PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Population-based case–control study of the effect of sun glare on pedestrian fatalities in Taiwan
AUTHORS	Ma, Hon-Ping; Chen, Ping-Ling; Chen, Shang-Ku; Chen, Liang-Hao; Linkov, Vaclav; Pai, Chih-Wei

VERSION 1 – REVIEW

REVIEWER	Donald Redelmeier University of Toronto
REVIEW RETURNED	06-Jan-2019

GENERAL COMMENTS	This is a case-control analysis of the Taiwan National Traffic Crash Database from 2003 to 2016 (14 years) comparing daylight pedestrian injury outcomes (fatal vs nonfatal) with apparent sun glare (solar position below or above 45 degrees to the horizon). A total of 100,411 pedestrian cases were included, of whom 1,925 died and 98,486 survived. Sun glare was present in 329 (17%) of cases who died and 13,026 (13%) of cases who survived, leading to a basic odds-ratio of 1.35 (95% confidence interval: 1.20 to 1.53). Multivariable logistic regression leads to similar results. Main conclusion restates the finding and adds mention of other predictors such as age and intoxication. One large concern is the analysis does not distinguish sun glare from clock time. In particular, the evening commute is often risky due to fatigue, distraction, and other factors unrelated to sun glare. Therefore, an analysis needs to match on specific commuting hour to distinguish the same hours when sun glare is present or absent. Taiwan, itself, is located at about 24 degrees latitude and the earth axis tilt is about 23 degrees from solar orbit; thereby allowing a direct test by month. In Table 2, the actual results of seasonality are worrisome since no discrepancy was found comparing summer to winter (if I read correctly), contrary to a sun glare idea and compatible with the commuting hour hypothesis. Several other improvements could also make the paper more robust. In particular, information on local cloud cover would be helpful since sun glare is more intense with clear rather than overcast weather. The classification of sun glare at 45 degrees is debatable and should be tested with more stringent thresholds of 10, 20, and 30 degrees. A further stratification based on travel path (north, south, east, west) would be helpful since sun glare is directional. More comments about the pre-hospital triage system would also be important since the study excludes the large number of cases that result in minor or trivial undocumented injuries (and such triage patterns may vary during the day).

	Several other aspects of the paper are excellent and should be retained. The core problem of daytime pedestrian fatalities is medically important and globally relevant. The background literature review was solid and detailed. The multivariate regression methods were reasonable given the large sample size. The nuanced finding related to the size of the striking vehicle was sensible and interesting, as was the secondary analysis on the potential risk reduction associated with walking facing traffic. A possible extension to other vulnerable road users (bicyclists, motorcyclists) could be added with little additional effort. I saw no ethical conflicts of interest.

REVIEWER	BG Heydecker Centre for Transport Studies UCL United Kingdom
REVIEW RETURNED	10-Feb-2019

GENERAL COMMENTS	Well conducted and well reported study with worthwhile conclusions that are properly supported by the results. A few comments and suggestions for finalisation: Line 149: give details of the astronomical calculations associated with collision at 06.18 on 18 June 2016: how was the angular distance between the sun and the direction of travel calculated for that timing? What were the results? This exemplar will underwrite the calculations for the full dataset. Crash records were excluded on the basis of adverse weather conditions, which seems appropriate. However, some other weather conditions could affect the intensity of sun glare: for example, cloudy conditions could effectively mask the sun and so would have prevented any glare. Was this considred, and what treatment was applied? Units of BrAC (lines 179-80, 189 etc) are mg/L (not mL/L) Line 223: the comment on inconsistent estimates relates to all statistical models, not just non-linear ones Line 242, Eq. (2) The form of the model investigated is binary logit with one outcome standardised with parameters set to 0 (ref line 277). For this reason, the denominator of the integrand should be rationalised to "1 + exp(\beta' X_in)" (BTW, the present form of Eq. (2) is incorrect: the dummy of summation in the denominator should _not_ be the free index i) Table 1: the p-values from the \chi^2 test should be aligned vertically with the first entry of the corresponding category Results of the mixed logit models, including Table 2 and Table 3, and all supporting text: >>>> This is a serious issue rather than one of format <<<< The mean of the random parameters "Male motorist" and "Heavy vehicle" are stated as being 0 (zero). This in itself would be an important research finding, but it seems implausible because according to the results presented in Table 1, each of these categories has a statistically significant ($p<0.01$) association with

