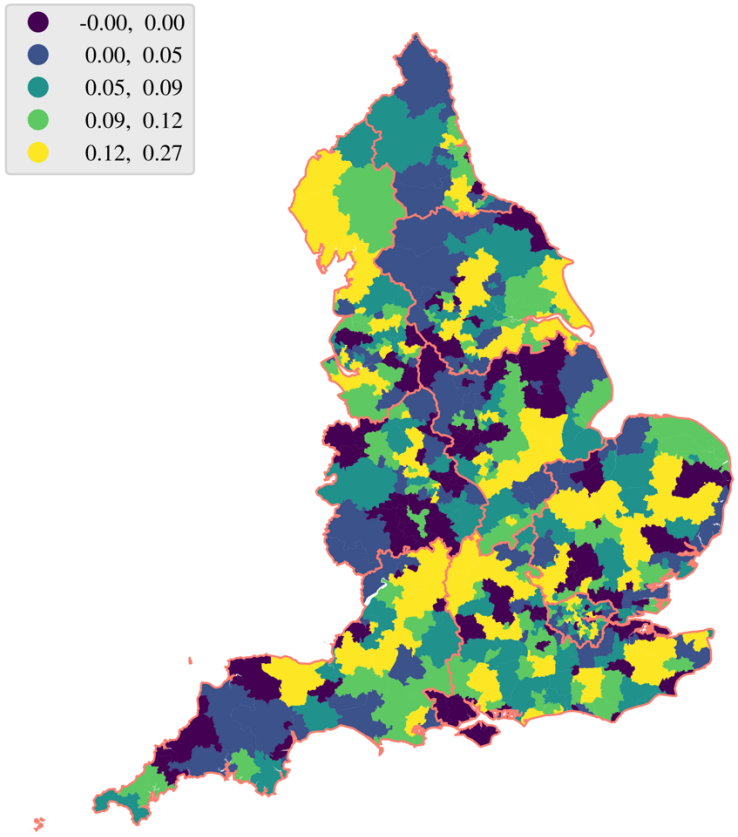
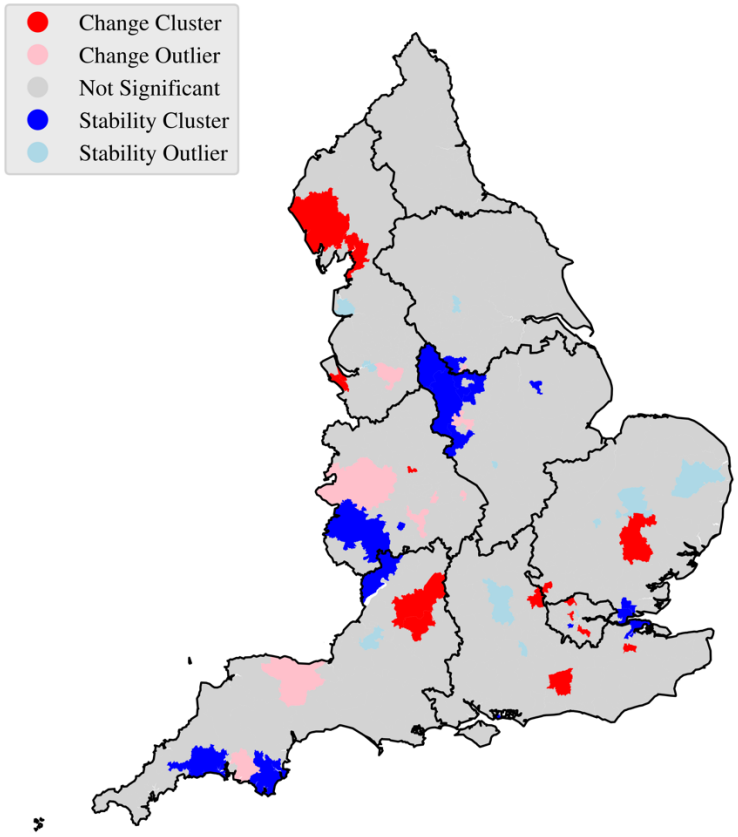


Figure 3: Relationship between the two fragmentation scores is strong, and their correlation is very high. This suggests that area and population are very similar for these measures of fragmentation, suggesting most of the "salient" redistricting decisions affect areas of fairly uniform population, such as those re-assigning communities within cities and towns, rather than those reassigning small rural communities.

Looking more closely at the geographical pattern of constituency boundary change shown in Figure 2, we see that there are clusters of constituency boundary change that stand out from the general pattern of the region in which they are located. For instance, there is a large cluster of boundary instability in the far north west, as well as areas of significant stability around Herefordshire. Interestingly, the population fragmentation clusters clearly pick up the fact that districts in the South West conform well to pre-existing boundaries, even where there are new districts created. In both analysis, as well, there are clear fragmentation outliers in Manchester, suggesting that the areas of central Manchester change seriously relative to their surroundings. This is a generally different pattern than the regional one is not easy to pick out. The map of fragmentation is also presented online in the "Boundary Fragmentation" and "Population Fragmentation" layers.

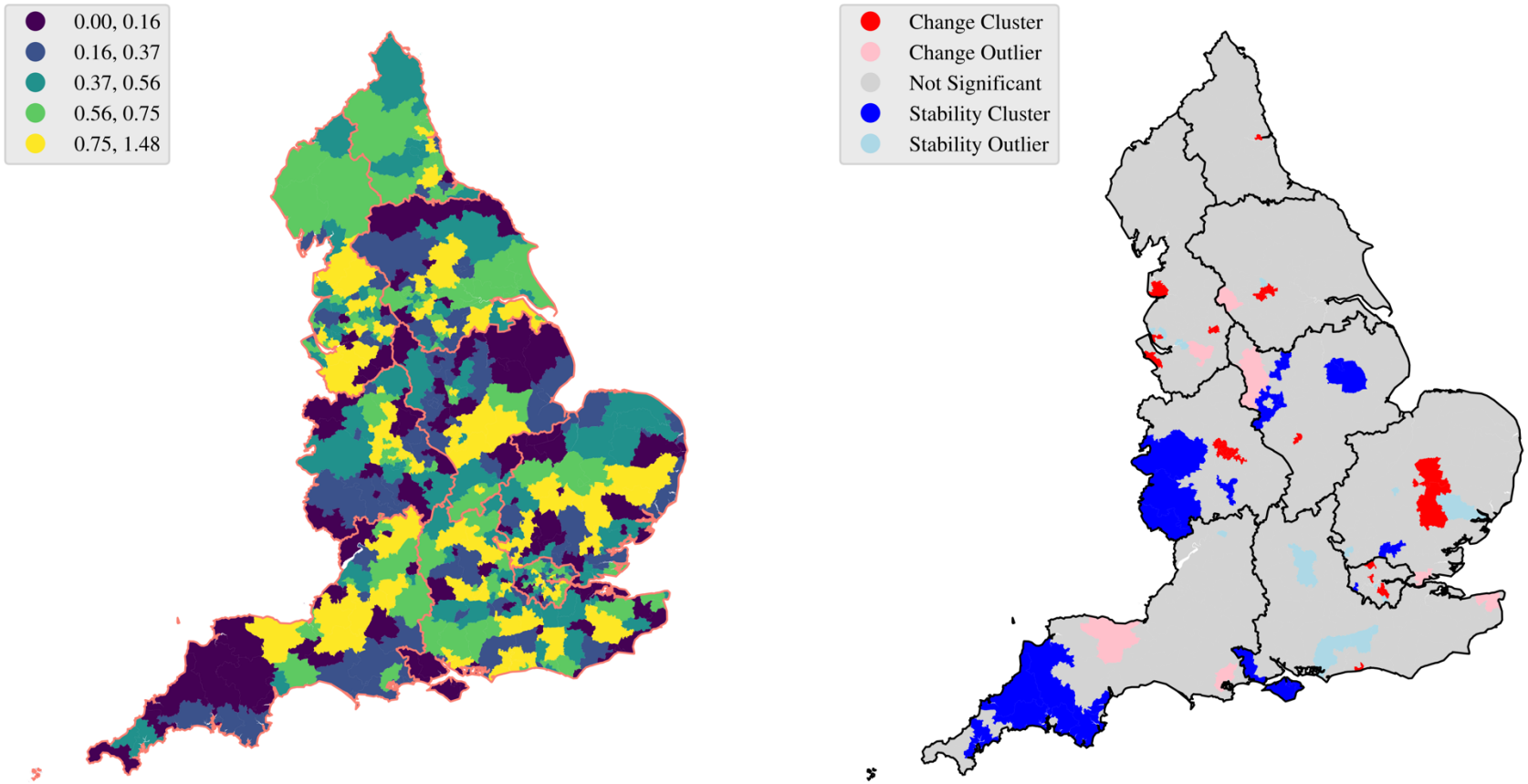


Constituency Boundary Fragmentation



Clusters in Fragmentation

Figure 4: Maps of constituency fragmentation and statistical clustering detected in constituency fragmentation. Change clustering indicate places where the electoral map has changed substantially more in that constituency and its immediate surroundings than is typical in the map. Therefore, this measures the *local change* in boundaries around each constituency, rather than a regional analysis. View online with the "Boundary Fragmentation" layer.



Constituency Population Fragmentation

Clusters in Fragmentation

Figure 5: Maps of constituency population and statistical clustering detected in this fragmentation. Change clustering indicate places where the electoral map has changed substantially more in that constituency and its immediate surroundings than is typical in the map. Therefore, this measures the *local change* in boundaries around each constituency, rather than a regional analysis. View online with the "Population Fragmentation" layer.

