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## Decision on your submission to Accident Analysis and Prevention

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Wed, Apr 1, 2020 at 7:55 AM

Reply-To: "aaphuang@csu.edu.cn" <aaphuang@csu.edu.cn>

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

Ref: AAP\_2020\_307

Title: An empirical assessment of strategies to model opponent effects in crash severity analysis

Journal: Accident Analysis and Prevention

Dear Dr. Paez,

Thank you for submitting your manuscript to Accident Analysis and Prevention.

I have completed my evaluation of your manuscript. The reviewers recommend reconsideration of your manuscript following revision. I invite you to resubmit your manuscript after addressing the comments below.

When revising your manuscript, please consider all issues mentioned in the reviewers' comments carefully: please outline in a cover letter every change made in response to their comments and provide suitable rebuttals for any comments not addressed. Please note that your revised submission may need to be re-reviewed.

If you would like to revise your manuscript, you first need to accept this invitation:

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Accident Analysis and Prevention values your contribution and I look forward to receiving your revised manuscript.

Kind regards,

Helai Huang  
Co Editor-in-Chief  
Accident Analysis and Prevention

### Editor and Reviewer Comments:

#### -Reviewer 1

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The paper investigates three general modelling strategies to analyze crash data. Namely, use of opponent related factors, single and multi-level model approach, and different sampling approach.

The combined application of those strategies is not completely new because it is part of a general methodological approach (and usually crash data contain information about opponent factors). The paper, in the present form, seems more an exercise, a good exercise, but not so much sufficient as to justify a paper. Why not to use other models besides ordered probit (row 525) (or ordered logit as in the abstract)?

To support this argument, tables 9 and 10 (confusion matrices) show a very poor performance of the models, especially for fatality; Models Ensemble improve it a little. It is curious that its 'percent correct by class' is generally very high (close to or greater than 90%) when numbers are so bad; it is curious too that the 'percent correct' is always lower than the lowest value of each 'percent correct by class'.

The availability of crash data at a repository on the web to reproduce the research or to make other seems very interesting (not only for exercise) and should be encouraged.

Title is a little misleading since the role of 'opponent' variables is not really the main focus of the paper.

#### Minor comments

Reorganize section 5.3.1 by listing at the beginning the considered measures for verification statistics. Furthermore, all the section is difficult to read.

At row 271 in which unit is 4536?

At row 302, "in two different" what?

At row 435, CSI requires a note.

At row 533, there is an s too many in 's(e.g. ...)'

Acknowledgment: It is quite strange that authors did not add now their acknowledgments but they reserve to do it in the 'final' version.

#### -Reviewer 2

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An empirical assessment of strategies to model opponent effects in crash severity analysis – the paper examines the injury severity of crashes employing ordered model.

"Accident" should be avoided. Crash/collision should be used.

"ways to deal with the way the different parties in a crash" – this sentence is confusing. Does it refer to methodological ways to accommodate for such correlation, if present? Please clarify.

"opponent effects" – this is misleading. What effects are you referring to and does opponent refer to 2 vehicles involved in a crash? After reading the paper it was possible to infer it, but, these terms should be clearly defined to avoid confusions and to improve readability.

"participants in the crash"- how can someone participate in a crash?

Please clearly state what are the objectives of the study and how it is contributing to existing road safety research. It is not at all clear from introduction/background section. It was not even clear whether authors are focusing on motor vehicle crashes only.

The four strategies identified in the methodology section; how different approaches contribute towards the empirical context? Please provide a detailed discussion first.

Line 125: the second part collect – what does collect represent here?

Page 2, line 29 – "shamsunnahar and Eluru" should be "Yasmin and Eluru".

Line 224: Were pedestrian/bicycle involved crashes also considered in the severity analysis along with motor vehicle crashes? The mechanisms of injury severity for these two groups are different. How these could be modeled in one model?

4.1.2 and 4.1.3: these procedures are standard in preparing crash severity data. Not sure why these are discussed in detail. For the data cleaning, the fundamental question is, other than deleting the cases with unknown information, how the statistical property of the dependent variable was maintained?

Line 262: virtually all crashes were fatal when the opponent is a driver – this statement is fundamentally wrong.

The data sample is high. How is it ensured that the model is not over fitted with high number of records? Number of coefficient in the models are an indication of over fitting.

The study design is quite confusing. Isn't it obvious that Model 3 and Model 4 are generalized version of the Model 1 and 2. More importantly, Model 3 and 4 can be easily combined to estimate a rather generalized version of severity model. What is the point of this modelling exercise? What is new in this exercise and why one should consider it?

The paper is merely a modelling exercise without any significant contribution to the state-of-the-art of severity model. The wordings of the paper are significantly misleading and confusing. If we are considering number of occupants in different vehicle units involved in a crash, the outcome is likely to be correlated. How such correlations were accommodated? What is the purpose of this modelling exercise rather than just estimating a set of models?

### **-Reviewer 3**

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The reviewer found the paper to be exceptionally well researched. It is quite long and so full of details, some quite nuanced, that reading the paper and digesting its many remarks and information is time consuming. However, the authors are praised on giving such detail, and especially on opening the code and data for others. It makes this paper highly useful as a base for further research on this important topic. The reviewer points out that Mannering has co-authored earlier work than Wang and Kockelman, which used direct opponent effects and classified models based on opponent types, in 2004 in AAP, although that particular paper did not focus on the opponent effects.

One small item to improve would be to name the four models with descriptive titles rather than only model 1, model 2, model 3, and model 4, which requires readers to remember which is which and makes the tables unreadable for readers browsing the paper.

### **-Reviewer 4**

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This study aims to evaluate approaches to model opponent effects in crashes involving two parties. A series of models are established and evaluated. The paper is well written and organized. Besides, authors make the data and code publicly available, which is great. Here are my comments:

1. The data preprocessing section could be simplified to make the paper more concise.
2. Ln 159, for any given coefficient  $q$ , you can have equation (7). I don't quite understand it. Please clarify.
3. Table 3 is mentioned in section 4 but shown in section 5. It's better to adjust the location of Table 3.
4. Ln 376-377, as mentioned by authors, models in Table 6 are clearly overfitted to the 2017 dataset. They don't generalize well to new data. To this end, the analysis based on these models might be biased.
5. As shown in Table 8, authors evaluated the outcomes of models by lots of different indicators. Normally, it's difficult to compare model performances based on so many indicators. How did you manage that? BTW, what's the difference between Percent Correct by Class and Probability of Detection?

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