	fatal injury. This point >>> requires <<< the author's attention and explanation. At the least, the author should present test results for the alternative hypothesis that the mean of these effects is non-zero. Otherwise, the mean value should be estimated together with the estimated of the standard deviation of the model parameter (see, for example, Table 6.1 in Train, 2002, available at https://eml.berkeley.edu/choice2/ch6.pdf) Table 2: This has repeated titles for "Male motorists" under random parameters, though the data differ so this seems to be a labelling issue. Table 3: the strong negative (ie beneficial) effect of "Pedestrians facing traffic" in sun glare related crashes is interesting: in these cases, the pedestrian's forward view will be strongly lit, which might be more favourable for them than other lighting directions. The author should consider this in the discussion. The statistical model of glare related crashes that is presented in Table 3 could have been undertaken within the analysis of all relevant crashes by including an interaction effect. This approach would highlight the specific reatures of this kind of crash. Wording: Line 157: "Focused on" - specify whether this was exclusive, and perhaps adopt another more specific term such as "considered only" or "selected" Line 165: "before sunrise and after sunset" - this is not chronological: reverse order to "after sunset and before sunrise" Line 179: BAC should be expanded as "blood alcohol concentration" (not ... consumption) Line 294: the effect is "random" (not "non-linear") Line 305: the text here is unclear: suggest "The direction of travel of pedestrians relative to vehicular traffic ..."

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Donald Redelmeier
Institution and Country: University of Toronto
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
1. This is a case-control analysis of the Taiwan National Traffic Crash Database from 2003 to 2016 (14 years) comparing daylight pedestrian injury outcomes (fatal vs nonfatal) with apparent sun glare (solar position below or above 45 degrees to the horizon). A total of 100,411 pedestrian cases were included, of whom 1,925 died and 98,486 survived. Sun glare was present in 329 (17%) of cases who died and 13,026 (13%) of cases who survived, leading to a basic odds-ratio of 1.35 (95% confidence interval: 1.20 to 1.53). Multivariable logistic regression leads to similar results. Main conclusion restates the finding and adds mention of other predictors such as age and intoxication.
Authors' response: We appreciate reviewer's insightful comments that have resulted in a significant improvement to our manuscript.

2. One large concern is the analysis does not distinguish sun glare from clock time. In particular, the evening commute is often risky due to fatigue, distraction, and other factors unrelated to sun glare. Therefore, an analysis needs to match on specific commuting hour to distinguish the same hours when sun glare is present or absent. Taiwan, itself, is located at about 24 degrees latitude and the earth axis tilt is about 23 degrees from solar orbit; thereby allowing a direct test by month. In Table 2, the actual results of seasonality are worrisome since no discrepancy was found comparing summer to winter (if I read correctly), contrary to a sun glare idea and compatible with the commuting hour hypothesis.
Authors' response: We appreciate reviewer's comment. We totally agree with reviewer that the evening commute is often risky due to fatigue, distraction, or other unrelated factors to sun glare. In our study, we did distinguish glare-related crashes from clock time. That is, with information on the times and dates of crashes from the Taiwan National Crash Data and data on daily sunrise and sunset times from the NOAA, we classified pedestrian crashes into glare-related or nonglare-related crashes. We have found that injuries sustained by pedestrians were more likely to be fatal under sunset conditions than other daytime conditions. It is certainly an important research topic to examine whether sun glare affect pedestrian fatalities in evening commuting crashes. However, this is beyond the scope of our study, primarily because evening commuting crashes that occurred when sun glare was absent (due to, for example, adverse weather or when it was cloudy) were not included in our analysis. In our study, we compared glare-related crashes (in which the car was travelling in a direction towards the sunrise or sunset) to nonglare crashes (crashes that occurred during daytime hours other than sunrise or sunset hours).