Constituency shapes change in very uneven ways across regions

	Smoothness (draft)	Smoothness (current)	Compactness (draft)	Compactness (current)
East Midlands	0.0302	-0.0301	0.07	-0.0119
Eastern	-0.476	-0.5038	0.2119	0.3325
London	0.6105	0.7418	-0.233	-0.2071
North East	-0.4266	0.0157	0.3022	0.0476
North West	0.3253	0.2792	0.2982	0.2598
South East	-0.0015	-0.1931	0.0569	-0.088
South West	-0.5755	-0.4041	0.2567	0.2464
West Midlands	0.3308	0.4437	-0.0097	0.2055
Yorks. & the Humber	-0.1194	-0.2497	-0.1048	-0.1987

Table 1: Change in the median boundary smoothness and shape compactness for constituencies in regions. Regions with constituencies that become less smooth/compact are coloured red.

The BCE notes that the statue focuses on constituency shape as a key trait for drawing good constituencies. Indeed, this is a common redistricting principle in many representative democracies with first-past-the-post electoral systems. Therefore, we measure the shape properties of constituencies through two composite measures: *smoothness*, which measures how indented or "wiggly" the constituency boundary is, and *compactness*, which measures how elongated or spindly the constituency shape itself is.[3] In this composite measure, negative scores indicate rougher or elongated shapes, and positive scores indicate smoother or more compact shapes. By design, *smoothness* is independent from *compactness*. Together, these provide a reasonable measurement of how well-shaped a constituency is. These can be viewed in the online map using the "Smoothness (% Change)" and "Compactness (% Change)" layers.[4]

[3] Details of the methodology are provided in the methodological appendix.
[4] Since districts cannot always be linked directly, this records the change *for each intersection* between the new and old constituencies. More detail is provided in the methodological appendix.

To start, the national median compactness and smoothness both decline in the BCE's draft plan. This suggests that, in aggregate nationwide, constituencies do slightly become more oddly shaped. This, by itself is not a cause for concern on its own. Breaking this down by region (again), we see in Table 1 that some regions have constituencies that become *more* well-shaped than other regions' constituencies, and this follows again the same regional pattern of inequality we noted in the previous section. This *is* concerning, however, as districts that are dramatically re-arranged into elongated and rough shapes may indicate boundary manipulation.

As a caveat, the raw shape of a constituencies *does not* capture boundary manipulation on its own, although it has been used for seventy years to do so. One large factor, the structure of population within the district, is ignored: oddly shaped districts may be drawn to collect communities along rivers, foothills, or roads. We acknowledge this and discuss this in the next section.

Accessibility changes are largely balanced within regions

As the commission notes, constituency shape *on its own* is a secondary concern to how that shape expresses the geographical structure of the population within it. Strangely shaped settlements exist often, as people sprawl out along riverfronts or concentrate into protected valleys to find suitable places to build communities. In the redistricting literature, this is well-recognised according to the concept of *accessibility*: how easy is it for members within a constituency to connect to one another? When a constituency is *accessible*, it is easy for voters within that constituency to interact with one another. When a constituency *is not accessible*, however, individuals may not be as easily able to interact with people in their constituency.

We analyze this here using the *population compactness* of a constituency as a measure of accessibility. This measures how long a typical trip must be for members of a constituency to meet in the same place.[5] Since this is longer for rural constituencies and smaller for urban constituencies, we only examine the *percentage change* in trip times for people across a constituency. We show this in Figure 6, but again recommend consulting the online map "Accessibility (% Change)" and "Accessibility (% Change

[5] Details of this measure are provided in the methodological appendix.

by Constituency)" layers for a more interactive display. In addition, the "raw" values are provided in the "Current Accessibility" and "Draft Accessibility" layers.

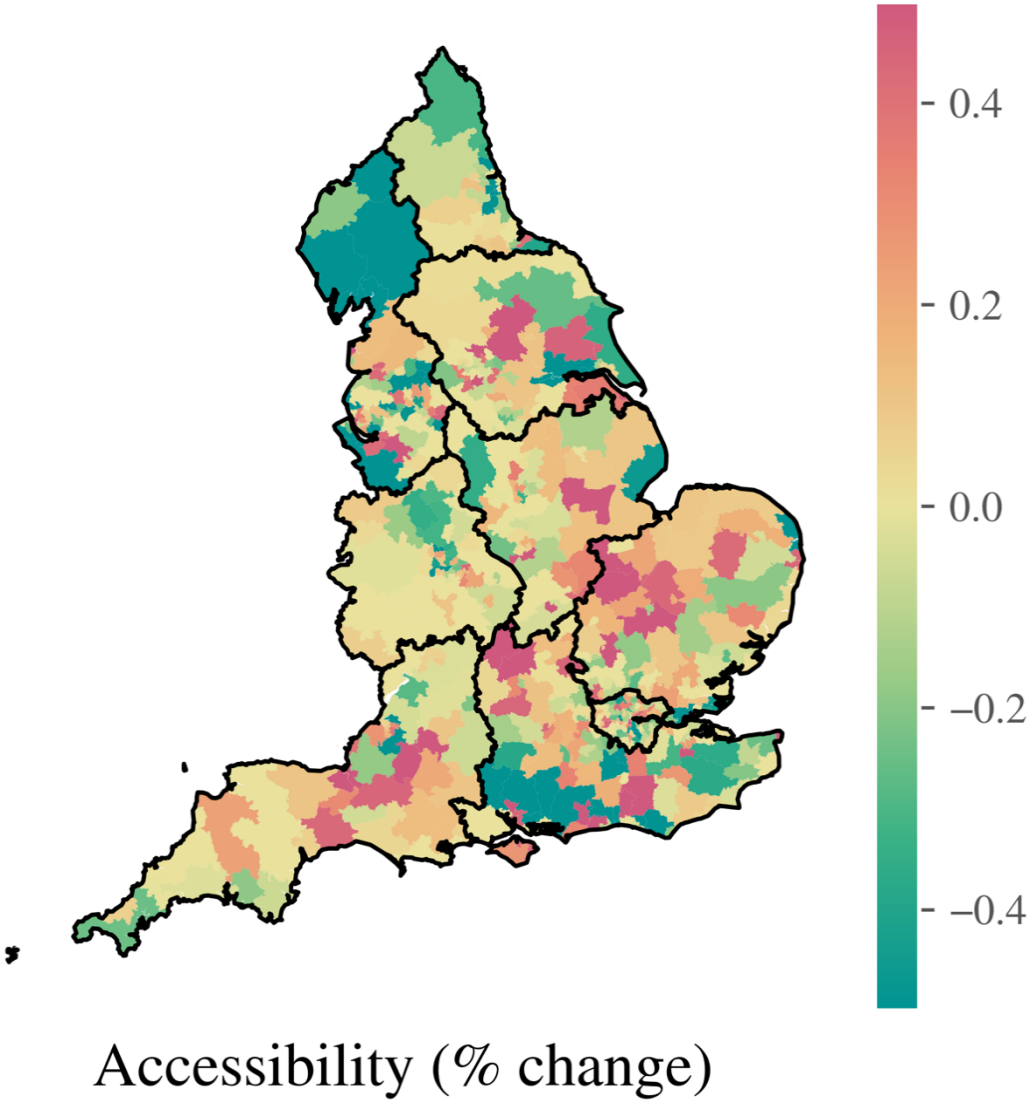


Figure 6: Change in accessibility between the current and draft plans. Negative values are shown in green and mean that trips generally become shorter between constituents in that constituency, whereas red positive values indicate longer trips. View online with the "Accessibility (% Change by Constituency)" layer.

From this, map, we can infer that the North East (and the north of the North West) both see dramatic reductions to population compactness. That is *even though* these constituencies have much worse population compactness than elsewhere in the nation, it is their *change* that is large and negative. As the densities increase (moving southwards), the story becomes more mixed, as some cities (and constituencies within those cities) see marked changes to their population compactness.

For example, in Yorkshire & The Humber, improvements to areas in and around York are balanced against decreases in Thirsk and Malton or Bridlington and Holderness. Likewise, dramatic reductions in population compactness throughout the Southeast (East Hampshire, Chichester) are balanced against serious improvements (Oxford West and Abingdon, Didcot and Wantage, Mid Sussex). Cornwall, sees serious aggregate improvements to accessibility overall, but this is also balanced by worsening in Avon areas, bringing the overall "South West" to a net zero. Thus, the regional story here obscures a significant amount of local detail. We look at this now.

Accessibility improves in Birmingham and Newcastle

Indeed, the most important variation in accessibility occurs at a city, not regional level. And, further, serious variation exists within constituency: there are usually parts of a constituency that are more remote than others. We illustrate this local analysis below with a few separate maps but encourage interested readers to follow along in the responsive online map. There, the "Accessibility Change" layer measures the sub-constituency change in accessibility for populations, or the "Accessibility Change (by Constituency)." The sub-constituency accessibilities for each districting plan are available in "Current Accessibility" and "Draft Accessibility" layers.

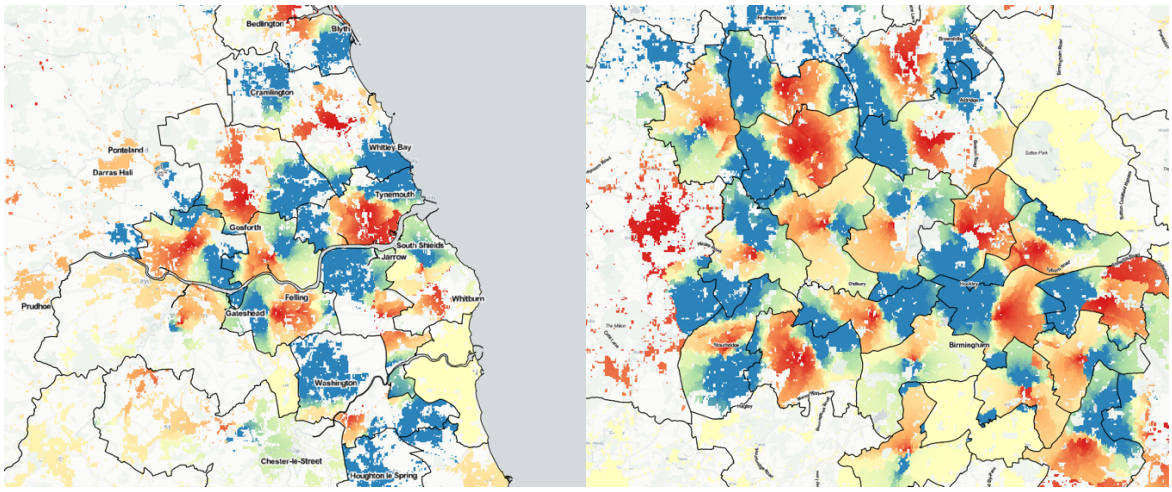


Figure 7: Accessibility increases on average in Newcastle (left) and Birmingham (right) at the sub-constituency level. Red areas see improvements to accessibility and blue areas see reduction in accessibility. View online with the "Accessibility (% Change)" and "Draft Constituencies" layers.

