

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Trends in body mass index, overweight and obesity among adults in the United States, the NHANES from 2003 through 2018: a repeat cross-sectional survey
AUTHORS	Li, Mingxi; Gong, Weijun; Wang, Shidong; Li, Zhe

VERSION 1 – REVIEW

REVIEWER	Barrett, Sheila Northern Illinois University, Department of Nutrition, Dietetics and Hospitality Administration
REVIEW RETURNED	14-Jul-2022

GENERAL COMMENTS	<p>Comments to the Authors</p> <p>Very detailed analysis of the trends by years, but a stronger background and significance is needed to show why examining the trends is important. See specific comments below</p> <p>Abstract</p> <p>Does not relate to what the purpose of the study is as stated in the introduction, nothing said about how the trends in obesity and overweight are impacted by age, race, educational, economic, and physical activity status in the abstract. Trends were reported in the abstract based on gender. Need to look back at the tables and figures presented and give a take home message for all the variables studied; what is the take home message for education, PA, race, sex, etc. These can be stated in the abstract with their respective p-values.</p> <p>Introduction</p> <p>Page 4- Line 25 – change form to from</p> <p>Need to make the introduction stronger to show the significance of this study.</p> <p>Study purpose needs to be more explicit; an aim is stated and it can be implied 2 objectives;</p> <ol style="list-style-type: none">1. Focus on mean BMI before and after 2009 when the global financial crisis hit2. Assess how these trends vary by age, sex, race, educational, economic, and physical activity status <p>Stronger objectives and more explicit purpose are needed.</p>
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Methods

Nothing said about energy intakes in the introduction in terms of variables to be measured.

Page 6- Line 46- data were. Sentence is awkwardly stated, remove the word "through"

Under statistical analyses, nothing said about energy intakes.

Not much said about the methods and procedures except to guide readers to go and find other info in the literature.

Results

Figures need to be numbered and named appropriately. They are called figures 1 and 2 on page 16 but they are not stated on the figures themselves. On page 16, be specific with regards to which variables are presented in figures one and figures 2. It appears from page 16, lines 12- 15, that figure one would include age, poverty ratio, education and race and it would then be assumed that figure 2 would now include sex, activity status, overweight and obesity.

Table 1- column on education needs to be formatted

Table 3- add economic status in the title of the table "Annual change in BMI, obesity, overweight and economic status during 2003-2018"

Tables 4 and 5 - use asterisks to denote significant p values at what levels, seems like obesity by gender did not significantly differ until after 2006 in the combined category as seen in table 4.

Discussion

Page 17- line 22- change "though" to through

Page 18- expand on the trends on PIR as shown in figure 1 and make some statements regarding the financial crisis as you implied, how do you think the financial crisis of 2008- 2009 impacted poverty and PIR during those years? This is the first time you are mentioning diet and obesity, energy intake was mentioned in the methods section, but it was not measured in your study. I do not see any data from your study on energy intake (see lines 43 onwards on page 18).

Page 19- expand on what you mean by "selection" when discussing education and BMI

Page 19- lines 51-onwards- there is not much data on covid-19 and BMI, it is too soon to even determine this, so say it is yet to be examined, instead of "not fully understood." Make a suggestion that this aspect needs to be examined.

Try to make your limitations and strengths more explicit.

Seems like more women than men are obese based on figures, expand on why you think this is so

Educational levels seem to favor the college graduates as less overweight and obese. See comment on what you mean by "selection"

	<p>Conclusion</p> <p>Needs a lot of work. Give one main take home message for each variable in the same order in which you discussed them in the paper. After this is done, you can also add this to your abstract.</p> <p>References are up to date for the most part.</p>
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REVIEWER	Pierce, Samantha CDC
REVIEW RETURNED	29-Aug-2022

GENERAL COMMENTS	<p>Although this paper is sound in terms of clearly describing the aim, methods, statistical approach, and results, I do not find this paper overly interesting to the field. The fact that obesity prevalence among US adults has risen over the last ~15 years is not novel. NCHS has published this; see https://nchstats.com/category/obesity/ and https://www.cdc.gov/nchs/data/databriefs/db360-h.pdf. The authors comment that their study is unique because it used a larger sample size and broader time period; I am not convinced that these are important enough distinctions to make the findings (which are so similar to what has been published numerous times) useful for the field. Further, there is no mention about why these findings are useful to the clinical field, epidemiological field, or other field nor implications of the very high prevalence of obesity among US adults nor what could be done with knowing this information (the conclusion/"so what" piece is weak). Lastly, if there is interest by the editors to publish this piece, I think the paper needs to undergo a thorough grammatical check.</p> <p>Intro</p> <ul style="list-style-type: none"> • Several instances where subject-verb agreement is not happening (e.g., “obesity rates has been on the rise”) <ul style="list-style-type: none"> ○ Page 5, Line 6/7 and Line 12 • Fragment sentences – Page 5, Line 24-25 <p>Methods</p> <ul style="list-style-type: none"> • Typo “from through” – Page 6, Line 46 • Statistical Analysis <ul style="list-style-type: none"> ○ Page 7, Line 22- technically overweight is classified as BMI\geq25 and BMI$<$30 and does NOT include obesity. Overweight and obesity are usually reported as mutually exclusive categories- see here- https://www.cdc.gov/obesity/basics/adult-defining.html. I see in Results that you report the prevalence of overweight, including obesity. If you keep this, please clarify in methods “We defined overweight, including obesity, as BMI\geq25; and obesity as \geq30.” ○ When you reference “obesity and
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overweight”, I suggest rearranging to say “overweight and obesity” since overweight is first ordinaly and obesity is more extreme.