To acknowledge reviewer's insightful comments, we have identified this as our research limitation and states that this is an important research area as follows (please also kindly refer to Line 397, page 24):

"Evening commute is often risky due to fatigue, distraction, or other unrelated factors to sun glare. In our study, we have found that injuries sustained by pedestrians were more likely to be fatal under sunset conditions than other daytime conditions. Additional research is warranted to examine whether sun glare affects pedestrian fatalities in evening commuting crashes."

Regarding the seasonal effect, the chi-square tests in Table 1 reveal that the effect of seasonality was not statistically significant and therefore was not incorporated into the model. Such a result cannot be ascertained with any certainty. However, we speculate that this is primarily because the anticipated effect of sun glare in different seasons may be offset by, for example, tropical hurricanes that strike Taiwan in summer and northeast monsoon in winter. Our result here seems different to those in other studies conducted in large countries (e.g., Mitra, 2014) where the adverse effect of sun glare was found to be greater in autumn and winter months. These studies were conducted in large countries such as the United States where climate changes significantly across areas with different latitudes, whereas Taiwan is a small country where climate does not change much across the small island.

The statements above have been added to the Section Discussion as follows (please also kindly refer to Line 423, page 25):
"In our study, no discrepancy was found when comparing injuries in spring/summer to autumn/winter. Such a result cannot be ascertained with any certainty. However, we speculate that this is primarily because the anticipated effect of sun glare in different seasons may be offset by, for example, tropical hurricanes that strike Taiwan in summer and northeast monsoon in winter. Our result here seems different to those in other studies conducted in large countries (e.g., Mitra, 2014) where the adverse effect of sun glare was found to be greater in autumn and winter months. These studies were conducted in large countries such as the United States where climate changes significantly across areas with different latitudes, whereas Taiwan is a small country where climate does not change much across the small island."

3. Several other improvements could also make the paper more robust. In particular, information on local cloud cover would be helpful since sun glare is more intense with clear rather than overcast weather. The classification of sun glare at 45 degrees is debatable and should be tested with more stringent thresholds of 10, 20, and 30 degrees. A further stratification based on travel path (north, south, east, west) would be helpful since sun glare is directional. More comments about the pre-hospital triage system would also be important since the study excludes the large number of cases that result in minor or trivial undocumented injuries (and such triage patterns may vary during the day).
Authors' response: We appreciate reviewer's comment. We actually excluded the data on crashes that occurred when it was cloudy. The exclusion criteria have been re-written as follows (please also kindly refer to Line 179, page 10):

"Crashes that occurred during adverse weather conditions, such as rain or fog, or when it was cloudy, were excluded (n = 45,712)."

Regarding the classification of sun glare at 45 degrees, we adopted this threshold based on the research in Japan13. We appreciate reviewer's valuable comment. However, comparing pedestrian injuries using more stringent thresholds is another research question that needs to be answered in additional research. To acknowledge reviewer's valuable suggestion, we identify this as a direction for future research; the following statements have been added to the Section Discussion (please kindly refer to line 474, page 28):

"We classified a crash as being glare-related when the angular distance between the driver's line of sight and the sun was between 0° and 45°, a threshold based on the research in Japan13. Further research may attempt to compare our results to those adopting more stringent thresholds of 10, 20, or 30 degrees, as well as the variance of this effect for motorists of different ages, as indicated by Jurado-Piña and Pardillo Mayora9."

