



Antonio Paez <paezha@gmail.com>

Geographical Analysis - Decision on Manuscript ID GEAN-04-20-028 [email ref: DL-SW-2-a]

Rachel Franklin <onbehalf@manuscriptcentral.com>

Tue, May 5, 2020 at 6:00 AM

Reply-To: "geographical.analysis@newcastle.ac.uk" <geographical.analysis@newcastle.ac.uk>

To: "Paez, Antonio" <paezha@mcmaster.ca>

05-May-2020

Dear Prof. Paez:

Manuscript ID GEAN-04-20-028 entitled "A spatio-temporal analysis of the environmental correlates of COVID-19 incidence in Spain" which you submitted to Geographical Analysis, has been reviewed. The comments of the reviewers are included at the bottom of this letter and attached.

All three reviewers are positive about your manuscript and offer largely cosmetic suggestions, or minor points around explanations or clarity of narrative. These are all helpful comments that will improve the final quality of your paper. In revising your manuscript, please be extra clear in what your analysis shows (and does not show)--one reviewer noted a lack of expertise on their part where the virology is concerned and I would want to be sure that we do not inadvertently claim expertise where we do not have it.

There are two ways to submit your revised manuscript. You may use the link below to submit your revision online with no need to enter log in details:

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Alternatively log into <https://mc.manuscriptcentral.com/gean> and enter your Author Center. You can use the revision link or you will find your manuscript title listed under "Manuscripts with Decisions." Under "Actions," click on "Create a Revision." Your manuscript number has been appended to denote a revision. Please DO NOT upload your revised manuscripts as a new submission.

You will be unable to make your revisions on the originally submitted version of the manuscript. Instead, revise your manuscript using a word processing program and save it on your computer. Please also highlight the changes to your manuscript within the document by using the track changes mode in MS Word or by using bold or colored text.

Once the revised manuscript is prepared, you can upload it and submit it through your Author Center.

When submitting your revised manuscript, you will be able to respond to the comments made by the reviewers in the space provided. You can use this space to document any changes you make to the original manuscript. In order to expedite the processing of the revised manuscript, please be as specific as possible in your response to the reviewers.

IMPORTANT: Your original files are available to you when you upload your revised manuscript. Please delete any redundant files before completing the submission.

Because we are trying to facilitate timely publication of manuscripts submitted to Geographical Analysis, your revised manuscript should be uploaded as soon as possible. If it is not possible for you to submit your revision within one month, we may have to consider your paper as a new submission. If you feel that you will be unable to submit your revision within the time allowed please contact me to discuss the possibility of extending the revision time.

Once again, thank you for submitting your manuscript to Geographical Analysis and I look forward to receiving your revision.

Sincerely,
Prof. Rachel Franklin
Editor, Geographical Analysis
geographical.analysis@newcastle.ac.uk

Reviewers' Comments to Author:

Reviewer: 1

Comments to the Author

Narrative

This timely paper examines the association between environmental variables and COVID-19 incidence in Spain. It is well-written and contains a robust statistical analysis. The SUR method is very robust and appropriate to address the authors' research questions; while it is very well articulated in the text. The results and discussion are well presented and the exhibited decrease in ρ (spatial autocorrelation) over time is particularly very insightful.

I believe that the paper is suitable for publication after some minor revisions.

Please see my specific suggestions and comments below:

Introduction and Purpose

Page 1, Lines 42-43: "the SARS-CoV2 virus has threatened to overrun health systems the world over" – sentence is awkward and should be rephrased to "around the world" or "global health systems".

Page 1, Line 47: "arrested the spread" should be "mitigated the spread of the virus".

Page 1, Line 48: "helped to keep a bad situation from becoming even worse" is awkward and should be rephrased. Do you have any citations regarding the efficacy of social distancing?

Page 2, Lines 24-28: You need to add the degree symbol ° in front of C. Please do so throughout the paper.

Page 3, Lines 32-42: This paragraph does not really belong in the introduction. You are discussing the key findings and results here, which belong in the discussion and conclusion. Instead, I suggest adding some hypotheses and research questions.

Page 3, Line 47: The link should be a footnote, rather than in the main body of the text.

Context and Data Methods

Page 3, Line 51: "January 31th" should be "January 31st, 2020".

Page 3, Lines 9-10: Is the relatively slow start due to testing lags? You may want to add something to clarify. In the United States, many people who died or were infected with the virus in January and February were considered influenza cases and not COVID-19 cases.

Page 4, Lines 13-14: Was Madrid the original hotspot of COVID-19 because of testing resources and population?

Section 2.2: This is all great information, but it almost reads like a literature review and could be condensed and discussed in the introduction. I think the paper can be rearranged to Introduction and Context; then Data and Methods.

Page 6, Lines 29-30: US should be abbreviated as U.S. Please fix throughout paper.

Table 1: Is the sunshine variable missing from the table?

Methods

Page 8, Line 15. "variables" is misspelled. Should be "variables".