Newcastle and Birmingham constituencies, shown in Figure 7, are much more population compact in the 2023 BCE's plan than they are in the existing constituencies. Serious improvements also exist in Preston, although this comes at the expense of communities on the urban edge who get pulled into the Ribble Valley constituency. The commission should be aware of local outliers (Wolverhampton South East, Sollihull) in Birmingham, though. While previous constituency lines followed the less-populated spaces between neighborhoods in Wolverhampton, the current boundary lines for Wolverhampton South East group together these neighborhoods. This *reduces* the overall accessibility for populations in the Wolverhampton South East constituency relative to the previous constituencies in the area which largely drew lines through less populous parts of these urban areas.

Elsewhere, accessibility worsens in clear and distinctive ways

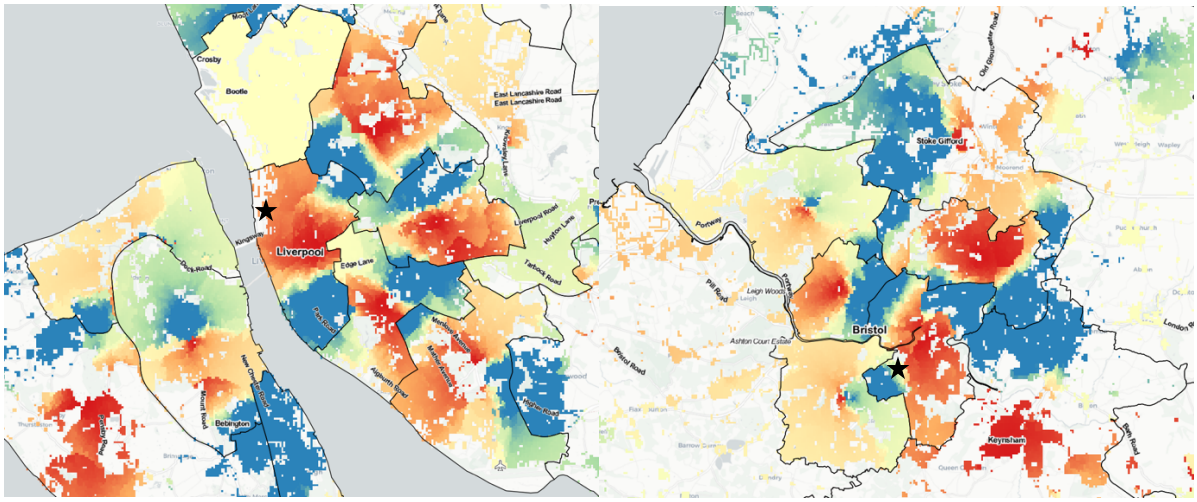


Figure 8: In contrast to Newcastle and Birmingham, constituency changes pictured here in central Liverpool and Bristol *decrease* accessibility. Red areas see improvements to accessibility and blue areas see reduction in accessibility. View online with the "Accessibility (% Change)" and "Draft Constituencies" layers.

Two other instructive cities come from Liverpool and Bristol, shown in Figure 8. There, we can see that the changes to Liverpool Riverside, despite improving the *shape compactness* of the constituency, worsen its *population compactness* as measured by accessibility. The area of Liverpool added to the Liverpool Riverside constituency (the blue area near the black star on the map on the left) is strongly north-south oriented in its urban structure; long major streets run along the course of the Mersey, but there

are few east-west-oriented streets crossing the Rupert Lane Recreation Grounds, a "built environment barrier." Further, the southern part of the revised Liverpool Riverside district splits Toxteth from the rest of nearby areas with which it is more naturally grouped. This also shows (again) in an intense blue patch in the Accessibility Change map of south Liverpool Riverside, and suggests that this decision to split Toxteth from the rest of Wavertree lumps together areas which are not easily accessible to one another and thus are likely not well-grouped. has been removed from the rest of Therefore, its inclusion into the Liverpool Riverside constituency seriously reduces the overall accessibility of the constituency to its electorate. We see this as well in the changes in Bristol East and Bristol South, where changes to constituency boundaries to "swap" communities between constituencies (such as Knowle, the blue "thumb" next to the black star on the map on the right) lead to serious reductions in accessibility for people in those communities, and thus for the constituency population as a whole.

It is challenging to systematically identify these kinds of areas without longer a longer consultation period. However, it is immediately apparent when this kind of "cracking" process happens in towns, and little local knowledge is necessary to identify these cases. Similar issues are also clearly present in Leicester (Leicester East; Blaby, Oadby, and Wigston), Leeds (Dewsbury most clearly, but also in Halifax and Headingly), and Manchester (Bolton South and Walkden, Manchester Central, also Failsworth and Droylsden). These constituencies are the most likely to have "cracked" communities into separate constituencies, harming the accessibility overall.

Because of its central place in the BCE's statutory criteria, these issues should not be taken lightly, and should be resolved where possible. We encourage the commission to examine these areas further using the "Accessibility" layers in our online map.

Age and voting patterns

Age of the electorate is one well-known factor that has a structural relationship with vote choice, participation, and campaign spending. Indeed, voters of different ages may have quite different life priorities, which can translate into seriously different electoral characteristics between otherwise similar constituencies. Therefore, careful

consideration of age distributions is one useful non-partisan way to examine representation among communities. Where possible, we hope that the national age distribution is reflected well in the distribution of ages by constituency; deviations from this may find their way into systematic biases for (or against) generations.

To conduct this part of the analysis, we look at the age distributions and successfully matching 482 constituencies of the 543 proposed new constituencies with 2019 ONS data on age distribution.[6] ONS anonymises age data for individuals over the age of 90 years old to avoid disclosure of identity. We focus on voters between the ages of 18 to 89 but acknowledge that that voters above 90 years of age are excluded here.

We make our point by examining Figure 9. There, the horizontal line represents the average age of 48.6. Of the 482 proposed constituencies studied, just over one third

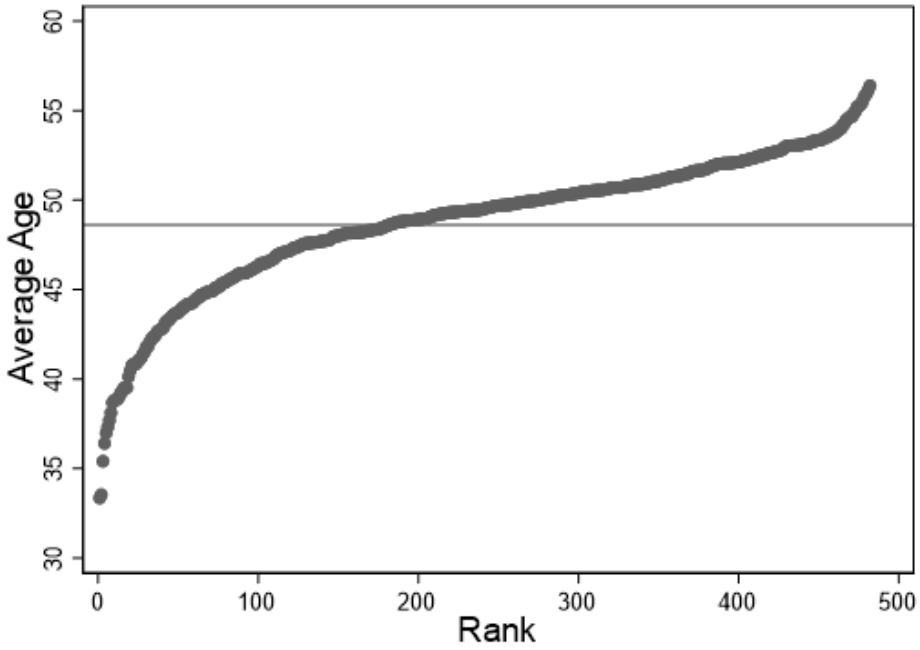


Figure 9. Average age per proposed constituency

(37.7%; n = 182) of constituencies have average ages of 48.6 and below. Amongst voters aged 18 to 89 years old within matched constituencies, our estimate is that the average voter is 48.6 years old for those between 18 to 89 years old and the median age is 48

[6] Source data from the ONS's Table SAPE22DT2: 'Mid-2019 Population Estimates for Lower Layer Super Output Areas in England and Wales'. See Appendix A for proposed constituencies that have been excluded from analysis due to failure of matching.

years old. That means that half of the population of concern eligible to vote is 48 years old or younger. However, when considering the proposed electorate boundaries, the average age rises to 49.5 years old. This means that the typical constituency is older than the typical voter, and that the BCE's draft plan may over-represent places with older individuals.

While we would expect random fluctuations in population composition to result in constituencies that have populations at the extreme (i.e., a younger than average electorate; an older than average electorate), it is evident in Figure 9 that certain constituencies "pack" large amounts of young voters into single constituencies. What this means is that given the clustering of younger voters in specific constituencies, the same age cohort in other boundaries and their age-specific priorities would be systematically under-represented when taken as an entire national demographic.

