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PLOS ONE Decision: Revision required [PONE-D-18-23419] - [EMID:bc7c71a7fb7e995d]

PLOS ONE <em@editorialmanager.com>   Fri, Oct 5, 2018 at 4:25 PM
Reply-To: PLOS ONE <plosone@plos.org>
To: "Paez, Antonio" <paezha@mcmaster.ca>

PONE-D-18-23419
Demand and Supply Inflation in Floating Catchment Area (FCA) Methods
PLOS ONE

Dear Dr. Paez,

Thank you for submitting your manuscript to PLOS ONE. After careful consideration, we feel that it has merit but does not fully meet PLOS ONE's publication criteria as it currently stands. Therefore, we invite you to submit a revised version of the manuscript that addresses the points raised during the review process.

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We look forward to receiving your revised manuscript.

Kind regards,

Tayyab Ikram Shah, Ph.D.
Academic Editor
PLOS ONE

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Reviewers' comments:

Reviewer's Responses to Questions

Comments to the Author

1. Is the manuscript technically sound, and do the data support the conclusions?

The manuscript must describe a technically sound piece of scientific research with data that supports the conclusions. Experiments must have been conducted rigorously, with appropriate controls, replication, and sample sizes. The conclusions must be drawn appropriately based on the data presented.

Reviewer #1: Partly

Reviewer #2: Partly

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2. Has the statistical analysis been performed appropriately and rigorously?

Reviewer #1: Yes

Reviewer #2: Yes

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3. Have the authors made all data underlying the findings in their manuscript fully available?

The PLOS Data policy requires authors to make all data underlying the findings described in their manuscript fully available without restriction, with rare exception (please refer to the Data Availability Statement in the manuscript PDF file). The data should be provided as part of the manuscript or its supporting information, or deposited to a public repository. For example, in addition to summary statistics, the data points behind means, medians and variance measures should be available. If there are restrictions on publicly sharing data—e.g. participant privacy or use of data from a third party—those must be specified.

Reviewer #1: No

Reviewer #2: Yes

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4. Is the manuscript presented in an intelligible fashion and written in standard English?

PLOS ONE does not copyedit accepted manuscripts, so the language in submitted articles must be clear, correct, and unambiguous. Any typographical or grammatical errors should be corrected at revision, so please note any specific errors here.

Reviewer #1: Yes

Reviewer #2: Yes

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5. Review Comments to the Author

Please use the space provided to explain your answers to the questions above. You may also include additional comments for the author, including concerns about dual publication, research ethics, or publication ethics. (Please upload your review as an attachment if it exceeds 20,000 characters)

Reviewer #1: The authors propose a very interesting adjustment to the 2SFCA method. I'm still unsure that these adjustments are the panacea as suggested by the authors (i.e. inflation issues are 'eliminated') – I'd like to do my own testing (in the future); however, they are a worthy addition to the literature for further academic debate.

One fundamental problem throughout the paper is their referral to step 1 as if is measuring the actual or real demand on that supply point. Clearly that is not the case because, in most scenarios, populations will have multiple supply points that are accessible and thus their demand will be 'averaged' across these. Typically the 2SFCA is measuring 'potential demand', but the authors effectively are presenting it as 'actual demand' (when in reality this is far from true). This very important distinction needs clarification upfront. The authors present an adjustment method that I distinguish as recalculating the 'likely demand on supply points'. Similarly, accessibility (Step 2) is 'averaged' across multiple supply points. The effect of demand inflation and supply inflation to the 2sfca method really should be looking at the combined effect – i.e. at the Ai (accessibility) scores.

Their simple examples in Figure 1 and 2 are highly extreme (wholly un-real) scenarios, which are very effective at demonstrating how the 2sfca method can fail. However, their extremeness also makes it hard for the reader to evaluate whether, in a more 'normal' scenario, the same deficiencies still exist or are a significant concern. I believe these examples need to introduced as such or similar: "These examples have been purposefully designed to demonstrate key weaknesses of the 2sfca method; we acknowledge these scenarios are not representative of typical demand and supply landscapes"

Overall, I like the concept of the demand vector summing to equal the original population (demand) size – even after the application of impedance weights. In theory, this enables the generation of accessibility scores that more truly are interpretable ratios (e.g. health providers per population). Having said that, their adjusted weights – which divide the original weight by the sum of all weights for (potential) service points – still assumes that all service points are equally 'attractive'. I strongly believe this is not the case at urban fringe locations where larger urban populations are unlikely to be attracted to nearby rural services, but the reverse scenario is very different. Similarly the concept of saturation of intervening opportunities and variable catchment sizes seem pertinent here (i.e. why would a population travel further if sufficient opportunities are available at nearer locations?). Some recent 2sfca methods papers have introduced variable catchment size modelling, which I believe are critical for larger geographic scale applications (e.g. for national modelling).

