

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Weight-Gain in Chinese Youth during a 4-Month COVID-19 Lockdown: A Retrospective Observational Study
AUTHORS	Dun, Yaoshan; Ripley-Gonzalez, Jeffrey; Zhou, Nanjiang; You, Baiyang; Li, Qiuxia; Li, Hui; Zhang, Wenliang; Thomas, Randal J.; Olson, Thomas; Liu, Jie; Dong, Yuchen; Liu, Suixin

VERSION 1 – REVIEW

REVIEWER	Petkeviciene, Janina Lithuanian University of Health Sciences, Faculty of Public Health, Medical Academy
REVIEW RETURNED	13-May-2021

GENERAL COMMENTS	<p>This manuscript focuses on the important issue of our current daily life – weight and lifestyle changes during COVID-19 lockdown. The topic and the aim of the research is important for public health. The results of the study are interesting; however, I have a few comments that I believe can improve the quality of the manuscript.</p> <p>Abstract</p> <p>Line 2 - The objectives of the study should be more precise (What population? What country? What pandemic?)</p> <p>Line 5 – Why do you think that your study is retrospective? Here is one of the definitions of retrospective study: ‘A retrospective study looks backwards and examines exposures to suspected risk or protection factors in relation to an outcome that is established at the start of the study.’ Is it right for your study?</p> <p>Lines 13-15. The associations between weight change and other factors cannot be participants.</p> <p>Lines 25-27 – incomplete sentence.</p> <p>Strength and limitations</p> <p>Lines 2-3 - incomplete sentence. Lines 5-6 – unclear sentence</p> <p>Lines 11-12. There are much more limitations than only study population free from chronic diseases.</p> <p>Introduction</p> <p>Lines 14-15. The sentence ‘Yet existing evidence on these factors is largely limited due to a tendency in studies to do a univariate analysis of behaviors on weight-gain’ is unclear.</p>
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	<p>I think a brief description of lockdown in China could be provided in the Introduction, not in the Method section.</p> <p>Methods</p> <p>Page 6; lines 13 and 16 – Why are inverted commas used for description of the questionnaire?</p> <p>Page 6; line 34 - I suggest moving the lockdown description to the introduction.</p> <p>Page 7; line 5 - Weight change – did all students have the scales at home? Did you ask about it?</p> <p>Page 8. Criteria of evaluation of depression, and anxiety scores have to be provided.</p> <p>Statistical analysis</p> <p>Page 8; lines 28-32 – description of logistic regression analysis is unclear.</p> <p>Results</p> <p>The results are described in detail, sometimes repeating the data in the tables and figures.</p> <p>Tables 2 and 3, also supplementary tables – linear regression calculates regression coefficients (beta), not means as you wrote in the table header.</p> <p>In footnotes Table 3, Figure 2 and some supplementary tables this sentence is provided: 'Multivariate linear model was adjusted for: 1) sex, age, baseline weight, smoking habit; 2) meal frequency and alcohol consumption per week, anxiety score during the lockdown; 3) changes in exercise volume per week and sedentary time per day before and over the lockdown; and 4) all the variables shown in the figure simultaneously.' What does this grouping mean? What does 'all the variables shown in the figure simultaneously' mean?</p> <p>I think logistic regression analysis is not necessary (Figure 3).</p> <p>Discussion</p> <p>Discussion should be rewritten. The first sentence: 'This is the first multivariate analysis aimed at exploring the burden of imposed lockdown practices on weight-gain' is incorrect. There are a lot of studies using multivariate analysis for associations between weight-gain and different factors.</p> <p>There is no need to repeat the results in the discussion. More attention should be paid to the explanation of the results obtained. Language editing is needed because some sentences are unclear.</p>
REVIEWER	Gornicka, Magdalena Warsaw University of Life Sciences
REVIEW RETURNED	19-May-2021
GENERAL COMMENTS	This manuscript needs to be improved, especially in the part of the methodology. I have a big problem with different weight measurements. I know it was mentioned in the limitation, but it is not enough for me. Why didn't you ask about your body weight

