

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	To what extent does sex, age, and BMI impact medical and pharmacy costs? A retrospective cohort study involving employees in a large school district in the United States
AUTHORS	Merrill, Ray; Fowers, Rylan

VERSION 1 - REVIEW

REVIEWER	Agnieszka Chwałczyńska, PhD Poland, Department of Human Biology Faculty of Physiotherapy University School of Physical Education in Wrocław
REVIEW RETURNED	18-Jun-2018

GENERAL COMMENTS	<p>The problem of overweight and obesity becomes not only a medical problem, but also an economic problem. On the one hand, it is a powerful source of income for pharmaceutical companies, on the other hand, a huge burden on healthcare, insurers or people with overweight and obesity. Health complications associated with excessive body weight generate absenteeism, additional medical costs and even the need for hospitalization. The article presented for review is an interesting supplement to the knowledge about problems resulting from overweight and obesity, which we often forget in medical publications. However, in order for the article to constitute a source of knowledge, it should meet the conditions for carrying out research projects and this has been omitted.</p> <p>Main reservations:</p> <p>The article requires mainly a correction in the field of methodology.</p> <p>Work methodology</p> <p>1. Lack of characterization of the study group - the studied group has not been characterized in terms of sex, age, body weight, BMI (on which the whole article is based), comorbidities that generate pharmaceutical costs. We do not know anything about the size of individual groups, why the division into 3 groups with respect to BMI has been applied, what with the BMI values <18.5 [kg / m²]. We know that the study was attended by the employees of the schools - what was the nature of their work, whether there were teachers among the respondents - what was their work experience - it also generates pharmaceutical costs resulting from the nature of work with the student (occupational diseases, greater contact with the child, seasonal diseases ...). Lack of information about medical history, especially chronic diseases requiring constant administration of medicines, recent illnesses, hospitalizations, medical checks</p>
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	<p>2. In my opinion, the research should include a division not only due to BMI but also to age and gender. An important information is the age of the respondents because the demand for medicines increases with age and not only with body weight.</p> <p>3. In the methods the authors give information about the tests - body mass, blood pressure, cholesterol and glucose. However, it is not known how they were carried out (especially blood tests) or were one-off studies since the program began in the school year 2010/2011 and ended in 2013/2014. What were these tests used for, what were their results, or whether they were excluded from the study group.</p> <p>4. In the Methods section, the lack of information whether the amount of pharmaceutical expenditure included prescription drugs or are generally available "over-the-counter" drugs, no breakdown into drugs and dietary supplements that can be used, e.g., for osteoporosis, gastric reflux</p> <p>5. Lack of information about employee health insurance, what its form was or whether it included reimbursement of medicines; what was the social status of the surveyed employees - the family, the amount of income, when determining the expenses for pharmaceuticals is a very important element.</p> <p>Results</p> <p>1. Results presented vaguely, no information what the tables contain, since the tables present results for men and women, why there is no comparison of statistical significance</p> <p>2. It is a pity that the results in Tables 2, 3 and 4 have not been divided according to gender, that in division 1 such a division has been proposed, and although there are no materiality results, the differences are.</p> <p>3. Lack of correlation between the amount of medicines and the amount of financial outlays with age, BMI or body weight</p> <p>Discussion</p> <p>The discussion is partly a repetition of the results. In the discussion, the authors refer to the non-reported correlation results. The discussion seems unfinished, lack of any summary</p> <p>NO APPLICATIONS</p> <p>The article requires a recast with regard to the remarks indicated</p>
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REVIEWER	Dr Meng-Wong Taing School of Pharmacy, The University of Queensland
REVIEW RETURNED	17-Aug-2018

GENERAL COMMENTS	<p>This is a well written, interesting and valuable retrospective analysis that adds to the literature regarding associations between medication use and BMI.</p> <p>A few points to consider within your manuscript:</p> <p>Introduction</p> <p>1) pg. 2 line 41: Should this read as "This study shows an association between BMI and pharmaceutical use and costs...?"</p> <p>2) Can you provide a reference for sentence on pg.5 line 10 "32 more commonly prescribed medications"...</p> <p>Methods</p> <p>3) Are there medications within specific drug classes (e.g. antifungal) that can be bought 'over the counter' from a pharmacy -</p>
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that is not recorded on Pharmaceutical claims data and hence left out of the analysis? Potential limitation?

