Author’s response to reviews

Title: Self-reporting and measurement of body mass index in youth: refusal, validity, and contributions of socioeconomic and health-related factors

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Version: 2 Date: 10 June 2013

Author’s response to reviews: see over
Dear Editor,

Thank you very much for your response and the pertinent comments of the reviewers for our paper (MS: 1069596591800008) entitled:

“Self-reporting and measurement of body mass index in youth: refusal, validity, and contributions of socioeconomic and health-related factors”

Nearkasen Chau, Kénora Chau, Aurélie Mayet, Michèle Baumann, Stéphane Legleye, Bruno Falissard

Please find enclosed the revised version and our responses to the reviewers’ comments. The changes in the manuscript are in red colour.

This manuscript has been seen and approved by all authors, which have been personally and actively involved in substantive work leading to this article, and will hold themselves jointly and individually responsible for its content. The manuscript is not simultaneously under consideration for publication in another journal and the material has not been published elsewhere. All relevant ethical safeguards have been met in relation to subjects’ protection. We have no conflict of interest to declare.

Looking forward to hearing from the Editorial Board,
Sincerely yours,

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Reviewers report

Title: Self-reporting and measurement of body mass index in youth: refusal, validity, and contributions of socioeconomic and health-related factors

Version: 1 Date: 12 November 2012

Reviewer: Anastase TCHICAYA

Reviewer's report:

Reviewer's Report

Title: Self-reporting and measurement of body mass index in youth: refusal, validity, and contributions of socioeconomic and health-related factors

Version: 1 Date: 10 November 2012

Reviewer: Dr Anastase TCHICAYA

Many thanks for your valuable comments which has allowed us to greatly improve the paper. All modifications in the paper are in red colour. Additional files are not in the paper (to alleviate it) but are complementary data that may be found in the Website of the journal.

Reviewer's report:

General remarks:
The text deals with an important issue of public health such as overweight and obesity in adolescents in school in a developed country like France. The methodological approach is interesting and could be replicated elsewhere on a larger scale. Here, the number of schools (3) is rather limited. This manuscript is newsworthy because it presents the results of interest to all those working in this field of research. The schools investigated are all those in the study geographical area with a sufficient number of adolescents. Further information is added (last paragraph of Introduction section and 1st paragraph of Study Design section).

# Major Compulsory Revisions

No

# Minor Essential Revisions

Abstract

Background:

1- "Body mass index assessment with self-reported height / weight ..." Replace ‘/’ with ‘and’. Yes.

Methods:

1- There is a lack of the age limits of the target population of the study. The adolescent age is not very well defined in Table 1. Yes, the age limits are added in Table 1. As age is considered now as continuous variable the age categories are deleted. Note that among the students investigated few of them were over 17 years because especially of repeating school years.

2- In the last sentence, add ‘regression’ before ‘models’.
Results:
1- The authors have to improve the presentation of results in order to facilitate understanding by the reader without the need to refer to the tables at this stage.
For example, what are the following figures:
Line 5 (age-gender-adjusted odds ratios 1.96-3.48), line 9 (1.52-3.95), line 11 (1.53-10.95)? Is confidence intervals of OR or variation of a measure of OR to another? Clearly, this is the second option after careful examination tables.
Yes, the Results section has been rewritten according to your suggestion.

Main text:
Background:
1- The authors could provide more information to the reader particularly as regards to the percentages of prevalence overweight and the period in question in reference [2] the following sentence: "Among adolescents, the overweight prevalence has tripled since 1960."
Yes, the sentence is rewritten and becomes (one reference from the same author is added):
    “Among American adolescents aged 12 to 18 years, the overweight prevalence increased from 4.4% in 1959-1962 to 6.8% in 1971-1974, 10.6% in 1988-1994, and to 14.7% in 1999-2000 [3]."

