

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Drug driving: a secondary analysis of factors associated with driving under the influence of cannabis in Jamaica
AUTHORS	Lalwani, Kunal; Martin, Jacqueline; Barton, Everard; Frazier, Gralyn; Abel, Wendel

VERSION 1 – REVIEW

REVIEWER	Fell, James NORC at the University of Chicago, Economics, Justice & Society
REVIEW RETURNED	23-Aug-2023

GENERAL COMMENTS	While your study is designed appropriately and the methods are correct, I have a number of issues you need to address: (1) You say that the "Cannabis Abuse Screening Test" (CAST) has been validated but reference #81 is not a validation. Please provide the appropriate citations for the validation. (2) INTRODUCTION, line 17, you say "....cannabis is the most often illicit drug" but it is NOT illicit in several countries now. So the term illicit is not accurate. (3) Page 6, lines 15-17 you say THC is dose dependent and you repeat that throughout. However, it has been shown in US studies not to be dose dependent and that per se levels of THC are not appropriate (studies by AAAFTS, NHTSA). Please balance this discussion. (4) Page 9, Line 22 the section on Risk Perception. What is the question? Risk perception for what? Please describe. (5) When discussing limitations please include the inclination of many of the survey participants to give "socially acceptable" answers and not admit any illegal activities. (6) Page 16, DISCUSSION, line 27 you say cannabis leads to a "reckless style of driving" and "increases the risk of a crash" but US studies (e.g., Compton & Berning) do not indicate such behavior. So please balance your discussion. (7) Do you have any data on the prevalence of cannabis in drivers involved in fatal crashes in Jamaica? That would help. (8) Page 18, line 49 you say 3.7 ng of THC is equivalent to a BAC of .05. But the US studies say that the THC dose is not relevant. Some users are impaired at 2-5 ng while frequent users of cannabis are not affected.
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REVIEWER	Jamt, Ragnhild Oslo Universitetssykehus, Forensic Sciences
REVIEW RETURNED	30-Aug-2023

GENERAL COMMENTS	Thank you for the opportunity to review this paper on the prevalence of cannabis use patterns, the sociodemographic
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	factors associated with DUIC and the associations between risk perception and cannabis dependence among Jamaican vehicle drivers. The paper is well written and addresses important concerns about cannabis use among drivers and road traffic safety in a setting that is currently little described in the existing scientific literature on the subject. I find the paper worthy of publication, however, I have a few comments and questions. Abstract: I suggest adding the 95% CI to the OR's presented. Methods: Study Design, Sample Size and Data Sources: Line 47 :“Vehicle drivers”: does that refer exclusively to drivers of motorized vehicles? Sociodemographic characters: Line 8: I recommend cation when using the term “gender”. I suggest changing it to “sex” Statistical analysis: I recommend mentioning all the variables added in the logistic regression model and which categories were used as reference categories in this section. Results: The number of participants with missing data for each variable is lacking. Table 1: I suggest adding the number of participants in the total population and in the vehicle driver group in the heading. The same can be done in Table 2. Table 4: I think it will improve the readability of this table to write what you chose as the reference category in the parenthesis after the name of the variables. Discussion: Page 16, line 49: “the globally accepted legal blood alcohol concentration (BAC) of 0.05 g/dL”. This sentence should be rephrased. Indeed many countries have .05 g/dL as the legal BAC for drivers but several countries have both higher and lower legal limits.
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REVIEWER	Hayley, Amie Swinburne University of Technology
REVIEW RETURNED	15-Sep-2023

GENERAL COMMENTS	This population-based study sought to explore the prevalence of cannabis use, and predictive factors contributing to self-reported driving under the influence of cannabis (DUIC) among Jamaican drivers. A strength of this work is the use of a comprehensive and representative survey of substance usage. My principal concern with this work is the indirect method used by the authors to approximate DUIC in this sample, and, by extension, the impact on the conclusions that have been drawn. I have a few points for the authors to consider: Major points: 1. Upon reading, it becomes clear that instances of DUIC are not explicitly assessed here; rather, that that authors estimate DUIC by examining DUID cases among those who only self-report cannabis usage. Whilst not inherently incorrect, this method may be a poor reflection of true cases of DUIC, as there is likely to be some issues with reporting and/or recall bias. It would have been ideal if DUIC was examined directly by sequentially ascertaining whether people had driven under the influence of drugs, and further probing the specific type of drug they had consumed prior to driving. At the very least, the authors must address this
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	methodological shortcoming and explain their method of calculating the outcome earlier (and more clearly); as the approach was only made clear further into the method/results section. However, I am unsure that post-hoc justification of these analytical methods will totally alleviate these concerns. 2. Does the risk assessment specifically relate to the cannabis use questionnaire, or else feature in the substance use module more broadly? I am unsure if the responses to this questionnaire item can be contextualised with respect to the primary outcome. 3. The authors conclude that the results show that ‘a significant number of Jamaican drivers operate a vehicle under the influence of cannabis’; however, this present work is looking instead at instances of DUIC among Jamaican drivers who use cannabis only. Therefore, it is not necessarily reflective of the wider population of Jamaica.
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Dr. James Fell, NORC at the University of Chicago