4) What are the characteristics/demographics of non-continuously employed participants? Are these different from those continuously employed? ie. is this sample representative of the population sampled from?

5) In your analysis, were age and gender significant predictors for drug usage/costs? I note that in the introduction, the NHANES data found differences in medication use only in individuals aged 40 years compared to those aged 25-39 years.

Results

6) Table 3 and 4 – I believe 'blood thinner' is meant to be high cholesterol?

Also, for Table 4, can the authors please justify why mean values rather than median values for annual costs were determined for selected medications (e.g. acid reflux).

Discussion

7) pg.12 sentence 11-15 the authors imply chronic inflammation compromises the immune system leading to greater risk of infection.

The cause-effect relationship between obesity and infection remains obscure/unknown, and the authors implication that chronic inflammation may lead to compromised immune system hence greater infections needs to be amended.

8) pg.12 line 20 "Some chronic inflammatory disease...influenza, edema" □ are these chronic inflammatory diseases?

I couldn't see influenza medication use listed in Table 3 or 4.

9) pg.12 line 39 "Because vaccination is less successful for obese individuals, a greater level of medication may be sought for treating colds, flu and allergies." Can this be supported by any studies/evidence other than a drawn tentative assumption?

10) pg.13 line 20 "Obese individuals filed more claims for vitamins and minerals. Previous research has associated low vitamin B1 with being overweight or obesity."(ref.73)

The authors study does not show any differences between overweight vs normal weight vitamin fills. Can you possibly explain/account for differences between your study and that referenced?

11) pg 13. Final paragraph: It would be interesting to see comparative vitamin B and D dispensings between obese and normal weight as a proportion of the cohorts (categorised by bmi) to support any associations are drawn between vitamin b and d fills and the different cohorts.

REVIEWER	Qing Wang Dalian University of Technology
REVIEW RETURNED	10-Oct-2018

GENERAL COMMENTS	<p>The manuscript aims to estimate the association of obesity and prescribed medication. A well-established link between obesity and health status has been established. Little is known about its impacts on healthcare expenditure. Therefore, it is an interesting topic. However, I am not sure the manuscript has figured out some convincing conclusion.</p> <p>The sample consists of the voluntary employees participating for wellness screening, which implies that a potential selection bias could exist. Those who choose not to be part of the screening programs may be more likely to have a worse health status. Heckman selection model could be applied to solve the issue. I think it is a descriptive study. Since it is a panel data, I am wondering why don't take advantage of it.</p> <p>The medication estimated in the study includes the mediation for treatment and prevention, which may have different meanings. There may be very interesting to disentangle the two and discuss more. In addition, I think policy implication should be extended in the discussion section.</p> <p>Page 7 line 10 "we will adjust for these variables," "will adjust" should be "adjusted".</p> <p>Since I am not familiar with the clinical aspects of the manuscript, I cannot comment more.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

Reviewer: 1

Reviewer Name: Agnieszka Chwałczyńska, PhD

Institution and Country: Poland, Department of Human Biology, Faculty of Physiotherapy, University School of Physical Education in Wrocław

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

Review

The problem of overweight and obesity becomes not only a medical problem, but also an economic problem. On the one hand, it is a powerful source of income for pharmaceutical companies, on the other hand, a huge burden on healthcare, insurers or people with overweight and obesity. Health complications associated with excessive body weight generate absenteeism, additional medical costs and even the need for hospitalization. The article presented for review is an interesting supplement to the knowledge about problems resulting from overweight and obesity, which we often forget in medical publications. However, in order for the article to constitute a source of knowledge, it should meet the conditions for carrying out research projects and this has been omitted.

Main reservations

The article requires mainly a correction in the field of methodology.