2- The last sentence is not necessary at this point and the first part of the sentence is not clear on the type of the social gradient in which the authors refer to the choice of schools. Would it, for example, an index of social deprivation or any other measure?
Yes, the sentence is suppressed.

Methods:
1- Methods, Study Design: In the first sentence, the authors suggest that schools were selected to reflect a social gradient. However, they do not specify how they can talk about social gradient in schools.
In this section, we also expect that the authors define better the target population, particularly the age of teenagers studied. Therefore, it is necessary to define the age of the target population.
Yes, these sentences are added in the last paragraph of Introduction section:
    “We focused on individuals in middle school students mostly under 16 years because school is compulsory in France until 16 years and many problems such as substance uses become persistent in late adolescence period (16-20 years) and all issues need to be solved sooner.”.
For social gradient, we know that, in the relatively large geographical area studied (which includes 38,000 inhabitants in the Nancy urban area), various social categories are represented. There were no selection criteria which may introduce a selection bias. The sentence is modified.

2- Measurement protocol: first sentence, to add ‘Demographic’ between "Socioeconomic characteristics".
Yes.

3- Methods, Measurements: Income variable has not been defined. What are the criteria used to consider that income is insufficient or is not?
Yes, the measure of income is added with cited references.

4- Statistical Analysis: To add ‘Regression’ in the phrase “To study the combination between ... were performed three logistic models ...”
Yes.

Results:
1- Table 4: Given the small number of variables of interest, particularly as regards to the reporting refusal (n = 56), the results should be considered with caution.
Yes. However, because it may be difficult to find significant relationships between variables when the number of subjects is small, significant links revealed may less occur at random, especially when p<0.01. But, our comment led us to add this sentence in the “Limitations and strengths” section:

“Third, our results should be interpreted with prudence because of small number of subjects, especially for reporting refusal”.

2- To complete the sentence “Table 6 evidences some discrepancies between BMI_{sr} and BMI_{m} ..., and behavioral factors”.
Yes, the sentence is completed as follow:

“In Table 6, the ORga evidence some discrepancies between BMI_{sr} and BMI_{m} when we examined their links with socioeconomic, health-related, and behavioural factors. Indeed, overweight measured with BMI_{m} and that with BMI_{sr} were both similarly related to single-parent, manual-worker, and inactive offspring, and WHOQOL-psychological (ORga between 1.36 and 2.47). Overweight measured with BMI_{m} was further related to insufficient income, WHOQOL-physical, and WHOQOL-environment (ORga between 1.38 and 1.54) contrarily to overweight measured with BMI_{sr} which was further related to male gender, low school performance, tobacco and cannabis uses, and being victim of sexual abuse (ORga between 1.27 and 1.85). Obesity measured with BMI_{m} and that with BMI_{sr} were both similarly associated with male gender, single-parent offspring, low school performance, sustained violence, involvement in violence, and WHOQOL-physical, psychological, social relationships, and environment (ORga between 1.55 and 2.96). Obesity measured with BMI_{m} was further associated with being victim of sexual abuse (ORga 2.22) contrarily to obesity measured with BMI_{sr} was further associated with craftsman, tradesman, and firm head offspring. Obesity measured with BMI_{m} was also associated with manual-worker and inactive offspring (ORga 2.67 and 2.89, respectively) but clearly less strongly than obesity measured with BMI_{sr} (ORga 3.67 and 5.06, respectively).”

Discussion:
The following sentence "An important finding is that because of reporting refusal, measurement refusal, and estimation errors ... using BMI_{sr} and BMI_{m}" is not clear. What can tell?
Yes, the sentence is simplified.