Results

- Page 9, Line 7- You say that 65% of adults reported meeting PA guidelines. Is this consistent with NCHS reports using NHANES data? From what I have read, I think that this is an over-estimate. Potentially something to discuss in Discussion <https://www.cdc.gov/nchs/fastats/exercise.htm>
- Your overall estimate (42.8%) is nearly identical to what NCHS reports so that is good- <https://www.cdc.gov/nchs/products/databriefs/db360.htm>. Same with prevalence of overweight (which includes obesity as well); NHANES 2017-2018 estimate was 73.6%- <https://www.cdc.gov/nchs/fastats/obesity-overweight.htm>

Discussion

- Typo Page 17, Line 20. “20013” should be 2003
- Type Page 17, Line 48. “From” should be lower-case
- The first sentence of Discussion- the fact that US adult obesity prevalence increased from 2003 to 2018 is well-established- <https://www.cdc.gov/nchs/data/databriefs/db360-h.pdf>.
- Page 19, Line 38-42 more fragments sentences. Please read and ensure you use complete sentences throughout this paper
- Discussion pages 18-19- The pieces about change in dietary intake over time and potential hypotheses are interesting
- Last paragraph- the one about COVID-19- I would mention that NHANES does not have data through March 2020; they combined the 2017-2018 cycle with the 2019-Mar2020 cycle so that the data remained nationally representative. Still, your point remains true that NHANES does not have data during the pandemic, unfortunately.

Conclusion

- Overall weak concluding statement that does not contain any information on implications (e.g., this puts X million Americans at risk for serious and costly chronic conditions, etc.) or why this information/paper is actually important to the field, whether that be clinical, epidemiological, etc.

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VERSION 1 – AUTHOR RESPONSE

Reply to Reviewer #1

Dear Reviewer,

Thank you very much for your time involved in reviewing the manuscript and your very encouraging comments on the merits.

Comments:

“Very detailed analysis of the trends by years, but a stronger background and significance is needed to show why examining the trends is important. See specific comments below

Abstract

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2. Assess how these trends vary by age, sex, race, educational, economic, and physical activity status

Stronger objectives and more explicit purpose are needed.

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Comment 1:

“Very detailed analysis of the trends by years, but a stronger background and significance is needed to show why examining the trends is important. See specific comments below

Abstract

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studied; what is the take home message for education, PA, race, sex, etc. These can be stated in the abstract with their respective p-values.”.

Response 1:

Thanks for your great suggestion on improving the accessibility of our manuscript. As suggested by the reviewer, we rewrote the Abstract. we presented the characteristics of the study participants according to BMI groups in Table S1. The prevalence of overweight and obesity varied significantly by age, sex, race, education, daily total energy intake, economic conditions, and physical activity status.

Table S1. Characteristics of participants according to BMI groups*

Characteristic	Total (n=42,266)	BMI, kg/m ² †			p-value
		< 25 (n=12,522)	25.0-29.9 (n=14,046)	≥ 30 (n=1,5698)	
Age, years	47.11 ± 0.20	44.29 ± 0.30	48.78± 0.24	47.99 ± 0.22	< 0.001
Age, years, n (%)					<0.001
20 - 30	8,033 (20.54)	3,396 (29.24)	2,180 (16.73)	2,457 (16.63)	
30 - 39	7,175 (18.37)	2,104 (18.37)	2,334 (18.12)	2,737 (18.61)	
40 - 49	7,035 (19.43)	1,772 (16.64)	2,408 (20.50)	2,855 (20.84)	
50 - 59	6,714 (18.11)	1,675 (15.60)	2,224 (18.28)	2,815 (20.08)	
60 - 69	6,629 (12.76)	1,521 (9.62)	2,340 (13.84)	2,768 (14.43)	
≥ 70	6,680 (10.78)	2,054 (10.54)	2,560 (12.53)	2,066 (9.41)	
Sex, n (%)					< 0.001
Male, n (%)	20,408 (47.97)	5,784 (41.87)	7,773 (55.66)	6,851 (46.17)	
Female, n (%)	21,858 (52.03)	6,738 (58.13)	6,273 (44.34)	8,847 (53.83)	

