

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	Socioeconomic status and cigarette expenditure among U.S. households: Results from 2010-2015 Consumer Expenditure Survey
<b>AUTHORS</b>	Siahpush, Mohammad; Farazi, Paraskevi; Maloney, Shannon; Dinkel, Danae; Nguyen, Minh; Singh, Gopal

### VERSION 1 – REVIEW

<b>REVIEWER</b>	Rosemary Hiscock University of Bath, UK
<b>REVIEW RETURNED</b>	22-Nov-2017

<b>GENERAL COMMENTS</b>	<p>This study replicates using USA wide survey data, what has been found elsewhere: low SES people pay more of lower incomes on tobacco. The paper has a good basis but needs tidying</p> <p>P4 line 25 Here is a study that looks at SES and tobacco expenditure in the US <a href="http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0043838">http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0043838</a></p> <p>P6 Define poverty threshold Define head of household</p> <p>P7 line 6 what do you mean by “for each CES” line 6 what sort of weights are they e.g. rake weights line 25 Do you then combine the results of the 44 subsamples into one result for the population? How? I’m not clear- did your models adjust for clustering? line 37 and elsewhere I think you mean bivariable (one outcome and one independent) not bivariate (two outcomes) line 44 If there were covariates in the model then it was not bivariable?</p> <p>Line 51 Did you check that the residuals were normal in the model with the transformed outcome? Did you check for multicollinearity?</p> <p>P8 Line 18 define average: mean, median?</p> <p>P9 Line 6 Need to state these bivariable differences were significant</p> <p>P11 (e0.57x100 – 100) and similar You need to explain these calculations in the methods – I don’t understand them</p> <p>Discussion Pictures on packaging have been found to be effective in</p>
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	<p>disadvantaged groups <a href="http://bmjopen.bmj.com/content/4/2/e004078">http://bmjopen.bmj.com/content/4/2/e004078</a>  Changing the tobacco tax structure to prevent cheap tobacco being available may stimulate quitting among low income groups  <a href="https://www.ncbi.nlm.nih.gov/pubmed/28525594">https://www.ncbi.nlm.nih.gov/pubmed/28525594</a>  <a href="http://tobaccocontrol.bmj.com/content/early/2017/10/09/tobaccocontrol-2017-053891.info">http://tobaccocontrol.bmj.com/content/early/2017/10/09/tobaccocontrol-2017-053891.info</a></p> <p>However if low income smokers don't quit the problem with increasing taxes for disadvantaged groups is that they (and their children) may miss out on other health promoting expenditure  <a 107="" 508="" 566"="" 881="" data-label="Table" href="https://watermark.silverchair.com/cyv026.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAaAwggGcBgkqhkiG9w0BBwagggGNMIBiQIBADCCAYIGCSqGSIB3DQEHTAeBglghkgBZQMEAS4wEQQMAG_2pQy3rKVk84zpAgEQgIIBU6yFgDRECzz6Yos1pU0rYsW6TzyULFFEUmP0MHXkah6wWPCgEjC6FcmHbVGERbiGM8ZOPVJovXnEP9yB692svKNZMa-NQLYr4RLYDeklvM7GXNdFiagf0M38nPtCVtpQ_oHRIU3j2zvmmdKdbhW96IEOj8-lyF6H_FxV6mJ4lOnnMJ1feg3kevqaAteB9_f5E75ZPJUQ7H60Rp_hWYuCOiKimAEcFtdt5usBfByVgi7D1XFk2Jt2orK5izJuHmZ6ce2vW16tWxbd3CS81WvEIMKeLoicSw9Ck31Udzn4WfCRHELzw1PkB4tveQPxrNvJ-X6D2YU6QgiEhwSbMrT9ZdW0C2swfYkRvPC1L--igBRWanWITUyQQjjh7SDTZlwlPdfXhm2Nazn_umOKhDZvhcBqZBc-GbV2SRmlsJ7_JukEpZIBx3GHqIUdazlttPTKiiKQ&lt;/a&gt;&lt;/p&gt; &lt;p&gt;This study is in America where Republican/ Trump ideology is that people make their own choices and bear the consequences. Why should a Republican/ Trump government do anything to help?&lt;br/&gt; Contributorship statement: This statement would normally make clear which author conducted the stata analysis&lt;/p&gt; &lt;/td&gt; &lt;/tr&gt; &lt;/table&gt; &lt;/div&gt; &lt;div data-bbox="> <table border="1"> <tr> <td data-bbox="177 1146 571 1240"><b>REVIEWER</b></td> <td data-bbox="577 1146 1399 1240">Manuja Perera Department of Public Health, Faculty of Medicine, University of Kelaniya, Sri Lanka</td> </tr> <tr> <td data-bbox="177 1240 571 1267"><b>REVIEW RETURNED</b></td> <td data-bbox="577 1240 1399 1267">25-Nov-2017</td> </tr> </table> </a></p>	<b>REVIEWER</b>	Manuja Perera Department of Public Health, Faculty of Medicine, University of Kelaniya, Sri Lanka	<b>REVIEW RETURNED</b>	25-Nov-2017
<b>REVIEWER</b>	Manuja Perera Department of Public Health, Faculty of Medicine, University of Kelaniya, Sri Lanka				
<b>REVIEW RETURNED</b>	25-Nov-2017				

