General comments.

I welcome the new version of the manuscript, appreciate the effort the author has gone to make the large scale structural changes to it, and think it makes the strengths of the approach much clearer. I think there are some relatively minor changes that could be made to improve the clarity of the message further. I will list these below.

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| Number | Position | Comment |
| 1 | General | Another general point: I think more separation between discussing the ‘cart’ part and ‘IS’ part of CART-IS would still be helpful, as I implied by suggesting the paper be structured with 1.4.1 Problem 1: discretization of values; 1.4.2 unequal population densities. Then later 2.1 Solution 1: splines/smoothing approaches; 2.2 Problem 2: density equalizing algorithms/methods. This would make it clearer that both CART and IS individually address important specific problems, and combining them in a single visualization addresses both at the same time. |
| 2 | Abstract - introduction | Suggest changing this to something like “There is spatial patterning in many health related outcomes, such as disease prevalence. Effective geovisualisation of such health data can help providers and commissioners of healthcare to make better decisions about where to direct limited healthcare resource. Poor geovisualisation can lead to misinterpretation of these data, worse decision making, and ultimately poorer population health. Developing and applying effective geovisualisation methods for communicating health data is therefore an important healthcare issue.  This paper presents a new geovisualisation technique, Cartography with Interpolated Spines or CART-IS, which clearly shows …”  I think the advantages of the approach seem to be that you have information on position of populations (relative position of areal units), size of populations (size of polygons), and severity of disease (shade/colour).  It’s important to think about how this first paragraph of the abstract is as engaging as possible to a relatively wide audience, as it may be all most academics see of the paper. |
| 3 | * 1. Intro   P. 3 1st para | Same argument as in #2 above. I think this paragraph focuses too much on specific data and not enough on the general issue of the importance of good visual communication of spatial data.  Firstly I would suggest looking for natural break-points in the paragraph to split it into two or three paragaphs, then think about the ordering of these paragraphs, to foreground decision-making and geovisualisation, then think about whether the wording could be improved. An important ‘kernel’ seems to be the sentence, “While GIS can often be perceived as…” – I think there’s an important point somewhere here, but it’s buried deep in the paragraph, and needs rephrasing/rethinking a bit. |
| 4 | P4 L 43 | “Dorling maps produce a visual output without retaining topology…” – Shouldn’t this be topography? i.e. the relative position of areal units is preserved where possible, but the areal unit polygons are simplified and abstracted away into simple geometric shapes.  The G & N algorithm attempts to preserve more of the topographical features of the polygons, making places easier to recognize. |
| 5 | P5 L1 | I think the software should be references along with other sources. There are standards for how to do this. The version number could be important for replicability of results. |
| 6 | P 5 L37 | I think the mention of the literature review should go at the discussion stage. |
| 7 | P5 L37 | CartIS is mentioned without first saying what it is. As well as spelling out the words, there should be some talk of the two components – cartography and interpolation – and what problems in effective visual communication they solve. |
| 8 | P5 L45 | I think there should be a short paragraph here signposting the rest of the manuscript “The next section will… The section after that will… Finally we will…” This could be good earlier in the manuscript too. |
| 9 | P6 L14-19 | “(for input parameters see appendix 2)” I think this should go as a separate sentence at the end of the paragraph. |
| 10 | P6 L51-54 | “The effect of the cartogram is shown to reduce the range of sizes each LSOA covers,…” I think I understand this but it is unclear. Explain why this is so, and perhaps present the findings in terms of ratios: e.g. “ In the standard map, the ratio of the largest to the smallest areal unit is X, but when the cartogram is used it reduces to Y.” |
| 11 | P7 L43-51 | “Following on from .. the use of an interpolation surface allows variability in the dataset…” I think something like this should have been a lot earlier. There needs to be discussion of the merits/uses of interpolation earlier on, to suggest motivation for wanting to use the approach (alongside cartograms). |
| 12 | Ibid. – more general point | Somewhere mention the potential dependence interpolated output has on the choice of smoothing parameter/bandwidth – discussion/limitations/further research all seem appropriate sections to raise this in |
| 13 | P8 L19-42 | “To test the practicality of the CartIS method…” – I think rephrase slightly – “although large scale evaluation was not done, preference testing on a convenience sample of XXX…” – make it clearer that this ‘in addition to’ the hard work of actually making the maps, is illustrative of something that’s promising, and suggests a useful kind of additional research that could be done. |
| 14 | P8 L48 | “The combined methods…” Say precisely what has been combined. Start with a summary of the entire article. “In this article, we …” |
| 15 | P15 Fig 1 | I like this. Something it suggests you should make clear is that, unless a practitioner has a clear idea of what the “undistorted” map looks like (fig 1b), correctly interpreting Fig 2 can be problematic. Some shapes – like Great Britain – are distinctive enough that even when distorted heavily they’re still recognizable. For somewhere like London the Thames may be really important for helping people understand what each shape refers to, just as it has been on the Tube maps. |
| 16 | P16 Fig 3 | Perhaps consider whether a colour scheme could be used which would work with a greyscale print out as well. Currently both ‘high’ and ‘low’ values correspond to the same shade of grey, but middling values are light. Both colour (e.g. redness) and shade (density of red) could be determined by the same variable. Note that relying too heavily on colour as an indicator can make the maps less accessible, as a significant proportion of the population are colourblind. Ideally colour should reinforce information that’s already apparent from another visual cue. |