We totally agree with reviewer that defining a sun-glare crash based on vehicle's travel path (north, south, east, or west) would be helpful. Actually we have taken this into account when defining a glare-

related crash. In our study, a glare-related crash is defined as a crash in which the car was travelling in a direction towards the sunrise or sunset. Data on vehicle's travel path (north, south, east, or west) are available from the National Traffic Crash Dataset; and data on sun directions are available from the NOAA. To clarify this, the statements above have been added to the section Materials and Methods as follows (please also kindly refer to Line 154, page 9):

"In our study, a glare-related crash is defined as a crash in which the car was travelling in a direction towards the sunrise or sunset. Data on vehicle's travel path (north, south, east, or west) are available from the National Traffic Crash Dataset; and data on sun directions are available from the NOAA."

We totally agree with reviewer that data on pre-hospital triage system would be important. However, due to restricted funds, we were just able to link the National Traffic Crash Dataset to the NOAA, but not to pre-hospital triage system or hospital data (e.g., the National Health Insurance Research Dataset: NHIRD). We recommend that future research should link our data to clinical datasets that provide more detailed data on injuries (e.g., injured body regions, hospitalisation) other than fatalities examined in the present paper. The statements above have been added to the Section Discussions as follows (please also kindly refer to Line 479, page 28):

"Due to restricted funds, we were just able to link the National Traffic Crash Dataset to the NOAA, but not to pre-hospital triage system or hospital data (e.g., the National Health Insurance Research Dataset: NHIRD). We recommend that future research should link our data to clinical datasets that provide more details on injuries (e.g., injured body regions, hospitalisation) other than fatalities examined in the present paper."

4. Several other aspects of the paper are excellent and should be retained. The core problem of daytime pedestrian fatalities is medically important and globally relevant. The background literature review was solid and detailed. The multivariate regression methods were reasonable given the large sample size. The nuanced finding related to the size of the striking vehicle was sensible and interesting, as was the secondary analysis on the potential risk reduction associated with walking facing traffic. A possible extension to other vulnerable road users (bicyclists, motorcyclists) could be added with little additional effort. I saw no ethical conflicts of interest.
Authors' response: We appreciate reviewer's favourable comments that have resulted in a significant improvement to our manuscript.

Reviewer: 2
Reviewer Name: Benjamin Heydecker
Institution and Country: Centre for Transport Studies
UCL
United Kingdom
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
Well conducted and well reported study with worthwhile conclusions that are properly supported by the results.

A few comments and suggestions for finalisation:

1. Line 149: give details of the astronomical calculations associated with collision at 06.18 on 18 June 2016: how was the angular distance between the sun and the direction of travel calculated for that timing? What were the results? This exemplar will underwrite the calculations for the full dataset.

Authors' response: We appreciate reviewer's comment. Following the example we used: according to the Taiwan National Traffic Crash Data, a car–pedestrian crash took place in in Hsinchu City, where a car heading to northeast collided with a pedestrian at 06:18 (A.M.) on 18 June, 2016. The angular distances, ranging from 0° to 45°, were reported13 in Japan to cause sun glare and potentially affect traffic safety. We adopted the angular distance, range of 0–45°, as the threshold for defining a glare-related crash. According to the NOAA website, for this particular timing (18 June, 2016) and location (Hsinchu City with latitude of 24.778 and longitude of 120.988), the sun rose from northeast, and the apparent sunrise and sunset times were at 05:07 and 18:47, respectively. The daytime length for this particular day is 13 hours and 40 mins, which is equivalent to 820 mins. The angular distances for sunrise and sunset are 0–180°; for this particular day, the sun moved 0.2195° every min (180/820=0.2195). The adopted angular distance of 45° is equivalent to 205 mins (45/0.2195=205); as such, the transformed angular distance of 0–45°for this particular crash is between 05:07 to 08:32 that has a difference of 205 mins. This particular crash was therefore classified as a glared–related crash because the car headed to northeast (which was the direction of the sunrise) and the time of the crash (06:18) falls into the angular distance of 0–45° (i.e., between 05:07 and 08:32).