Discretionary Revisions:
The title of the article could be slightly modified. It may not be necessary to include the terms of rejection and validity in the title.
We prefer to do not change the title because the contributions of socioeconomic and health-related factors concern the refusal and validity. Furthermore, we may need to state what issues we studied concerning self-reporting and measurement of body mass index.
Other changes:
- Some modifications have been made as suggested by the other reviewer.
- Some changes have been made concerning the factors; age was considered as a continuous variable. We have thus computed most results which have rather little changed. We further added the results obtained with logistic regression models with stepwise procedure retaining only significant factors (p<0.05).
- Two references are added.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**
No competing interests
Reviewer's report
Title: Self-reporting and measurement of body mass index in youth: refusal, validity, and contributions of socioeconomic and health-related factors
Version: 1 Date: 9 May 2013
Reviewer: Georgia Frey
Reviewer's report:

Many thanks for your valuable comments which has allowed us to greatly improve the paper. All modifications in the paper are in red colour. Additional files are not in the paper (to alleviate it) but are complementary data that may be found in the Website of the journal.

Major Revisions
The introduction could be more succinct because the issue is quite simple and really doesn’t require a lot of explanation. Self-reported BMI is subject to error, but the degree of this error and factors that influence the error are unclear.
BMI is widely used by researchers and carers such as general practitioners, by parents for their children, and other individuals. All of these people may not be well informed about BMI issues. As the paper is to be read by all people, it would be important to describe the issues concerning self-reporting and measurement.
Yes, self-reported BMI is subject to error. But the issues are multiple, complex, and need thus explanations. First, self-reporting is subject to refusal and measurement may be more subject to refusal, leaving measured BMI lacked for more people. Second, as you have stated, self-reported BMI values are subject to errors and factors that influence the error are unclear. In the introduction, for different readers, we may need to present the various issues and the hypotheses leading to the risk factors investigated. BMI is currently used in many domains such as nutrition, and as risk factor for mental health, sleep disorders, balance control, sports activities, various diseases, injuries (school, and work-related for adults, domestic and falls for elderly people, etc.), mortality, etc. Research in these areas also often investigates a number of factors (such as socioeconomic, substance uses, etc.) which may be strong biases for self-reported and measured BMIs, and consequently may lead to inappropriate results. So our introduction is also written to present the issues and to retain attention of researchers and careers in various domains. It appears that self-reported and measured BMIs reflect a number of socioeconomic and living difficulties among adolescents while the literature although abundant remains lacking for these factors.
Your remark led us to add this sentence (Introduction, 2nd paragraph):
“But both BMIsr and BMIm are subject to refusals and BMIsr is subject to error, the degree of which and factors influencing it have remained unclear.”

Also, the authors seem to be taking a “shotgun” approach to research by including so many variables in the analysis. Inclusion of all the variables needs to be better supported.
A power calculation is needed to support the appropriateness of the statistical methods with regard to the large number of variables.
The independence of all the variables is questionable. Some measure of multiple collinearity is recommended to determine if some variables can be eliminated.
The authors acknowledge the possibility of Type I error, but make not attempts to adjust for this error.
Yes, in this study we would like to consider most issues which early affect adolescents. Many factors studied were dependent 2 by 2, but there were no collinearity between them 2 by 2. However, in multivariate analysis, generally some factors can be concealed by a set of other factors. Such an issue is not rare. It is also the case in our study.

However, your comments are pertinent and led us to reduce the number of family categories (5 to 3 groups) and that of father’s occupation categories (7 to 5 groups) (see Table 1), suppress poor health status, suicide ideation. Age is considered as a continuous variable.

In fact, the issues somewhat exceed the collinearity of various variables. For example, we may need to know first whether measurement refusal, under or over-reporting were associated with non-intact families, altered psychological health or being obese whatever the associations between these factors. So, gender-age-adjusted ORs appeared to be important.

But, your comment led us to add, in Tables 4 and 6 and additional file 3, adjusted ORs computed by full logistic models including all factors with stepwise procedure retaining significant factors only. This procedure finally retained few factors.