<b>GENERAL COMMENTS</b>	Accept as it is
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<b>REVIEWER</b>	Charu Mathur India
<b>REVIEW RETURNED</b>	11-Dec-2017

<b>GENERAL COMMENTS</b>	<p>This paper examines (1) the association between household socioeconomic status (SES) and whether a household spends money on cigarettes, and (2) socioeconomic variations in percentage of total household expenditure spent on cigarettes among smoking households.</p> <p>The authors will have to make a much stronger argument for the contribution of their study to the literature. Several previous studies have examined the association between SES and individual level smoking. Although these authors may be one of the few to examine association between SES and expenditure on cigarettes, they need to convince the reader why this approach provides better information than simply examining association at individual level. Basically, the findings from their research questions are a logical extension of previous research on SES and individual level smoking, they do not appear to enhance our understanding of SES and household expenditure on cigarettes.</p>
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Further, the correlation between SES indicators was not reported. In addition, the implications for are relatively weak.
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## VERSION 1 – AUTHOR RESPONSE

Response to Reviewer 1

COMMENT: P4 line 25 Here is a study that looks at SES and tobacco expenditure in the US <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0043838>

RESPONSE: We thank the reviewer for bringing this article to our attention. We have mentioned it in the review of literature in the introduction (p. 4, towards the bottom of the first paragraph) and in the first paragraph of Discussion.

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COMMENT: P6 Define head of household

RESPONSE: We have provided a definition of head of household in the first paragraph in the section: “Measurement of smoking status of households and cigarette expenditure as a percentage of total household expenditure.”

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COMMENT: P7, line 6 what do you mean by “for each CES”

RESPONSE: We changed “for each CES”, to “for each CES survey quarter.” Please note that survey quarters are described in the Data section.

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COMMENT: line 6 what sort of weights are they e.g. rake weights line 25 Do you then combine the results of the 44 subsamples into one result for the population? How?

RESPONSE: These are not rake weights. They are the same kind of weights that are described in the first paragraph of the “Statistical analysis” section:

These weights were computed based on the probability of selection of a household, household non-response, and national household distribution of age, race, and region.<sup>18</sup>

We have expanded our description of the replicate weights method for computing standard errors and provided a formula in the “Statistical analysis” section as follows:

The U.S. Department of Labor also provides 44 replicate samples with accompanying sampling weights for standard error estimation.<sup>18</sup> Using replicate samples to estimate a standard error involves computing a statistic for subsets of the full study sample and examining the variability of the statistic over the subsets.<sup>26</sup> In essence, this method allows a single sample to simulate multiple samples. Replicate samples were constructed using the “balanced repeated replication” method where the sampled PSUs were divided into 44 strata and the households within each stratum were randomly divided into two half samples. CES uses a 44x44 Hadamard matrix to create the replicates in a “balanced” way.<sup>27</sup> Once the subsamples were formed, survey weights were computed for each subsample using the method described above for the weights for each CES survey quarter.

Subsequently, 44 different estimates of a statistic were generated using only one half-sample per stratum. These estimates were then used to approximate standard errors based on the standard formula for computing sample standard deviation:

$$\sigma_{\theta^{\wedge}} = \sqrt{\left( \frac{1}{44} \sum_{r=1}^{44} (\theta^{\wedge}_r - \theta^{\wedge})^2 \right)}$$

where  $\theta^{\wedge}$  is the estimated statistic based on the full sample,  $\sigma_{\theta^{\wedge}}$  is the standard error of  $\theta^{\wedge}$ , and  $\theta^{\wedge}_r$  is the  $r$ th replicate estimate of  $\theta^{\wedge}$ .

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COMMENT: I'm not clear- did your models adjust for clustering?

RESPONSE: To preserve the anonymity of participants, the CES does not provide a cluster identifier. Therefore, it is not possible to take into account clustering. Please note the following passage at the bottom of the second paragraph in the "Statistical analysis" section:

We used this data-dependent method of estimating standard errors which is especially useful when data is generated through a multi-stage sampling design and where, to preserve respondent anonymity, complete information on sample clusters or strata is not made available to researchers as is the case in CES.28

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COMMENT: line 37 and elsewhere I think you mean bivariable (one outcome and one independent) not bivariate (two outcomes)

RESPONSE: We thank the reviewer for pointing this out. We have corrected this error throughout.