To clarify this further, the statements above have been added to the Section Materials and Methods as follows (please also kindly refer to line 158, page 9):

"For example, according to the Taiwan National Traffic Crash Data, a car–pedestrian crash took place in Hsinchu City, where a car heading to northeast collided with a pedestrian at 06:18 (A.M.) on 18 June, 2016. The angular distances, ranging from 0° to 45°, were reported13 in Japan to cause sun glare and potentially affect traffic safety. We adopted the angular distance, range of 0–45°, as the threshold for defining a glare-related crash. According to the NOAA website, for this particular timing (18 June, 2016) and location (Hsinchu City with latitude of 24.778 and longitude of 120.988), the sun rose from northeast, and the apparent sunrise and sunset times were at 05:07 and 18:47, respectively. The daytime length for this particular day is 13 hours and 40 mins, which is equivalent to 820 mins. The angular distances for sunrise and sunset are 0–180°; for this particular day, the sun moved 0.2195° every min (180/820=0.2195). The adopted angular distance of 45° is equivalent to 205 mins (45/0.2195=205); as such, the transformed angular distance of 0–45°for this particular crash is between 05:07 to 08:32 that has a difference of 205 mins. This particular crash was therefore classified as a glared–related crash because the car headed to northeast (which was the direction of the sunrise) and the time of the crash (06:18) falls into the angular distance of 0–45° (i.e., between 05:07 and 08:32)."

2. Crash records were excluded on the basis of adverse weather conditions, which seems appropriate. However, some other weather conditions could affect the intensity of sun glare: for example, cloudy conditions could effectively mask the sun and so would have prevented any glare. Was this considred, and what treatment was applied?
Authors' response: We appreciate reviewer's comment. We actually excluded the data on crashes that occurred when it was cloudy. The exclusion criteria have been re-written as follows (please also kindly refer to Line 179, page 10):

"Crashes that occurred during adverse weather conditions, such as rain or fog, and when it was cloudy, were excluded (n = 45,712)."

3. Units of BrAC (lines 179-80, 189 etc) are mg/L (not mL/L)
Authors' response: We appreciate reviewer's comment. This has been corrected.

4. Line 223: the comment on inconsistent estimates relates to all statistical models, not just non-linear ones

Authors' response: We appreciate reviewer's comment. The term "in non-linear models" has been changed to "all statistical models".

5. Line 242, Eq. (2) The form of the model investigated is binary logit with one outcome standardised with parameters set to 0 (ref line 277). For this reason, the denominator of the integrand should be rationalised to "1 + exp(\beta' X_in)" (BTW, the present form of Eq. (2) is incorrect: the dummy of summation in the denominator should _not_ be the free index i)
Authors' response: We appreciate reviewer's comment. Eq. (2) has been revised as follows:

6. Table 1: the p-values from the \chi^2 test should be aligned vertically with the first entry of the corresponding category
Authors' response: We appreciate reviewer's comment. This has been revised.

7. Results of the mixed logit models, including Table 2 and Table 3, and all supporting text:
>>>> This is a serious issue rather than one of format <<<<
The mean of the random parameters "Male motorist" and "Heavy vehicle" are stated as being 0 (zero). This in itself would be an important research finding, but it seems implausible because according to the results presented in Table 1, each of these categories has a statistically significant ($p<0.01$) association with fatal injury. This point >>> requires <<< the author's attention and explanation. At the least, the author should present test results for the alternative hypothesis that the mean of these effects is non-zero. Otherwise, the mean value should be estimated together with the estimated of the standard deviation of the model parameter (see, for example, Table 6.1 in Train, 2002, available at https://eml.berkeley.edu/choice2/ch6.pdf)
Authors' response: We appreciate reviewer's comment. We now have adopted the normal distribution for these two variables. We found that the results seem more plausible. The original statements regarding these two variables have been re-written as follows (please also kindly see line 307, page 19):