Race, n (%)					< 0.001
Mexican American	6,805 (8.38)	1,355 (5.61)	2,581 (9.35)	2,869 (9.86)	
Other Hispanic	3,755 (5.33)	917 (4.51)	1,412 (6.04)	1,426 (5.38)	
Non-Hispanic White	18,120 (67.36)	5,735 (69.30)	6,070 (67.90)	6,315 (65.24)	
Non-Hispanic Black	9,094 (11.41)	2,268 (9.24)	2,624 (9.82)	4,202 (14.70)	
Other Race	4,492 (7.51)	2,247 (11.35)	1,359 (6.89)	886 (4.82)	
Education, n (%)					< 0.001
Less than high school	10,814 (16.4)	2,899 (15.19)	3,779 (16.79)	4,136 (16.95)	
High school graduate	9,787 (23.6)	2,747 (21.39)	3,200 (23.25)	3,840 (25.84)	
Some college or AA degree	12,266 (31.4)	3,409 (29.03)	3,860 (29.85)	4,997 (34.71)	
College graduate or above	9,345 (28.6)	3,441 (34.26)	3,194 (30.06)	2,710 (22.43)	
Poverty income ratio, n (%)					< 0.001
< 130%	12,129 (21.29)	3,588 (21.83)	3,802 (19.69)	4,739 (22.28)	
≥ 130%	26,450 (78.71)	7,863 (78.17)	8,944 (80.31)	9,643 (77.72)	
BMI, kg/m ²	28.93 ±0.07	22.20 ± 0.02	27.44 ±0.02	35.98 ±0.07	
Total energy intake, Kcal/d	2,027.31±7.96	2051.4 ±12.7	2049.5 ± 12.8	1988.0 ± 11.1	< 0.001
Total energy intake, n (%)					< 0.001
Tertile1	9,991 (25.36)	2,614 (24.87)	3,245 (23.89)	4,132 (27.06)	
Tertile2	8,990 (27.08)	2,609 (26.89)	3,080 (28.30)	3,301 (26.16)	
Tertile3	15,644	4,673	5,180	5,791	

	(47.56)	(48.24)	(47.81)	(46.79)	
Physical activity, n (%)					< 0.001
Inactive	8,504 (18.09)	2,138 (14.52)	2,744 (16.99)	3,622 (22.15)	
Insufficiently active	6,649 (17.52)	1,995 (17.40)	2,232 (17.63)	2,422 (17.51)	
Sufficiently active	23,320 (64.39)	7,295 (68.09)	7,761 (65.38)	8,264 (60.34)	

* Data are presented incorporating sample weights and adjusted for clusters and strata of the complex sample design of the National Health and Nutrition Examination Survey (2003-2018).

† Values are presented as mean ± SE for continuous variables and unweighted numbers (weighted %) for categorical variables.

Abbreviations: AA, Associate of Arts; BMI, body mass index

Comment 2:

“Introduction

Page 4- Line 25 – change form to from”

Response 2:

Thank you for the detailed review. we have corrected the sentence into “The prevalence of obesity **increased** from 22.9% to 30.5% **from** 1988-1994 through 1999-2000, maintaining similar growth rates of about 8% ”

Comment 3:

“Need to make the introduction stronger to show the significance of this study. ”

Response 3:

Thanks for your suggestion. As suggested by the reviewer, a stronger background and significance has been stated as follows:“**The effects of 2008–2009 global financial crisis on economic status,**

physical activity status, and daily total energy intake are still unknown. How these changes in economic status, physical activity status, and daily total energy intake may impact on the prevalence of overweight and obesity are less well understood.”

Comment 4:

“Study purpose needs to be more explicit; an aim is stated and it can be implied 2 objectives;

1. Focus on mean BMI before and after 2009 when the global financial crisis hit

2. Assess how these trends vary by age, sex, race, educational, economic, and physical activity status

Stronger objectives and more explicit purpose are needed. ”

Response 4:

Thanks for your suggestion. As suggested by the reviewer, we have rewrote the objectives as follows:

“In this study, **our primary aim was** to provide the latest national estimates of adult obesity and evaluate trends in mean body mass index(BMI) and adult obesity between 2003-2004 and 2017-2018. **The secondary aims of our study were as follows: (1) To explore** the changes in the mean BMI and adult obesity before and after 2009 (The 2008–2009 global financial crisis taken place). **(2) To assess** how these trends might vary by age, sex, race, educational status, economic status, and physical activity status.

Comment 5:

“Methods

Nothing said about energy intakes in the introduction in terms of variables to be measured.”

Response 5:

Thank you for the detailed review. As suggested by the reviewer, we have corrected the sentences into “The differences in the prevalence of obesity by other covariates such as educational status, economic status, **total daily energy intake, and** physical activity status have been scarcely studied.”

and “(2) To assess how these trends might vary by age, sex, race, educational status, economic status, **total daily energy intake**, and physical activity status.”

Comment 6:

“Page 6- Line 46- data were. Sentence is awkwardly stated, remove the word “through”

Response 6:

Thank you for the detailed review. As suggested by the reviewer, we have corrected the sentence into “**Data on physical activity was obtained from the physical activity questionnaire**”.

Comment 7:

“Under statistical analyses, nothing said about energy intakes.”

Response 7:

Thank you for the detailed review. As suggested by the reviewer, we have corrected the sentence into “Multivariate survey-weighted generalized linear regression models were adjusted for age, sex, race, education, PIR, **total energy intake** and activity status.”

Comment 8:

“Not much said about the methods and procedures except to guide readers to go and find other info in the literature.”

Response 8:

Thanks for your suggestion. As suggested by the reviewer, we briefly summarized our (NHANES) methods and procedures as follows “The NHANES is a nationally representative sample of the United States population, which collects data from survey participants through household interviews, standardized physical examinations, and laboratory tests in mobile examination centers. **The survey is unique in that it combines interviews and physical examinations.** The NHANES released data every 2 years to ensure an adequate sample size for analyses and protect confidentiality. **The survey**

examines a nationally representative sample of about 5,000 people each year. The NHANES interview includes demographic, socioeconomic, dietary, and health-related questions. The examination component consists of medical, dental, and physiological measurements, as well as laboratory tests administered by highly trained medical personnel. Detailed information on the NHANES procedures is available in the literature.”

