PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Adolescents' media usage and self-reported exposure to advertising across six countries: implications for less healthy food and beverage marketing
AUTHORS	Demers-Potvin, Élisabeth; White, Martin; Potvin Kent, Monique; Nieto, Claudia; White, Christine; Zheng, Xueying; Hammond, D; Vanderlee, Lana

VERSION 1 – REVIEW

REVIEWER	Tatlow-Golden, Mimi The Open University
REVIEW RETURNED	24-Nov-2021

GENERAL COMMENTS	This is a clearly defined and well presented paper on a large scale multi country study of adolescents' self-reported media use and self-reported unhealthy food marketing exposure in these media. I have a few recommendations as follows RE: definition of children/adolescents RECOMMEND: While most food marketing and digital privacy regulation does define 'children' as those 13 and under, or under 13 (and this applies also to social media sign-up ages) this doesn't accord with medical and psychological definitions of adolescence onset which are usually specified at 10 or 11 years. For example WHO definition of adolescence is 10-19 years So more accurately the participants, who have been assigned to 2 groups aged 10-13 and 14-17, would be defined not as children and adolescents but rather as being in early and mid adolescence. Text in the introduction could clarify the regulatory mismatch here but I would recommend that the paper refers to a study of adolescent exposure. RE: Abstract – at 21-25 RECOMMEND: making it clear that all findings are self-reported RE: As children 129 could have been viewing multiple media channels simultaneously, the sum of exposure 130 (i.e., total minutes across all media types) was used as an overall indicator of total amount 131 of exposure to screen-based media RECOMMEND: The nature of this measure is justifiable but it does inflate the amount of actual time' spent engaging with screens.

	Recommend clarifying this in Abstract and discussing later at 357-9 Also reporting how this double-counting is accounted for across the sample, with proportions of those for whom concurrent viewing is reflected in the data if possible. RE 288-298 RECOMMEND: In addition to the overall %s, recommend splitting the reporting of social media use into the age binaries recorded in the analysis, as the 10-13y group closely match those whose age precludes them from social media use according to their Ts&Cs RE: However, our data align with 420 marketing expenditure data, an objective indicator of marketing efforts by companies: 421 fast-food advertisement expenditures are the highest for television, although digital 422 marketing expenditures increased by 74% between 2012 and 2019 (45). RECOMMEND: reviewing this discussion point in light of https://doi.org/10.3390/ijerph17197231 Which outlines the many reasons why expenditure data are not appropriate for estimating the size of the food digital advertising market – however many of these reasons also support the point that children are less likely to recognise marketing/promotion as ads in digital media. Note this also for refining discussion point at line 468 – while digital expenditure data are objective, they are unlikely to be accurate RE: In the UK, where participants were less likely to be exposed daily to 429 advertisements for fast food and sugary drinks RECOMMEND: checking throughout that the language reinforces self-report rather than implying these are observed facts. However, re this particular instance, also recommend applying this as a strength – as the self-report data align with what would be expected with this policy in place RE subjective indicator of actual exposure, the latter likely to be higher because of the 477 frequent and implicit nature of marketing RECOMMEND: rewriting for clarity, as the sentence structure doesn't allow for easy recognition that 'the latter' refers to actual rather than self-reported exposure RE measure may be less reliable in a sample of children and adolescents due to poor recall, 480 and inability to recognize RECOMMEND: I don't believe that Reference 61 claims that children/adolescents have poorer recall than other age groups (which is what this sentence seems to imply)

	RE The amount of 488 marketing exposure on cable television compared to streaming platforms is likely very 489 different, and this may play an important role in understanding the amount of exposure. RECOMMEND: you clarify this point or reference studies that show this differential between cable/streaming. I think the difference you may be wishing to point to may be between cable and free streaming vs subscription, ad-free streaming? RE: survey. This approach has not yet been validated in the literature, but nevertheless seems 494 comparable to self-report estimates from other surveys. RECOMMEND: The data are a good bit higher than Europe data from eg EU Kids Online (for screen time) or a Europe-wide study https://op.europa.eu/en/publication-detail/-/publication/347b8314-e2c0-11eb-895a-01aa75ed71a1/language-en In fact I would expect that the data reported in the present study are more accurate and they accord with other studies (eg Pew reports from memory?) for total screen time, but probably important to acknowledge that it's really unclear about the demand characteristics of these various study environments and how they interact with recall and self-report. I think you could also refer back to the UK self-report point here. RE: at Line 521 RECOMMEND: referencing some data on activity of F&B advertisers during pandemic that have been published recently to underscore this point. RECOMMEND: Table 1 BMI should be indicated as self-report Overall, I think the finding regarding lower self-report from UK adolescents of sugary drinks/fast food ads compared to the other countries is somewhat underplayed given this is the one country with some regulation (albeit contested impact of same). SMALL points 1) children's and adolescent's media Typo in Abstract and at 519