	<p>before the pandemic? Now we are not sure if these differences, especially small ones, are not a measurement error. From the research planning point of view, this seems to me to be a significant mistake. I didn't find a description for height measurement and BMI classification. I don't understand why you have chosen only meal frequency, alcohol, and snacking as dietary habits. Please clarify. Line 36-37 p. 6 should be delete. The results should be organized and analyzed so that they clearly correspond to the aim. With such small participation of men in the study, the relationships for the total group are questionable. I would like to find the answer to the question of which and how lifestyle changes were associated with weight changes. In my opinion, psychological variables are not within the lifestyle changes. This requires a change of title and precise aim. I can't agree with the sentence line 9-10 p.10; there are a few studies exploring weight changes during a pandemic. In the Discussion, I propose to show lifestyle changes and weight changes, mood changes in this time all over the world. Improve Figures and Tables, and add information about used statistical test. With more and more publications on lifestyle changes, weight changes, etc. during Covid, please review and add relevant references.</p>
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REVIEWER	Hamamoto, Yoshiyuki
REVIEW RETURNED	Kansai Electric Power Medical Research Institute, Center for Diabetes, Metabolism and Endocrinology 24-May-2021

GENERAL COMMENTS	<p>In this manuscript, entitled “Lifestyle Changes and Weight-gain in Youth during a 4-Month COVID-19 Lockdown: A Retrospective Observational Study”, Yaoshan D et al. investigated the impact of COVID-19 lockdown on body weight in Chinese youth population and the association between lifestyle/mood changes and weight change. It seems that the study was performed nicely, and there is no major flaw. The number of subjects was large enough to investigate this kind of topic. But the results and conclusion are similar to the previously reported papers from other groups and countries, and new findings were scarce. The impact of containment measures of COVID-19 may differ depending on its strictness and duration, therefore this paper reports just one example. Another weakness of this study exists in the point that the lack of control (to compare the results) as the authors state in the limitation. But I do recognize the importance of accumulating evidences, and this paper may contribute as one of them.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Prof. Janina Petkeviciene, Lithuanian University of Health Sciences

This manuscript focuses on the important issue of our current daily life – weight and lifestyle changes during COVID-19 lockdown. The topic and the aim of the research is

important for public health. The results of the study are interesting; however, I have a few comments that I believe can improve the quality of the manuscript.

We thank the esteemed professor for evaluating and providing constructive suggestions that will undoubtedly improve our work.

Abstract Line 2 - The objectives of the study should be more precise (What population? What country? What pandemic?)

We appreciate the advice from this reviewer; we have now amended this for better clarity.

Abstract - Objectives: *“To observe the weight change in **Chinese youth** during a 4-month COVID-19 lockdown, and the association between weight change and mental health, physical activity and sedentary time changes, and dietary habits.”*

Line 5 – Why do you think that your study is retrospective? Here is one of the definitions of retrospective study: ‘A retrospective study looks backwards and examines exposures to suspected risk or protection factors in relation to an outcome that is established at the start of the study.’ Is it right for your study?

We thank the reviewer for bringing this point to our attention. After careful consideration and consultation with a clinical research professional again, this research fit the definition of a retrospective observational study.

Lines 13-15. The associations between weight change and other factors cannot be participants.

We appreciate the correction from the reviewer and we have moved this to the objectives sub-section.

Lines 25-27 – incomplete sentence.

Thank you for spotting this error. We have now amended this.

Abstract – Results: *“...An increase in overweight and obese individuals according to Asian cut-off points as a demographic percentage by 4.5% and 2.7% and 4.8% and 3.4% in men and women respectively ($P < 0.001$) was observed...”*

Strength and limitations Lines 2-3 - incomplete sentence.

Thank you for pointing this out. These have been amended and in some cases changed.

Lines 5-6 – unclear sentence Lines 11-12. There are much more limitations than only study population free from chronic diseases.

We agree with the reviewer that this study has much more limitations than one. We have now highlighted the main limitation in the strength and limitations section, and added the rest of the limitations into the discussion section.

Strengths and limitations: “

- *The occurrence of weight-gain during a 4-month lockdown due to the COVID-19 pandemic was in a large population of 12,889 Chinese youth.*
- *This study provides evidence for the associations between weight-gain and increased sedentary time, COVID-19 related stress, and depression score throughout a 4-month lockdown.*

- *The methods of collecting body weight in the two time periods differed, with the first being under the supervision of professionals, the second being self-administered due to the constraints of lockdown.*

Introduction Lines 14-15. The sentence ‘Yet existing evidence on these factors is largely limited due to a tendency in studies to do a univariate analysis of behaviors on weight-gain’ is unclear.

We agree with the reviewer and have opted to remove this sentence from the manuscript as it may no longer be correct, given the recent literature on weight-gain during the lockdown.

I think a brief description of lockdown in China could be provided in the Introduction, not in the Method section.

We agree and have now included this information in the introduction section rather than the methods.