Comment 9:

“Results

Figures need to be numbered and named appropriately. They are called figures 1 and 2 on page 16 but they are not stated on the figures themselves. On page 16, be specific with regards to which variables are presented in figures one and figures 2. It appears from page 16, lines 12- 15, that figure one would include age, poverty ratio, education and race and it would then be assumed that figure 2 would now include sex, activity status, overweight and obesity.”

Response 9:

Thank you for the detailed review. As suggested by the reviewer, we have added figure numbers on both figure1 and figure2. We have added the description of figure1 and figure 2 as follows:“ Graphical representations of the changes in the distribution of mean BMI, overweight and obesity prevalence are shown in Figure1 and Figure2. **Figure 1 shows the changes in mean BMI across years stratified by age, PIR, education, and race...Figure 2 shows the changes in mean BMI across years stratified by sex and activity status. Changes in overweight and obesity prevalence across years stratified by sex are also shown in Figure 2....”**

Comment 10:

“Table 1- column on education needs to be formatted”

Response 10:

Thank you for the detailed review. We have formatted Table 1 (education column) as requested.

Comment 11:

“Table 3- add economic status in the title of the table “Annual change in BMI, obesity, overweight and economic status during 2003-2018”

Response 11:

Thank you for the detailed review. As suggested by the reviewer, We have added economic status in the title of the table “Annual change in BMI, overweight, obesity and economic status during 2003-2018”

Comment 12:

“Tables 4 and 5 - use asterisks to denote significant p values at what levels, seems like obesity by gender did not significantly differ until after 2006 in the combined category as seen in table 4.”

Response 12:

Thanks for your suggestion. As suggested by the reviewer, p values have been represented using † for $P < 0.05$ and ‡ for $P < 0.01$. As is shown in table S3, the sex-specific prevalence of obesity did not significantly differ until after 2008.

Comment 13:

“Discussion

Page 17- line 22- change “though” to through”

Response 13:

Thank you for the detailed review. As suggested by the reviewer, We have changed “though” to “through”.

Comment 14:

“Page 18- expand on the trends on PIR as shown in figure 1 and make some statements regarding the financial crisis as you implied, how do you think the financial crisis of 2008- 2009 impacted poverty and PIR during those years? This is the first time you are mentioning diet and obesity, energy intake was mentioned in the methods section, but it was not measured in your study. I do not see any data from your study on energy intake (see lines 43 onwards on page 18).”

Response 14:

Thanks for your suggestion. As suggested by the reviewer, we have expanded on the trends on PIR as shown in figure 1 and make some statements regarding the financial crisis as follows:“...In our study, the impact of economic conditions on BMI was complex. A significant increase in mean BMI was found among both the poor and the rich. The overall BMI was higher for those with poor economic conditions since 2005-2006 compared to good economic conditions (Figure 1). However, the acceleration in the rise of obesity prevalence was mainly due to an increase in the prevalence of obesity among those who are in a better economic position (Table 3). Interestingly, there was no statistical difference in annual change in obesity prevalence before and after the financial crisis. This may be mainly due to the increase in the proportion of the poor after the financial crisis. The proportion of the poor increased from 21.68% in 2009-2010 to 24.6% in 2011-2012. This trend continued until 2015....”

As suggested by the reviewer, we evaluated the levels of mean BMI and prevalence of overweight and obesity according to total daily energy intake tertiles. Data were shown in Table S2, Table S3, Table S4, and Table S8. Interestingly, participants in the highest daily total energy intake tertile had the lowest BMIs compared with those in the lowest daily total energy intake tertile (28.97 kg/m² vs. 29.30 kg/m²). The findings were similar for the prevalence of obesity (36.7% vs. 39.9%) and overweight (69.8% vs. 70.9%). Thus, we analyzed the characteristics of the participants according to tertiles of daily total energy intake (Table S8). Compared with those in the lowest daily total energy intake tertile, participants in the highest daily total energy intake tertile had higher proportions of Non-Hispanic Whites and individuals who were college educated (college degree or higher), sufficiently physically active, and had good economic status. This might in part be related to the lower BMI and prevalence of obesity. We have also addressed this point in the Discussion section.

Table S8. Characteristics of participants according to tertiles of daily total energy intake*

Characteristic	Total (n=34,625)	Daily total energy intake (Kcal/d) †			P-value
		Tertile1 (n=9,991)	Tertile2 (n=8,990)	Tertile3 (n=1,5644)	
Age, years	48.81 ± 0.48	49.57 ± 0.28	48.23± 0.28	46.38 ± 0.25	< 0.001
Sex, n (%)					< 0.001
Male, n (%)	16,457 (47.20)	3,159 (27.81)	4,442 (48.79)	8,856 (56.63)	
Female, n (%)	18,168 (52.80)	6,832 (72.19)	4,548 (51.21)	6,788 (43.37)	
Race, n (%)					< 0.001
Mexican American	5,430 (7.85)	1,670 (8.43)	1,383 (7.43)	2,377 (7.78)	
Other Hispanic	2,973 (5.02)	1,049 (6.46)	698 (4.33)	1,226 (4.65)	
Non-Hispanic White	15,635 (69.51)	3,905 (64.17)	4,353 (72.29)	7,377 (70.77)	
Non-Hispanic Black	7,384 (10.97)	2,465 (13.87)	1,759 (9.64)	3,160 (10.19)	
Other Race	3,203 (6.64)	902.00 (7.06)	797.00 (6.31)	1,504 (6.60)	
Education, n (%)					< 0.001
Less than high school	8,224 (14.99)	3,085 (19.78)	1,912(13.29)	3,227 (13.39)	
High school graduate	8,042 (23.55)	2,397 (25.76)	2,051 (22.95)	3,594 (22.71)	
Some college or AA degree	10,281 (31.61)	2,727 (29.98)	2,748 (32.51)	4,806 (31.98)	
College graduate or above	8,049 (29.80)	1,773 (24.41)	2,272 (31.20)	4,004 (31.88)	
Poverty income ratio, n (%)					< 0.001
< 130%	9,588 (19.89)	3,157(24.23)	2,335 (18.50)	4,096 (18.41)	
≥ 130%	22,370 (80.11)	5,931(75.77)	5,972 (81.50)	10,467 (81.59)	