Work methodology

1. Lack of characterization of the study group - the studied group has not been characterized in terms of sex, age, body weight, BMI (on which the whole article is based), comorbidities that generate pharmaceutical costs. We do not know anything about the size of individual groups, why the division into 3 groups with respect to BMI has been applied, what with the BMI values <18.5 [kg / m²]. We know that the study was attended by the employees of the schools - what was the nature of their work, whether there were teachers among the respondents - what was their work experience - it also generates pharmaceutical costs resulting from the nature of work with the student (occupational diseases, greater contact with the child, seasonal diseases ...). Lack of information about medical history, especially chronic diseases requiring constant administration of medicines, recent illnesses, hospitalizations, medical checks

Response: Paragraphs 1 and 3 now introduce two new tables that characterize the study group according to sex, age, year, and BMI. The second table and a new figure shows the relationship between medical and pharmacy costs and sex, age, year, and BMI. In addition, the following was added to the first paragraph of the Methods: "Employees consisted of approximately three teachers to every one staff member (cooks, bus drivers, grounds keepers, maintenance workers, administrators, clerical workers, etc.). We were not provided specific job type and salary for each employee. However, we can assume that the teachers, administrators, counselors, and nurses, who represent almost all of the employees, had at least a college degree, that their salaries are commensurate with other school districts, and that the employer-sponsored insurance coverage was not strongly impacted by the employee's income or education."

2. In my opinion, the research should include a division not only due to BMI but also to age and gender. An important information is the age of the respondents because the demand for medicines increases with age and not only with body weight.

Response: This is now done in Tables 2-4.

3. In the methods the authors give information about the tests - body mass, blood pressure, cholesterol and glucose. However, it is not known how they were carried out (especially blood tests) or were one-off studies since the program began in the school year 2010/2011 and ended in 2013/2014. What were these tests used for, what were their results, or whether they were excluded from the study group.

Response: The paragraph now says: "All employees were offered wellness screening. Although participation was voluntary, it was promoted through incentives. The HRA involved 36 questions. Biometric screenings involved measurements of body mass index (BMI kg/m²), blood pressure (mm Hg), cholesterol (mg/dL), and glucose (mg/dL). The HRA and biometric screenings were provided at no cost to the employees, and were made available on location or with a personal physician. A health nurse or physician assisted the employee in interpreting their HRA and screening results, in order to help guide their need for lifestyle changes and control measures. The current study only considers BMI. Weight classifications are based on commonly accepted ranges of BMI, as follows: underweight (BMI < 18.5), normal weight (BMI 18.5-24), overweight (BMI 25-29), obese (BMI 30-39), and morbidly obese (BMI 40+)."

4. In the Methods section, the lack of information whether the amount of pharmaceutical expenditure included prescription drugs or are generally available "over-the-counter" drugs, no breakdown into drugs and dietary supplements that can be used, e.g., for osteoporosis, gastric reflux

Response: In the revised paragraph describing the medical and pharmacy claims data we now say: "Employee pharmacy data do not include over-the-counter drugs, but only those medications requiring a prescription."

5. Lack of information about employee health insurance, what its form was or whether it included reimbursement of medicines; what was the social status of the surveyed employees - the family, the amount of income, when determining the expenses for pharmaceuticals is a very important element.

Response: The following was added to the section Medical and Pharmacy Claims Data: "All active employees received employer-sponsored medical and pharmacy coverage, for themselves and their families. The school district is fully insured with a retained-retention agreement that makes the plan act very much like a self-funded health plan. Each month the district pays a health insurance premium for the cost of healthcare and a small premium for reinsurance of catastrophic claims. Catastrophic claims greater than \$250,000 are reinsured by a stop loss policy and are not paid for by the school district. Employee pharmacy data do not include over-the-counter drugs, but only those medications requiring a prescription. In the United States, a drug is sold over-the-counter if the Food and Drug Administration deems it as sufficiently safe and effective. These medications are not included in the current study. Further, medical and pharmacy cost represents the amount paid by the insurance company as well as copays by the employee."

Results

1. Results presented vaguely, no information what the tables contain, since the tables present results for men and women, why there is no comparison of statistical significance

Response: The results are now clear and more informative. The tables present information on sex, age, year, and BMI, and include tests of statistical significance.

2. It is a pity that the results in Tables 2, 3 and 4 have not been divided according to gender, that in division 1 such a division has been proposed, and although there are no materiality results, the differences are.

Response: The results and tables now provide this information.

3. Lack of correlation between the amount of medicines and the amount of financial outlays with age, BMI or body weight.

Response: This is now reflected in Table 3 and Figure 1.