Is the model actually a space-time model, rather than spatial? I don't think it is explicitly stated.

The methods section is well written and model structure is clearly articulated. Although spatial SUR is not the only approach to answer your research questions, it is a very robust statistical approach. I am curious how the results from the SUR approach compares to Geographic and Temporally Weighted Regression and Space-Time Conditional Autoregressive Models (MCMC or INLA).

Analysis

Section 4.1 is well-written.

Figure 1 needs to be improved. The class breaks in the legends are inconsistent, making it difficult to compare incidence rates. The projection seems to be a bit odd. Mainland Spain should be much larger, while the Canary Islands should be in separate insets, or remove altogether. Finally, the black line for the Madrid label masks many provinces.

Suggest caption for Figure 2 should be "Autonomous Communities in Spain (sorted from north to south)"

I have the same suggestions for Figure 3 as I did for Figure 1. The resolution is poor, and the mainland should be much larger and the center of the map frames.

Figure 4: Are the correlations statistically significant? Please provide p-values.

What is the justification of using Rook instead of Queen? Queen would strengthen the examination of spatial interaction and dependence. I think you are losing important information with a Rook weight matrix.

Is it justifiable to assume that the islands are adjacent? I think that introduces a degree of uncertainty, especially after the lockdown order.

Figure 5: Please increase the font size of the pooled-R2 labels.

Results and Discussion

I suggest that this section should just be "Discussion", while "Analysis" should be renamed to "Results".

Page 20, Line 32: "pandemia" is misspelled. Should be "pandemic".

Conclusion

Page 24, Lines 43-44: "Thirdly, all environmental data are based on a single station in a province". This is a bit concerning since a province is essentially similar to a state. I suppose the justification that you selected a single station based on population distribution is fair, but an interpolation could have improved the accuracy and precision of the environmental variables.

I also think that you should not finish your paper with limitations. I suggest moving the limitations to the discussion, then finish with a strong conclusion regarding the main findings and public health impacts.

Reviewer: 2

Comments to the Author

This is a well written paper exploring environmental impacts on incidence of CV19 with spatial models, controlling for a number of socioeconomic variables. There is value in this paper, but a number of issues need to be considered:

- It would be helpful for the authors choose a name for the virus (e.g. SARS-COV2, COVID19) and use it consistently or explain if there are differences in when/how these names are use. Additionally, make sure presentation is consistent: e.g. sars-cov2 vs. sars-cov-2, COVID/Covid, etc.
- pg 5, ln 13 - percentage*
- pg 6, ln 46 - I'm not sure I fully understand the weighting ... given the results indicate this approach doesn't produce a good fit, perhaps it can left out
- pg 8 ln 15 "variable" misspelled, ln 16 "restrictions" misspelled.
- use of mean temp/humidity - does daily variation matter? For example do some regions have lows near 2 and highs near 20 c, where others have lows near 5 and highs near 6?
- pg 10 ln 50 - sentence grammar
- could W be defined using commuter flow to gain a better sense of interaction? Are there past examples in the literature that define W for provinces across Spain? Perhaps there's more interaction between Madrid and Barcelona, etc.
- pg 15 ln 22 - 'transit' systems
- given multiple equations would it be appropriate to account for multiple testing and adjust accordingly?
- pg 18 ln 32-33, do the authors mean 'due to *violations* of the restrictions of movement'?
- pg 19, not sure the anecdote is appropriate - suggest this be deleted
- pg 21, ln 52 - can this recommendation be backed up with further evidence about lockdown effectiveness?
- pg 22 ln 36 - I'm not sure I follow this statement ("Without a lockdown..."). Also, please remove "I". I've tried to work through this logic, but can't quite seem to figure out how you have come to this conclusion. Wouldn't cases generated elsewhere also be affected by temperatures in those locations? Would this not make the process more complex/less clear?
- please double check spelling/grammar throughout.

Reviewer: 3

Comments to the Author

The paper is well written and very timely. I truly enjoyed reading it and I think it should be granted publication only with some very minor revisions. Although I understand and I use econometric and statistical models, I am not an expert on the technical part and therefore I will not comment on that specifically. My comments are more "general".

1. There is a clear need of looking at environmental factors such as those you are considering. However, there has been a huge debate on pollution as a possible environmental factor affecting the spread of the disease. I would suggest that you clarify somewhere that you look only at weather-related factor and not pollution and explain why (bad data I assume?).

2. Working on the topic myself I often wonder how the results would change if the disease had hit somewhere else first? Clearly that would have affected the spread...Could this be a problem in your case?

Very minor:

3. I would write NUTS2, NUTS3...I have almost never seen NUTII and NUTIII...

4. Page 6: when you say you use a rather large geographical unit of analysis. I get that, to be quick, you have to use whatever data are available in the short run. However, I do not get what you mean by "the analysis must therefore be considered "ecological"". Either you explain it better or you simply remove the sentence acknowledging your results are preliminary, but could be easily applied to a finer scale once, and if, better data become available.

5. Here and there I would remove some "however".



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