PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Lifestyle Risk Behaviours among Adolescents: A Two-Year Longitudinal Study of the Impact of the COVID-19 Pandemic
AUTHORS	Gardner, Lauren; Debenham, Jennifer; Newton, Nicola; Chapman, Cath; Wylie, Fiona; Osman, Bridie; Teesson, Maree; Champion, Katrina

VERSION 1 – REVIEW

REVIEWER	Petkeviciene, Janina Lithuanian University of Health Sciences, Faculty of Public Health, Medical Academy
REVIEW RETURNED	28-Jan-2022

GENERAL COMMENTS	The manuscript is generally well-written. The study is well-designed, providing interesting results on trends of lifestyle risk behaviours of Australian adolescents during two years of the COVID-19 pandemic. The results of the study are presented in a clear and interesting way (Figure 1). The results are properly discussed, and the strengths and limitations of the study are correctly identified. I have only one minor comment. The conclusion could be shortened without repeating the description of the study results.

REVIEWER	Olaya-Contreras, Patricia Sahlgrenska Academy, University of Gothenburg,
REVIEW RETURNED	01-Feb-2022

GENERAL COMMENTS	Dear Authors, Thank you for your paper increasing the information about the impact of the pandemic on the health of the adolescents. From a public health perspective, it is important to promote the health of young people in Australian, and worldwide after the pandemic. I recommend Minor changes or additions described below. In the Abstract: “To examine changes in the prevalence of six key chronic disease risk factors”, Please add (the Big 6) for clarification. Add the age of the adolescents included in this sample. In Conclusion: It is written: “Lifestyle risk behaviours are prevalent among adolescents, and they must be supported to find ways to improve or maintain their health” Please state which of them, not all the risk factors were associated or changed over time. It could be meaningful to rewrite and clarify the conclusions. In the Introduction: it could be adding a brief description of the impact of the pandemic particularly on this region where the

	participants are coming from, and if the impact of the pandemic in this region different from the rest of the country. For instance, to present the impact on incidence and mortality rates, specifically for this group of age, in the country and in the region; those important aspects give a contextualization of the study-phenomenon. How is the representativeness of the adolescents in this region? more younger people here than in the rest of the country, or not? (To complete to the already described in Methods). Ethics: It is not clearly described in which way were the adolescents enrolled in the study, and how they accepted or not to participate. Please explain it in detail. Did the parents give a written consent for the adolescents' participation? Or explain how they were involved. Which information was given to the adolescents when enrolling them in the study? Please describe the procedure more concisely. In Results: "The prevalence of past 6-month alcohol use increased by 334% over time (PR=4.34), is it the % correct? "The prevalence of alcohol use increased more in females compared to males (PR=2.34, 95% CI=1.19-4.62, for Males=?)", add the PR for men. In Discussion: If it's possible, Add the information regarding the % of physical activities (PA) specifically in teams or organized training, i.e., Sports clubs in this sample. This information is not presented. You are giving a general conclusion on physical activities, but not giving the information on the % of them whose were participating in sports/teams before or during the pandemic; Their participation in training were, for sure impacted (restricted) by the restrictions, is it? Otherwise, explain and discuss it in this section this matter. If the authors do not have this specific information (% of adolescents participating in sports/teams), complete the discussion with "the possibility that the prevalence of PA among the adolescents participating in sports of PA maybe lower than the % of PA among the adolescents not participating in sports/teams". Or, explain it in the way that you consider best to differentiate those groups, and as a limitation of the study. Please present the following comparison: Based on the results of your study, Is the impact of the pandemic in terms of the associated factors to the Big 6 in this region (where your sample is coming from) different from the rest of the country? Clarify, and discuss some derived limitations (representativeness). Best regards,

VERSION 1 – AUTHOR RESPONSE

Response to Reviewer 1

The manuscript is generally well-written. The study is well-designed, providing interesting results on trends of lifestyle risk behaviours of Australian adolescents during two years of the COVID-19 pandemic. The results of the study are presented in a clear and interesting way (Figure 1). The results are properly discussed, and the strengths and limitations of the study are correctly identified. I have only one minor comment. The conclusion could be shortened without repeating the description of the study results.