Proposed Constituency	Average Age
Lowest average ages	
Manchester Central BC	33.4
Sheffield Central BC	33.5
Bristol Central BC	35.4
Leeds Central BC	36.4
Headingley BC	37.0
Highest average ages	
Christchurch CC	56.4
West New Forest CC	56.2
North Norfolk CC	56.0
West Dorset CC	55.9
Honiton CC	55.7

Table 2. Youngest five constituencies versus oldest five constituencies

To provide evidence on this, we first see in Table 2, the constituencies with the youngest on average population are within urban city centers while those with the highest average age is within rural county constituencies. This correlates well with our understanding of how age factors into decisions about where to live. However, this has serious political consequences, as inter-city constituencies are likely to have

lower spending caps and stronger third-party competition (as discussed in the next sections). This leaves younger voters in a double bind: packed into constituencies with an excess of young voters *and* designated as Borough constituencies, minor party competition expands, competitiveness increases, and the general electoral preferences of younger people are diluted.

This is further confirmed in Figure 10 below, where we break down the constituencies into two parts: county constituencies (n=284) and borough constituencies (n=198). Averaging across all proposed constituencies, the average age within county constituencies is older (50.8) than borough constituencies (46.0). To address the inequality in age distribution amongst constituencies, we propose a crude estimate of half (241 of the 482) of the constituencies should either have averages at less than 48.6 years old or medians less than or equal to 48 years old. We understand that 182 constituencies have averages less or equal to 48.6. Looking more closely at the constituencies that are within the 3rd quintile (40% to 60%) listed in the methodological appendix, the median ages of an additional 20 constituencies are all 48 years old. With 202 constituencies, there is a minimum of a shortfall of 39 proposed constituencies of the necessary 241 constituencies to distribute constituencies evenly according to age. Potential constituencies for the commission to consider further on age-related electoral inequalities are highlighted in the methodological appendix, and on the "Average Age by Constituency" layer in our online map.

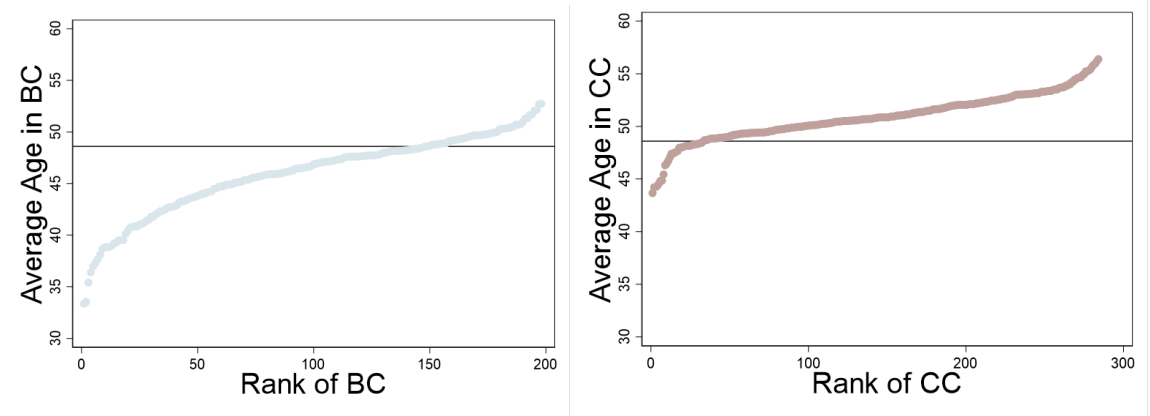


Figure 10: Average ages of Borough Constituencies versus County Constituencies

Historical macro-geographic boundaries are generally preserved

Throughout the history of parliamentary democracy at Westminster, MPs have represented spatially-bounded constituencies as it was rightly understood that each constituency should be a distinct community with distinct interests which ought to be represented by their constituency MP. This is what the BCE refers to when discussing *local ties* being preserved in districting plans. Even in the era of "rotten" and "pocket" boroughs prior to the 1832 Great Reform Act, parliamentarians appreciated the need to represent particular interests, and that such interests tended to be spatially defined. For example, members representing the Cinque Ports in the unreformed House of Commons traditionally spoke for the Navy, while members representing County constituencies represented the interests of landowners and MPs for Borough constituencies represented the interests of manufacturers and merchants (Blackstone, 1765). Similarly, in the modern era, the BCE notes that constituencies ought to respect the *local ties* of inhabitants, insofar as it is possible to do so while preserving the remaining statutory critieria.

As we discuss elsewhere in the report, many districts represent distinct communities with distinct interests. However, given the complex networks of human interaction, identifying such communities is by no means straightforward. Therefore, we employ community detection algorithms to simplify these dense networks and identify the principal zones within which the majority of movements between populations occur. While community-detections algorithms simplify complex networks, it is necessary to bear in mind that these networks are the product of economic, social and cultural factors, which are not easily disentangled from one another. For example, the town of Middlesbrough grew at a blistering pace in the latter half of the nineteenth-century, drawing in migrants from across England and Wales as the iron and steel industry in the town boomed (Yasumoto, 2011). Consequently, the network of human movement changed, as migrants met Middlesbrough's demand for labour by the end of the nineteenth century. Therefore, in order to identify barriers to human interaction that represent the longstanding cultural and historical boundaries of communities, rather than more transient networks of human interaction, we compare the regions produced from two very different human networks separated in time by a hundred years.

Using birthplace data derived from the 1911 individual-level census returns, the lifetime migration paths of those that had left the parental home were reconstructed and used to identify the principal boundaries within which migration occurred (Day, 2020). We compare this to commuting flows derived from the 2011 census. This exercise identified barriers to human interaction which have remained stable over the previous hundred years and which therefore – it can confidently be inferred – represent real and meaningful boundaries between communities which ought to be respected when drawing parliamentary constituency boundaries, designed to identify and represent discrete groups of voters in the House of Commons. These historically-justified *local ties* are then what we consider in subsequent figures.

Figure 11 compares the 'primary' boundaries produced by the community detection algorithm and identifies where the boundaries are stable and where they are unstable, i.e., where they have changed significantly between 1911 and 2011 and which are therefore unlikely to represent long-standing, meaningful boundaries between communities. Two boundaries deserve further comment; those boundaries around Birmingham – the West Midlands area – and those between Manchester and Leeds.

Figure 12 shows that by and large, the proposed constituency boundaries largely respect long-standing barriers to human interaction and delineate the separate communities effectively. Indeed, it is of interest that the route following approximately what is now the A5 between Crick and Shrewsbury appears to have represented a significant break in the network of human interaction for at least for past 100 years.

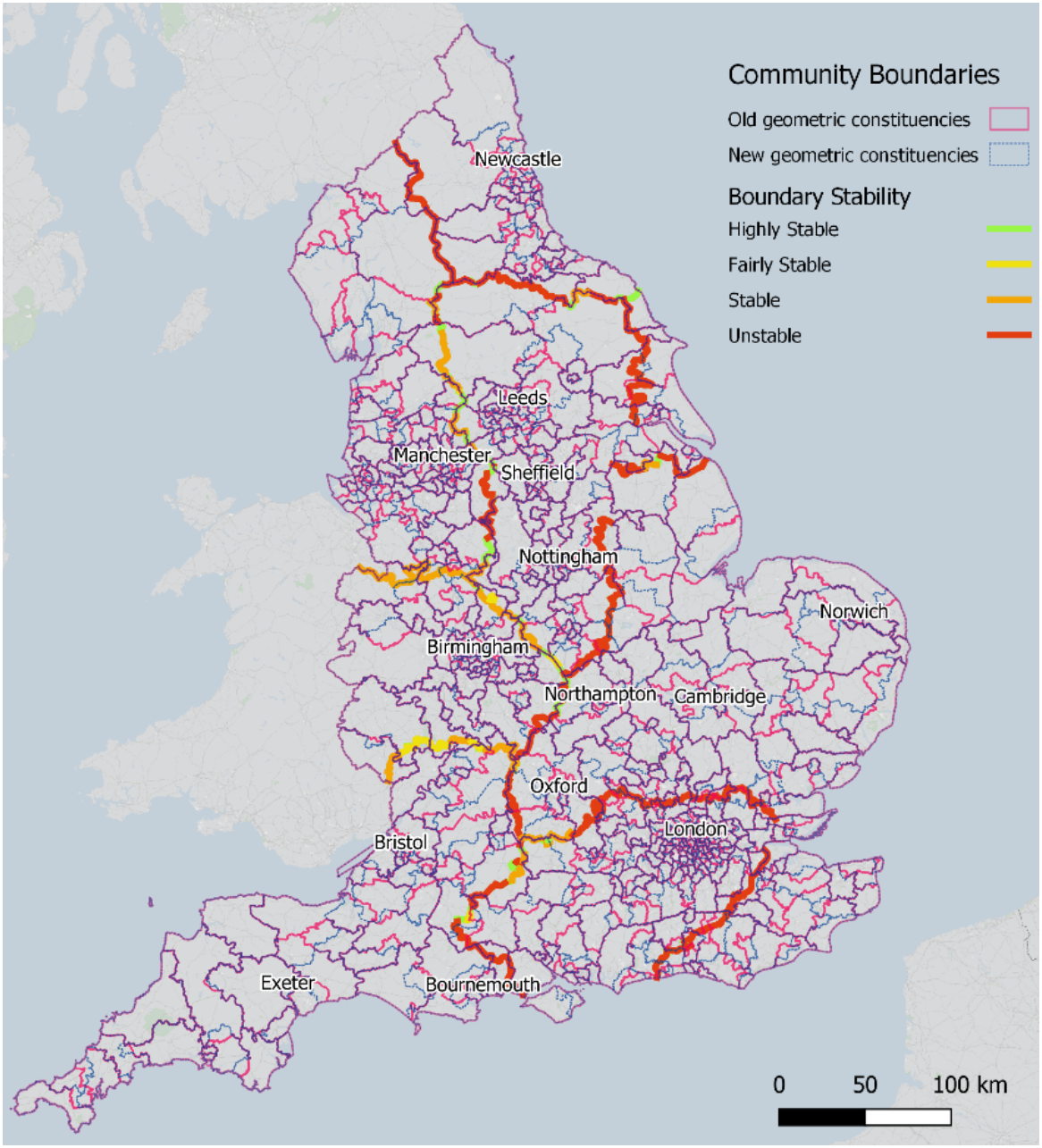


Figure 11: Historic communities and parliamentary constituencies

However, this does not appear to be true in the case of the Pennines in Figure 12. While many of the proposed parliamentary boundaries do indeed follow the barriers identified in both 1911 and 2011, the physical geography of the Pennines, the Skipton and Rion constituency is a notable exception.