Discussion

The discussion is partly a repetition of the results. In the discussion, the authors refer to the non-reported correlation results. The discussion seems unfinished, lack of any summary

NO APPLICATIONS

The article requires a recast with regard to the remarks indicated

Response: Throughout the Discussion we have done a better job summarizing findings. In addition, a Conclusion was added to the paper.

Reviewer: 2

Reviewer Name: Dr Meng-Wong Taing

Institution and Country: School of Pharmacy, The University of Queensland

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

This is a well written, interesting and valuable retrospective analysis that adds to the literature regarding associations between medication use and BMI.

A few points to consider within your manuscript:

Introduction

1) pg. 2 line 41: Should this read as "This study shows an association between BMI and pharmaceutical use and costs..."?

Response: The sentence was modified, as suggested.

2) Can you provide a reference for sentence on pg.5 line 10 "32 more commonly prescribed medications"...

Response: The following reference was added: Fuentes AV, Pineda MD, Venkata KCN. Comprehension of top 200 prescribed drugs in the US as a resource for pharmacy teaching, training and practice. Pharmacy (Basel). 2018;6(2):E43.

Methods

3) Are there medications within specific drug classes (e.g. antifungal) that can be bought 'over the counter' from a pharmacy - that is not recorded on Pharmaceutical claims data and hence left out of the analysis? Potential limitation?

We have added: "Employee pharmacy data do not include over-the-counter drugs, but only those medications requiring a prescription. In the United States, a drug is sold over-the-counter if the Food and Drug Administration deems it as sufficiently safe and effective. These medications are not included in the current study."

4) What are the characteristics/demographics of non-continuously employed participants? Are these different from those continuously employed? ie. is this sample representative of the population sampled from?

Response: The first paragraph of the Results and a new Table 1 were added to address this question.

5) In your analysis, were age and gender significant predictors for drug usage/costs? I note that in the introduction, the NHANES data found differences in medication use only in individuals aged 40 years compared to those aged 25-39 years.

Response: This is now answered by the results in Tables 1-3.

Results

6) Table 3 and 4 – I believe 'blood thinner' is meant to be high cholesterol?

Response: Blood thinner was combined under high cholesterol in the revised version of the paper.

Also, for Table 4, can the authors please justify why mean values rather than median values for annual costs were determined for selected medications (e.g. acid reflux).

Response: Median values are now presented in Table 2. The old Table 4 was deleted.

Discussion

7) pg.12 sentence 11-15 the authors imply chronic inflammation compromises the immune system leading to greater risk of infection. The cause-effect relationship between obesity and infection remains obscure/unknown, and the authors implication that chronic inflammation may lead to compromised immune system hence greater infections needs to be amended.

Response: This was dropped from the Discussion.

8) pg.12 line 20 “Some chronic inflammatory disease...influenza, edema” □ are these chronic inflammatory diseases? I couldn’t see influenza medication use listed in Table 3 or 4.

Response: We dropped the word “chronic”. In addition, we now consistently use the word “influenza” instead of “flu.”

9) pg.12 line 39 “Because vaccination is less successful for obese individuals, a greater level of medication may be sought for treating colds, flu and allergies.” Can this be supported by any studies/evidence other than a drawn tentative assumption?

Response: Yes, two papers have shown this result, which are now included in the paper, as cited at the end of this.

10) pg.13 line 20 “Obese individuals filed more claims for vitamins and minerals. Previous research has associated low vitamin B1 with being overweight or obesity.”(ref.73) The author’s study does not show any differences between overweight vs normal weight vitamin fills. Can you possibly explain/account for differences between your study and that referenced?

Response: The challenge in addressing this question is because we did not have information on purchases of over-the-counter vitamins. Hence, we now address the limitations of drawing conclusions here in the final paragraph of the paper.

11) pg 13. Final paragraph: It would be interesting to see comparative vitamin B and D dispensings between obese and normal weight as a proportion of the cohorts (categorised by bmi) to support any associations are drawn between vitamin b and d fills and the different cohorts.

Response: Our ability to pursue this interesting question was limited because of small numbers and since we did not have information on over the counter consumption of vitamin B and D. We now address this limitation in the final paragraph of the paper.