With these changes, the Type I error may be acceptable. We don’t know how adjust for this error in multivariate logistic models. Your comment may suggest choosing as significant p-values p<0.01 rather than p<0.05. But in our paper, most adjusted ORs are with p<0.01 or p<0.001; the power statistical of various tests would be appropriate. Further, it would be more hard to reach significance p<0.05 when the number of subjects is rather small; so we preferred to choose finally p<0.05.

A big issue in the BMIm refusal that is not addressed is privacy and embarrassment. The authors do not specify if ht/wt measures were taken in a private area. This may have been part of the protocol referred to in the references, but that part of the methodology is not clear in the paper.

Adolescents are particularly vulnerable to be self-conscious and embarrassed. If measures were taken in front of peers, it is not surprising that some refused to be exposed to possible ridicule.

Yes, your comment is pertinent. We are aware of this measurement issue and a particular attention had been made in our study. So, the following sentence is added (page 6, “Weight and height self-reporting and measurement” section):

“Weight and height measurements were made in a chosen space and a second research-team ensured that peers cannot to come near. The teachers were also not allowed to come close. So, other persons could not know the measurements.”

The conclusion needs to be more succinct and more “conclusive” rather than a restatement of the findings. For example, should future studies statistically compensate for a certain percentage of under- and over-reporting? Can methods be used to avoid measurement refusal? Should studies only use measurement?

Many thanks for these important observations. So, the conclusion is entirely rewritten. By considering your remarks, it is not more succinct. It becomes:

“Our study demonstrates that BMI self-reporting suffered from refusal which relied on a number of factors: single-parent offspring, low school performance, lack of physical/sports activity, sustained violence, poor psychological health, poor social relationships, and feeling too thin or too fat. Self-reported BMIs should be used with prudence as they were strongly affected by under-reporting which related to multiple factors: male gender, involvement in violence, poor psychological health, overweight/obese (assessed by BMI measurement), and feeling too fat. They were also strongly affected by over-reporting which related to male gender, age, alcohol use,
underweight (assessed by BMI measurement), and feeling too fat. Our work also recommends prudence when using measured BMIs as their measurement suffered more from refusal (than self-reported BMIs) which relied on, in addition to risk factors for self-reporting (except sustained violence and poor social relationships), several other covariates: advancing age, divorced/separated parents, manual-worker and inactive offspring, insufficient income, tobacco/cannabis uses, involvement in violence, poor physical health, and poor living environment. The contributions of socioeconomic, health-related, and behavioural factors to the associations of feeling too fat or too thin with reporting refusal, under and over-reporting ranged from -82% to 44%. Identifying risk factors of overweight and obesity assessed with self-reported or measured BMIs resulted in substantial discrepancies and call for caution when it leads to prevention and care. Self-reporting and measurement are thus affected by multiple biases mostly related to vulnerability conditions which are well known as potential risk factors for obesity. Finally, we may prefer measured BMIs and our findings suggest that all should be made to reduce measurement refusal among vulnerable people. When BMI measurement cannot be made, using self-reporting also needs to reduce refusal, and further under and over-reporting among vulnerable people. Our results may be used to correct self-reported BMIs based on covariates (to approximate measured BMIs). They need to be confirmed by other research in different populations.”.

Your comment further led us to add these sentences (page 12, 1st complete paragraph):

“Finally, should studies only use measurement or also use BMIre to complete missing BMIm? Further analysis shows that among the 123 subjects with missing BMIm, BMIre were available for 102 subjects, leaving only 21 subjects (1.3% of the total sample) with lacked values. We found that those 102 subjects had similar BMIre categories than the subjects with available BMIm (p=0.21 with inclusion missing BMIre category, and p=0.35 with its exclusion). Belonging to this group was significantly (p<0.05) associated with advancing age (ORga 1.33), single-parent offspring (3.08), manual-worker offspring (1.76), inactive offspring (3.22), insufficient income (1.67), low school performance (2.72), tobacco use (2.02), hard drugs use (2.49), lack of physical/sports activity (2.34), involvement in violence (1.68), and with WHOQOL-physical, psychological, and environment (1.77, 2.00, and 2.21, respectively). It was not surprising that these risk factors were close enough to those for measurement refusal. We may thus suggest gathering and using self-reported values when the survey wants to retain measured ones only.”.