Please also see attached documents.

Comments to the Author:

While your study is designed appropriately and the methods are correct, I have a number of issues you need to address:

1. You say that the "Cannabis Abuse Screening Test" (CAST) has been validated but reference #81 is not a validation. Please provide the appropriate citations for the validation.

Response: Thank you for indicating this oversight. Please see the appropriate citation #52 (Legleye S, Karila L, Beck F, Reynaud M. Validation of the CAST, a general population Cannabis Abuse Screening Test. Journal of substance use. 2007 Jan 1;12(4):233-42). The previous citation has been omitted.

2. INTRODUCTION, line 17, you say "...cannabis is the most often illicit drug" but it is NOT illicit in several countries now. So the term illicit is not accurate.

Response: Thank you. The word illicit has been removed. Please see the first paragraph of the introduction on page 3. It has been reworded and now states "While driving under the influence has historically referred to alcohol, cannabis is evidently the second leading drug detected among drivers involved in road traffic injuries and fatalities worldwide (8,9). This remains foreseeable, as it continues to be widely used globally, as stated by the latest World Drug Report (10)."

3. Page 6, lines 15-17 you say THC is dose dependent and you repeat that throughout. However, it has been shown in US studies not to be dose dependent and that per se levels of THC are not appropriate (studies by AAFTS, NHTSA). Please balance this discussion.

Response: The authors are inclined to agree. Recent research remains inconclusive with regards to dose-dependence and per se levels of THC. The following has been inserted in the first paragraph on

page 4 - "Contemporary research, however, is less conclusive as it pertains to the dose-response effects of delta-9-tetrahydrocannabinol (THC) on driving skills, with a number of studies showing a positive association between elevated levels of THC and impairment (38,39), whilst others found no clear relationship (40)". Thank you for this suggestion.

4. Page 9, Line 22 the section on Risk Perception. What is the question? Risk perception for what? Please describe.

Response: Thank you for highlighting this gap. The section on risk perception has been updated on page 8 to include the following details. "Risk perception was investigated in the initial survey by asking participants, "In your opinion, please indicate the risk level of smoking marijuana sometimes and smoking marijuana often". Participants indicated their risk level along a Likert scale continuum - (1) no risk; (2) low risk; (3) moderate risk; (4) high risk, and (5) I don't know the risk. For the secondary analysis, response options were re-categorized to reflect 0=no risk to low risk and 1=moderate to high risk and examine respondents who had indicated some level of perceived risk. The option "I don't know the risk" was excluded as an underrepresented category with insufficient frequencies that may introduce variability and bias in interpreting the results (53)."

5. When discussing limitations please include the inclination of many of the survey participants to give "socially acceptable" answers and not admit any illegal activities.

Response: Thank you. The following sentence has also been included in the in the final paragraph of the discussion regarding limitations on page 20 - "Moreover, the inclination of many of the survey participants to give "socially acceptable" answers and not admit any illegal activities might also introduce a response bias".

6. Page 16, DISCUSSION, line 27 you say cannabis leads to a "reckless style of driving" and "increases the risk of a crash" but US studies (e.g., Compton & Berning) do not indicate such behavior. So please balance your discussion.

Response: Thank you for this suggestion. With reference to comment #3 as well, the authors agree that the literature demonstrates inconclusive or mixed findings with regards to THC dose dependence and reckless driving. The sentence has been adjusted. Please see the first paragraph of the discussion on page 16 – "The high proclivity towards its use among Jamaicans, no doubt as a result of social and cultural influence (46,47), represents a worrying proposition given that extensive research demonstrates that cannabis use while driving, or under its influence, may impair driving ability (55)."