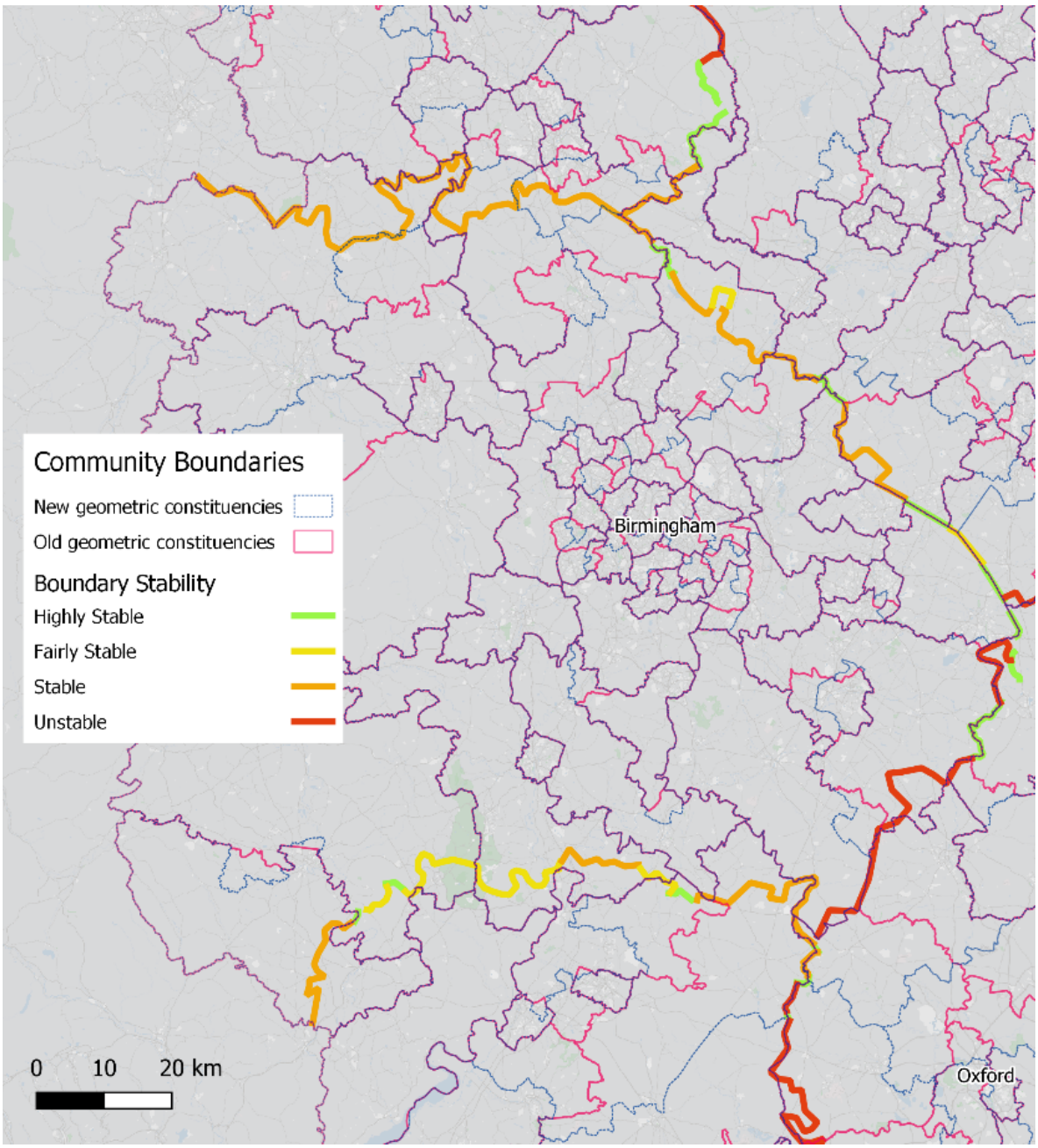


Figure 12: Historic boundary stability and constituencies in the Midlands.

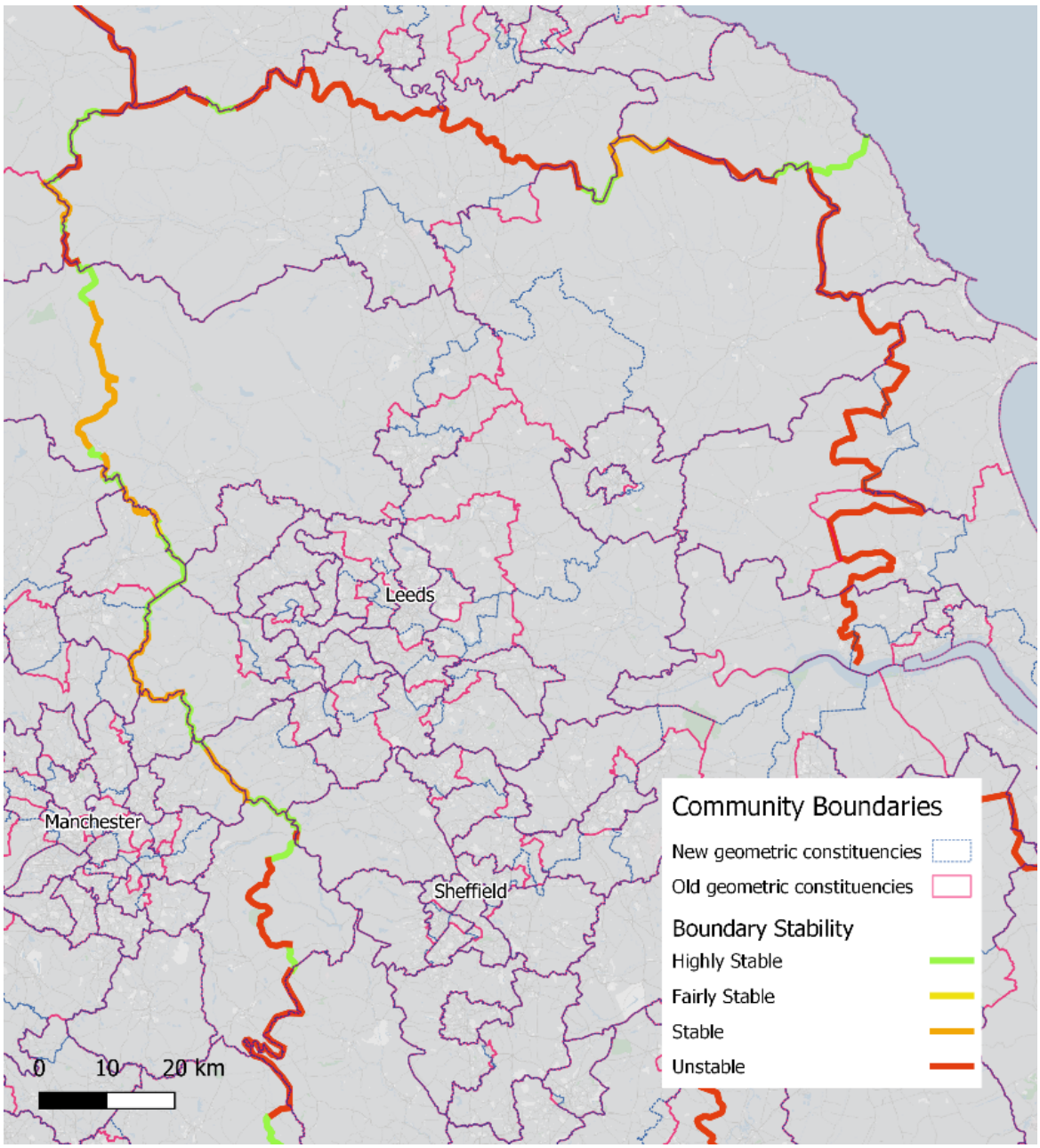


Figure 13: Historic community boundaries and constituency boundaries around Leeds, Sheffield, and Manchester.

Designations & Density

One other important role the BCE plays beyond drawing the lines is in determining the *designations* of constituencies. This *designation* is intended to separate "rural" from "urban" constituencies. Criteria for these decisions is provided by the BCE:

> *The BCE considers that, as a general principle, where constituencies contain more than a small rural element they should normally be designated as county constituencies. In other cases, they should be designated as borough constituencies.*
>
> *The designation also determines the limit on the amount that a candidate is allowed to spend during a Parliamentary election in the constituency. The limit is slightly lower in borough constituencies, to reflect the lower costs of running a campaign in a more geographically compact urbanised area.*

The BCE also provides population density data with their draft constituencies to demonstrate the density of different constituencies. While not explicitly stated, we infer that population density could both to contribute to the statutory goal of constituency *accessibility*, as well as serve as an indicator to help determine these constituency designations. As we argue in subsequent sections, however, population density may not be the best metric to understand accessibility, or indeed even how we *experience* urban-ness.

Deciding what is "urban" and what is "rural" can be quite challenging, but these revised designations create a serious inequality in campaign spending allowances across England which, in turn affects the competitiveness of elections (Fouirnaies, 2021). For example, Fouirnaies (2021) finds

> *"when spending limits are increased, campaigns become more expensive […]; the pool of candidates shrinks and elections become less competitive; and the financial and electoral incumbency advantages are amplified". (p. 409)*

Thus, a seemingly apolitical decision such as the constituency designation can have serious partisan consequences, depending on *whose constituencies* get redesignated.