Your valuable comments may raise the problem of BMIre correction: do we could improve the BMIre using various covariates? This is also a complex problem which may be later explored in another possible paper of us.

Minor Revisions
The issue of refusal in measurement seems to be less of a concern and more of an artifact of the methods, as well as conducting research in humans. Refusal will always occur when testing humans.

We agree with your remark that refusal generally occurs in research in humans. But we may think that the individuals who refuse depend on the research question, and refusal for such a BMI one may not be at random and may rather reflect certain individual features. This hypothesis is confirmed in our study. We found that measurement refusal was more common than reporting refusal (7.9% vs. 3.6%), and their difference may reflect some differences in individual features that may be important to be revealed. Our results show the bias of self-
reported and measured BMIs due to weight self-perception, to socioeconomic, health-related, behavioural factors and also to measured BMI (for self-reporting refusal). In fact, self-reporting refusal may also somewhat be an artefact of the methods.

Do not interpret the data with regard to under- and over-reporting as “high” (11% & 6%). Effect size should be used to determine the magnitude of the values. Also, 11% and 6% of such a large sample does not seem significant. Your comment is pertinent and led us to add the standard deviation (SD) for the % in Table 1. For the two percentages we have: 11.8 (0.8) and 6.0 (0.6); the low SDs clearly show that 11.8 and 6% are significantly different from zero with p<0.001. We agree with you that 11% and 6% may not be high. But, finally they may be considered as rather high enough when comparing to underweight (2.5%) and obese (10.1%). However, your remark led us to suppress the term “high”.

It is possible that adolescents have a difficult time reporting overweight because there is less understanding of overweight. Obesity and underweight are on two extremes of the spectrum and more recognizable. Overweight could be perceived as more variable and vague. Cognitively, adolescents do not understand things that are not “black and white”.

Yes, overweight is less clear for adolescents, especially as it is defined by a range of BMI values and the threshold values vary according to gender and age (contrarily to adults). Obesity and underweight are not entirely clear because of the threshold values also vary according to gender and age. This is an important issue which suggests that adolescents’ weight perception is not entirely and always correct and that adolescents may need to have their BMIs regularly measured and their BMI categories regularly determined. Furthermore, our findings showed that many factors have strong roles.

Your remark led us to add the following sentences in the Introduction (page 3, end of 2nd paragraph) and in the Discussion section (page 10, 2nd paragraph):

“The BMI threshold values for obesity and underweight, and a wide range of intermediate BMI values defining overweight may be difficult to be appreciated by some adolescents, especially by those with mental difficulties”;

“This finding may suggest that overweight covering a wide range of intermediate BMI values, may be more difficult to be appreciated than obesity by some adolescents, especially by boys and those with low school performance, tobacco or cannabis uses, or being victim of sexual abuse. But, BMIm appeared to be more pertinent than BMI sr to evaluate the associations of overweight with insufficient income, poor physical health, and poor living environment.”.

Socioeconomic, health-related and behavioral factors may play a prominent role in what? The sentence is completed (page 11, line 5).

Do not repeat statistical results in the discussion. The discussion is used for interpretation. Your comment is pertinent. To show what issue or finding each paragraph of discussion is related, we may need to state it a bit. Your comment led us to rewrite various sentences.

What is “inactive offspring”? We added “(unemployed and retired people)” in Measures section.
Other changes:
- Some modifications have been made as suggested by the other reviewer.
- Some changes have been made concerning the factors; age was considered as a continuous variable. We have thus computed most results which have rather little changed. We further added the results obtained with logistic regression models with stepwise procedure retaining only significant factors (p<0.05).
- Two references are added.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**
I declare that I have no competing interests.