Author response: Thank you for your positive comments. As suggested, we have shortened the conclusion by removing the summary of results and instead stated the behaviours that were most prevalent and should be targeted:

“Lifestyle risk behaviours, particularly excessive recreational screen time, poor diet, physical inactivity, and poor sleep, are prevalent among adolescents and should be addressed with effective behaviour change interventions.[32] With the pandemic remaining a continually evolving situation across the world, the impact on health behaviours is also likely to be dynamic and diverse. Supporting young people to improve or maintain their health behaviours, regardless of the course of the pandemic, is important, alongside targeted research and intervention efforts to support groups that may be disproportionately impacted, such as adolescent females.”

Response to Reviewer 2

Dear Authors,
Thank you for your paper increasing the information about the impact of the pandemic on the health of the adolescents. From a public health perspective, it is important to promote the health of young people in Australian, and worldwide after the pandemic. I recommend Minor changes or additions described below.

In the Abstract: “To examine changes in the prevalence of six key chronic disease risk factors”, Please add (the Big 6) for clarification.
Author response: Thank you for your time reviewing the manuscript and providing feedback. As suggested, we have added “the Big 6” into the first sentence of the abstract. It now reads:
“To examine changes in the prevalence of six key chronic disease risk factors (the “Big 6”), from before (2019) to during (2021) the COVID-19 pandemic, among a large and geographically diverse sample of adolescents, and whether differences over time are associated with lockdown status and gender.”

Add the age of the adolescents included in this sample.
Author response: The mean age (M_{age}) at baseline is presented within the participants section of the abstract:
“Participants: 983 adolescents (baseline M_{age}=12.6, SD=0.5, 54.8% female) drawn from the control group of the Health4Life Study.”

In Conclusion: It is written: “Lifestyle risk behaviours are prevalent among adolescents, and they must be supported to find ways to improve or maintain their health” Please state which of them, not all the risk factors were associated or changed over time. It could be meaningful to rewrite and clarify the conclusions.
Author response: The most prevalent lifestyle risk behaviours have now been stated in the conclusion of the abstract. Some of these may not have changed significantly over time, but remained highly prevalent, which is why the statement suggests they should be addressed regardless of the course of the pandemic:
“Lifestyle risk behaviours, particularly excessive recreational screen time, poor diet, physical inactivity, and poor sleep, are prevalent among adolescents. Young people must be supported to find ways to improve or maintain their health, regardless of the course of the pandemic. Targeted approaches to support groups that may be disproportionately impacted, such as adolescent females, are needed.”

In the Introduction: it could be adding a brief description of the impact of the pandemic particularly on this region where the participants are coming from, and if the impact of the pandemic in this region different from the rest of the country. For instance, to present the impact on incidence and mortality rates, specifically for this group of age, in the country and in the region; those important aspects give a contextualization of the study-phenomenon. How is the representativeness of the adolescents in this region? more younger people here than in the rest of the country, or not? (To complete to the already described in Methods).

Author response: A key strength of this study is that it included participants from three of Australia's eight states and territories, rather than focusing on one region, a limitation of much of the previous pandemic-related research. We have provided additional information on the strictness of government responses in Australia, despite the relatively low incidence and mortality rates, drawing comparisons to the US and UK using the Oxford COVID-19 Government Response Tracker data. Given the low incidence and mortality rates, and that these rates are even lower among adolescents, we argue that the greatest health ramifications for young people are due to the indirect effects of COVID-19, primarily the government responses. As such, we retain a focus on these restrictions, and highlight that that sub-national/within-country variation is common. We outline some of the key differences between Australian states, particularly the three states where the current sample resides, including NSW being one of the most densely populated states (this is the case for both adolescents and adults). This justifies why the Australian context may be a useful case study for investigating the varied impact of these government responses. As noted, we then provide specific detail about the types of government responses and restrictions put in place in the Greater Sydney region vs the other regions within the methods section. The additional sections in the introduction read:

"While disease severity, hospital admissions and deaths have typically been lower among adolescents, compared to adults, government responses, such as movement restrictions and school closures, present further potential health ramifications due to the related changes in lifestyle behaviours." (page 4).