7. Do you have any data on the prevalence of cannabis in drivers involved in fatal crashes in Jamaica? That would help.

Response: Previous prevalence data would be most helpful. Unfortunately, there is a significant gap in data collection regarding driving under the influence of cannabis involved in fatal crashes. It is the hope of the authors that the findings of this manuscript as well as a previous publication on drunk driving in Jamaica (please see reference: Lalwani K, Sewell C, Frazier G, Abel W. Drunk driving: a secondary analysis of factors associated with driving under the influence of alcohol in Jamaica. *BMJ open*. 2023 Jul 1;13(7):e073529) will catalyze legislative change, that endorse cost-effective strategies, inclusive of meticulous data collection that have found favor in low-income and middle-income countries (LMICs) (please see reference: Fell JC, Achoki T, DeJong W, Fisher DA. Implementation of Road Safety Countermeasures in Four Cities to Reduce the Harmful Effects of Alcohol: A Progress Report. *Archives of Clinical and Biomedical Research*. 2022;6:606-11).

8. Page 18, line 49 you say 3.7ng of THC is equivalent to a BAC of .05. But the US studies say that the THC dose is not relevant. Some users are impaired at 2-5ng while frequent users of cannabis are not affected.

Response: With reference to comments #3 and #6, the above statement has been adjusted. Please see the first paragraph on page 19 – “Several countries, including Norway, Australia and Denmark, alongside a number of states in the US (69-71), have adopted per se limits ranging from 2-5 ng/ml THC on oral fluid and blood tests, where studies demonstrate the first indications of impairment may occur. While some studies establish that a level of 3.7 ng/ml THC is equivalent to the legal blood alcohol concentration (BAC) of 0.05 g/dL accepted in a number of countries (72,73), other studies in the US suggest an absence of a dose-dependent relationship between THC level and driving impairment especially among frequent users where tolerance may be a factor (40,74).” The team of authors is grateful to the reviewer’s comments in guiding parity in both the introduction and discussion.

Reviewer: 2

Dr. Ragnhild Jamt, Oslo Universitetssykehus

Please also see attached document.

Comments to the Author:

Interesting and well written paper. Please see the attached file for my comments.

Thank you for the opportunity to review this paper on the prevalence of cannabis use patterns, the sociodemographic factors associated with DUIC and the associations between risk perception and cannabis dependence among Jamaican vehicle drivers. The paper is well written and addresses important concerns about cannabis use among drivers and road traffic safety in a setting that is currently little described in the existing scientific literature on the subject. I find the paper worthy of publication; however, I have a few comments and questions.

Abstract:

1. I suggest adding the 95% CI to the OR’s presented.

Response: Thank you for this suggestion. The 95% CI to the OR’s presented have been added in the abstract as well as results section.

Methods:

2. Study Design, Sample Size and Data Sources: Line 47: “Vehicle drivers”: does that refer exclusively to drivers of motorized vehicles?

Response: Yes. The sentence has been corrected. Please see the first paragraph on page 6 under subheading “Study design, sample size and data source” - “This study is a secondary data analysis of the National Household Survey, Jamaica 2016. The target population comprised all respondents that identified as drivers of motorized vehicles”.

3. Sociodemographic characters: Line 8: I recommend caution when using the term “gender”. I suggest changing it to “sex”

Response: Thank you for this suggestion. The word “gender” has been replaced by the word “sex” throughout the document.

4. Statistical analysis: I recommend mentioning all the variables added in the logistic regression model and which categories were used as reference categories in this section.

Response: Thank you. The authors have taken this suggestion and included all the variables added in the logistic regression model and indicated which categories were used as reference categories in this section. Please see first paragraph on page 10.

Results:

5. The number of participants with missing data for each variable is lacking.

Response: For the variable household income, responses were not recorded in 137 cases of drivers in the population and 16 cases of drivers that are current cannabis users who DUIC only. This would have been attributable to persons choosing “no response” or “don’t know” options in the original questionnaire and thus were not included in the analysis. Notwithstanding, mention has been made in the results section under subheading “Sociodemographic factor findings” in the first paragraph on page 13. For the occupation variable, the number of responses for non-machine and machine operator options reflects those that would have been employed and would have had no missing values. Likewise there were no missing values for all other variables.

6. Table 1: I suggest adding the number of participants in the total population and in the vehicle driver group in the heading. The same can be done in Table 2.

Response: Thank you for this suggestion. The number (“n”) of participants in the total population and in the vehicle driver group has been included in the heading of table 1 (page 11). Likewise, the number (“n”) of vehicle drivers in the population and drivers that are current cannabis users who DUIC only has been included in the heading of table 2 (page 12).

7. Table 4: I think it will improve the readability of this table to write what you chose as the reference category in the parenthesis after the name of the variables.

Response: Thank you. The authors agree with this suggestion and have indicated which categories were used as reference categories in table 4 (pages 15-16).

Discussion:

8. Page 16, line 49: “the globally accepted legal blood alcohol concentration (BAC) of 0.05 g/dL”. This sentence should be rephrased. Indeed many countries have .05 g/dL as the legal BAC for drivers but several countries have both higher and lower legal limits.

Response: Thank you for this suggestion. The above statement has been adjusted. Please see the first paragraph on page 19 – “Several countries, including Norway, Australia and Denmark, alongside a number of states in the US (69-71), have adopted per se limits ranging from 2-5 ng/ml THC on oral fluid and blood tests, where studies demonstrate the first indications of impairment may occur. While some studies establish that a level of 3.7 ng/ml THC is equivalent to the legal blood alcohol concentration (BAC) of 0.05 g/dL accepted in a number of countries (72,73), other studies in the US suggest an absence of a dose-dependent relationship between THC level and driving impairment especially among frequent users where tolerance may be a factor (40,74).”

Reviewer: 3

Comments to the Author:

This population-based study sought to explore the prevalence of cannabis use, and predictive factors contributing to self-reported driving under the influence of cannabis (DUIC) among Jamaican drivers. A strength of this work is the use of a comprehensive and representative survey of substance usage. My principal concern with this work is the indirect method used by the authors to approximate DUIC in this sample, and, by extension, the impact on the conclusions that have been drawn. I have a few points for the authors to consider:

Major points:

1. Upon reading, it becomes clear that instances of DUIC are not explicitly assessed here; rather, that that authors estimate DUIC by examining DUID cases among those who only self-report cannabis usage. Whilst not inherently incorrect, this method may be a poor reflection of true cases of DUIC, as there is likely to be some issues with reporting and/or recall bias. It would have been ideal if DUIC was examined directly by sequentially ascertaining whether people had driven under the influence of drugs, and further probing the specific type of drug they had consumed prior to driving. At the very least, the authors must address this methodological shortcoming and explain their method of calculating the outcome earlier (and more clearly); as the approach was only made clear further into the method/results section. However, I am unsure that post-hoc justification of these analytical methods will totally alleviate these concerns.

Response: The authors are in agreement that it would have been ideal if DUIC was examined directly by asking whether people had driven under the influence of cannabis. The method utilized for extracting those respondents who DUIC in this study has been previously described in a publication using data from the Substance Abuse and Mental Health Services Administration (SAMHSA) National Survey on Drug Use and Health (NSDUH) from 2002–2014 in the United States (please see reference: Azofeifa A, Mattson ME, Lyerla R. Driving under the influence of alcohol, marijuana, and alcohol and marijuana combined among persons aged 16–25 years—United States, 2002–2014. *Morbidity and Mortality Weekly Report*. 2015 Dec 11;64(48):1325-9). The method of calculating the outcome has been expounded on and the approach has been made clear earlier, as the section on driving under the influence of cannabis has been moved to follow cannabis use prevalence under the subsection “Study variables” of the “Methods” section (please see page 7). The authors are grateful to the suggestion as the overall organization of the variables is much improved. With regards to recall bias, this has been mentioned, quite rightly, as possible limitations. Please see the final paragraph of the discussion on page 20 which begins with the following sentences - “One of the study’s limitations was that DUI information was self-reported, which can be affected by recall bias. Moreover, the inclination of many of the survey participants to give “socially acceptable” answers and not admit any illegal activities might also introduce a response bias”.

2. Does the risk assessment specifically relate to the cannabis use questionnaire, or else feature in the substance use module more broadly? I am unsure if the responses to this questionnaire item can be contextualized with respect to the primary outcome.

Response: Thank you for highlighting this gap. The section on risk perception has been updated on page 8 to include the following details. “Risk perception was investigated in the initial survey by asking participants, “In your opinion, please indicate the risk level of smoking marijuana sometimes and smoking marijuana often”. Participants indicated their risk level along a Likert scale continuum - (1) no risk; (2) low risk; (3) moderate risk; (4) high risk, and (5) I don’t know the risk. For the secondary analysis, response options were re-categorized to reflect 0=no risk to low risk and 1=moderate to high

risk and examine respondents who had indicated some level of perceived risk. The option “I don't know the risk” was excluded as an underrepresented category with insufficient frequencies that may introduce variability and bias in interpreting the results (53).”

3. The authors conclude that the results show that ‘a significant number of Jamaican drivers operate a vehicle under the influence of cannabis’; however, this present work is looking instead at instances of DUIC among Jamaican drivers who use cannabis only. Therefore, it is not necessarily reflective of the wider population of Jamaica.

Response: Thank you for this suggestion. Please see the first paragraph of the discussion on page 16. The sentence has been corrected to now state “The findings reveal that a significant number of Jamaican drivers who use cannabis, operate a vehicle under the influence of cannabis, with more than 10% conceding to this unsafe and risky practice”.

VERSION 2 – REVIEW

REVIEWER	Fell, James NORC at the University of Chicago, Economics, Justice & Society
REVIEW RETURNED	20-Dec-2023

GENERAL COMMENTS	Thank you for responding to each of my comments. Your responses were adequate for each comment except comment #4: "4. Page 9, Line 22 the section on Risk Perception. What is the question? Risk perception for what? Please describe." Please elaborate: Risk perception for what? Impaired driving? Getting cancer? Damaging my brain? What risk does the question refer to? Please respond. This is a minor revision.
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REVIEWER	Hayley, Amie Swinburne University of Technology
REVIEW RETURNED	11-Dec-2023

GENERAL COMMENTS	The authors have provided a thorough revision, and have largely addressed my concerns in their re-submission. One thing that I did not pick up in the original submission, but which was brought to my attention in the revision is the statement that 'several countries, including Norway, Australia and Denmark, alongside a number of states in the US (69-71), have adopted per se limits ranging from 2-5 ng/ml THC on oral fluid and blood tests'. Australia has a de-facto zero-tolerance per-se limit for THC (it is illegal to drive with any traceable amount of THC in ones system). Thus, it is not in any way comparable to Norway, Denmark or the US in that way, as stated here. Please revise and review the accompanying reference for this.
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VERSION 2 – AUTHOR RESPONSE

Reviewer: 1

Dr. James Fell, NORC at the University of Chicago

Comments to the Author:

Thank you for responding to each of my comments. Your responses were adequate for each comment except comment #4: "4. Page 9, Line 22 the section on Risk Perception. What is the question? Risk perception for what? Please describe." Please elaborate: Risk perception for what? Impaired driving? Getting cancer? Damaging my brain? What risk does the question refer to? Please respond. This is a minor revision.

Response: Thank you for this suggestion. In this study, the question on risk perception refers to the individual's perception of risk associated with frequent or infrequent use of marijuana. The section on risk perception has been updated to include the following details at the beginning of the paragraph on page 7, "Perception of risk associated with frequent or infrequent use of marijuana was investigated in the initial survey by asking participants ..."

Reviewer: 3

Dr. Amie Hayley, Swinburne University of Technology

Comments to the Author:

The authors have provided a thorough revision, and have largely addressed my concerns in their re-submission.

One thing that I did not pick up in the original submission, but which was brought to my attention in the revision is the statement that 'several countries, including Norway, Australia and Denmark, alongside a number of states in the US (69-71), have adopted per se limits ranging from 2-5 ng/ml THC on oral fluid and blood tests'. Australia has a de-facto zero-tolerance per-se limit for THC (it is illegal to drive with any traceable amount of THC in ones system). Thus, it is not in any way comparable to Norway, Denmark or the US in that way, as stated here. Please revise and review the accompanying reference for this.

Response: Thank you for this clarification. This statement has been corrected, and the accompanying reference included in the last paragraph on page 17 now states "Several countries, including Norway and Denmark, alongside a number of states in the US (69-70), have adopted per se limits ranging from 2-5 ng/ml THC on oral fluid and blood tests, where studies demonstrate the first indications of impairment may occur, while other nations like Australia endorse the de-facto zero-tolerance approach (71)."