

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Assessing the impact of sports and recreation facility density within school neighbourhoods on Canadian adolescents' substance use behaviours: quasi-experimental evidence from the COMPASS study, 2015 to 2018
AUTHORS	Doggett, Amanda; Godin, Katelyn; Schell, Olena; Wong, Suzy; Jiang, Ying; Leatherdale, Scott

VERSION 1 – REVIEW

REVIEWER	Kristjansson, Alfgeir West Virginia University, Department of Social and Behavioral Sciences
REVIEW RETURNED	11-Dec-2020

GENERAL COMMENTS	Thank you for the opportunity to review this manuscript into the potential impact of sports and recreation facility density in neighborhoods and relations to adolescent substance use from the COMPASS study. I found the paper well written and to the point and mostly easy to follow. I have a handful of recommendations for the authors. In statistical models it would be helpful if the authors could control for other important individual level SES related factors that are known to be strongly related to substance use among youth, such as parental education, family structure, in addition to income measures. These variables are also likely to cluster in neighborhoods or areas. In section 2.1 I would still like to see a few words about the linking of the data across survey years. Simply referring to a different paper is insufficient. For the models that include alcohol and cigarette smoking I would encourage the authors to also run the models without controlling for number of retailers. This likely will complete the story more given that the findings may be more elaborate without these confounders. Then the interpretation can take account of both models, with and without retailers. On a similar note I would encourage the authors to run all 4 models also without the other substance use variables included. This likely will bring a more complete picture to the story line. By first running models without controlling for other substance use and thereafter by controlling for other substances the authors can strengthen their arguments given that the relations between the main IV and outcomes likely will be stronger in the former models.
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	Page 10, line 13 it appears that the time variable in Model 3 is actually protective. That is, that the odds of smoking decreased over time given the >1.0 significant odds ratios. This issue also bear relations to section 4.1.
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REVIEWER	Cristello, Julie Florida International University
REVIEW RETURNED	17-Dec-2020

GENERAL COMMENTS	The authors seek to advance current research on physical activity and sport involvement by examining how the density of recreational facilities impacts adolescent substance use. Specifically, the authors use longitudinal data from the COMPASS study to do this. While this study has important implications for the adolescent substance use field and ways to promote prosocial behaviors, there are limitations that if addressed could further strengthen the study. Namely, the structure of the manuscript could be reorganized to improve clarity. Additionally, decisions around why certain variables were included/not included should be described. Abstract/Introduction 1. There are multiple grammatical errors throughout the manuscript. I have listed a few examples: a. The Icelandic Centre for Social Research & Analysis (ICSRA) was listed as ISCRA multiple times. b. Line 16, page 3 should say engaging, not engaged. c. Line 37, page 6 should say previously instead of previous. 2. The majority of research that the authors cite related to the sport context (e.g., Kwan et al., Wichstrøm et al.) focuses on the team sport context within a school. This literature may not generalize to the proposed research question related to the impact of out-of-school recreational facilities. There are many reasons why this may be (e.g., leisure activity vs. varsity sport), but this should be clarified within the text. 3. The authors do not include any prior work related to physical activity and cigarette or e-cigarette use. 4. The introduction lacks a clear rationale for the proposed research question. Why might recreational facilities be protective and why is it important for us, as a field, to know this? Less of a focus on associations between sports and substance use and more discussion related to the availability of resources in one's community may help to strengthen this. Methods/Results 1. It is unclear why the authors chose to focus on binge drinking as an outcome and not alcohol use more broadly. Relatedly, binge drinking for females is defined as 4 or more drinks. For males, it is 5 or more drinks. It seems that the authors used 5 or more for all participants. 2. A rationale for using substance use variables across different time frames should be provided, as this makes it difficult to compare across substances. 3. All covariates should be described together. This would improve the flow of the methods section. For example, the authors state that they control for number of alcohol and tobacco retailers in the neighborhood but describe this in a separate section. Additionally,
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	the rationale for not including marijuana dispensaries or vape shops should be included when that variable is introduced. 4. Instead of including the other three substances in each model, a latent variable for substance use, or prior substance use, could be created and included as a covariate. 5. A rationale for including all covariates should be included. For example, prior research should be described and cited if personal spending money is associated with adolescent substance use, and controlled for. 6. The term ethnicity is used incorrectly. Race refers to phenotypic traits, such as skin color, whereas ethnicity refers to unique identities reflecting language, nationality, or culture. For example, participants can identify as both Black and Latinx or White and Latinx. Discussion 1. Many statements in the discussion are without citations. For example, stating that there are differences in the social contexts in which substances are typically used by
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Dr. Alfgeir Kristjansson, West Virginia University, Icelandic Center for Social Research and Analysis

