Author's response to reviews

Title: Combined television viewing and computer use and mortality from all-causes and diseases of the circulatory system among adults in the United States

Authors:

Earl S. Ford (eford@cdc.gov)

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Author's response to reviews:

Reviewer: Anders Grøntved

Major Compulsory Revisions

The models excluding participants with chronic disease at baseline should be the primary models and not serve as sensitivity analysis. This is a standard feature of a cohort study. If diseased participants are not excluded at baseline the chance of reverse causation bias are likely to be greater, and characteristics related to history of disease and TV viewing and that are risk factors for premature mortality, serves as confounders. Such confounders can be unknown and both positive and negative. Excluding these individuals will reduce the chance of such biases.

RESPONSE: My main hesitation in eliminating participants with existing major chronic conditions is that such an action substantially reduces the number of deaths. Consequently, I have added a new table (Table 4) that shows estimates for participants without the major chronic conditions. Given that the estimates are pretty similar for all-cause mortality, readers can use their preferred estimates.

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The author must provide a quantitative assessment for a possible non-linear relationship between screen time and mortality risk.

RESPONSE: I ran models that added a quadratic term for screen time, which was not significant. This observation was added to the results.

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Title: It would be more correct to have the title “Screen time and mortality among adults...” instead of Television viewing, computer use, and mortality...”. The ladder refer to that both components of screen time are being analyzed individually.

RESPONSE: I understand your concern and have changed the title to “Combined television viewing and computer use and mortality from all-causes
and diseases of the circulatory system among adults in the United States: a prospective study”. I am not adverse to using the term “screen time”, but I am not sure how well acquainted people are with this term and if people use the term screen time to conduct literature searches. Interestingly, when I did a search of publication titles using PubMed, it seemed that the term “screen time” was mostly used when the studies included children or adolescents although a few studies of adults also referred to screen time in the title.

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Minor Essential Revisions

Abstract: Last sentence in the results section: please indicate that the results with mortality from circulatory system diseases were multivariable adjusted.

RESPONSE: I added the term “maximally-adjusted”.

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Methods section

Please provide a minimum of details about the validity of the National Death Index.

RESPONSE: I have added several references that examined the validity of the NDI.

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Please provide details here that participants with disease at baseline (self-reported cancer, diabetes and cardiovascular disease) were excluded.

RESPONSE: I have chosen not just to exclude participants with several major chronic conditions at baseline. As I stated earlier, I added a new table that provides results for all the relevant models.

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Description of leisure time PA and alcohol use: please provide details on how these variables were grouped, or alternatively if they were not grouped that they were ordinal/continuous variables. It is also unclear whether the time spent on physical activity was based on a minimum of intensity (i.e. at least moderate).

RESPONSE: I added in parentheses that alcohol use and leisure-time physical activity were modeled as continuous covariates. The physical activity time was for moderate and vigorous activities. I thought that this was understood. In an attempt to make this clearer, I modified the last part of the sentence to “..., the time spent being physically active was calculated from their responses to the frequency and duration of the reported moderate and vigorous activities ....” I also added a clarification that vigorous minutes were weighted by a factor of two.

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Please provide details on test of assumptions in proportional hazard models, especially the proportional hazard assumption.

RESPONSE: I added a sentence stating that the proportional hazard assumption was met for screen time.

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Results section
First sentence: The author must provide details on why these 10 individuals were excluded.

RESPONSE: I added the following explanation: “Participants were ineligible if the information needed to link to the National Death Index submission was lacking.”

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Table 1: Please indicate the number of participants underlying the data presented.

RESPONSE: Sample sizes were added to the column headings.

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Table 1: TV viewing is indicated, however, this should more correctly be named screen time.

RESPONSE: The label has been changed to screen time.

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Table 3: Please also indicate the person-years at risk for each group of screen time.

RESPONSE: The unweighted number of person-years have been added to Table 3. It is not clear that this is particularly useful because of the issue of sample weights.

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Discussion section
On page 11 third paragraph, the author state that only the present study fails to produce a significant association. The Aerobics Center Longitudinal Study mentioned on page 10 did not report a significant association either. Please revise this sentence.

RESPONSE: The first half of the paragraph in question pertains to all-cause mortality. My impression is that the ACLS looked at cardiovascular disease and not all-cause mortality. In the second half of the paragraph, the discussion deals with cardiovascular disease, and here the lack of a significant association for the ACLS is acknowledged. I have split the paragraph in two to emphasize that one
relates to all-cause mortality and the other to cardiovascular disease.

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Page 14 second paragraph, the median screen time reported from the present study may also be underestimated due to low number of categories and the infinite upper limit of the 5 hour category.

RESPONSE: Unless the upper category or categories contained more than 50% of the data, it would not have affected the estimate of the median. The top 3 categories contained about 43% of the data. Thus, the median had to be smaller than the third highest category. I did have to correct the median hours of screen time to 2 hours. I agree that having more categories of screen time especially in the 2 to 3 hour range would have allowed for a more accurate estimate of the median screen time.

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Reviewer: David W Dunstan

Major compulsory revision:
A key distinction between the previous studies that have reported significant associations with TV and mortality and the current study is the number of categories of the exposure that have been used in the analysis. The current study has used 6 categories – based on the item responses within the question. Other prospective studies have used fewer categories to great effect. The utilisation of 6 categories invariably influences the cell sizes for recorded deaths, with only 56 deaths observed in the reference category <1 hr. For CVD, very low numbers of deaths are recorded across all of the categories. The author should consider whether greater statistical power could be obtained from the collapsing of categories.

RESPONSE: The study by Warren et al. used quartiles. The studies by Dunstan et al. and Stamatakis et al. used three levels: <2, 2<-4, and 4+ h/d. The study by Wijndaele et al. reported the hazard ratios per hour of screen time. I have added a table that approximates the classification used by Dunstan and Stamatakis. However, the results still do not show a significant association between screen time and mortality.

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Minor essential revisions
2. Methods: Please provide some information on the level of accuracy of the National Death Index with respect to data linkage.

RESPONSE: I have added several references addressing this issue.

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3. Methods: Line 124: Please provide information on the validity and reliability of
the questions used to ascertain physical activity status.

RESPONSE: To the best of my knowledge, the physical activity questions used in NHANES have not been tested for validity and reliability per se. Some of our previous work suggests that the questions correlate with physiologic measures as expected.

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4. Methods: It appears that history of CVD was based on self-report – was a verification process applied to this data?

RESPONSE: No verification process was attempted. Indirect evidence suggests some degree of validity to the self-reported information. For example, the mortality rate for these folks is elevated. Furthermore, the use of some classes of medication such as cholesterol-lowering medications is elevated in this group as one might expect. Also, there is a substantial amount of literature that suggests that the self-reported cardiovascular disease is reasonable.

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5. Methods: Did the author perform an analysis to explicitly assess the sex interaction? If there was a significant interaction, should the results be presented separately for males and females?

RESPONSE: Yes. The original submission contained the following sentence: “Using model 4 as shown in Table 3 and screen time as a continuous variable, no effect modification by age (<65 years versus >=65 years) (p = 0.471 for mortality from diseases of the circulatory system), gender (p interaction = 0.852 for all-cause mortality and p = 0.252 for mortality from diseases of the circulatory system) or by race or ethnicity for the three major groups (p interaction = 0.783 for all-cause mortality and p = 0.611 for mortality from diseases of the circulatory system) was noted.”

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6. Discussion: Page 11: The author should acknowledge that the Scottish Health Survey included both TV viewing and computer as their exposure variable.

RESPONSE: Thanks for pointing this out. I have adjusted the sentence in question.

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7. Discussion: the author needs to acknowledge the possibility that other unmeasured or unknown confounding factors may have played a role in the findings.

RESPONSE: I have added a sentence about this to the section on limitations.

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Reviewer: Katrien Wijndaele

I have the following comments/suggestions:

Major compulsory revisions:

1) Methods, sample description: please include in text the numbers and response rates at the different stages of both the home interview and the physical examination. Please comment in the discussion section of the manuscript on the external validity of the results found.

RESPONSE: The external validity of the NHANES data is generally accepted. The sampling design was specifically developed to produce results that are representative of the civilian, noninstitutionalized population of the United States. The response rates have been added.

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2) A somewhat limited number of cases in some of the 6 different screen time categories might partially explain the less stable risk estimates across conditions. Having higher numbers would also enable to put stronger emphasis on the analyses in which participants are excluded based on prevalent CVD, cancer and diabetes at baseline. Would there have been a possibility to include another NHANES cycle (2002-2003) to increase numbers and statistical power of the analyses? Or would this not result in a substantial increase in number of cases, given the relatively young average age, and the limited follow up time between 2002-2003 and 31st Dec 2006? Another option would have been to collapse the 6 screen time categories into 3 categories instead, although this strategy would partially reduce the information gained from this study.

RESPONSE: As so often happens with NHANES, the questions change and, in this instance, the question used for screen time from 1999-2002 was split into two, thereby interrupting consistent assessment of screen time. For this reason, I did not include data from 2003-2004 in my original analysis. Both you and Dr. Dunstan suggested reducing the number of categories, which I did (please see new Table 4). Still, my interpretation of the results remained essentially unchanged.

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3) Discussion: 7th Paragraph: this paragraph describes results of previous studies examining the association between total sitting time and mortality in large detail. This is in addition to the previous 5 paragraphs which describe in detail the results of previous studies specifically examining the association between TV viewing/screen time and mortality. Please abbreviate this 7th paragraph, as this is too detailed, especially as the exposure of the studies described in this paragraph still differs from the exposure in the present study (TV viewing/screen time might be associated with mortality via additional pathways (e.g. dietary intake through exposure to advertisement etc), compared to sitting per se).
RESPONSE: Given that word count is not an issue, I am not sure why the details in the paragraph were of concern. Nevertheless, I have shortened the paragraph to two summary sentences.

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4) Please discuss in the discussion section of the manuscript the main strengths and limitations of the current study.

RESPONSE: There were 3 paragraphs that addressed limitations, so that should be covered. I just did not introduce this portion of the manuscript with a sentence stating that the limitations are as follows. With the new introductory sentence, this should hopefully be clearer.

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5) Discussion, page 14, line 5: besides non-discrimination between TV and computer use, the single question on screen time also did not ask to report separately between week- and weekend days (and these behaviours might differ substantially between week- and weekend days), which might be another potential cause for misclassification for the exposure variable.

Please comment on this in this section of the discussion.

RESPONSE: I have added your thought to the limitations.

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Minor essential revisions:

1) Background, last paragraph, page 4: please change into “… spent watching television or videos and using computers outside work in a population-based sample of adults in the United States.”

RESPONSE: Done

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2) Methods, 2nd paragraph: please briefly include the level of completeness with which vital status is ascertained in NHANES participants by means of the National Death Index, is this 100%?

RESPONSE: It is unknown for most linkages and unlikely to be 100%. Previous studies show that the NDI successfully identified over 90% of deaths. Several references were added to address the NDI in response to all of the reviewers.

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3) Methods, 4th paragraph, line 12: please include “in leisure time” after the phrase “moderate and vigorous physical activity”

RESPONSE: Done
4) Methods, page 7, line 2: please include “independents samples” t-test
RESPONSE: Done

5) Results, 1st paragraph, 2nd line: why were they ineligible for follow up, please include the reason in text
RESPONSE: Done

6) Results, 2nd paragraph: please include total person-years of follow up
RESPONSE: I included the unweighted follow-up time, but this should not be used by readers to make calculations.

7) Table 1: please specify by including “all cause” mortality status in the title
RESPONSE: I made the change although technically the study also includes mortality from diseases of the circulatory system.

8) Table 1: Please change “Television viewing” into “Screen time“
RESPONSE: Done

9) Table 3: include numbers of deaths and totals numbers of participants in each of the six screen time groups in the table for the Models 5 with additional exclusions of participants (they are already in text, but it would ease interpretation if they were in the Table 3).
RESPONSE: I added a new table with results limited to participants without major chronic diseases. This table includes the requested information.

Discretionary revisions:

1) Title: a more precise but similarly concise title would be “Television viewing, computer use and all-cause and cardiovascular mortality among US adults: a prospective study”
RESPONSE: I have incorporated your suggested revision with a modification in the title.
2) Background, 3rd paragraph, line 7: please include the reference of the study executed in the US including a selective sample of men.

RESPONSE: Done

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