BMI, kg/m ²	29.05 ±0.08	29.30±0.11	28.95 ±0.11	28.97±0.10	
BMI, kg/m ² (group)					< 0.001
< 25	9,896 (30.04)	2,614 (29.47)	2,609 (29.83)	4,673 (30.47)	
25 - 30	11,505 (32.91)	3,245 (31.00)	3,080 (34.39)	5,180 (33.09)	
≥ 30	13,224 (37.04)	4,132 (39.53)	3,301 (35.78)	5,791 (36.44)	
Overweight					0.3
No	9,788 (29.68)	2,583 (29.14)	2,576 (29.33)	4,629 (30.16)	
Yes	24,837 (70.32)	7,408 (70.86)	6,414 (70.67)	11,015 (69.84)	
Obesity					< 0.001
No	21,294 (62.65)	5,829 (60.14)	5,660 (63.95)	9,805 (63.25)	
Yes	13,331 (37.35)	4,162 (39.86)	3,330 (36.05)	5,839 (36.75)	
Physical activity, n (%)					< 0.001
Inactive	6,677 (17.45)	2,329 (21.39)	1,681 (16.85)	2,667 (15.71)	
Insufficiently active	5,548 (17.92)	1,540 (16.56)	1,499 (18.54)	2,509 (18.29)	
Sufficiently active	19,207 (64.63)	5,127 (62.05)	5,007 (64.61)	9,073 (66.00)	

* Data are presented incorporating sample weights and adjusted for clusters and strata of the complex sample design of the National Health and Nutrition Examination Survey (2003-2018).

† Values are presented as mean ± SE for continuous variables and unweighted numbers (weighted %) for categorical variables.

Abbreviations: AA, Associate of Arts; BMI, body mass index

Comment 15:

“Page 19- expand on what you mean by “selection” when discussing education and BMI”

Response 15:

Thanks for your suggestion. As suggested by the reviewer, we explained “selection” as follows : “
Theories of selection note that low-BMI children tend to have higher grades and test scores and better chances of completing secondary and tertiary education.”

Comment 16:

“Page 19- lines 51-onwards- there is not much data on covid-19 and BMI, it is too soon to even determine this, so say it is yet to be examined, instead of “not fully understood.” Make a suggestion that this aspect needs to be examined.”

Response 16:

Thanks for your suggestion. As suggested by the reviewer, we have corrected the sentence into “**The effects of the COVID-19 global pandemic on BMI and prevalence of obesity are yet to be examined.**” We also made a suggestion as follows :“ **Especially, the potential impact of the COVID-19 pandemic on socio-economic and physical activity status requires more attention.**”

Comment 17:

“Try to make your limitations and strengths more explicit.”

Response 17:

Thanks for your suggestion. As suggested by the reviewer, we have corrected the strengths and limitations as follows :

Strengths and limitations of this study

- 1.Our present study used a larger sample size as well as a longer time span.
- 2.Although NHANES is designed to provide nationally representative estimates, it is a repeated cross-sectional survey, which precludes within-individual change in BMI or obesity.

3. Our study assessed annual change in BMI and obesity, and the potential effects of the financial crisis around 2009 among US adults.

4. Obesity was defined mainly based on measurements of BMI, which does not measure body fat directly.

Comment 18:

“Seems like more women than men are obese based on figures, expand on why you think this is so”

Response 18:

Thanks for your suggestion. As suggested by the reviewer, We discuss this as follows: “ Our results also show that women had a higher prevalence of obesity than men. This may be due to estrogen-reducing postprandial fatty acid oxidation, leading to an increase in body fat. Meanwhile, It was less likely for women to be physically active than for men.”

Comment 19:

“Educational levels seem to favor the college graduates as less overweight and obese. See comment on what you mean by “selection”

Response 19:

Thank you for the detailed review. Theories of selection note that low-BMI children tend to have higher grades and test scores, and better chances of completing secondary and tertiary education. This is partly because low-BMI children tend to come from socioeconomically advantaged families.

Comment 20:

“Conclusion

Needs a lot of work. Give one main take home message for each variable in the same order in which you discussed them in the paper. After this is done, you can also add this to your abstract.”

Response 20:

Thanks for your suggestion. As suggested by the reviewer, we have rewrote the conclusion as follows :“Although the prevalence of adult obesity continues to rise, there have been no significant changes in the rising rate of adult obesity prevalence between 2003-2004 and 2017-2018. In 2017-2018,the prevalence of obesity was 42.8%, which puts 76 million Americans at risk for serious and costly chronic conditions. The prevalence of overweight and obesity varied significantly by age, sex, race, education, daily total energy intake, economic conditions, and physical activity status.”