Reviewer: 3

Reviewer Name: Qing Wang

Institution and Country: Dalian University of Technology

Please state any competing interests or state ‘None declared’: None declared

Please leave your comments for the authors below

The manuscript aims to estimate the association of obesity and prescribed medication. A well-established link between obesity and health status has been established. Little is known about its impacts on healthcare expenditure. Therefore, it is an interesting topic. However, I am not sure the manuscript has figured out some convincing conclusion.

The sample consists of the voluntary employees participating for wellness screening, which implies that a potential selection bias could exist. Those who choose not to be part of the screening programs may be more likely to have a worse health status. Heckman selection model could be applied to solve the issue.

Response: Although participation was voluntary, over 80% of employees participated. This is noted in the second paragraph of the Results. There is no evidence that those who initially chose wellness screening were healthier. The following was added to the second paragraph of the Results: "In 2010-11, there was no significant difference in mean medical cost between those who participated and those who did not in wellness screening (\$3148 vs. \$2571, $p = 0.2900$). However, median medical cost was significantly greater for those who participated in wellness screening (\$588 vs. \$470, $p = 0.0454$).

I think it is a descriptive study. Since it is a panel data, I am wondering why don't take advantage of it.

Response: Medical and pharmacy costs are now evaluated by academic year (see Table 2).

The medication estimated in the study includes the medication for treatment and prevention, which may have different meanings. There may be very interesting to disentangle the two and discuss more. In addition, I think policy implication should be extended in the discussion section.

Response: The following was added to the Discussion: "Despite mean medical costs being similar for those who participated in wellness screening during the first year of the study, over the four academic years, participants in wellness screening ended up having significantly lower mean medical costs. However, pharmacy costs did not go down. It has been shown that wellness screening can cause the number and cost of pharmaceuticals to go up, at least initially, as the need for treatment is identified.⁸⁷ Needed treatment can then, in turn, help prevent more costly health problems in the future. For example, medications used to treat high blood pressure can result in lowering the risk of diabetes, heart disease, stroke and kidney disease; treatment of insomnia can help lower the risk of irritability, depression or anxiety, difficulty paying attention, and accidents due to increased errors; treatment of high cholesterol with statins can help lower the risk of cardiovascular disease; treatment of oral infections can help reduce the risk of diabetes, cardiovascular disease, and preterm birth; and vitamins/minerals can help prevent a host of diseases (scurvy, rickets, anemia, neural tube defects, pellagra, etc.). High blood pressure and statin medications were among the highest prescribed in our study."

Page 7 line 10 "we will adjust for these variables," "will adjust" should be "adjusted".

Response: We now use "adjusting" or "adjusted" in the paper.

Since I am not familiar with the clinical aspects of the manuscript, I cannot comment more.

VERSION 2 – REVIEW

REVIEWER	Agnieszka Chwałczyńska, PhD Associate Professor Department of Human Biology Faculty of Physiotherapy University School of Physical Education in Wrocław Poland
REVIEW RETURNED	05-Dec-2018

GENERAL COMMENTS	In Table 2, explain what A and B mean
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REVIEWER	Dr Meng-Wong Taing The University of Queensland, Australia
REVIEW RETURNED	25-Nov-2018

GENERAL COMMENTS	pg./line numbers to be entered for the Strobe Checklist. Results 6) Table 3 and 4 – I believe 'blood thinner' is meant to be high cholesterol? Response: Blood thinner was combined under high cholesterol in the revised version of the paper. Reviewer recommendation: By combining blood thinner drugs with high cholesterol drugs (statins) may potentially confound results when determining the Attributable Fraction - suggestion not to combine these drug classes.
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REVIEWER	Qing Wang, Dr. Dalian University of Technology, China.
REVIEW RETURNED	15-Dec-2018

GENERAL COMMENTS	I am still concerned about the sample selection issue. As author mentioned, those more likely to remain employed are older, and age could be an important factor of medical costs. Another thing I would like to mention is the design of panel data. I am afraid authors are not taking fully advantage of the panel data design to adjust unobserved variables.
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VERSION 2 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

Reviewer: 2

Reviewer Name: Dr Meng-Wong Taing

Institution and Country: The University of Queensland, Australia

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

pg./line numbers to be entered for the Strobe Checklist.

Results

6) Table 3 and 4 – I believe ‘blood thinner’ is meant to be high cholesterol?