Therefore, this section examines whether proposed changes to classifications (a) are made with consistent reasoning relative to the stated criteria on urbanity/ruralness, (b) are likely to affect the competitiveness of elections based on the proposed

boundaries, and (c) whether differences in potential cost of elections in current Borough and County constituencies are associated with spending patterns by 'major' and 'minor' parties. Designations are visible in the online map by clicking/tapping on the constituencies, and designation *changes* are available in the "Designation Changes" layer. Population density is shown by default in the "Population" layer, which comes from the most recent WorldPop constrained population estimates for 100m grid cells.

Raw density reported by the BCE is inconsistent for designations

Constituency	Draft Designation	Designation	Density
Bristol North West	Borough	Borough	460.27
Peterborough	County	Borough	419.07
Filton & Bradley Stoke	County	County	1623.60
Hornchurch & Upminster	County	Borough	1399.53
Hartlepool	County	Borough	723.71
Dewsbury	Borough	County	1441.11

Table 3: selected constituencies linked across the draft and existing plans, alongside the constituency's population density, reported by the BCE. Borough constituencies are those that are "containing a predominantly urban area."

To start this discussion, we examine the consistency in (re)designations across parliamentary constituencies. Immediately, we see that there is a very wide range of population densities across different designations. We link constituencies with the same name across the current and draft plans.[7] In total, we were able to link 336 (about 61%) of constituencies in this manner. This allows us to examine the population density of the constituency (as presented in the draft plan), along with the current and new (if altered) designations.

Since designations have serious consequences for campaign spending and marginality, it is important to implement the designations consistently between areas with similar population densities. However, this appears not to be the case. This

[7] Since constituency naming is preserved when constituency boundaries remain (largely) the same, this links constituency where the commission thought substantially the same area was represented.

creates the potential for different levels of campaign spend in otherwise similar areas. Politicians in very dense "County" constituencies are able to maximise the reach of their dollars, while those in sparsely populated "Boroughs" may have a harder time reaching their prospective voters.

We present a selection of constituencies to illustrate our point in Table 3. There, you can see that some constituencies, such as Bristol North West, remain Borough Constituencies with relatively low population densities, while others (such as Peterborough) get re-classified to County Constituencies. In contrast, some County Constituencies that *remain* Counties, such as Filton and Bradley Stoke, have nearly *four times* the population density as re-classified Peterborough.

This occurs at the same time some other Boroughs (such as Hartlepool, which sees no change *in its boundaries*) are re-classified as Counties while having approximately the same population density as Counties that become Boroughs (such as Dewsbury, which absorbs part of the former Batley and Spen constituency). Thinking regionally, constituencies in the North East, North West, and Yorkshire & the Humber regions comprise the majority (65%) of re-classifications from Borough to County, meaning that constituencies in those areas will generally see increased campaign spending, fewer minor-party candidates (such as Greens or Liberal Democrats) and more competitive elections.

Therefore, we believe that clearer general rules, or at least specific justifications for the 29 existing constituency reclassifications we see, should be provided by the BCE. Further, we are mindful that this only occurs among the 61% of constituencies we can unambiguously link between existing and draft plans; it is also possible that highly reconfigured areas (such as those we identify in the previous sections) will also experience significant increases in spending.

Lived density, a better measure, still shows inconsistencies

However, despite these significant disparities in *density*, we do not think this metric is the most appropriate for the BCE to consider. Instead, we strongly encourage the consideration of a measure of *lived density*, which reflects how compact the population that lives in the constituency is spread *across inhabited areas*. Thus, a constituency with

very dense, concentrated populations will have higher *lived density*, even if these constituency must stretch to accommodate disparate towns.

Constituency	Draft	Current	Density	Lived Density
Bristol North West	Borough	Borough	460.27	3406.14
Peterborough	County	Borough	419.07	3647.74
Filton & Bradley Stoke	County	County	1623.60	2365.19
Hornchurch & Upminster	County	Borough	1399.53	3355.69
Hartlepool	County	Borough	723.71	2960.83
Dewsbury	Borough	County	1441.11	3362.62

Table 4: Comparisons of raw population density, *lived* density, and designation among the constituencies mentioned in Table 3.

Many lived density metrics exist, but here we compute it directly from the WorldPop population raster from 2020 using the BCE's draft constituencies and present the correlation in Figure 14. There, we see that most constituencies have a higher lived density than raw population density. Most importantly, the lived population density can be much higher (relatively speaking) than the comparable raw population density. That is, a constituency with very low population density can have nearly the median *lived* density, which suggests these constituencies are collections of very dense settlements. Further, as density increases, the relationship tightens between the two.

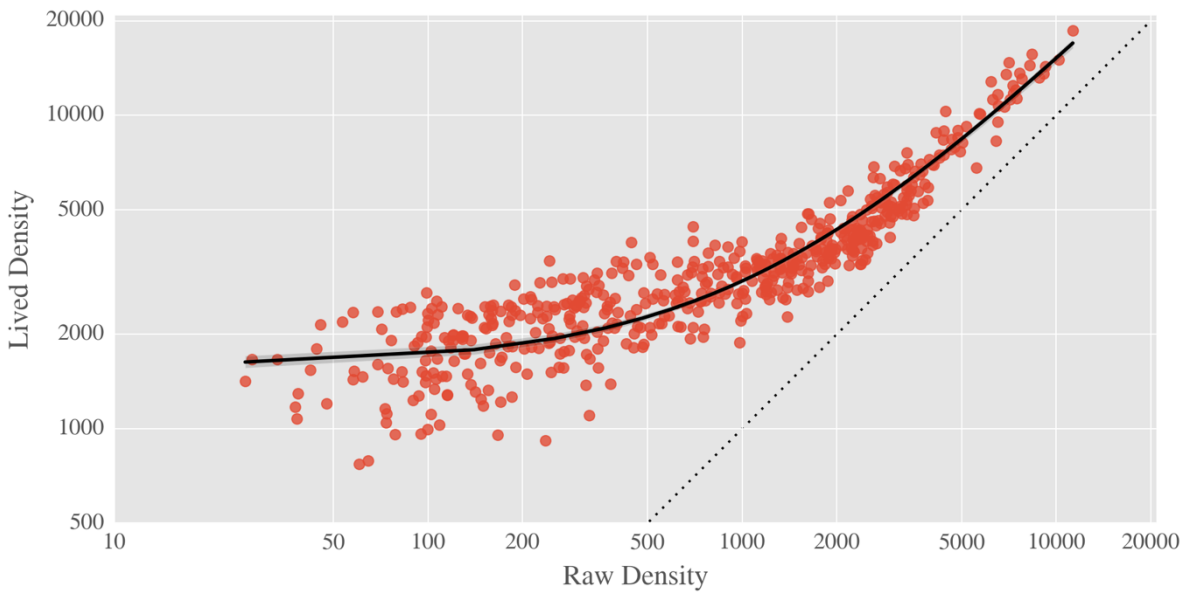


Figure 14: Raw and lived population densities for constituencies in the BCE 2023 plan.

This metric much better captures the fuzzy overlap of the constituency density profiles we considered in Table 3. In Table 4, we show the lived density, which is much more similar between *all* of these constituencies. This still suggests that the decisions made about the proper designations for constituencies needs attention, however, since the concerns relating different designations remain: Peterborough has an extremely high lived density, for example, but is changed from a Borough to a County, yet Dewsbury, which has lower lived density, is reclassified from a County to a Borough. Thus, the decisions around designation remain unclear; with such large political (not partisan) implications, this deserves further dedicated attention from the commission to clarify the re-designation decisions, especially for the constituencies that do not change boundaries substantially like Hartlepool.

Draft (Re)Designations may reduce competitiveness

To visualize the changes in the constituency designations, the web map provides a "Designation Changes" layer. Using data compiled by Fouirnaies (2021), we examine the relationship between Borough and County classification and the competitiveness of elections for the current boundaries in the 2015, 2017, and 2019 elections. We use constituency-level data in a cluster-robust linear regression (clustered by constituency). Major parties were defined as Labour and the Conservatives, owing to the sizeable difference between their levels of spending and any other party.

The results of the regression model examining the competitiveness of elections in Borough and County constituencies is presented in Table 5. This model controlled for the year of the election, the size of the electorate, and region. The reference region was North West England as this was a median region for the average number of candidates per election.

The average election in 2015 in a Borough constituency and with the mean number of electors in North West England was estimated to involve six candidates. Elections in County constituencies, with higher spending limits, were found to be less competitive, averaging 0.41 fewer candidates than Borough elections. While this seems slight, it suggests a chilling effect on minor party competition in County elections. Moving to constituency size, for every extra thousand electors in a constituency, elections were estimated to have a very small increase in the number of candidates – for example, it

would take around an additional 40,000 electors for the size of electorate to equal the effect of being a Borough constituency. Given the relatively tight range of constituency electorates, then, this effect is quite marginal indeed. There were also regional variations in the competitiveness of elections, with Greater London, South-East England, and Yorkshire and the Humber tending to have more candidates than the median region.

Variable	**Estimate**	**2.50%**	**97.50%**
Constant	6.08	5.90	6.25
Year (2017)	-0.94*	-1.06	-0.82
Year (2019)	-0.96*	-1.09	-0.84
Constituency Category (County)	-0.41*	-0.54	-0.28
Number of Electors (1000s)	0.01*	0.00	0.02
Region (Reference: North West England)			
East England	-0.05	-0.28	0.17
East Midlands	0.02	-0.20	0.24
Greater London	0.58*	0.27	0.88
North East England	0.19	-0.06	0.44
South East England	0.33*	0.10	0.56
South West England	-0.08	-0.28	0.11
West Midlands	-0.11	-0.30	0.07
Yorkshire and the Humber	0.56*	0.30	0.82

Table 5: Regression results for model examining the competitiveness of elections.

In summary, constituency classification is associated change in election competitiveness for these boundaries, though there is some further regional variation to competitiveness. Based on this simple model accounting for classification, electorate size, and region, across the 29 reclassified constituencies one would expect a combined 7 fewer candidates to run in this set of constituencies' elections compared the actual number that ran in 2019. Thus, without a clearer picture of *why* these redesignations were conducted (especially without change of boundaries), we suggest that this anticompetitive effect should be avoided.