REVIEWER	Jancey, Jonine Curtin University, Western Australian Centre for Health Promotion Research, School of Public Health
REVIEW RETURNED	16-Dec-2021

GENERAL COMMENTS	I think this an interesting paper that contributes to the literature

REVIEWER	Ogurtsova, Katherine Modeller Institute for Health Services Research and Health Economics, DE, Institute for Health Services Research and Health Economics
REVIEW RETURNED	15-Feb-2022

GENERAL COMMENTS	I reviewed this manuscript, where the authors described the media usage of the children and adolescents from six countries and found associations between media viewing and self-reported exposure to unhealthy food and beverage advertising. Methods used in the statistical analysis sound appropriate and comprehended. The importance of such a study is underlined by the potential policy implications. The quite large sample size was analysed, which is a strong advantage. However, it's not given if the questionnaire was validated and the comprehension of the questions for children was proved, particularly regarding "unhealthy" food. Also, there is no discussion on country-specific existing policy and acceptance/attention to the advertising of "unhealthy" food in this target audience. I have also doubts if the self-reported time of media viewing, particularly in children, can be reliable. However, the authors mentioned in the discussion that the results are comparable to previous publications and, unfortunately, there is no validation study done in this area. That is why I would put more attention to relative values/results compared with the absolute numbers (for example, hours). In the results section, there is too much description of the results that have been already given in figures and tables. I think that the text potentially might be reduced by avoiding doubling the information.

VERSION 1 – AUTHOR RESPONSE

Reviewer comment		Author's response	Changes made to text
Reviewer 1			
1.	Definition of children/adolescents RECOMMEND: While most food marketing and digital privacy regulation does define 'children' as those 13 and under, or under 13 (and this applies also to social media sign-up ages) this doesn't accord with medical and psychological definitions of adolescence onset which are usually specified at 10 or 11 years. For example WHO definition of adolescence is 10-19 years So more accurately the participants, who have been assigned to 2 groups aged 10-13 and 14-17, would be defined not as children and adolescents but rather as being in early and mid adolescence. Text in the introduction could clarify	We have adjusted this throughout the paper, and the title of the paper was also adjusted. Age groups were renamed as "younger adolescents" and "older adolescents".	Title: "Adolescents' media usage…" All changes were marked with track changes. Line 99-101 : "According to the World Health Organization (WHO), the period of adolescence is between 10 and 19 years of age (24); participants will henceforth be referred to as younger adolescents (ages 10-13) and older adolescents (14-17)."