As seen in Figures 5 and 6, the demand inflation factor is mostly a factor of urbanized populations only. I didn't understand the Accessibility scores in Figures 7 and 8 or 11 and 12 – how do you get an Accessibility ratio of 1 (i.e. equal supply/demand ratio)?

Again, the values in Figure 9 and 13 make no sense to me. Are the authors truly claiming that 'current' accessibility scores (e.g. 2sfca, e2sfca) are inflated 4 to 9 times higher than they should be? In all of the published work on floating catchments, I've never seen any evidence that even vaguely suggests they are out by this factor level.

Figures 14 and 15 are very interesting in that they suggest a very systematic bias between metropolitan and fringe/rural locations (strongest reds in the most metropolitan, strongest blues in the outer edges) – I suggest this is a key finding that

needs further discussion.

Reviewer #2: This is a very interesting paper that presents an issue that I've grappled with in the past. Per PLOS ONE's reviewer policy, I'm going to unblind myself in an effort to promote a constructive dialog (and because the content of my review would likely do this anyways).

Major concerns/issues/comments

L89: This equation is somewhat confusing as presented. Are these all from different metrics?

L104-105: Could this also be conceptualized as the cost required to overcome distance?... e.g., rather than making it about preferences, it seems like this passage should acknowledge that overcoming distance/time is a "cost" of using the service, rather than just framing it as preference-based.

L347-349: I feel like I'm missing something here. The overall ratio of the system does not appear to be preserved, given my understanding of what the numbers represent. I think that they are (for 2SFCA): Prov/Pop ratio for A = 0.066 and for B = 0.006. In that scenario, the overall "system" ratio would be 0.46 (not 0.02) in this calculation. (If I'm interpreting the output incorrectly, I apologize. However, if that is the case, I think it would be extremely helpful to extend the example calculation to clearly demonstrate the output values and how the overall system ratio is preserved in the resulting values)

Using the row standardized weight matrix to "allocate" the population to the various facilities in the first step appears to be very similar to the example I provided in Delamater, 2013 (citation 20 in the ms) on pages 33 and 34 and illustrated in System's #4 and #5. In this case, I was concerned about the overall effect of splitting populations into discrete "pieces" and it appears that this approach might have similar issues. If I'm understanding the authors' approach correctly, I think that the 2SFCA calculation for the Figure 1(I) system would result in an accessibility value of (0.03 + 0.03 + 0.03) = 0.09 facilities per person. This output doesn't really make sense to me, purely from a logical perspective – and it would concern me that the approach does not perform well in the most simple of systems.

My overall thought is that the problem of supply and demand overestimation might be "problem" when each is considered in a vacuum, but not in the output/results when the two steps are integrated. I would suggest that the Demand and Supply Inflation section be expanded to show more simple examples – and most importantly how inflation actually effects the final sp accessibility values (A) in these systems, as a "proof of concept". As of right now, I can clearly see the issue in the two separate steps, but I'm having a hard time understanding what the demonstrated effects of this are on the final outcome [e.g., is A (sp accessibility) under/over estimated for Pop A?... Pop B?]. This was one of my concerns when I critiqued the Wan et al 3SFCA paper in Delamater, 2013... I was not sure that competition really "needed" to be accounted for to adequately capture potential sp accessibility. In this case, I'm not sure if the inflation happening in the two steps is having a detrimental effect on the results. I think that clearly demonstrating issues with the output calculations of the E2SFCA and 2SFCA (in more than a single system) would provide a much better justification for this approach (than is presented currently).

I did not do a deep dive into the Results yet, given my concerns about the approach. However, I do wonder if using a ratio to describe inflation is a good approach, especially given that the output has true units (people and supply/people), e.g., from 0.002 to 0.004 and 2 to 4 would have a similar inflation factor... but would have very different absolute differences.

Minor concerns/issues/comments

L90: Should this be Sj, not Si?

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6. If you would like your identity to be revealed to the authors, please include your name here (optional).

Your name and review will not be published with the manuscript.

Reviewer #1: (No Response)

Reviewer #2: Paul L Delamater

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