Draft (Re)Designations may inflate minor party campaign spend

Using the same data compiled by Fouirnaies (2021) that we analyzed in the previous section, we examine the proportion of possible spending by major and minor parties were examined across the 2015, 2017, and 2019 elections using a mixed-effects linear regression model (candidates nested within constituencies) with variables at the candidate and constituency level. The results are presented in Table 6. This model controlled for the year of the election, competitiveness of the election, size of the electorate, incumbency of the candidate, and region. The reference region was the East of England as this was the median region for average proportion of possible spending.

Variable	**Estimate**	**2.50%**	**97.50%**
Constant	48.02	44.82	51.23
Year (2017)	-0.25	-1.68	1.16
Year (2019)	6.18*	4.72	7.63
Number of Candidates	-0.82*	-1.37	-0.28
Electors (1000s)	-0.18*	-0.31	-0.05
Incumbent	29.54*	27.87	31.21
Constituency Designation (County)	-9.88*	-12.19	-7.59
Member of Minor Party	-30.21*	-31.93	-28.50
Member of Minor Party * Designation (County)	8.86*	6.65	11.07
Region: Reference (East of England)			
East Midlands	-2.93	-6.74	0.88
Greater London	0.09	-3.55	3.72
North East England	-3.79	-8.40	0.82
North West England	-1.65	-5.15	1.85
South East England	-0.40	-3.69	2.89
South West England	6.53*	2.90	10.15
West Midlands	-2.18	-5.87	1.52
Yorkshire and the Humber	-1.35	-5.01	2.32

Table 6: Regression results for a model examining the percentage of the spending limit used across constituencies in elections from 2015, 2017, and 2019.

Interpreting these results, we see that a candidate running in 2015, in an election with the mean number of candidates and electors, who was not an incumbent, was a member of a major party in a Borough constituency in the median region, was estimated to have spent around 48% of the possible limit in their campaign. There was a significant interaction between major/minor party classification and constituency classifications in terms of the percentage of possible spending by candidates. Major party candidates in County constituencies – with a higher spending cap – tended to spend around 9.9% less (spending 38.1%) of the possible limit than major party candidates in Borough constituencies. Minor party candidates in Borough constituencies spent around 30.2% less (spending 17.81%) than major party candidates in Borough constituencies. Minor party candidates in County constituencies however spend around 8.9% more (26.7%) than their colleagues in Boroughs, in a reversal of the trend seen for major parties. There was little regional variation evident around the median, as only the South West presented a significant difference with candidates in the South West spending around 6.5% more of the possible limit than candidates in the median region (East of England).

In summary, based on this data and modelling, constituency classification is associated with different spending patterns for major parties and minor parties. Major parties tend to spend more of the spending limit in Borough constituencies where there is a lower cap, whilst minor parties spend more of the limit in higher-cap County constituencies. This suggests that reclassifications, such as the redesignation of Hartlepool as a County Constituency, will have serious effects on minor parties and will structurally affect the geography of minor party competitiveness. We encourage the commission to re-examine the patterns of re-designation noted above in light of these political effects, and encourage the public to view the re-designations online.

Conclusion

Redistricting a nation is no small task, and we commend the BCE for the work it has already done. However, there are a few districting decisions, such as constituency re-designations, which deserve much more thorough (and specific) justification. There are quite a few instances where redistricting changes severely harms *accessibility* of a district to its inhabitants, in the sense that voters are less well-connected to one another. We detail how the extensiveness of change in the electoral geography is

concentrated in the North and London in terms of district instability, district shape, and accessibility, as well as how specific constituency changes on the urban/rural periphery result in severe decreases to accessibility. We uncover age-related issues with the constituency design, suggesting that younger voters may be packed unnecessarily into urban Borough constituencies that dilute electoral power. We also find that constituency designations do not align well with the stated criteria of urban/ruralness, and identify the potential effects of constituency designation changes on the competitiveness and expense of campaigning.

We encourage the BCE to take a second look at several districts, although we acknowledge that the potential for change may be limited by the cascading effect that this has on other districts. Fortunately, constituency *designations* can be changed without cascading effects, and we encourage the commission to review this further. In total, we hope the commission can respond to these specific concerns, as they note that this district plan has a high likelihood of becoming enacted into law.

Methodological Appendix

Constituency Boundary Fragmentation

Boundary fragmentation can be estimated using simple information-theoretic approaches (Nowosad and Stepinski, 2018). Specifically, *entropy* has long been used to characterise the change in boundaries in zoning problems. For a given district *i* in plan P, we can use its area A_i to compute the *areal entropy* of plan P. This reflects the evenness of district areas. This can be computed by examining the *proportion of area*, p_i, within district *i*:

$$p_i = \frac{A_i}{\sum_i^n A_i}$$

Then, the entropy of the entire districting plan is computed directly from p_i:

$$h_a^P = \sum_i^n p_i \log(p_i)$$

This characterises the total discrepancy in district sizes. We use it as a *normalizing factor* to compute the *overlay entropy* of a district, which measures how strongly a district in the draft plan is split among districts in the previous plan. Let p_{ij} denote the fraction of draft district *i*'s area that falls within the *j*th current constituency. Then, the *overlay entropy* of draft districts onto current constituencies *Q* is measured by:

$$h_i = \frac{1}{h_a^Q} \sum_j^n p_{ij} \log(p_{ij})$$

This factor is large when districts in the draft plan are split very evenly across districts in the previous plan. Put another way, this is large when districts in the draft plan are formed from many equally sized cuts from existing districts and is small (or zero) when the current districts are drawn from exactly one current district. Thus, taking an existing district and splitting it into two, following exactly the old boundaries of the main district, results in lower fragmentation values. These can also be computed using *population* within the district, rather than area, but this is not done in this analysis due to time constraints.

Measurements of Smoothness and Compactness

Our measures of smoothness and compactness are driven by four separate measures of constituency shape:

- *boundary amplitude*, which is the perimeter of the convex hull of the constituency divided by the perimeter of the constituency itself. This measure is close to 1 when the boundary is perfectly smooth, with no indentations or deviations from the convex hull, and becomes zero when the boundary becomes highly indented. (Brinkhoff et al. 1995, Wolf 2017)
- *convex hull areal ratio*, which is the area of the constituency divided by the area of the constituency itself. This measure is close to 1 when the constituency is extremely convex, with no indentations or deviations from the convex hull, and becomes zero when the boundary becomes highly non-convex. (Ansolabehere & Snyder 2015)
- *isoperimetric quotient,* which is the area of the district divided by the area of the circle with the same perimeter as the district. This is close to 1 when the shape is very close to a circle, and zero otherwise. (Polsby and Popper, 1991)
- *minimum bounding circle areal ratio,* which is the area of the district, divided by the area of a circle that contains the district (Reock, 1961)

These measures are correlated with one another, but each does provide a distinctive view of the shape of a district. Some are much more strongly correlated than others; the boundary amplitude and isoperimetric quotient are highly correlated (generally speaking) because they use information about constituency *perimeters*. Formally, the boundary amplitude is generally taken to be a measure of *boundary indentation,* and the isoperimetric quotient is taken to be a measure of *circularity*, but each are generally very correlated in the data we on both new and old constituency plans. While the *convex hull areal ratio* is generally taken to be a measure of *convexity* and the *minimum bounding circle areal ratio* is generally taken to be a measure of *elongation*, the two are less strongly related than the two perimeter-based ratios.

Therefore, to pull these different measurements together into our indices of smoothness and compactness, we compute these measures for all districts in the current and draft plans. Then, we run a factor analysis on the pooled scores, to split

the scores into two dimensions. Doing this, we see a very strong loading of boundary amplitude and isoperimetric quotient on factor 1 (smoothness), since both measure perimeter-specific properties, whereas loadings for the convex hull and minimum bounding circle areal ratio focus more on factor 2 (compactness). However, none are perfectly loaded, so they each contribute something to the two measures. The loadings are generally invariant to reasonable rotations (none, quartimax, or varimax are tested). Further, to avoid strong shoreline/fractal dimensionality effects, we simplify and quantise the boundaries of constituencies to a consistent level of detail after clipping the districts to the shoreline. While this is not complete protection from fractal dimension effects on the perimeter measures, it provides boundaries with consistent resolution.

Measuring Population Compactness

To measure population compactness, we use a very old measure deriving from studies of districting in the 1960s (Weaver & Hess 1963, Boyce & Clark 1964). We use *inertia*. At a high level, it is large when residents are generally far from one another, and it is smaller when residents are close to one another. There is no absolute minimum or maximum on this score, although the score is generally higher when populations are concentrated on the *boundaries* of constituencies and lower when populations are concentrated towards their center. This means that the measure can be useful to analyze *cracking*, where a populated community is cut in two by the constituency boundary. Mathematically, we compute inertia as the population times the squared distance from the population center of the constituency. Thus, for an arbitrary location k within the district, its contribution to inertia is:

$$I_k = p_k d(k, c)^2$$

Where c is the population center. For the purposes of our study, we use the WorldPop 2020 estimates (Tatem, 2017), which are the most recent at the time of publication. Further, we use *trip distance* (Foti et al. 2012), rather than Euclidean distance, to reflect the very different natures of accessibility across England.

We requested electorate estimates at the ward level from the commission. These were present online in the bcereviews.org.uk website, but we were informed that they would not be supplied. In lieu of these, WorldPop data provides a high-quality alternative.

Community Detection

We employed community detection algorithms in order to create homogenous clusters of areas in the UK not based on the characteristics of these areas, but, instead, on the population flows originating from or destining in these areas during different time periods. Simply put, the areas clustered within the same communities are more densely connected in comparison to the connections they share with the rest of the country. Hence, these communities represent 'functional' regions which reflect the activity space of individuals in different time periods.