Comment 21:

“References are up to date for the most part.”

Response 21:

Thank you for the detailed review. We would like to thank you again for your careful reading, helpful comments, and constructive suggestions, which have significantly improved the presentation of our manuscript.

Reply to Reviewer #2

Dear Reviewer,

Thank you for your thoughtful comments and for having provided us with the opportunity to resubmit a revised manuscript. And we hope the revised manuscript could be acceptable for you.

Comments:

Trends in BMI, obesity, and overweight among adults in the US, NHANES 2003-2018

Li et al.

Intro

- Several instances where subject-verb agreement is not happening (e.g., “obesity rates has been on the rise”)

- o Page 5, Line 6/7 and Line 12

- Fragment sentences – Page 5, Line 24-25

Methods

- Typo “from through” – Page 6, Line 46

- Statistical Analysis

o Page 7, Line 22- technically overweight is classified as BMI \geq 25 and BMI $<$ 30 and does **NOT** include obesity. Overweight and obesity are usually reported as mutually exclusive categories- see here- <https://www.cdc.gov/obesity/basics/adult-defining.html>. I see in Results that you report the prevalence of overweight, including obesity. If you keep this, please clarify in methods **“We defined overweight, including obesity, as BMI \geq 25; and obesity as \geq 30.”**

o When you reference “obesity and overweight”, I suggest rearranging to say “overweight and obesity” since overweight is first ordinally and obesity is more extreme.

Results

- Page 9, Line 7- You say that 65% of adults reported meeting PA guidelines. Is this consistent with NCHS reports using NHANES data? From what I have read, I think that this is an over- estimate. Potentially something to discuss in Discussion <https://www.cdc.gov/nchs/fastats/exercise.htm>

- Your overall estimate (42.8%) is nearly identical to what NCHS reports so that is good- <https://www.cdc.gov/nchs/products/databriefs/db360.htm>. Same with prevalence of overweight (which includes obesity as well); NHANES 2017-2018 estimate was 73.6%- <https://www.cdc.gov/nchs/fastats/obesity-overweight.htm>

Discussion

- Typo Page 17, Line 20. “20013” should be 2003
- Type Page 17, Line 48. “From” should be lower-case
- The first sentence of Discussion- the fact that US adult obesity prevalence increased from 2003 to 2018 is well-established <https://www.cdc.gov/nchs/data/databriefs/db360-h.pdf>.
- Page 19, Line 38-42 more fragments sentences. Please read and ensure you use complete sentences throughout this paper
- Discussion pages 18-19- The pieces about change in dietary intake over time and potential hypotheses are interesting

- Last paragraph- the one about COVID-19- I would mention that NHANES does not have data through March 2020; they combined the 2017-2018 cycle with the 2019-Mar2020 cycle so that the data remained nationally representative. Still, your point remains true that NHANES does not have data during the pandemic, unfortunately.

Conclusion

- Overall weak concluding statement that does not contain any information on implications (e.g., this puts X million Americans at risk for serious and costly chronic conditions, etc.) or why this information/paper is actually important to the field, whether that be clinical, epidemiological, etc.

Comment 1:

“Intro

- Several instances where subject-verb agreement is not happening (e.g., “obesity rates has been on the rise”)

- o Page 5, Line 6/7 and Line 12

- Fragment sentences – Page 5, Line 24-25 ”

Response 1:

Thank you for the detailed review. we have corrected the sentence into “**Obesity is one of the most common risk factors for chronic diseases...**”, “**obesity rate has been on the rise since ...**” and “**The prevalence of obesity increased from 22.9% to 30.5%...**”.

Comment 2:

“Methods

- Typo “from through” – Page 6, Line 46

- Statistical Analysis

o Page 7, Line 22- technically overweight is classified as BMI \geq 25 and BMI $<$ 30 and does **NOT** include obesity. Overweight and obesity are usually reported as mutually exclusive categories- see here- <https://www.cdc.gov/obesity/basics/adult-defining.html>. I see in Results that you report the prevalence of overweight, including obesity. If you keep this, please clarify in methods **“We defined overweight, including obesity, as BMI \geq 25; and obesity as \geq 30.”**

o When you reference “obesity and overweight”, I suggest rearranging to say “overweight and obesity” since overweight is first ordinally and obesity is more extreme. ”

Response 2:

Thanks for your suggestion. we have corrected the sentence into **“Data on physical activity was obtained from the physical activity questionnaire.”**

As suggested by the reviewer, we have corrected the sentence into **“We defined overweight, including obesity, as BMI \geq 25 kg/m²; and obesity as \geq 30 kg/m²”.**

As suggested by the reviewer, we have used “overweight and obesity” to replace “obesity and overweight” in the manuscript.

Comment 3:

“Results

- Page 9, Line 7- You say that 65% of adults reported meeting PA guidelines. Is this consistent with NCHS reports using NHANES data? From what I have read, I think that this is an over- estimate. Potentially something to discuss in Discussion <https://www.cdc.gov/nchs/fastats/exercise.htm>
- Your overall estimate (42.8%) is nearly identical to what NCHS reports so that is good- <https://www.cdc.gov/nchs/products/databriefs/db360.htm>. Same with prevalence of overweight (which includes obesity as well); NHANES 2017-2018 estimate was 73.6%- <https://www.cdc.gov/nchs/fastats/obesity-overweight.htm>”

Response 3:

Thank you for the detailed review. As reported by NCHS, 53.3% of adults aged 18 and over met the Physical Activity Guidelines for aerobic physical activity in 2018. The NCHS estimates were limited to leisure-time physical activity only. Our estimates were based on the Global Physical Activity Questionnaire, including both daily activities (work activities) and leisure time activities. For this reason, our estimates were larger than those reported by NCHS reports. We also explained this in Discussions.