Introduction: *“On January 20, 2020, China issued a national lockdown to halt the spread of the virus, ending on April 8. All individuals were ordered to stay home or at their residence, except for permitted work, local shopping. All schools, sports facilities, entertainment, recreational venues, personal care and beauty services, and*

most factories and markets were closed. While this strategy was largely successful, its adverse effects could be of consequence to the health of youth, as for four months, they were out of school and, for the most part, stuck in the confines of their homes (1).”

Methods Page 6; lines 13 and 16 – Why are inverted commas used for description of the questionnaire?

We thank the reviewer for their observation. The inverted commas should not be there and have been removed.

Page 6; line 34 - I suggest moving the lockdown description to the introduction.

We agree with the reviewer and have moved this section to the introduction.

Page 7; line 5 - Weight change – did all students have the scales at home? Did you ask about it?

During the pandemic and lockdown, due to limitations in gathering we were unable to meet with students and had to ask them to weigh themselves. We had asked them to follow our weighing procedures, in the morning, with coats off and without shoes at home if a scale was available. If they had no scales at home, they were directed to weigh themselves at a local community health centre. These are small centres within communities and will usually have access to scales inside the building and outside, by the entrance of the building. This would allow them to weigh themselves without any physical interaction with other people.

Page 8. Criteria of evaluation of depression, and anxiety scores have to be provided.

Thank you for bringing this to our attention. We have now included this information in the manuscript.

Methods - COVID-19 induced stress, depression, and anxiety *“In this study, the presence of depression was defined as a BDI-II depression score ≥ 14 (23) and the presence of anxiety was defined as an STAI score of 49 (22).”*

Statistical analysis Page 8; lines 28-32 – description of logistic regression analysis is unclear.

We appreciate this evaluation from the reviewer. We have since deleted the logistic regression analysis and its results.

Results: The results are described in detail, sometimes repeating the data in the tables and figures.

Thank you for your observation. We have now made extensive amendments to the results section, we hope to provide a clearer view of the results of this study.

Tables 2 and 3, also supplementary tables – linear regression calculates regression coefficients (beta), not means as you wrote in the table header.

Thank you for finding this error. We have corrected this accordingly.

In footnotes Table 3, Figure 2 and some supplementary tables this sentence is provided: 'Multivariate linear model was adjusted for: 1) sex, age, baseline weight, smoking habit; 2) meal frequency and alcohol consumption per week, anxiety score during the lockdown; 3) changes in exercise volume per week and sedentary time per day before and over the lockdown; and 4) all the variables shown in the figure simultaneously.' What does this grouping mean? What does 'all the variables shown in the figure simultaneously' mean? I think logistic regression analysis is not necessary (Figure 3).

We thank the reviewer for bringing this comment for us. We have since amended the statistical analysis part of method section, and deleted all repetitions at the end of tables and figures. We have now removed the logistic regression analysis.

Statistical analysis: “ ... The secondary outcomes were the associations between weight change and mental health (COVID-19 related stress, depression, anxiety), changes in physical activity volume and sedentary time, and dietary habits (snacking per day, alcohol consumption and meal frequency per week) during the lockdown ... For analysis of all secondary outcomes, multivariate linear regression was used in which sex, age, baseline body weight, smoking history, mental health, physical activity, sedentary time and dietary habits were adjusted accordingly ...”

Discussion: Discussion should be rewritten. The first sentence: 'This is the first multivariate analysis aimed at exploring the burden of imposed lockdown practices on weight-gain' is incorrect. There are a lot of studies using multivariate analysis for associations between weight-gain and different factors. There is no need to repeat the results in the discussion. More attention should be paid to the explanation of the results obtained. Language editing is needed because some sentences are unclear

We appreciate all of the suggestions given to us by the reviewer. We agree with these and have substantially amended the discussion section as well as the other sections to improve clarity. Furthermore, we have now avoided repeating any results in the discussion and have included previous literature on the topic to improve this section.

Reviewer: 2

Dr. Magdalena Gornicka, Warsaw University of Life Sciences

This manuscript needs to be improved, especially in the part of the methodology.

We appreciate the time and all the suggestions provided by the esteemed doctor. We have worked to extensively improve our manuscript as per the suggestions of the reviewers.

I have a big problem with different weight measurements. I know it was mentioned in the limitation, but it is not enough for me. Why didn't you ask about your body weight before the pandemic? Now we are not sure if these differences, especially small ones, are not a measurement error. From the research planning point of view, this seems to me to be a significant mistake.

We understand the concerns from the reviewer. The initial weight of each participant was assessed prior to the pandemic with the use of scales though they had also been asked. During the pandemic and lockdown, due to limitations in gathering we were unable to meet with students and had to ask them to weigh themselves. We had asked them to follow our weighing procedures, in the morning, with coats off and without shoes at home if a scale was available. If a scale was not available at their residence, they were suggested to go to a community health centre local to their area. The reason for this is that these have scales within their building and have one posted outside the building during opening hours. This would allow them to weigh themselves without any physical interaction with other people.

Methods – Weight change: “...Follow-up body weight was measured by participants themselves at home or a community health centre near to their home if no scales were available at home, and reported to us via the online follow-up questionnaire. Concerning the validity and reliability of determining follow-up body weight, all participants were asked to measure their body weight in the morning right after waking up, in a state of fasting, shoes off, with no large coat...”

I didn't find a description for height measurement and BMI classification.

Thank you for bringing this to our attention. This has now been included. Height was measured with a free-standing height measure during the CNSPFS. Height was also one of the questions in the questionnaire. BMI was classified according to the WHO Asian population cut off.

Methods – Weight change: “Baseline body weight was measured in accordance with the Chinese National Student Physical Fitness Standard (CNSPFS) by staff members of the two respective universities for all university students (7), using scales and after the removal of shoes/coats, while height was measured using a free-standing height measure. BMI was calculated and classified according to the Asian cut-off points,

classifying overweight as $BMI \geq 24$ and $< 28 \text{ kg/m}^2$, and obesity as $BMI \geq 28 \text{ kg/m}^2$...”

I don't understand why you have chosen only meal frequency, alcohol, and snacking as dietary habits.

Meal frequency, alcohol, and snacking were selected as these were questions which could be asked with relative ease to the student population in China. Since in China, it is customary to eat several “dishes” in each meal it would be particularly burdensome for the students to answer this question and may lead to unreliable results. We have since included this in our methods section and limitations. Thank you for this point.

Methods – Dietary habits: “In this study, food composition was not assessed due to the high participant burden of such a questionnaire and data collection limitations. The present study evaluated meal frequency, including breakfast and lunch frequency, alcohol units per week, and snacking times per day at the follow-up time point through a questionnaire based on previous research...”

Discussion – Limitations: “...While breakfast and lunch frequency, snacking and alcohol intake were observed, this study did not report on dietary composition, due to the heavy burden on participants, particularly in Chinese cuisine which involves several dishes per meal...”

Please clarify. Line 36-37 p. 6 should be delete. The results should be organized and analyzed so that they clearly correspond to the aim.

We thank the reviewer for these points. We agree with the reviewer and have substantially rearranged the results section to provide the reader greater clarity. Below we have included the frame of the rearranged and updated results section.

Results

1. *Demographics;*
2. *Primary outcome - weight change*
3. *Secondary outcomes*
 - I *Associations between weight change and the changes in physical activity and sedentary time*
 - I *Associations between weight change and dietary habits*
 - I *Associations between weight change and mental health*

With such small participation of men in the study, the relationships for the total group are questionable. I would like to find the answer to the question of which and how lifestyle changes were associated with weight changes.

Regarding the population sizes of males and females we have performed a power analysis and have now included this in the updated manuscript.

Results "...We conducted power analysis based on the sample size and primary result (weight change) in the present study for men and women, respectively. For men, a sample size of 2,549 achieves 99.9% power to detect a mean of paired differences of 2.6 kg with a known standard deviation of differences of 0.6 kg with a significance level (alpha) of 0.05 using a two-sided paired *t*-test. For women, a sample size of 10,340 achieves 99.9% power to detect a mean of paired differences of 2.1 kg with a known standard deviation of differences of 0.3 kg..."

In my opinion, psychological variables are not within the lifestyle changes. This requires a change of title and precise aim.

We agree with the reviewer and have changed the title and objectives in the abstract and introduction accordingly. The new title now reads:

Title: *"Weight-Gain in Chinese Youth during a 4-Month COVID-19 Lockdown: A Retrospective Observational Study"*

I can't agree with the sentence line 9-10 p.10; there are a few studies exploring weight changes during a pandemic.

We agree with the reviewer that there have been recent studies looking at weight change during the pandemic we have now removed this and have amended the discussion section extensively to include recent literature.

In the Discussion, I propose to show lifestyle changes and weight changes, mood changes in this time all over the world. Improve Figures and Tables, and add information about used statistical test. With more and more publications on lifestyle changes, weight changes, etc. during Covid, please review and add relevant references.