In order to create these communities we built two networks based (i) on the 2011 commuting flows between the Census Output Areas and (ii) on migration data from the 1911 census data (Day, 2020). Given the relatively large size of these networks, we employed the 'fast and greedy' algorithm (Clauset et al, 2004) as implemented in the igraph package for the statistical software R (Csardi and Nepusz, 2006). Our analysis consisted of two steps. At the first step, we utilised all the flows within England and we fed them to the community detection algorithm separately for the 1911 and the 2011 data. The resulting communities represent the 'optimal' solution for England. We mapped these communities and compared their boundaries with the prosed draft boundaries. At a second stage we focused on what appeared to be the West Midlands regions in the communities derived both networks. We subset the networks to only include flows within this region and we re-run the analysis only for these flows. The outcome was a much more detailed picture for the activity spaces within West Midlands for 1911 and 2011. Again, these results were mapped and compared with the proposed boundaries to assess to what extend they respect or ignore such activity spaces, some of which appear to be stable for over a century.

Lived Density

Lived density is a relatively old concept but has found some major uses in recent analysis of population structure (Rae, 2018; Babbitt et al. 2020). It omits unpopulated areas from the computation of the "area" in which people live. This means that constituencies that contain sprawling but populated areas tend to reduce the *lived*

density, whereas constituencies with a few very dense towns will have larger lived density, all else holding equal. We compute this directly from the WorldPop 2020 constrained population estimates (Tatem, 2017), dropping cells where fewer than one person are estimated to live.

Age Inequalities

Constituencies that failed to match between the ONS and existing data are below:

Aylesbury CC	Marlow and South Buckinghamshire CC
Basingstoke BC	Melksham and Devizes CC
Brent Central BC	Mitcham and Morden BC
Brentford and Isleworth BC	North Cornwall CC
Camborne and Redruth CC	Northampton North BC
Cambridge BC	Northampton South BC
Camden Town and St John's Wood BC	Oxford East BC
Carshalton and Wallington BC	Princes Risborough CC
Chesham and Amersham CC	Rother Valley CC
Chippenham CC	Rotherham BC
Chorley CC	Ruislip, Northwood and Pinner BC
City of London and Islington South BC	Salford BC
Corby and East Northamptonshire CC	Salisbury CC
Daventry CC	South East Cornwall CC
Deptford BC	South Northamptonshire CC
Ealing Central and Acton BC	Southall BC
Ealing North BC	Southgate and Barnet East BC
East Isle of Wight CC	St Austell and Newquay CC
Edmonton BC	Stanmore and Edgware BC
Enfield North BC	Sutton Coldfield BC
Feltham and Heston BC	Trowbridge and Warminster CC
Finchley and Muswell Hill BC	Truro and Falmouth CC
Hammersmith and Chiswick BC	Twickenham BC
Harrow BC	Uxbridge and South Ruislip BC
Hartlepool CC	Wellingborough and Raunds CC

Hayes and West Drayton BC	West Hampstead and Kilburn BC
Hendon and Golders Green BC	West Isle of Wight CC
High Barnet and Mill Hill BC	
High Wycombe CC	
Hornsey and Wood Green BC	
Kentish Town and Bloomsbury BC	
Kenton and Wembley West BC	
Kettering CC	
Lewisham East BC	

In addition, the ranked list of all proposed constituencies between 40th to 60th percentile is provided below. Blue indicates constituencies that are less than or equal to the population average. Green highlights constituencies with median ages less than or equal to the population median. Pink indicates those constituencies that are in the top half of the highest age range. Constituencies without a highlight (that mainly fall between the median and mean ages, may need to be reconsidered based to resolve age-related disparities in electoral representation.

Rank	*Proposed Constituency*	*Average Age*	*Median Age*
146	Luton North BC	47.9	46
147	Stevenage CC	48.0	47
148	Gillingham and Rainham BC	48.0	47
149	Oldham East and Saddleworth CC	48.0	48
150	North West Cambridgeshire CC	48.0	47
151	Ashton-under-Lyne BC	48.0	48
152	Stretford and Urmston BC	48.1	47
153	Maidstone and Malling CC	48.1	47
154	Cheltenham BC	48.1	47
155	North West Hampshire CC	48.1	47
156	Harlow CC	48.1	47
157	Weybridge and Chertsey CC	48.1	47
158	Chingford and Woodford Green BC	48.1	47
159	Windsor CC	48.2	47

160	Bexleyheath and Crayford BC	48.2	47
161	Bournemouth East BC	48.2	47
162	Sunderland Central BC	48.2	48
163	Knowsley BC	48.2	48
164	Liverpool West Derby BC	48.2	48
165	Buckingham and Bletchley CC	48.2	47
166	Wolverhampton West BC	48.2	47
167	Doncaster Town CC	48.3	47
168	Basildon and Billericay BC	48.3	47
169	Bury South BC	48.3	48
170	Dunstable and Leighton Buzzard CC	48.3	47
171	Heywood CC	48.3	48
172	South Basildon and East Thurrock CC	48.3	48
173	Croydon East BC	48.3	48
174	Walsall BC	48.4	47
175	Southend West BC	48.4	47
176	St Albans CC	48.4	47
177	Ashford CC	48.4	48
178	Norwich North BC	48.4	47
179	Wakefield BC	48.5	48
180	Stockton North CC	48.5	48
181	Bolton North East BC	48.6	48
182	Bootle BC (Average)	48.6	49
183	Dudley BC	48.7	48
184	Swindon North CC	48.7	48
185	Gravesham CC	48.7	48
186	Barnsley South CC	48.7	49
187	Bloxwich and Brownhills BC	48.8	48
188	Sheffield South East BC	48.8	48
189	Halifax CC	48.8	48
190	Batley and Hipperholme BC	48.8	48
191	St Neots CC	48.8	48

192	Hitchin CC	48.8	48
193	Kingston upon Hull East CC	48.9	49
194	Sidcup and Welling BC	48.9	48
195	Sittingbourne and Sheppey CC	48.9	49
196	Hornchurch and Upminster CC	48.9	48
197	Birkenhead BC	48.9	49
198	Stoke-on-Trent North BC	48.9	49
199	Warrington South CC	48.9	48
200	Great Grimsby and Cleethorpes BC	48.9	49
201	Hertford and Stortford CC	48.9	48
202	Nuneaton CC	48.9	49
203	Kingston upon Hull West and Hessle CC	48.9	49
204	Broxbourne CC	49.0	48
205	Pontefract and Castleford CC	49.0	49
206	Burnley and Bacup CC	49.0	49
207	Burton CC	49.1	49
208	Croydon South BC	49.1	48
209	Chester North and Neston CC	49.1	49
210	Epping Forest CC	49.1	48
211	Jarrow and Sunderland West BC	49.2	49
212	Bromley BC	49.2	48
213	Wigan CC	49.2	49
214	Denton and Hyde CC	49.2	49
215	Cannock Chase CC	49.2	49
216	Blackpool South BC	49.2	50
217	Woking BC	49.3	48
218	Bury St Edmunds and Newmarket CC	49.3	49
219	Hyndburn CC	49.3	49
220	Didcot and Wantage CC	49.3	48
221	Newport and Wellington CC	49.3	48
222	Barnsley North CC	49.3	50
223	Romsey and Southampton North CC	49.3	50

224	Makerfield BC	49.3	49
225	Westminster and Chelsea East BC	49.3	49
226	Warrington North CC	49.4	49
227	Broxtowe CC	49.4	49
228	Crewe and Nantwich CC	49.4	49
229	Newport Pagnell CC	49.4	50
230	Leeds East CC	49.4	49
231	Sheffield Hallam CC	49.4	50
232	Leigh South and Atherton BC	49.4	49
233	West Lancashire CC	49.4	50
234	Rugby CC	49.4	49
235	Widnes and Halewood CC	49.4	50
236	Ilkeston and Long Eaton CC	49.4	49
237	South Derbyshire CC	49.4	49
238	Redditch CC	49.4	49
239	Bury North BC	49.5	49
240	Rawmarsh and Conisbrough CC	49.5	50
241	Mansfield CC (Median)	49.5	50
242	Scunthorpe CC	49.5	50
243	Spelthorne BC	49.6	49
244	Newbury CC	49.6	49
245	Oxford West and Abingdon CC	49.6	49
246	Eastleigh BC	49.6	49
247	West Pennine Moors CC	49.6	50
248	Stourbridge BC	49.7	49
249	Plymouth Moor View BC	49.7	50
250	Three Rivers CC	49.7	49
251	Normanton and Hemsworth CC	49.7	50
252	Tynemouth BC	49.7	50
253	St Helens South BC	49.7	50
254	Ashfield CC	49.7	50
255	Halesowen BC	49.7	49

256	Mid Bedfordshire CC	49.7	50
257	Reigate CC	49.7	49
258	Tamworth CC	49.8	50
259	Liverpool Garston BC	49.8	50
260	Ellesmere Port BC	49.8	50
261	Maidenhead CC	49.8	49
262	Tunbridge Wells CC	49.8	49
263	Bolton West CC	49.8	50
264	Wallasey BC	49.9	50
265	Hertsmere CC	49.9	49
266	Bicester CC	49.9	49
267	Doncaster North CC	49.9	50
268	Newcastle upon Tyne North BC	49.9	50
269	Witney CC	49.9	50
270	Worsley and Eccles CC	49.9	50
271	St Helens North CC	50.0	50
272	Epsom and Ewell BC	50.0	49
273	Darlington CC	50.0	50
275	North West Leicestershire CC	50.0	50
277	Winchester CC	50.0	50
278	Gedling CC	50.1	50
279	Huntingdon CC	50.1	50
280	Hedge End CC	50.1	50
281	Bolsover CC	50.1	50
282	Mid Leicestershire CC	50.1	50
283	Calder Valley CC	50.1	50
284	Surrey Heath CC	50.1	50
285	Braintree CC	50.2	50
287	Selby CC	50.2	50
288	Orpington CC	50.2	50
289	Rushcliffe CC	50.2	50
290	North Bedfordshire CC	50.3	50

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