Thank you for the detailed review. In our study, all statistical analyses were computed using survey commands of R software to incorporate sample weights and adjust for clusters and strata of the complex sampling design. Therefore, the overall estimates of the prevalence of overweight (including obesity) and obesity are nearly identical to what NCHS reports.

Comment 4:

“Discussion

- Typo Page 17, Line 20. “20013” should be 2003”

Response 4:

Thank you for the detailed review. we have corrected the word into “2003”.

Comment 5:

- “• Type Page 17, Line 48. “From” should be lower-case”

Response 5:

Thank you for the detailed review. we have corrected the word into “from”.

Comment 6:

“• The first sentence of Discussion- the fact that US adult obesity prevalence increased from 2003 to 2018 is well-established <https://www.cdc.gov/nchs/data/databriefs/db360-h.pdf>. ”

Response 6:

Thank you for the detailed review. We have corrected the sentence into “ **Our present study showed that the prevalence of obesity among American adults increased from 32.3% in 2003-2004 to 42.8% in 2017-2018. These results are in fact broadly consistent with the results reported by National Center for Health Statistics (NCHS).** ”

Comment 7:

“• Page 19, Line 38-42 more fragments sentences. Please read and ensure you use complete sentences throughout this paper ”

Response 7:

Thank you again for your suggestion to improve the quality of our manuscript. We have corrected the sentence into “ **In addition, the study used a large nationally representative sample of adults from the United States.**” We feel sorry for our poor writing, however, we do invite a friend of ours who is fluent in English to help polish our article. And we hope the revised manuscript could be acceptable for you.

Comment 8:

“• Discussion pages 18-19- The pieces about change in dietary intake over time and potential hypotheses are interesting”

Response 8:

we evaluated the levels of mean BMI and prevalence of overweight and obesity according to total daily energy intake tertiles. Data were shown in Table S2, Table S3, Table S4, and Table S8.

Interestingly, participants in the highest daily total energy intake tertile had the lowest BMIs compared with those in the lowest daily total energy intake tertile (28.97 kg/m² vs. 29.30 kg/m²). The findings were similar for the prevalence of obesity (36.7% vs. 39.9%) and overweight (69.8% vs. 70.9%).

Thus, we analyzed the characteristics of the participants according to tertiles of daily total energy intake (Table S8). Compared with those in the lowest daily total energy intake tertile, participants in the highest daily total energy intake tertile had higher proportions of Non-Hispanic Whites and individuals who were college educated (college degree or higher), sufficiently physically active, and had good economic status. This might in part be related to the lower BMI and prevalence of obesity. We have also addressed this point in the Discussion section.

Comment 9:

“Last paragraph- the one about COVID-19- I would mention that NHANES does not have data through March 2020; they combined the 2017-2018 cycle with the 2019-Mar2020 cycle so that the data remained nationally representative. Still, your point remains true that NHANES does not have data during the pandemic, unfortunately.”

Response 9:

Thank you for the detailed review. Unfortunately, information about anthropometric measurements in NHANES after 2018 has not been released. we will continue to focus on this aspect.

Comment 10:

“Conclusion

- Overall weak concluding statement that does not contain any information on implications (e.g., this puts X million Americans at risk for serious and costly chronic conditions, etc.) or why this information/paper is actually important to the field, whether that be clinical, epidemiological, etc.”

Response 10:

Thank you for the detailed review. As suggested by the reviewer, we have rewrote the conclusion as follows :“Although the prevalence of adult obesity continues to rise, there have been no significant changes in the rising rate of adult obesity prevalence between 2003-2004 and 2017-2018. In 2017-2018,the prevalence of obesity was 42.8, **which puts 76 million Americans at risk for serious and**

costly chronic conditions. The prevalence of overweight and obesity varied significantly by age, sex, race, education, daily total energy intake, economic conditions, and physical activity status.”

VERSION 2 – REVIEW

REVIEWER	Barrett, Sheila Northern Illinois University, Department of Nutrition, Dietetics and Hospitality Administration
REVIEW RETURNED	02-Nov-2022

GENERAL COMMENTS	Efforts to correct edits from first submission are noted such as adding p-values to the abstract, naming variables on the figures. The conclusion can be expanded to include a main sentence for each variable such as age, education sex, race etc. For writing style, do not start a sentence with an abbreviation.
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REVIEWER	Pierce, Samantha CDC
REVIEW RETURNED	19-Oct-2022