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COMMENT: line 44 If there were covariates in the model then it was not bivariable?

RESPONSE: We have changed "covariates" to "each predictor."

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COMMENT: Line 51 Did you check that the residuals were normal in the model with the transformed outcome? Did you check for multicollinearity?

RESPONSE: We checked for the normality of residuals and multicollinearity and found no violation of these ordinary least squares regression assumptions in the multivariable model. We have mentioned this in the last paragraph in the "Statistical analysis" section:

We checked for the normality of residuals and multicollinearity and found no violation of these ordinary least squares regression assumptions in the multivariable model. In relation to the issue of multicollinearity, we note that the associations between poverty status and education (Kendall's tau-b=0.34), poverty status and occupation (Cramer's V = 0.27), and education and occupation (Cramer's V = 0.27) were moderate.

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COMMENT: P8 Line 18 define average: mean, median?

RESPONSE: We have replaced "average" with "mean."

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COMMENT: P9 Line 6 Need to state these bivariable differences were significant

RESPONSE: We have added that "Bivariate results also provide strong evidence that ...". We do not subscribe to making a distinction between "significant" and "non-significant" results. We believe that this distinction is arbitrary and was not the intention of the founders of statistical inference. The idea of significance testing was introduced by Fisher in 1925 in *Statistical Methods for Research Workers*. He did not advocate an absolute rule for rejecting or failing to reject a null hypothesis. He contended that the p value is an index for measuring the strength of evidence against the null hypothesis. Problems with significance testing have been noted since the early 1940s (e.g. by Berkson in 1942, Roseboom 1960, Bakan in 1966, Meehl in 1967, Freiman et al. in 1978, Schmidt and Hunter in 1997, and Sterne and Davey Smith in 2001). We believe that the p-value for a particular statistic indicates the extent (from "very little" to "overwhelming") to which the data provides evidence for an effect or association. For a review of the issues with significant testing, please see the 2001 article by Sterne and Davey Smith in the *British Medical Journal*.

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COMMENT: P11 ( $e^{0.57 \times 100} - 100$ ) and similar You need to explain these calculations in the methods – I don't understand them

RESPONSE: We have described these calculations in the "Statistical analysis" section as follows:

When the outcome is a log-transformed variable in a regression equation, the interpretation of the regression coefficients can be derived as follows. An equation with a log-transformed variable and two covariates  $X_1$  and  $X_2$  can be written as:

$$\ln(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2$$

Suppose,

$$\ln(Y_1) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \text{ (Equation 1)}$$

$$\ln(Y_2) = \beta_0 + \beta_1 [(X_1) + 1] + \beta_2 X_2 \text{ (Equation 2)}$$

Subtracting Equation 1 from Equation 2 gives:

$$[\beta_1 = \ln(Y_2) - \ln(Y_1)]$$

which can be expressed as:

$$e^{\beta_1} = 1 + (Y_2 - Y_1) / Y_1$$

It follows that a one unit increase in  $X_1$  is associated with " $e^{\beta_1} * 100 - 100$ " percentage change in  $Y$ , controlling for all other covariates.

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COMMENT: Discussion Pictures on packaging have been found to be effective in disadvantaged groups <http://bmjopen.bmj.com/content/4/2/e004078>

Changing the tobacco tax structure to prevent cheap tobacco being available may stimulate quitting among low income groups

<https://www.ncbi.nlm.nih.gov/pubmed/28525594>

<http://tobaccocontrol.bmj.com/content/early/2017/10/09/tobaccocontrol-2017-053891.info>

However if low income smokers don't quit the problem with increasing taxes for disadvantaged groups is that they (and their children) may miss out on other health promoting expenditure

[https://watermark.silverchair.com/cyv026.pdf?token=AQECAHi208BE49Ooan9khhW\\_Ercy7Dm3ZL\\_9Cf3qfKAc485ysgAAaAwggGcBqkqhkiG9w0BBwagggGNMIIBiQIBADCCAYIGCSqGSib3DQEHATAeBglghkgBZQMEAS4wEQQMAG\\_2pQy3rKVk84zpAgEQgIIBU6yFgDRECzz6Yos1pU0rYsW6TzyULFF](https://watermark.silverchair.com/cyv026.pdf?token=AQECAHi208BE49Ooan9khhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAaAwggGcBqkqhkiG9w0BBwagggGNMIIBiQIBADCCAYIGCSqGSib3DQEHATAeBglghkgBZQMEAS4wEQQMAG_2pQy3rKVk84zpAgEQgIIBU6yFgDRECzz6Yos1pU0rYsW6TzyULFF)

EUmP0MHXkah6wWPCgEjC6FcmHbVGERbiGM8ZOPVJovXnEP9yB692svKNZMa-NQLYr4RLYDeklvM7GXNdFiagf0M38nPtCVtpQ\_oHRIU3j2zvmmDkdbhW96IEOj8-lyF6H\_FxV6mJ4IOnnMJ1feg3kevqaAteB9\_f5E75ZPJUQ7H60Rp\_hWYuCOiKimAEcFtdt5usBfByVgi7D1XFK2Jt2orK5izJuHmZ6ce2vW16tWxbd3CS81WvEIMKeLoicSw9Ck31Udzn4WfCRHELzw1PkB4tveQPxrNvJ-X6D2YU6QgiEhwSbMrT9ZdW0C2swfYkRvPC1L--igBRWanWITUyQQjjh7SDTZlwLpDfXhm2Nazn\_umOKhDZvhcBqZBc-GbV2SRmletsJ7\_JukEpZIBx3GHqIUdazlttPTKiiKQ

RESPONSE: We thank the reviewer for pointing out these important articles. We note that the last URL was broken. We contacted the editorial office and they could not fix this issue and asked us to mention it in this document. We have added the following passages in the Discussion section to include the material in the articles that the reviewer has mentioned:

Moreover, there is evidence that the effectiveness of increased taxation can be undermined by the availability of cheap tobacco and that changing the tobacco tax structure for cheap tobacco may promote quitting among low income groups.<sup>40 41</sup>

Furthermore, it has been reported that plain packaging of and featuring large health warning labels on cigarette packs are associated with reduced positive brand image and intention to purchase cigarettes among socioeconomically disadvantaged smokers.<sup>44</sup>

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COMMENT: This study is in America where Republican/ Trump ideology is that people make their own choices and bear the consequences. Why should a Republican/ Trump government do anything to help?

REPOSE: We hope that the Trump administration, which has an approval rating of only 32%, is not long-lived and that the current events in the US represent only a temporary dark phase of our history.

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COMMENT: Contributorship statement: This statement would normally make clear which author conducted the stata analysis

RESPONSE: We have added to the statement that Mohammad Siahpush used Stata to conduct analysis.

Response to Reviewer 2

COMMENT: Accept as it is.

RESPONSE: None.

Response to Reviewer 3

COMMENT: The authors will have to make a much stronger argument for the contribution of their study to the literature. Several previous studies have examined the association between SES and individual level smoking. Although these authors may be one of the few to examine association between SES and expenditure on cigarettes, they need to convince the reader why this approach provides better information than simply examining association at individual level. Basically, the

findings from their research questions are a logical extension of previous research on SES and individual level smoking, they do not appear to enhance our understanding of SES and household expenditure on cigarettes.

RESPONSE: We note that examining the relationship between SES and smoking behavior versus SES and cigarette expenditure do not result in entirely similar patterns of findings. For example, while the prevalence of smoking is higher among lower income groups, these groups spend less on cigarettes, as shown in Siahpush's 2006 Australian study or Perera et al.'s 2017 study in Sri Lanka (Please, see the last paragraph in Introduction). Furthermore, while the primary implication of studies of the behavioral determinants or prevalence of smoking pertains to the deleterious health effects of smoking, the primary implication of studies of cigarette expenditure relates to the financial burden of smoking. We have added this point to the last paragraph in Introduction:

Whereas the primary implication of studies of the SES determinants of smoking pertains to the deleterious health effects of smoking and health inequalities, the primary implication of studies of cigarette expenditure relates to the financial burden of smoking.<sup>3 13-15</sup>

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COMMENT: Further, the correlation between SES indicators was not reported.

RESPONSE: We have added the following sentence to the last paragraph in the "Statistical analysis" section:

In relation to the issue of multicollinearity, we note that the associations between poverty status and education (Kendall's tau-b=0.34), poverty status and occupation (Cramer's V = 0.27), and education and occupation (Cramer's V = 0.27) were moderate.

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COMMENT: In addition, the implications for are relatively weak.

RESPONSE: We mentioned above (and in the passage added to the last paragraph in Introduction) that the main implication of studies on cigarette expenditure pertains to the financial burden of smoking. We have added the following passage to the beginning of the last paragraph in Conclusion:

Cigarette expenditure may contribute to financial deprivation and lower standards of living, which in turn can lead to unfavorable smoking behaviors and outcomes.<sup>3 4 37-39</sup> For example, financial stress is associated with a lower probability of smoking cessation among smokers and a higher probability of relapse among ex-smokers.<sup>37</sup> Moreover, while smokers with financial stress are more likely to have an interest in quitting, they are less likely to make a quit attempt or succeed in quitting.<sup>40</sup>

## VERSION 2 – REVIEW

<b>REVIEWER</b>	Rosemary Hiscock University of Bath, UK
<b>REVIEW RETURNED</b>	01-Feb-2018
<b>GENERAL COMMENTS</b>	This paper purports to show that low SES households are more likely to spend money on cigarettes and a higher proportion of their income on cigarettes. This replicates findings in several other papers including one in the same country. The authors thus need a better

	<p>justification for their paper. The second analysis (a higher proportion of their income on cigarette) uses the wrong type of regression model. I have also raised other issues with the analyses and presentation of results within the line by line review.</p> <p>Line by line review:</p> <p>Implication 3 should be “causal inferences”</p> <p>P3 line 28 poor grammar</p> <p>P3 line 44 From the description of the studies below I would not say that very little has been published. This study appears to be repeating previous studies which have all made the same conclusion. Therefore there is not a good rationale for the paper. Be more specific about the shortcomings of the previous US study: for example is it old? Is it nationwide? Is it a small sample? Did it answer slightly different questions?</p> <p>P4 line 12 ‘more’ should probably be ‘a higher proportion’?</p> <p>P4 line 27-30 poor grammar</p> <p>P5 line 21 Please confirm that no household was included more than once in your sample for analysis? If households could be included more than once this must be taken into account when modelling</p> <p>P5 line 26 were the non in-person interviews by phone or online? What proportion was this? This should be included as a control variable</p> <p>P5 line 52 “study sample size” might be better as “final sample analysed”?</p> <p>P5 line 52 Normally funding is discussed in the acknowledgements /financial support section rather than the paper body</p> <p>P6 line12 “primary person” sounds a bit woolly. What happens if a rent contract or mortgage is in two names? Is the man then the primary person?</p> <p>P6 line 26 either insert “an” or give the name of the index. Is it validated/ commonly used?</p> <p>P6 line 42-3 what is the poverty threshold?</p> <p>P7 line 3 define ‘service’</p> <p>P7 line 16 why count adult males and not adult females?</p> <p>Statistical analysis weighting: I don’t possess the understanding to be able to confirm whether the authors have applied the weighting correctly but from my limited knowledge of weighting this looks OK. However given the errors in the rest of the analysis, the weighting methodology needs to be reviewed by a weighting specialist.</p> <p>P8 line 30. My understanding is that ordinary linear regression should not be used for percentages because percentages are bound between 0 and 100. Percentages can be analysed as a form of count data. Additionally I think there are a large number of zeros for</p>
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	<p>non smoking households. Thus I believe zero inflated poisson/binomial regression should be used  <a href="https://stats.idre.ucla.edu/stata/dae/zero-inflated-negative-binomial-regression/">https://stats.idre.ucla.edu/stata/dae/zero-inflated-negative-binomial-regression/</a>.</p> <p>P8 line 50 To assess multicollinearity in logistic regression models such as this I would recommend looking at the change in standard errors between the variable alone in the model and then the variable in the final model. An increase of 50% or more is a problem. Salmond, C. (2006). Fitting complex models using Health Survey data Available from <a href="http://www.otago.ac.nz/wellington/otago020178.pdf">http://www.otago.ac.nz/wellington/otago020178.pdf</a></p> <p>P9 lines 9 to 30 Why not just back transform using exp (b)? However I think this should be removed because of the problems with the regression model</p> <p>P9 line 48 If there is a zero inflated response variable the median might be better to report in addition to or instead of the mean. Perhaps also give information for the sample overall and just for smoking households.</p> <p>Table 1 Weighted data results should be reported with confidence intervals</p> <p>P11 -12 Odds ratios are not precise enough to report differences in sizes. Just report the odds ratios (and confidence interval) for each group</p> <p>P12 line 24 'odds' should be 'odds ratio'</p> <p>I have not commented on table 2 or the accompanying text because I think the wrong regression model has been used.</p> <p>P14 line 12 'used' should be 'pooled'</p> <p>P14 line 40 where are the 'new independent states'? The authors should also have checked whether number of females in the household was important in the US context.</p>
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<b>REVIEWER</b>	Charu Mathur IIHMR,India
<b>REVIEW RETURNED</b>	03-Feb-2018

<b>GENERAL COMMENTS</b>	The revised version addresses all the previous concerns, and therefore, I have no further comments
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## VERSION 2 – AUTHOR RESPONSE

### Response to Reviewer

COMMENT: This paper purports to show that low SES households are more likely to spend money on cigarettes and a higher proportion of their income on cigarettes. This replicates findings in several other papers including one in the same country. The authors thus need a better justification for their paper. The second analysis (a higher proportion of their income on cigarette) uses the wrong type of regression model. I have also raised other issues with the analyses and presentation of results within the line by line review.

RESPONSE: Please see our responses below.

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COMMENT: Implication 3 should be “causal inferences”

RESPONSE: We have changed “inferences about causality” to “causal inferences.” Please see the third paragraph in the discussion section.

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COMMENT: P3 line 28 poor grammar

RESPONSE: We have fixed the sentence by adding “the” to the phrase “poverty line.”

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COMMENT: P3 line 44 From the description of the studies below I would not say that very little has been published. This study appears to be repeating previous studies which have all made the same conclusion. Therefore there is not a good rationale for the paper. Be more specific about the shortcomings of the previous US study: for example is it old? Is it nationwide? Is it a small sample? Did it answer slightly different questions?

RESPONSE: We have changed “very little” to “less”: “Less has been published on the association between SES and expenditure on cigarettes.” (p. 3, last paragraph)

We have added the following passage about the specific shortcomings of the US study in the last paragraph of the introduction:

“This study did not assess the association of other commonly used indicators of SES (e.g. education and occupation) with cigarette expenditure. Furthermore, the study did not adjust for the effect of possible confounders in assessing the relationship between income and percent of income spent on cigarettes. Finally, the study did not measure cigarette expenditure directly; instead, it was estimated indirectly by asking respondents how many cigarettes they smoked each day and the price they paid for their last pack of cigarettes. Our aim was to address these shortcomings. We used data from ...”

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COMMENT: P4 line 12 ‘more’ should probably be ‘a higher proportion’?

RESPONSE: We have changed “more” to a “higher proportion.”

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COMMENT: P4 line 27-30 poor grammar

RESPONSE: We have omitted the sentence with poor grammar and substituted it with a passage about specific shortcomings of the study in the U.S., as discussed above.

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COMMENT: P5 line 21 Please confirm that no household was included more than once in your sample for analysis? If households could be included more than once this must be taken into account when modelling

RESPONSE: No household was included more than once. Each year the sample household was dropped and replaced by a new household. This was described in the first half of the paragraph in the “Data” section.

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COMMENT: P5 line 26 were the non in-person interviews by phone or online? What proportion was this? This should be included as a control variable

RESPONSE: A variable for survey mode is not included in the CES household datasets that are available for public use. We contacted the Bureau of Labor Statistics for assistance and they were able to provide us with a rather unrefined variable which indicates that 38.4% of the surveys were in-person, 10.4% were telephone surveys, and no information on survey mode is available for 51.2% of the sample. Furthermore, some of the in-person surveys had an undefined telephone component, which were possibly at the very end of the survey; many households were contacted several times before the surveys were completed and in many cases the final contact was via telephone. Because of these issues, we did not include the mode of survey in the analysis. We have mentioned this as a weakness at the end of the penultimate paragraph:

“Finally, we note that we did not have a reliable variable for survey mode to include in the analyses. Telephone surveys are associated with underreporting of smoking (Donovan et. al. 1997; Arday et. al. 1997) and based on the extent to which survey mode is associated with SES, the results of this study could be biased.”

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COMMENT: P5 line 52 “study sample size” might be better as “final sample analysed”?

RESPONSE: We have changed the wording to “The final sample size for the analysis.”

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COMMENT: P5 line 52 Normally funding is discussed in the acknowledgements /financial support section rather than the paper body

RESPONSE: We have removed the sentence about funding.

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COMMENT: P6 line12 “primary person” sounds a bit woolly. What happens if a rent contract or mortgage is in two names? Is the man then the primary person?

RESPONSE: We actually contacted the Bureau of Labor Statistics last year and asked for more specific description about who the primary person is. They referred us to the websites we have cited in the paper. The websites states that the primary person, which is also referred to as the head of household or the reference person within the survey documents, is:

“the first member mentioned by the respondent when asked to ‘Start with the name of the person or one of the persons who owns or rents the home.’”

They further explained to us in an email that:

“For example, if the interview is with a CU of a husband, wife, and children and the interviewer speaks with the wife she might answer, ‘My husband and I...,’ in which case her husband will be the reference person. If, on the other hand, she responds ‘I and my husband...,’ then she’s the reference person.”

We have added the following clause to the beginning of the section “Measurement of smoking status of household ....”:

“The head of household, who is the first person mentioned by a respondent to be the one who owns or rents the home of the household, ...”

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COMMENT: P6 line 26 either insert “an” or give the name of the index. Is it validated/ commonly used?

RESPONSE: We have added the phrase “the commonly used.” The all-item consumer price index is commonly used in economic analyses to compare dollar amounts across time. Reference 23 provides a list of all-items consumer price index for several years. These figures are calculated each year by the United States Bureau of Labor Statistics.

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COMMENT: P6 line 42-3 what is the poverty threshold?

RESPONSE: Poverty thresholds are given in reference 24. There is a different set of poverty thresholds in each of the six survey years based on family size and number of children under 18 years. For example, poverty thresholds in 2010 were as follows:

Poverty Thresholds for 2010 by Size of Family and Number of Related Children Under 18 Years										
Size of family unit	Weighted average thresholds	Related children under 18 years								
		None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person (unrelated individual)...	11,139									
Under 65 years.....	11,344	11,344								
65 years and over.....	10,458	10,458								
Two people.....	14,218									
Householder under 65 years.....	14,676	14,602	15,030							
Householder 65 years and over.....	13,194	13,180	14,973							
Three people.....	17,374	17,057	17,552	17,568						
Four people.....	22,314	22,491	22,859	22,113	22,190					
Five people.....	26,439	27,123	27,518	26,675	26,023	25,625				
Six people.....	29,897	31,197	31,320	30,675	30,056	29,137	28,591			
Seven people.....	34,009	35,896	36,120	35,347	34,809	33,805	32,635	31,351		
Eight people.....	37,934	40,146	40,501	39,772	39,133	38,227	37,076	35,879	35,575	
Nine people or more.....	45,220	48,293	48,527	47,882	47,340	46,451	45,227	44,120	43,845	42,156
Source: U.S. Census Bureau.										

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COMMENT: P7 line 3 define ‘service’

RESPONSE: We have expanded the definition of service to include cleaning and building service, health service, and food and beverage preparation.

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COMMENT: P7 line 16 why count adult males and not adult females?

RESPONSE: We have included % females in all analyses.

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COMMENT: Statistical analysis weighting: I don’t possess the understanding to be able to confirm whether the authors have applied the weighting correctly but from my limited knowledge of weighting this looks OK. However given the errors in the rest of the analysis, the weighting methodology needs to be reviewed by a weighting specialist.

RESPONSE: No response is required.

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COMMENT: P8 line 30. My understanding is that ordinary linear regression should not be used for percentages because percentages are bound between 0 and 100. Percentages can be analysed as a form of count data. Additionally I think there are a large number of zeros for non smoking households. Thus I believe zero inflated poisson/binomial regression should be used <https://stats.idre.ucla.edu/stata/dae/zero-inflated-negative-binomial-regression/>.

RESPONSE: In econometrics and biostatistics, linear regression is routinely used for response variables that are bounded (e.g. percent unemployed) or take on only positive values (e.g. body fat), especially if a strictly positive variable takes on many different values. However, we appreciate the purist perspective of the reviewer and have used fractional response logistic regression (Smithson & Merkel 2014; Papke & Wooldridge 2008; Papke & Wooldridge 1996), suitable for doubly bounded continuous variables, to examine the association between covariates and proportion of household expenditure spent on cigarettes. We have revised the relevant parts of the methods and results sections of the manuscript. We have added the following passage to the last paragraph in the statistical analysis section:

“We also used multivariable fractional response logistic regression to assess the association of cigarette expenditure as a proportion of total household expenditure with SES indicators. (Smithson & Merkel 2014; Papke & Wooldridge 2008; Papke & Wooldridge 1996) Fractional models are suitable for doubly bounded continuous variables such as proportions. The results of these models can be presented as relative proportion ratios.(Smithson & Merkel 2014)”

We note that Poisson or negative binomial models are not appropriate for our data. These methods are suitable for count data or situations where a proportion is derived from a binary variable. Our outcome represents the share of the total household expenditure that is spent on cigarettes, i.e., amount spent on cigarettes divided by total expenditure, as stated in the measurement section (please see the first full paragraph on p. 6).

We also note that the proportion of income spent on cigarettes is not zero-inflated in that the proportion is computed only among smoking households, i.e., households that do report cigarette expenditure. We have stated this in a few places in the manuscript. For example, in the first sentence in the abstract, we state: “... socioeconomic variations in proportion of total household expenditure spent on cigarettes among smoking households. [emphasis added]” In the measurement section, we state: “For smoking households, we computed cigarette expenditure as a proportion of total expenditure ....[emphasis added]” To further clarify this, we have added “among smoking households” in the beginning of the last paragraph in the Results section.

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COMMENT: P8 line 50 To assess multicollinearity in logistic regression models such as this I would recommend looking at the change in standard errors between the variable alone in the model and then the variable in the final model. An increase of 50% or more is a problem. Salmond, C. (2006). Fitting complex models using Health Survey data Available from <http://www.otago.ac.nz/wellington/otago020178.pdf>

RESPONSE: The largest change in standard error comparing bivariable and multivariable regression results was 29.3% and pertained to the dummy variable comparing households in poverty and those at or above 300% of poverty line in the binary response logistic regression model. We have added the following passage to the last paragraph in the statistical analysis section:

“Furthermore, the largest change in a standard error comparing bivariable and multivariable regression results was 29.3% and pertained to the dummy variable comparing households in poverty with those at or above 300% of poverty line in the binary response logistic regression.”

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COMMENT: P9 lines 9 to 30 Why not just back transform using exp (b)? However I think this should be removed because of the problems with the regression model

RESPONSE: We have removed this passage.

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COMMENT: P9 line 48 If there is a zero inflated response variable the median might be better to report in addition to or instead of the mean. Perhaps also give information for the sample overall and just for smoking households.

RESPONSE: As mentioned above the variable, the response variable is not zero-inflated.

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COMMENT: Table 1 Weighted data results should be reported with confidence intervals

RESPONSE: We have added confidence intervals to Table 1.

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COMMENT: P11 -12 Odds ratios are not precise enough to report differences in sizes. Just report the odds ratios (and confidence interval) for each group

RESPONSE: We have followed the reviewer's suggestion and added the following passage in the first paragraph in the multivariable analyses section:

"The odds ratio comparing households in poverty with those above 300% of poverty threshold was 1.91 (95% CI: 1.66, 2.21). Similarly, the odds ratio comparing households headed by a person who did not complete high school with those headed by a person with at least a Bachelor's degree was 3.4 (95% CI: 2.95, 3.93). Furthermore, the odds ratio comparing households headed by a blue-collar worker with those headed by a person in a managerial or professional occupation was 1.46 (95% CI: 1.27, 1.67)."

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COMMENT: P12 line 24 'odds' should be 'odds ratio'

RESPONSE: We cannot locate the word "odds" in line 24 or the few adjacent lines.

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COMMENT: I have not commented on table 2 or the accompanying text because I think the wrong regression model has been used.

RESPONSE: As noted above, we have changed the analysis.

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COMMENT: P14 line 12 'used' should be 'pooled'

RESPONSE: We have made the correction.

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COMMENT: P14 line 40 where are the 'new independent states'? The authors should also have checked whether number of females in the household was important in the US context.

RESPONSE: We have replaced "new independent states" with "the Russian Federation, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, and Tajikistan."

### VERSION 3 – REVIEW

<b>REVIEWER</b>	Rosemary Hiscock University of Bath, UK
<b>REVIEW RETURNED</b>	20-Mar-2018

<b>GENERAL COMMENTS</b>	The authors have much improved this article and as far as I am able to judge it is suitable for publication. Note however that I am not an expert on weighting. There are one or two minor language errors which I think will be picked up at the proof reading stage.
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### VERSION 3 – AUTHOR RESPONSE

RESPONSE: We have added effect sizes and confidence intervals to the abstract.

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COMMENT: It's important that the analyses used the sampling weights and the weighting adjustment across years looks sensible. The only confusion was calling it a 'unified' weight which at first made me think it was the same across all years. Something like 'adjusted' weight might be better.

RESPONSE: We have changed “unified” to “adjusted”. Please, see bottom of page 7.

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COMMENT: There is a cause and effect puzzle which is mentioned in the introduction and acknowledged in the discussion. It's also somewhat mentioned in the bullet points, but I think the wording in the discussion is better and could be reused in the bullets.

RESPONSE: We have altered the bullet point.

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COMMENT: So there is no way to adjust for correlated data from the same household (page 8) although many households are repeatedly surveyed because there is no household ID number? I think this should be explicitly acknowledged as readers would expect a random intercept per household or Generalized Estimate Equation model to account for correlation. A likely consequence of the non-independence in results will be to over-estimate accuracy and lead to confidence interval that are too narrow.

RESPONSE: The same household is not in the sample more than once. We mention in the Data section, “Each household is interviewed every three months over four calendar quarters.” But six lines below that sentence we state, “We appended data from the third quarter data collection ... of six consecutive years...” To provide further clarity, we have added the following sentence: “Each household appears only once in the pooled dataset.” Please, see the bottom of page 5.

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COMMENT: The Kendall tau correlations are somewhat useful for assessing colinearity, but the variance inflation factor would be more useful as that measures the actual impact of correlation on the regression, whereas the correlation only gives a potential idea of the problem.

RESPONSE: Variance inflation factor cannot be computed where predictors are categorical. All predictors are categorical in this study

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COMMENT:

- The \$458.10 figure could be presented without the cents
- All the percents in table 1 could be to one decimal place, especially given the large volume of numbers
- Table 1, a footnote explaining that higher percentages mean less poverty would be useful

RESPONSE: We have made all the above suggested changes.

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COMMENT: Larger households are somewhat expected to report more smoking simply because there are more people and the outcome is any smoking. So the reduction in odds for houses with 1 female is striking.

RESPONSE: We do have household size as a predictor in the regression models and the results show as expected that larger households have a higher probability of reporting cigarette expenditure. Our results also indicate that having one female in the household may be protective against spending money on cigarettes. This is an interesting finding and can be investigated in future research dedicated to this phenomenon.