Comments to the Author:

Thank you for the opportunity to review this manuscript into the potential impact of sports and recreation facility density in neighborhoods and relations to adolescent substance use from the COMPASS study. I found the paper well written and to the point and mostly easy to follow. I have a handful of recommendations for the authors.

Thank you for your comments and feedback on this manuscript. We believe the changes based on your feedback have strengthened this work.

In statistical models it would be helpful if the authors could control for other important individual level SES related factors that are known to be strongly related to substance use among youth, such as parental education, family structure, in addition to income measures. These variables are also likely to cluster in neighborhoods or areas.

Unfortunately, variables related to parental/family characteristics and behaviours are not available to be included in this study because they are not collected as part of the COMPASS host study. We have now added this as a limitation in section 4.4:

“Moreover, family-related indicators such as parental income or education may be associated with youth substance use but were not collected in this study, and as such may confound results.”

In section 2.1 I would still like to see a few words about the linking of the data across survey years. Simply referring to a different paper is insufficient.

We have now included a sentence in section 2.1 that reads:

“Student questionnaires were linked across years without the need for identifying information by generating a consistent but unique code from a series of questions on the front page of the questionnaire.”

For the models that include alcohol and cigarette smoking I would encourage the authors to also run the models without controlling for number of retailers. This likely will complete the story more given that the findings may be more elaborate without these confounders. Then the interpretation can take account of both models, with and without retailers.

The authors ran these additional models, however there was little impact on the main IV as effect sizes and significance remained stable. We have included a sentence to address this in the results:

“Models which did not include substance use retailers were also tested, but effect size and significance for sports and recreation facilities remained stable compared to the models presented.”

However, per the similar comment below, we now present models without and without substance use controls (see next comment).

On a similar note I would encourage the authors to run all 4 models also without the other substance use variables included. This likely will bring a more complete picture to the story line. By first running models without controlling for other substance use and thereafter by controlling for other substances the authors can strengthen their arguments given that the relations between the main IV and outcomes likely will be stronger in the former models.

This was a valuable recommendation, and the authors did run these additional models expecting similar results to this reviewer (i.e., that the effect sizes would be greater for the main IV). Interestingly, the effects of doing this did not have much impact on the main IV. For cannabis and smoking, the effect of sports and rec centers remained insignificant, and for binge drinking and e-cigarette smoking, significance remained. Moreover, effect sizes for this main IV remained stable.

We have modified Table 2 to include the results of the models with and without these substance use controls, and differentiated the models using lettering (Models ‘A’ and ‘B’ for

each substance use behaviour). We have updated the methods and results where needed to correspond to this new approach.

The authors also recognize this table is now more complicated with these additional models added, which may impact clarity for a reader. At the discretion of this reviewer and the editor we are happy to either include this expanded table (as is in the updated manuscript document) or revert back to the original format only showing four models, but still mention that these models were run and estimates remained stable in the results section (similar to what was done for the previous comment).

Page 10, line 13 it appears that the time variable in Model 3 is actually protective. That is, that the odds of smoking decreased over time given the >1.0 significant odds ratios. This issue also bears relations to section 4.1.

Thank you for highlighting this. We now qualify section 4.1 with:

“Likewise, consistent with previous research (71, 72), this study observed increased likelihood of substance use over time (except for smoking, which decreased over time) in regression models as well as descriptive analyses, which showed increases in substance use prevalence rates between baseline Y1 and follow up by Y3.”

As well as point to this decrease in section 4.4.2:

“This can be observed even over the short time period of the present study, as smoking was the only substance use behaviour that showed decreased likelihood over time.”

Reviewer: 2

Dr. Julie Cristello, Florida International University

Comments to the Author:

The authors seek to advance current research on physical activity and sport involvement by examining how the density of recreational facilities impacts adolescent substance use. Specifically, the authors use longitudinal data from the COMPASS study to do this. While this study has important implications for the adolescent substance use field and ways to promote prosocial behaviors, there are limitations that if addressed could further strengthen the study. Namely, the structure of the manuscript could be reorganized to improve clarity. Additionally, decisions around why certain variables were included/not included should be described.