GENERAL COMMENTS	<p>I apologize but the overall sentiment from my initial review remains- this information is not novel and I do not think it is very useful. We know that the prevalence of adult obesity is very high in the US and that it's higher among lower income, less educated, less active, non-white groups. And we know that the prevalence increases year over year unfortunately. This paper's aim, as presented in the abstract, is to look at trends and provide the latest adult obesity estimates; we already know this info from NCHS (using NHANES).</p> <p>I appreciate that the authors took the time to address the specific comments I made and revise the grammatical mistakes. However, I just do not see the novelty in this paper.</p> <p>RESULTS: when you talk about the prevalence of overweight, it is important to say "the prevalence of overweight, including obesity" because you are defining overweight in a non-traditional way. Typically, it is defined as BMI ≥ 25 and < 30, separately from obesity (≥ 30). It does not read smoothly as it stands when you say that the prevalence of overweight is 73.8% and the prevalence of obesity is 42.8%; you need to add "overweight, including obesity".</p> <p>CONCLUSION: I am confused when you say "there have been no significant changes in the rising rate of adult obesity prevalence between 2003-2004 and 2017-2018" In Results and Abstract you say that there is a significant increase over time, specifically 10 percentage points from 03/04 to 17/18. Please be consistent.</p>
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VERSION 2 – AUTHOR RESPONSE

Reply to Reviewer #1

Dear Reviewer,

Thank you very much for your time involved in reviewing the manuscript and your very encouraging comments on the merits.

Comments:

"I apologize but the overall sentiment from my initial review remains- this information is not novel and I do not think it is very useful. We know that the prevalence of adult obesity is very high in the US and that it's higher among lower income, less educated, less active, non-white groups. And we know that the prevalence increases year over year unfortunately. This paper's aim, as presented in the abstract, is to look at trends and provide the latest adult obesity estimates; we already know this info from NCHS (using NHANES).

I appreciate that the authors took the time to address the specific comments I made and revise the grammatical mistakes. However, I just do not see the novelty in this paper.

RESULTS: when you talk about the prevalence of overweight, it is important to say "the prevalence of overweight, including obesity" because you are defining overweight in a non-traditional way. Typically, it is defined as BMI ≥ 25 and < 30 , separately from obesity (≥ 30). It does not read smoothly as it stands when you say that the prevalence of overweight is 73.8% and the prevalence of obesity is 42.8%; you need to add "overweight, including obesity".

CONCLUSION: I am confused when you say "there have been no significant changes in the rising rate of adult obesity prevalence between 2003-2004 and 2017-2018" In Results and Abstract you say that there is a significant increase over time, specifically 10 percentage points from 03/04 to 17/18. Please be consistent.

Comment 1:

"I apologize but the overall sentiment from my initial review remains- this information is not novel and I do not think it is very useful. We know that the prevalence of adult obesity is very high in the US and that it's higher among lower income, less educated, less active, non-white groups. And we know that the prevalence increases year over year unfortunately. This paper's aim, as presented in the abstract,

is to look at trends and provide the latest adult obesity estimates; we already know this info from NCHS (using NHANES).

I appreciate that the authors took the time to address the specific comments I made and revise the grammatical mistakes. However, I just do not see the novelty in this paper.”

Response 1:

Thank you for the detailed review. The NCHS Data Brief and most of the majority of previous studies have focused on differences in the prevalence of obesity by age, sex, and race. Differences in the prevalence of obesity by other covariates such as educational level, economic status, daily total energy intake, and physical activity status have been scarcely studied. Meanwhile, our present study used a larger sample size as well as a longer time span than the previous studies. The effects of the 2008–2009 global financial crisis on economic status, physical activity status, and daily total energy intake are still unknown. Thus, our study aimed to answer the above questions.

Comment 2:

“RESULTS: when you talk about the prevalence of overweight, it is important to say "the prevalence of overweight, including obesity" because you are defining overweight in a non-traditional way. Typically, it is defined as BMI ≥ 25 and < 30 , separately from obesity (≥ 30). It does not read smoothly as it stands when you say that the prevalence of overweight is 73.8% and the prevalence of obesity is 42.8%; you need to add "overweight, including obesity.”

Response 2:

Thank you for the detailed review. As suggested by the reviewer, when we talk about the prevalence of overweight, we have add "**overweight (including obesity)**" at the appropriate place in the results.

Comment 3:

“CONCLUSION: I am confused when you say "there have been no significant changes in the rising rate of adult obesity prevalence between 2003-2004 and 2017-2018" In Results and Abstract you say

that there is a significant increase over time, specifically 10 percentage points from 03/04 to 17/18.

Please be consistent. ”

Response 3:

Thank you for the detailed review. As suggested by the reviewer, we have corrected the sentence into “Although the prevalence of adult obesity continues to rise, there have been no significant changes in **the annual growth** of adult obesity prevalence between 2003-2004 and 2017-2018.”

Reply to Reviewer #2

Dear Reviewer,

Thank you for your thoughtful comments and for having provided us with the opportunity to resubmit a revised manuscript. And we hope the revised manuscript could be acceptable for you.

Comments:

Efforts to correct edits from first submission are noted such as adding p-values to the abstract, naming variables on the figures. The conclusion can be expanded to include a main sentence for each variable such as age, education sex, race etc. For writing style, do not start a sentence with an abbreviation.

Response :

Thank you for the helpful comments. As suggested by the editor, we have rewrote the conclusion as follows :“ Although the prevalence of adult obesity continues to rise, there have been no significant changes in the annual growth of adult obesity prevalence between 2003-2004 and 2017-2018. In 2017-2018, the prevalence of obesity was 42.8%, which equates to 76 million American adults at risk for serious and costly chronic conditions. **The prevalence of obesity was higher among older adults (aged 60-69 years), females, non-Hispanic Blacks, and those who did not graduate college, were physically inactive, reported lower daily total energy intake, and had poor economic status.**