We appreciate all of the suggestions provided by the reviewer. We have extensively amended the discussion sections according to the commentary made by the reviewers. We have updated references with previous research in the same area and improved the clarity of the section. Regarding Figures and Tables, we have now added the method of statistical tests used in the figure legends and table notes.

Reviewer: 3

Dr. Yoshiyuki Hamamoto, Kansai Electric Power Medical Research Institute

In this manuscript, entitled “Lifestyle Changes and Weight-gain in Youth during a 4-Month COVID-19 Lockdown: A Retrospective Observational Study”, Yaoshan D et al. investigated the impact of COVID-19 lockdown on body weight in Chinese youth population and the association between lifestyle/mood changes and weight change. It seems that the study was performed nicely, and there is no major flaw. The number of subjects was large enough to investigate this kind of topic. But the results and conclusion are similar to the previously reported papers from other groups and countries, and new findings were scarce. The impact of containment measures of COVID-19 may differ depending on its strictness and duration, therefore this paper reports just one example. Another weakness of this study exists in the point that the lack of control (to compare the results) as the authors state in the limitation. But I do recognize the importance of accumulating evidences, and this paper may contribute as one of them.

We appreciate the renowned doctor for his comments and evaluation of our work. We agree that when regarding the topic of weight change during the pandemic, there have been some studies from different populations from around the world, and in this study, it is Chinese youth. There is an importance of accumulating evidence from around the world.

VERSION 2 – REVIEW

REVIEWER	Petkeviciene, Janina Lithuanian University of Health Sciences, Faculty of Public Health, Medical Academy
REVIEW RETURNED	27-Jun-2021
GENERAL COMMENTS	Dear Authors, Thank you for improving the manuscript. I think your response is detailed and accurate. Please find my suggestions below. In the statistical analysis section, the description of linear regression analysis should be more accurate. How the analysis was performed for Table 2 and Table 3? What is the difference? Are data in Table 2 only age- and baseline body weight-adjusted? Check Table 2 for errors: Page 20, line 23 Alcohol, drinks/wk 0.023 (-0.029 to 0.075) P=0.01 -0.007 (-0.039 to 0.025) P=0.009 If 95% CI includes 1, P-value cannot be <0.05

VERSION 2 – AUTHOR RESPONSE

Reviewer: 1

Prof. Janina Petkeviciene, Lithuanian University of Health Sciences

Comments to the Author:

Dear Authors,

Thank you for improving the manuscript. I think your response is detailed and accurate. Please find my suggestions below.

In the statistical analysis section, the description of linear regression analysis should be more accurate. How the analysis was performed for Table 2 and Table 3? What is the difference? Are data in Table 2 only age- and baseline body weight-adjusted?

We thank Prof. Janina Petkeviciene for this suggestion. The reviewer is correct, yes, they are. Data in Table 2 were only adjusted for age- and baseline body weight; data in Table 3 was for multivariate adjustment. We have now updated the “statistical analysis” to reflect this change.

Statistical analysis: “...The secondary outcomes were the associations between the weight change and mental health (COVID-19 related stress, depression, anxiety), changes in physical activity volume and sedentary time, and dietary habits (snacking per day, alcohol consumption and meal frequency per week) during the lockdown...For analysis of the secondary outcomes, we initially performed an age- and baseline body weight-adjusted linear regression for the associations between the weight change and mental health, dietary habits and the changes in physical activity and sedentary time. Then, the associations between the weight change and the potential influencing factors were further assessed by multivariate linear regression in which sex, age, baseline body weight, smoking history were adjusted. Mental health, physical activity, sedentary time and dietary habits were also adjusted in the multivariate linear regression accordingly...”

Check Table 2 for errors: Page 20, line 23 Alcohol, drinks/wk, 0.023 (-0.029 to 0.075) P=0.01; -0.007 (-0.039 to 0.025) P=0.009. If 95% CI includes 1, P-value cannot be <0.05.

We thank Prof. Janina Petkeviciene for bringing this critical point to us. We have now re-run the analysis and revised these two errors. We have also double-checked the rest of results of manuscript at this round of revision.

Table 2

	Men (N = 2,549)			Women (N = 10,340)		Total (N = 12,889)	
	Coefficient (95% CI)	P Value		Coefficient (95% CI)	P Value	Coefficient (95% CI)	P Value
...							
Alcohol, drinks/wk	0.023 (-0.029 to 0.075)	0.38		-0.072 (-0.115 to -0.028)	<0.001	-0.017 (-0.049 to 0.016)	0.31
...							