Thank you for your comments and feedback on this manuscript. We believe the changes based on your feedback have strengthened the clarity and completeness of this work.

Abstract/Introduction

1. There are multiple grammatical errors throughout the manuscript. I have listed a few examples:
 - a. The Icelandic Centre for Social Research & Analysis (ICSRA) was listed as ISCRA multiple times.
 - b. Line 16, page 3 should say engaging, not engaged.
 - c. Line 37, page 6 should say previously instead of previous.

Thank you for highlighting these errors. We have corrected the errors listed above as well as others that were present in the manuscript.

2. The majority of research that the authors cite related to the sport context (e.g., Kwan et al., Wichstrøm et al.) focuses on the team sport context within a school. This literature may not generalize to the proposed research question related to the impact of out-of-school recreational facilities. There are many reasons why this may be (e.g., leisure activity vs. varsity sport), but this should be clarified within the text.

Thank you for this feedback. We have added this clarification, as below:

“The wide range of contexts for sports and recreation activities (e.g., inside vs. outside of the school recreation, varsity vs. intramural sports) can differentially impact youth substance use (41,42). However, in general, engagement in these activities is seen as a positive for youth development (43).”

3. The authors do not include any prior work related to physical activity and cigarette or e-cigarette use.

We have now added a sentence in the fourth paragraph following the presentation of binge drinking and cannabis literature that reads:

“Research surrounding physical activity, sports and cigarette/e-cigarette use is less established, although some studies have observed inverse associations (37-40) ”

4. The introduction lacks a clear rationale for the proposed research question. Why might recreational facilities be protective and why is it important for us, as a field, to know this? Less of a focus on associations between sports and substance use and more discussion related to the availability of resources in one’s community may help to strengthen this.

Thank you for this feedback. We have now reduced the discussion of sports and substance use research in the introduction, and added a paragraph which elaborates more broadly on the connection between sports, recreation, community resources and wellbeing, as below:

“The wide range of contexts for sports and recreation activities (e.g., inside vs. outside of the school recreation, varsity vs. intramural sports) can differentially impact youth substance use (41,42). However, in general, engagement in these activities is seen as a positive for youth development (43). Notably, the concept of sports participation being beneficial for youth extends beyond physiological impact, as social and psychological factors also play a substantial role in how these activities can be health-promoting (44). Moreover, although much of the literature focuses on potential protective effects of physical activity and sports, there is substantial rationale to support that leisure more broadly is health-promoting. Leisure plays a large role in how individuals find life purpose and meaningfully engage with life (45,46), and leisure activities have been shown to promote youth health and protect against behaviours such as substance use (47). As such, availability of community resources that offer spaces for youth to engage in recreation and leisure may promote health in a variety of ways, including being protective against substance use behaviours.”

Methods/Results

1. It is unclear why the authors chose to focus on binge drinking as an outcome and not alcohol use more broadly. Relatedly, binge drinking for females is defined as 4 or more drinks. For males, it is 5 or more drinks. It seems that the authors used 5 or more for all participants.

The authors focused on binge drinking for this manuscript because binge drinking is a more high-risk behaviour compared to alcohol use in general. Unfortunately, alcohol consumption is a fairly common behaviour among Canadian youth (Government of Canada, 2019). We have added a clarification in section 2.2. that reads:

“Binge drinking was examined in this study as opposed to alcohol consumption in general because it represents the more high-risk substance use behaviour.”

The binge drinking question on this survey was developed to be consistent with national surveillance of youth substance use in Canada (Health Canada, 2019; The Canadian Student Tobacco Alcohol and Drugs Survey, 2019), which focuses on the 5 drink threshold across males and females. This is also consistent with longitudinal studies from other jurisdictions (McCabe et al., 2020; Modecki et al., 2014). We have now cited these existing studies to provide rationale for this measure in section 2.2.