	the regulatory mismatch here but I would recommend that the paper refers to a study of adolescent exposure.		
2.	Abstract – at 21-25 RECOMMEND: making it clear that all findings are self-reported	We have highlighted that all findings were self-reported.	Line 22-24: “Self-reported daily exposure to advertising varied between countries for sugary drinks (10-43%) and fast food (19-44%), and was positively associated with self-reported screen time. Self-reported exposure to screen-based media...”
3.	As children could have been viewing multiple media channels simultaneously, the sum of exposure (i.e., total minutes across all media types) was used as an overall indicator of total amount of exposure to screen-based media RECOMMEND: The nature of this measure is justifiable but it does inflate the amount of actual time’ spent engaging with screens. Recommend clarifying this in Abstract and discussing later at 357-9 Also reporting how this double-counting is accounted for across the sample, with proportions of those for whom concurrent viewing is reflected in the data if possible.	We have clarified this in the abstract and highlighted it in the discussion. Unfortunately, it is impossible to determine how the double-counting is accounted for across the sample because no measure of concurrent viewing was assessed in the survey. We have included this in the limitations (see line 532-535).	Line 16-18: “The average amount of time spent in front of various screens ranged from 7.6 hours to 10.2 hours across countries per weekday which may include viewing of multiple media channels simultaneously.” Line 376-379: “This study found that adolescents across Australia, Canada, Chile, Mexico, UK and USA are spending considerable amounts of time viewing screen-based media, although these self-reported estimates include simultaneous viewing of multiple media.” Line 531-536: “Responses may not be precisely accurate, and likely overestimate the absolute amount of screen time reported by youth as overall exposure was calculated by summing self-reported exposure to individual media channels and thus may include simultaneous use of multiple screens. Indicators of simultaneous viewing of screens were not directly measured in the survey.”
4.	288-298 RECOMMEND: In addition to the overall %s, recommend splitting the reporting of social media use into the age binaries recorded in the analysis, as the 10-13y group closely match those whose age precludes	This is an interesting suggestion, and we have made changes. Additionally, we have added	Line 311-314: “After stratifying self-reported social media usage by age category (Supplementary Figure S4), usage was still common among younger adolescents (10-13 years), and TikTok

	them from social media use according to their Ts&Cs	Supplementary Figure S4 which reports social media usage by platform, country and age category.	usage was more frequent among 10-13 than 14-17 year old adolescents in all countries." Line 556-560: "Our results were similar, with the younger adolescents (10-13 years) self-reporting widespread usage of social media platforms. The high rates of social media usage and self-reported exposure to advertisements via this medium further demonstrates the need for restrictions to limit exposure to this vulnerable age group. "
5.	However, our data align with marketing expenditure data, an objective indicator of marketing efforts by companies: fast-food advertisement expenditures are the highest for television, although digital marketing expenditures increased by 74% between 2012 and 2019 (45). RECOMMEND: reviewing this discussion point in light of https://doi.org/10.3390/ijerph17197231 Which outlines the many reasons why ependiture data are not appropriate for estimating the size of the food digital advertising market – however many of these reasons also support the point that children are less likely to recognise marketing/promotion as ads in digital media. Note this also for refining discussion point at line 468 – while digital expenditure data are objective, they are unlikely to be accurate	The discussion and strengths and limitations points have been reviewed to underscore the inaccuracy of digital expenditure data as a proxy for digital advertising exposure.	Line 448-452: "However, digital marketing expenditures are likely underestimated as not all industry spending can be captured and spending is not necessarily associated with the reach of the message on digital media (45). Therefore, both self-reported exposure data and the general digital marketing expenditure data likely underestimate the amount of digital marketing to which adolescents are currently exposed." Line 500-503 : "Many studies use gross rating points or expenditure data as a proxy for exposure to advertising. While the latter provide objective data, they are unlikely to be accurate for digital advertising (46)…"
6.	In the UK, where participants were less likely to be exposed daily to advertisements for fast food and sugary drinks RECOMMEND: checking throughout that the language reinforces self-report rather than implying these are observed facts.	The manuscript was revised throughout to ensure reinforcement of self-reported data.	Line 462-465: "The lower likelihood of self-reported exposure to advertising aligns with what would be expected with the UK's current policy in place, although evidence on the impact of the UK policy is mixed."