"The parameter for the variable of male motorist appeared to be random, with a normal distribution with a mean of 0.324 and standard deviation of 0.389 (see Table 2), indicating that individual pedestrians being struck by male motorists had different parameters. Given the estimates (a mean of 0.324 and standard deviation of 0.389), approximately 79.8% of all pedestrians had a higher probability of sustaining fatal injuries when all other variables remain constant. Another parameter found to have a random effect across the sample of pedestrians was the variable of a heavy vehicle as the crash partner (with a normal distribution). This parameter had a mean of 0.274 and standard deviation of 0.622 (see Table 2), indicating that individual pedestrians struck by heavy vehicles have different parameters, with 67.0% of the distributions resulting in a positive parameter (increasing the likelihood of fatal injuries) and 33.0% resulting in negative parameter (decreasing the likelihood of fatal injuries)."

8. Table 2: This has repeated titles for "Male motorists" under random parameters, though the data differ so this seems to be a labelling issue.
Authors' response: We appreciate reviewer's comment. The second title should be heavy vehicle. This typo has been corrected.

9. Table 3: the strong negative (ie beneficial) effect of "Pedestrians facing traffic" in sun glare related crashes is interesting: in these cases, the pedestrian's forward view will be strongly lit, which might be more favourable for them than other lighting directions. The author should consider this in the discussion.
Authors' response: We appreciate reviewer's comment. The following statements have been added to the original statements (please also kindly refer to line 451, page 27):

“Studies have reported that facing traffic is beneficial for preventing pedestrian crashes27 and decreasing the severity of related injuries25. Our study complements these two studies by concluding that walking against the traffic was associated with decreased injury severity. In these cases, it is possible that pedestrians’ forward views are strongly lit, which might be more favourable for them than other directions. Information expressing the necessity facing traffic while walking along a street, particularly in conditions of sun glare, should be supplemented with specific information regarding its safety benefits.”

10. The statistical model of glare related crashes that is presented in Table 3 could have been undertaken within the analysis of all relevant crashes by including an interaction effect. This approach would highlight the specific reatures of this kind of crash.
Authors’ response: We appreciate reviewer’s comment. We have re-estimated the model of all crashes (n = 100,411) by including the variable “glare-related crashes” interacting with the other variables, as reported by Table 3 below.

Table 3: Mixed logit estimation results for pedestrian injury severity with interaction terms of glare crashes and other variables[a] (n = 100,411)

Variable	Parameter	Standard error	*t*-value
Fatal injury			
Fixed parameter			
Constant	−0.324	0.139	−2.33
Male motorist	0.193	0.069	2.80
Sunset	0.274	0.089	3.08
Pedestrians facing traffic × glare crashes	−0.439	0.126	−3.48
Pedestrians aged 65+	0.533	0.210	2.54
Motorists aged 65+ × glare crashes	0.432	0.143	3.02
Rural roadways × glare crashes	0.684	0.190	3.60
Intoxicated motorist	0.461	0.154	2.99
Weekend	0.157	0.075	2.09
Car overtaking manoeuvre	0.329	0.121	2.72
Random parameter			
Heavy vehicle as crash partner	0.248	0.089	2.78
Standard deviation of distribution	0.526	0.211	2.49
Restricted log-likelihood (constant only): −7,302.7			
Log-likelihood at convergence: −5,054.6			
ρ^2=0.308			

[a] The outcome “injury” is constituted the baseline, with its parameters set at zero

Wording:
11. Line 157: "Focused on" - specify whether this was exclusive, and perhaps adopt another more specific term such as "considered only" or "selected"
Authors’ response: We appreciate reviewer’s comment. The term has been changed to “considered only”.

12. Line 165: "before sunrise and after sunset" - this is not chronological: reverse order to "after sunset and before sunrise"
Authors’ response: We appreciate reviewer’s comment. This has been changed to “after sunset and before sunrise”.

13. Line 179: BAC should be expanded as "blood alcohol concentration" (not ... consumption)
Authors' response: We appreciate reviewer's comment. This has been corrected.

14. Line 294: the effect is "random" (not "non-linear")
Authors' response: We appreciate reviewer's comment. This has been corrected.