Response: Blood thinner was combined under high cholesterol in the revised version of the paper.

Reviewer recommendation: By combining blood thinner drugs with high cholesterol drugs (statins) may potentially confound results when determining the Attributable Fraction - suggestion not to combine these drug classes.

Response: Blood thinner drugs were and statins are now presented separately in the paper (Table 4).

Reviewer: 1

Reviewer Name: Agnieszka Chwałczyńska, PhD Associate Professor

Institution and Country: Department of Human Biology

Faculty of Physiotherapy

University School of Physical Education in Wrocław

Poland

Please state any competing interests or state ‘None declared’: None declared

Please leave your comments for the authors below

In Table 2, explain what A and B mean

Response: The footnote of the table includes the statement “Different letters in the SNK columns indicate significant difference among the levels of the variables at the 0.05 level.”

Reviewer: 3

Reviewer Name: Qing Wang, Dr.

Institution and Country: Dalian University of Technology, China.

Please state any competing interests or state ‘None declared’: None

Please leave your comments for the authors below

I am still concerned about the sample selection issue. As author mentioned, those more likely to remain employed are older, and age could be an important factor of medical costs.

Response: The last paragraph of the Discussion now says “A limitation of this study involves external validity (generalizability). Specifically, the study only considered those individuals who remained employed over all four academic years. These people were generally healthier and in the age range 40-59.” Also, at the start of the results we specify that it was both the youngest and oldest age groups who were less likely to remain employed over all four academic years.

Another thing I would like to mention is the design of panel data. I am afraid authors are not taking fully advantage of the panel data design to adjust unobserved variables.

Response: Our analyses of BMI, medical costs, and pharmacy costs over time showed no significant change (Table 2). Therefore, in order to improve the power of the study, we chose to combine all four years of data. This was particularly important in our assessment of selected medication use according to sex, age, and BMI weight classification (Table 4). That is, for some of the medications considered, the numbers across the levels of these variables were too small for assessment in any given year.

VERSION 3 - REVIEW

REVIEWER	Dr Meng-Wong Taing School of Pharmacy, The University of Queensland, Australia
REVIEW RETURNED	07-Feb-2019

GENERAL COMMENTS	<p>Abstract: Conclusion: Authors consider rephrasing "Lowering medical and pharmacy costs requires weight management in older ages, particularly for underweight and obese men and women" TO "Lowering medical and pharmacy costs requires weight management in older ages, particularly for underweight and obese" --> ie. were men and women equally represented in the underweight and obese categories?</p> <p>Regarding sentence: "Medical costs were significantly reduced, likely due to effective drug treatment and prevention."</p> <p>Was this finding reported in the results (if so where?), or is it a tentative assumption? Authors may consider adding more context around reduced medical costs for the benefit of the reader.</p> <p>Can the authors please add context to this statement</p>
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VERSION 3 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

Reviewer: 2

Reviewer Name: Dr Meng-Wong Taing

Institution and Country: School of Pharmacy, The University of Queensland, Australia

Please state any competing interests or state 'None declared': None

Please leave your comments for the authors below

Abstract:

Conclusion:

Authors consider rephrasing "Lowering medical and pharmacy costs requires weight management in older ages, particularly for underweight and obese men and women" TO "Lowering medical and pharmacy costs requires weight management in older ages, particularly for underweight and obese" --> ie. were men and women equally represented in the underweight and obese categories?

Response: No. The sentence now appears in the Abstract as suggested by Dr. Taing.

Regarding sentence:

"Medical costs were significantly reduced, likely due to effective drug treatment and prevention."

Was this finding reported in the results (if so where?), or is it a tentative assumption? Authors may consider adding more context around reduced medical costs for the benefit of the reader.

Can the authors please add context to this statement

Response: After further consideration, we see that this sentence is a distraction from the focus of the Abstract, and that the word limitation will not allow us to add the context needed to include this statement. Hence, we have deleted this sentence from the Abstract. The Conclusion of the Abstract now says: "Medications associated with higher medical and pharmacy costs among women, older age, and underweight or obese individuals are identified. Lowering medical and pharmacy costs requires weight management in older ages, particularly for underweight and obese. Higher pharmacy costs for certain drugs among underweight individuals may be associated with poorer nutrition."