	However, re this particular instance, also recommend applying this as a strength – as the self-report data align with what would be expected with this policy in place		
7.	Subjective indicator of actual exposure, the latter likely to be higher because of the frequent and implicit nature of marketing RECOMMEND: rewriting for clarity, as the sentence structure doesn't allow for easy recognition that 'the latter' refers to actual rather than self-reported exposure	We have rewritten this sentence as suggested.	Line 509-511 : "Self-reported exposure to food marketing is a method used by researchers in large population samples (57, 59, 60) as a subjective indicator of actual exposure, although actual exposure is likely to be higher…"
8.	Measure may be less reliable in a sample of children and adolescents due to poor recall, 480 and inability to recognize RECOMMEND: I don't believe that Reference 61 claims that children/adolescents have poorer recall than other age groups (which is what this sentence seems to imply)	We apologize for this error and thank the reviewer for pointing it out. We have changed the reference.	Line 516 : This reference was added: Blades M, Oates C, Li S. Children's recognition of advertisements on television and on Web pages. Appetite 2013;62:190-3 PubMed . doi: 10.1016/j.appet.2012.04.002. "Our measures may further underestimate exposure as such a measure may be less reliable in a sample of adolescents due to risk of recall errors, and inability to recognize all forms of marketing (particularly in digital media) (15)."
9.	The amount of 488 marketing exposure on cable television compared to streaming platforms is likely very 489 different, and this may play an important role in understanding the amount of exposure. RECOMMEND: you clarify this point or reference studies that show this differential between cable/streaming. I think the difference you may be wishing to point to may be between cable and free streaming vs subscription, ad-free streaming?	Thank you for helping us making this distinction. This point has been clarified, although we have not found any strong references, given this is an emerging area of the literature. We have thus used the phrasing "is likely very different" so as not to assume that this is a conclusion we are drawing from our data	Line 523-526: "The amount of marketing exposure on cable television and free streaming websites compared to subscription platforms (that are typically ad-free) is likely very different, and this may play an important role in understanding the amount of exposure."

10.	Survey. This approach has not yet been validated in the literature, but nevertheless seems 494 comparable to self-report estimates from other surveys. RECOMMEND: The data are a good bit higher than Europe data from eg EU Kids Online (for screen time) or a Europe-wide study https://op.europa.eu/en/publication-detail/-/publication/347b8314-e2c0-11eb-895a-01aa75ed71a1/language-en In fact I would expect that the data reported in the present study are more accurate and they accord with other studies (eg Pew reports from memory?) for total screen time, but probably important to acknowledge that it's really unclear about the demand characteristics of these various study environments and how they interact with recall and self-report. I think you could also refer back to the UK self-report point here.	We appreciate this point. We have added a reference to the documents you provided, and mentioned that there are important differences in the methodologies that may have resulted in these differences.	Line 399-401: "However, the current estimates appear to be higher than several European estimates from various countries, which may be due to differences in the types of questions asked and the study context which may affect recall and self-report."
11.	at Line 521 RECOMMEND: referencing some data on activity of F&B advertisers during pandemic that have been published recently to underscore this point.	Thanks for this suggestion, we have added data reference to this sentence.	Line 566– added reference 69.
12.	RECOMMEND: Table 1 BMI should be indicated as self-report	We have made changes to table 1.	Table 1. "Self-reported BMI"
13.	Overall, I think the finding regarding lower self-report from UK adolescents of sugary drinks/fast food ads compared to the other countries is somewhat underplayed given this is the one country with some regulation (albeit contested impact of same).	Thanks for this interesting point. We are hesitant to place too much emphasis on the ability of this cross-sectional data to assess policy impact; nevertheless, we do make reference to this in line 458-465, where we state "In the UK, where participants were less likely to self-	No changes have been made.

		report daily exposure to advertisements for fast food and sugary drinks than those in all other countries, a total ban of advertisements for unhealthy foods and beverages has been in place since 2007 during and adjacent to television programs appealing to children and adolescents under the age of 16 (47). The lower likelihood of self-reported exposure to advertising aligns with what would be expected with the UK's current policy in place, although evidence on the impact of the UK policy is mixed."	
14.	SMALL points 1) children's and adolescent's media Typo in Abstract and at 519	We have corrected this.	Line 2 and 563: "adolescents' media/exposure"
Reviewer 2			
1.	I think this an interesting paper that contributes to the literature	Thank you for the positive feedback.	No changes have been made.
Reviewer 3			
1.	However, it's not given if the questionnaire was validated and the comprehension of the questions for children was proved, particularly regarding "unhealthy" food. Also, there is no discussion on country-specific existing policy and acceptance/attention to the advertising of "unhealthy" food in this target audience.	The questionnaire has not been validated. For the "unhealthy foods or drinks", this is why an example was given in the question in the survey: "Participants were instructed "*Unhealthy food and drinks include*	Line 216-220 : "The questionnaire has not been validated, but cognitive testing among a subsample of English-speaking adolescents for various questions including screen time and exposure to advertisements has been conducted to verify their understanding. When necessary, questions were adapted to improve