15. Line 305: the text here is unclear: suggest "The direction of travel of pedestrians relative to vehicular traffic ..."
Authors' response: We appreciate reviewer's comment. The original sentence has been written as: "The direction of travel of pedestrians relative to vehicular traffic was also discovered to significantly affect pedestrian fatalities."

VERSION 2 – REVIEW

REVIEWER	Jake Olivier School of Mathematics and Statistics University of New South Wales Sydney, Australia
REVIEW RETURNED	25-Jun-2019

GENERAL COMMENTS	I found the use of mixed logit models with parameters determined to "fixed" or "random" based on p-values to be a curious choice. Since the outcome variable was binary (fatal or injury), why not use a random effects logistic regression? Penalised methods, e.g., LASSO, could also be incorporated for estimation and model selection. Perhaps, more importantly, it is not clear what a "cluster" or "subject" is in this context. Is it a crash? Is it each individual person? This further raises questions as to whether the outcomes being counted are injuries or individuals. There were parts of this manuscript I found quite interesting, e.g., determining angle of the sun and direction of travel to identify sun glare, but I also found the manuscript to have many grammatical errors. Paragraphs also tended to be overly long with some over 1 page (try limiting to six lines and 1 main idea, if possible). Please clean those up. Also, the equation editor in Word could be used for the formulae in the stats section. They appear to be images that have been stretched (see Eq. 2). It is not true that a large, population-based dataset minimises selection bias. Individuals are included in this database if they have had a crash and not all pedestrians are involved in crashes (i.e., there is still a selection bias). I urge the authors to read up on the current discussion regarding the appropriateness of p-values. The authors should be more cautious with how they are used in the manuscript. https://amstat.tandfonline.com/doi/full/10.1080/00031305.2016.1154108 https://tandfonline.com/doi/full/10.1080/00031305.2019.1583913 https://www.nature.com/articles/d41586-019-00857-9 Please use "crash" instead of "accident" in the manuscript. There is some debate in the literature about the appropriateness of using "accident", but it could be argued "crash" is better since it is in the name of the dataset itself.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 3

Reviewer Name: Jake Olivier

Institution and Country: School of Mathematics and Statistics, University of New South Wales, Sydney, Australia

Please state any competing interests or state ‘None declared’: None declared

1. I found the use of mixed logit models with parameters determined to "fixed" or "random" based on p-values to be a curious choice. Since the outcome variable was binary (fatal or injury), why not use a random effects logistic regression? Penalised methods, e.g., LASSO, could also be incorporated for estimation and model selection.

Authors’ responses: We appreciate this reviewer’s comments. Also, we appreciate the reviewer for providing us with the three valuable references regarding the term ‘statistical significance’ and using p values. Indeed, researchers and statisticians have debated for decades the meaning of statistical and clinical significance (see, for example, Ioannidis (2019a, b)). Halsey (2019) suggested that the Akaike Information Criterion (AIC) can take the place of the p value, providing quantified information regarding the optimal model. We adopted the approach recommended by Halsey (2019) and compared the AIC of the models when determining the optimal distribution and identifying whether the parameters were fixed or random. In addition, we have abandoned dichotomous statements (significant/nonsignificant) throughout the manuscript.

We have added the following statements to the manuscript (please also kindly see Line 292, page 17):

“We compared the Akaike Information Criterion (AIC) of the models when determining the optimal distribution and identifying whether the parameters should be fixed or random.”

Ioannidis, J., 2019a. The importance of predefined rules and prespecified statistical analyses: Do not abandon significance. JAMA, 2067-2068.

Ioannidis, J., 2019b. Retiring statistical significance would give bias a free pass. Nature 567(7749): 461.

Halsey LG. 2019. The reign of the p-value is over: what alternative analyses could we employ to fill the power vacuum? Biology Letters. 15: 20190174.