Refs:

Government of Canada. (2019). *Summary of results for the Canadian Student Tobacco, Alcohol and Drugs Survey 2018-19 (CSTAD)*. <https://www.canada.ca/en/health-canada/services/canadian-student-tobacco-alcohol-drugs-survey/2018-2019-summary.html>

Health Canada. (2019). *Summary of results for the Canadian Student Tobacco, Alcohol and Drugs Survey 2018-19*. <https://www.canada.ca/en/health-canada/services/canadian-student-tobacco-alcohol-drugs-survey/2018-2019-summary.html>

McCabe, S. E., Boyd, C. J., Evans-Polce, R. J., McCabe, V. V., & Veliz, P. T. (2020). School-Level Prevalence and Predictors of e-Cigarette Use in 8th, 10th, and 12th Grade U.S. Youth: Results From a National Survey (2015–2016). *Journal of Adolescent Health*, 67(4), 531–541. <https://doi.org/10.1016/j.jadohealth.2020.03.032>

Modecki, K. L., Barber, B. L., & Eccles, J. S. (2014). Binge drinking trajectories across adolescence: For early maturing youth, extra-curricular activities are protective. *Journal of Adolescent Health*, 54(1), 61–66. <https://doi.org/10.1016/j.jadohealth.2013.07.032>

The Canadian Student Tobacco Alcohol and Drugs Survey. (2019). *Questionnaires*. <https://uwaterloo.ca/canadian-student-tobacco-alcohol-drugs-survey/questionnaires>

2. A rationale for using substance use variables across different time frames should be provided, as this makes it difficult to compare across substances.

Thank you for highlighting this gap in the methods description. All substance use measures were developed such that binary variables indicate past 30-day use; however, this was not clear in our original description of the methods. A line has been added to section 2.2 to clarify that all substance use variables are over the same time period:

“For comparability, all four substance use measures were dichotomized into current and non-current use, where current use was defined as engaging in the respective behaviour at least once in the past month.”

3. All covariates should be described together. This would improve the flow of the methods section. For example, the authors state that they control for number of alcohol and tobacco retailers in the neighborhood but describe this in a separate section. Additionally, the rationale for not including marijuana dispensaries or vape shops should be included when that variable is introduced.

Thank you for highlighting this disconnect in the methods. We have now moved all descriptions pertaining retailers to section 2.3.2.2 to improve flow of the methods.

4. Instead of including the other three substances in each model, a latent variable for substance use, or prior substance use, could be created and included as a covariate.

Per comments from the other reviewer, we have now used a stepwise model approach, whereby initial models do not include these other substance use variables, and then these variables were subsequently added in (see revised Table 2). Estimates and significance for the main variable of interest (sports and recreation facilities) remained stable between the models.

5. A rationale for including all covariates should be included. For example, prior research should be described and cited if personal spending money is associated with adolescent substance use, and controlled for.

We have now rationalized the inclusion of spending money, as below:

“Personal spending money (zero, \$1 to \$5, \$6 to \$10, \$11 to \$20, \$21 to \$40, \$41 to \$100, More than \$100, I do not know how much money I get each week) was also included as an important control which may influence propensity for substance use behaviours (53-55)”

Support has also been similarly added for the inclusion of physical activity, and urbanicity/income variables.

6. The term ethnicity is used incorrectly. Race refers to phenotypic traits, such as skin color, whereas ethnicity refers to unique identities reflecting language, nationality, or culture. For example, participants can identify as both Black and Latinx or White and Latinx.

Thank you for highlighting this. Although we are unable to change how this indicator was measured, we have now more appropriately referred to this measure as ‘ethno-racial identity’ throughout. Notably, this was a ‘select all that apply’ question (now clarified in section 2.3.1) so participants could select more than one of the response options.

Discussion

1. Many statements in the discussion are without citations. For example, stating that there are differences in the social contexts in which substances are typically used by

We have now reviewed the discussion and added citations to this statement as well as the others that appeared to be lacking citations.

VERSION 2 – REVIEW

REVIEWER	Kristjansson, Alfgeir West Virginia University, Department of Social and Behavioral Sciences
REVIEW RETURNED	10-May-2021

GENERAL COMMENTS	The authors have responded to my earlier comments to my satisfaction. Thank you
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REVIEWER	Cristello, Julie Florida International University
REVIEW RETURNED	13-May-2021

GENERAL COMMENTS	The manuscript has substantially improved. My only suggestion is that this phrase in the introduction "research surrounding sport participation and cigarette use is less established" is not accurate. There is a substantial amount of prior work on sports being protective from cigarette use.
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