		processed foods high in sugar, salt, or saturated fat, such as soda/pop, fast food, chips, sugary cereals, cookies and chocolate bars." (Lines 160-162). In lines 458-472, we discuss country-specific existing policies in the UK and USA which was also slightly revised as per the response to reviewer 1; however, we are hesitant to increase the emphasis of the ability to evaluate policies using a single cross-sectional evaluation with self-report data. As such, it is our preference to not make any additional changes.	comprehension (unpublished data)."
2.	I have also doubts if the self-reported time of media viewing, particularly in children, can be reliable. However, the authors mentioned in the discussion that the results are comparable to previous publications and, unfortunately, there is no validation study done in this area. That is why I would put more attention to relative values/results compared with the absolute numbers (for example, hours).	While we agree that self-reported screen time may not be completely accurate (As explored in the pros and cons of self-reported data in Lines 525-535), we have conducted cognitive testing of the measures (newly described on Lines 215-219) and the general agreement between our results and other objective measures suggests that this is a reasonable approach. However, we have reduced	Line 277 : "…and comprised 4.8 hours (weekday) and 5.4 hours (weekend day) on average." This was removed. Line 379: "On average, children and youth reported between 7.6 hours and 10.2 hours of daily screen time, which varied by country." This was removed. We have also added a qualifier in Line 401 to state "Even with limitations on the precision of screentime estimates due to self-report, most participants in the current study exceeded screen time guidelines across countries…"

		the emphases on hours in the discussion to focus on relative results (except in the comparison to other surveys of screentime, where we think this is critically important to allow readers to compare the results).	
3.	In the results section, there is too much description of the results that have been already given in figures and tables. I think that the text potentially might be reduced by avoiding doubling the information.	In the results section, all description of results relating to sex, perceived income adequacy, school grades and BMI (variables for which we adjusted the models) were removed because this was not a main focus of the paper. We have left these results in the tables and supplementary tables, so that if there is interest from the reader they can obtain this information directly.	Line 273 : “Similar findings were observed across countries for a weekend day, but with higher total amounts (Supplementary Figure S2), which ranged from 8.9 hours (Canada) to 11.2 hours (Chile).” The bold part was removed. Line 278 : “Browsing, reading websites and Googling accounted for the least amount of screen time on a weekday and weekend day in all countries.” was removed. Line 294 : “Participants classified as having obesity had a greater total screen time than those of all other BMI categories and those who did not report their height and weight. Those who did not report their BMI (height and/or weight) had less screen time (compared to overweight) and those in the overweight category had greater screen time compared to participants in the severe thinness/thinness/normal weight category. […], except for the findings on BMI, for which there were only associations between those with obesity vs. all other

			categories" was removed because not explored in discussion. Line 289 : "Female participants self-reported less screen time than their male counterparts; (…)participants from minority ethnicity groups and those who perceived their family income as inadequate had a greater self-reported exposure to screen-based media. Those who described themselves as having high grades in school (compared to low and moderate) spent less time on screens." was removed. Line 308 : "TikTok usage ranged from 20% (Mexico) to 32% (Canada) and Twitter usage ranged from 16% (Australia) to 34% (Mexico)." was removed. Line 319 : "…and significant differences by sex, perceived income adequacy, school grades and BMI for some platforms." was removed. Line 329 : "Female participants were more likely to use Instagram, TikTok and Snapchat; (…)); and ethnicity groups were not associated with exposure to social media platforms. Participants who perceived their family income as adequate were more likely to use Twitter; and participants who reported having high grades in school (compared to low and moderate) were less likely to use Facebook and TikTok. Those who were classified as having obesity were more likely to use all social media platforms except Twitter compared to those

			whose BMI was is the category “not reported”. was removed. Line 367: “Participants who did not report their height or weight were less likely to report daily exposure to advertisements for both types of food categories compared to participants living with obesity, overweight or in the severe thinness/thinness/normal weight category. There were no other significant differences by socio-demographic characteristics.” was removed.

VERSION 2 – REVIEW

REVIEWER	Ogurtsova, Katherine Modeller Institute for Health Services Research and Health Economics, DE, Institute for Health Services Research and Health Economics
REVIEW RETURNED	01-Apr-2022

GENERAL COMMENTS	Thank you for revising the manuscript! I have no further comments.