Mixed (random parameters) logit models have different □ values for each individual; this, is an extension of the random effects logistic model where only the intercept is stochastic. A theoretical derivation of mixed logit models is available in several studies, notably by McFadden and Train (2000) and Train (2003). A thorough review of recent studies employing sophisticated models to assess factors associated with injury severities is available by Savolainen et al. (2011).

Savolainen, P., Mannering, F., Lord, D., Quddus, M., 2011. The statistical analysis of highway crash-injury severities: A review and assessment of methodological alternatives. Accident Analysis and Prevention 43, 1666-1676.

McFadden, D., Train, K., 2000. Mixed MNL models for discrete response. Journal of Applied Econometrics 15(5), 447-470.

Train, K., 2003. Discrete Choice Methods with Simulation. Cambridge University Press.

2. Perhaps, more importantly, it is not clear what a "cluster" or "subject" is in this context. Is it a crash? Is it each individual person? This further raises questions as to whether the outcomes being counted are injuries or individuals.

Authors' responses: We appreciate this reviewer's comments. In our sample,

each pedestrian was counted. Only crashes involving a single pedestrian were considered in this study; crashes involving multiple pedestrians (accounting for 0.12% of all pedestrian crashes) were excluded.

These statements have been added to the text (please see Line 177, page 10).

For investigation of the injury severity of more than one crash-involved individual in the same crash, within-crash correlations must be accounted for. Research (e.g., Ouyang et al., 2002) has adopted a simultaneous binary logit model of individual injuries and demonstrated the importance of accounting for injury correlations in crashes. In our study, accounting for within-crash correlations was unnecessary because crashes involving multiple pedestrians were excluded.

Quyang, Y., Shankar, V., Yamamoto, T., 2002. Modeling the simultaneity in injury causation in multi-vehicle collisions. Transportation Research Record 1784, 143-152.

3. There were parts of this manuscript I found quite interesting, e.g., determining angle of the sun and direction of travel to identify sun glare, but I also found the manuscript to have many grammatical errors.

Authors' responses: We appreciate this reviewer's favourable comments regarding our attempts to identify sun glare. We have had our manuscript edited by Wallace Academic Editing, a professional proofreading company. Hopefully the English is satisfactory.

4. Paragraphs also tended to be overly long with some over 1 page (try limiting to six lines and 1 main idea, if possible). Please clean those up.

Authors' responses: We appreciate this reviewer's comments. To improve readability, paragraphs with different themes have now been separated. For example, in the Introduction, the long paragraph has been split into two paragraphs. Similarly, long paragraphs in other sections have also been split into short paragraphs.

5. Also, the equation editor in Word could be used for the formulae in the stats section. They appear to be images that have been stretched (see Eq. 2).

Authors' responses: We appreciate this reviewer's comments. All formulae have been edited using the equation editor in Word.

6. It is not true that a large, population-based dataset minimises selection bias. Individuals are included in this database if they have had a crash and not all pedestrians are involved in crashes (i.e., there is still a selection bias).

Authors' responses: We appreciate this reviewer's comments. The original strength of the paper: 'The large population-based dataset minimises selection bias' has been removed. One more strength has been added: 'Glare-related crashes were defined when the angular distance between the driver's line of sight and the sun was between 0° and 45°'.

7. I urge the authors to read up on the current discussion regarding the appropriateness of p-values. The authors should be more cautious with how they are used in the manuscript.

https://amstat.tandfonline.com/doi/full/10.1080/00031305.2016.1154108

https://tandfonline.com/doi/full/10.1080/00031305.2019.1583913

https://www.nature.com/articles/d41586-019-00857-9

Authors' responses: We appreciate this reviewer for providing us with the three valuable references regarding the term 'statistical significance' and using p values. Please refer to our response to reviewer comment #1.

8. Please use "crash" instead of "accident" in the manuscript. There is some debate in the literature about the appropriateness of using "accident", but it could be argued "crash" is better since it is in the name of the dataset itself.

Authors' responses: We appreciate this reviewer's comments. The original term 'accident' has been changed to 'crash' throughout the manuscript.