"According to the Oxford COVID-19 Government Response Tracker, the strictness of lockdown restrictions since the first confirmed cases in January 2020 through to October 2021 was similar in Australia, the United States and the United Kingdom, with average stringency indexes of 60/100, 59/100, and 61/100, respectively, despite much lower incidence and mortality rates in Australia. However, there can be substantial variation within countries. In Australia, for example, stringency index values varied between states and territories by as much as 68 during 2020. The strictest and most extensive lockdown restrictions have been implemented in Victoria (VIC) and New South Wales (NSW), two of the most populous states that saw heightened case numbers during the January 2020-October 2021 period, while other Australian states, such as Queensland (QLD) and Western Australia (WA), experienced far fewer cases and restrictions. The Australian context may therefore serve as a case study for understanding the impact of various levels of restrictions on adolescent health behaviours." (page 4)

Additionally, we acknowledge that the sample may not be representative of the Australian adolescent population within the discussion on page 16:

"Other limitations include the reliance on self-report measures, and while the sample was more diverse than other Australian studies, it is limited to three Australian states and is therefore not representative of the entire Australian adolescent population."

Ethics: It is not clearly described in which way were the adolescents enrolled in the study, and how they accepted or not to participate. Please explain it in detail. Did the parents give a written consent for the adolescents' participation? Or explain how they were involved. Which information was given to the adolescents when enrolling them in the study? Please describe the procedure more concisely.

Author response: As data were drawn from a large multisite RCT, including a range of school types (Independent, Government and Catholic) across 3 Australian States, the research was reviewed and approved by 9 different ethics committees/panels, resulting in several different consent procedures depending on the school type/region. For example, while Independent schools in NSW used passive parental consent, Government schools in NSW required active parental consent in either written or verbal format. Additionally, while Catholic schools in WA also required active parental consent, the panel did not approve the verbal consent procedure so only written format was accepted within those schools. We have added more detail to specify that student consent was in written format, while parental consent could have been in several formats:

“Participants who provided written consent and had parental consent (passive, active written, or active verbal, depending on approved procedures for the school type and region) completed self-report assessments in a supervised classroom setting.” (page 7)

In Results: "The prevalence of past 6-month alcohol use increased by 334% over time (PR=4.34), is it the % correct?
Author response: Yes this is correct. Prevalence ratios are interpreted as the estimated prevalence of the outcome in one group, compared to another, providing an indication of a change in prevalence, as opposed to risk or odds. In this instance, the prevalence of alcohol use at Time 2 is 4.34 times what it was at Time 1, which represents an increase of 334%. We have added additional detail about prevalence ratios in the methods (page 10):
“Prevalence ratios are interpreted as the estimated prevalence of an outcome in one group, compared to another, providing an indication of a change in prevalence, as opposed to risk or odds.”

"The prevalence of alcohol use increased more in females compared to males (PR=2.34, 95% CI=1.19-4.62, for Males=?)", add the PR for men.
Author response: Similar to above, this prevalence ratio represents the ratio of female alcohol use to male alcohol use over time. It is showing that whilst both males and females showed increased prevalence of alcohol use, female use increased 2.34 times more than males. We believe the additional description of prevalence ratios now presented on page 10 clarifies this.

In Discussion: If it’s possible, Add the information regarding the % of physical activities (PA) specifically in teams or organized training, i.e., Sports clubs in this sample. This information is not presented. You are giving a general conclusion on physical activities, but not giving the information on the % of them whose were participating in sports/teams before or during the pandemic; Their participation in training were, for sure impacted (restricted) by the restrictions, is it? Otherwise, explain and discuss it in this section this matter. If the authors do not have this specific information (% of adolescents participating in sports/teams), complete the discussion with “the possibility that the prevalence of PA among the adolescents participating in sports of PA maybe lower than the % of PA among the adolescents not participating in sports/teams”. Or, explain it in the way that you consider best to differentiate those groups, and as a limitation of the study.
Author response: Physical activity in this context is broader than organised sport participation and relates to the number of days over the past week that participants engaged in any moderate-to-vigorous physical activity (MVPA) for at least 60 minutes. This is to align with the Australian health guidelines for physical activity which recommend engaging in at least 60 minutes of MVPA each day. Although rates of organised youth sport participation are typically high in Australia (~80% for 12-14 year olds [AusPlay, 2018]), we cannot tell from the data whether the reported physical activity was derived from organised sport or something else (e.g., a gym session, non-organised sport, general exercise). We recognise that sports participation was impacted by the restrictions and have added additional information to highlight this (page 15 “Previous studies have attributed reductions in physical activity during the pandemic to government responses, such as the cancellation of sport and closure of gyms and recreation centres.”). However, given overall moderate-to-vigorous physical activity did not change significantly from before to during the pandemic, nor did it differ between the lockdown and no lockdown groups, our conclusions are that adolescents may be resilient and find other ways to be physically active when sport may not be possible: