PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (see an example) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below. Some articles will have been accepted based in part or entirely on reviews undertaken for other BMJ Group journals. These will be reproduced where possible.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Are socioeconomic disparities in tobacco consumption increasing in India? A repeated cross-sectional multilevel analysis
AUTHORS	Bhan, Nandita; Srivastava, Swati; Agrawal, Sutapa; Subramanyam, Malavika; Millett, Christopher; Selvaraj, Sakthivel; Subramanian, S V

VERSION 1 - REVIEW

REVIEWER	Prabhat Jha, University of Toronto
REVIEW RETURNED	22-May-2012

THE STUDY	English is poor in the Manuscript. Better citation of papers like those from the Jha - NEJM etc and WHO MPOWER data would make the paper more relevant and up to date.
GENERAL COMMENTS	The analyses is interesting, but the quality of the writing and exposition is not very clear. Some areas to improve: 1. Describe why upward trends in males were seen but not in females. 2. Describe weaknesses if any of asking questions on smoking from a reproductive health survey, in which women are first interviewed. 3. Better description of each of the tables and their results, linked to the result section. 4. A major re-write might well help this paper get its interesting conclusions out to the reader.

REVIEWER	Dr. Meerjady Sabrina Flora Associate Professor of Epidemiology National Institute of Preventive and Social Medicine Bangladesh
REVIEW RETURNED	13-Jun-2012

THE STUDY	Repeated cross-sectional study is an appropriate method for trend study, but to study trend over time data at two point might not be sufficient. for trend analyses data at three point are required. Changes between two points might be due to chance only. methodology refers ref no. 7 & 8, it could be briefly described in this paper. so that reader could understand the methodology without going through the paper. Abstract does not highlight any data, only conclusive findings are given. It shows risk which is not mentioned in the main body of the paper.
RESULTS & CONCLUSIONS	methodological limitations reduce the credibility of data.

GENERAL COMMENTS	Results are not sufficiently described. All tables are not refred in the text.

REVIEWER	P. Sankara Sarma Professor Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Sciences and Technology INDIA No competing interests
REVIEW RETURNED	02-Jul-2012

GENERAL COMMENTS	1. In the first sentence of the abstract, '...prevalence of tobacco..' may be changed to '...prevalence of tobacco use...'. 2. Why Household and Year were not considered as levels in the multilevel models. 3. Mention that the prevalence is in percentage (?) in Table 1. 4. Are the results presented in Table 1 and in the Figures 1-3, survey weighted and age-adjusted? Please clarify with footnotes if required.

VERSION 1 – AUTHOR RESPONSE

Reviewer Comment #1:
"Given the point about trends below you should consider rewording the title. Please ensure you include the study design type and the research question."
Authors' Response:
We have revised the title in line with the comment. The revised title clearly states both the purpose of the paper and the study design (repeated cross-sectional surveys): "Are socioeconomic disparities in tobacco consumption increasing in India? A repeated cross-sectional multilevel analysis."

Reviewer Comment #2:
"Better citation of papers like those from the Jha - NEJM etc and WHO MPOWER data would make the paper more relevant and up to date."
Authors' Response:
We have included the following citations in line with the comments:
• WHO (2008). WHO Report on the Global Tobacco Epidemic, 2008: The MPOWER package. Geneva, World Health Organization, 2008.
• WHO (2008). WHO Report on the Global Tobacco Epidemic, 2008: The MPOWER package. "Gender, Women and the Tobacco Epidemic. Summary and Overview". Geneva, World Health Organization, 2008.
• Jha P, Jacob B, Gajalakshmi V, Gupta PC et al. (2008). A nationally representative case-control study of smoking and death in India. N Engl J Med. 2008;358:1137-47
• Dikshit R, Gupta PC, Ramasundarahettige C, et al. (2012). Cancer mortality in India: a nationally representative survey. The Lancet, Mar 28. Epub. DOI:10.1016/S0140-6736(12)60358-4
• Palipudi KM, Gupta PC, SInha DN, et al. (2012). Social determinants of health and tobacco use in thirteen low and middle income countries: evidence from Global Adult tobacco Survey. Plos One. 2012. 7(3):e33466.
• Sinha DN, Palipudi KM, Rolle I, et al. (2011). Tobacco use among youth and adults in member countries of South-East Asia region: review of findings from surveys under the Global Tobacco Surveullance System. Indian J Public Health. 2011: 55(3): 169-76

• Shah PB, Pednekar MS, Gupta PC, et al. (2008). The relationship between tobacco advertisements abnd smoking status of youth in India. Asian Pac J Cancer Prev. 2008:9(4):637-42
• Viswanath K, Ackerson LK, Sorensen G, et al. (2010). Movies and TV influence tobacco use un India: findings from a ntational survey. PLoS One. 2010:5(6):e11365
• Stigler M, Dhavan P, Van Dusen D, et al. (2010). Westernization and tobacco use among young people in Delhi, India. Soc SCi Med. 2010: 71(5): 891-7
• Critchley JA, Unal B. (2003). Health effects associated with smokeless tobacco: a systematic review. Thorax 2003; 58:435–443

Reviewer Comment #3:
"1. Describe why upward trends in males were seen but not in females.
Authors' Response:
In the discussion section, we elaborate on the potential explanations for gender differences in tobacco consumption in India, especially reasons why prevalence is high among men but not women.
"Third, social gradients in tobacco use (overall and by type of tobacco) in India distinctly differ by gender. Despite women's empowerment, large-scale increases in women's smoking as predicted by the Cigarette Epidemic Model are yet to be seen in India[10-11,16-17]. Aggregate estimates show that women are far behind men in prevalence rates for smoking; and smoking and chewing rates among women, barring a few groups, seem to be declining. The reasons for this could be several. First, that Indian sociocultural realities and lower acceptability of smoking among women leads to delays in age of initiation of smoking and higher rates among older compared to younger women (Web Table 1). Women's smoking has been linked to their empowerment, but this may be confined to urban areas and it is possible that on average, smoking continues to remain a social taboo among women. Representation of smoking in the media may also explain the gender patterns in the use of tobacco; smoking has been projected as an expression of masculinity among men and has moralistic connotations for women[18-20]. Second, an economic perspective explaining the lower smoking rates among women in India may attribute this statistic to women's unequal participation in the labor market and limited access to personal disposable income. Higher smoking among women in cities may partly indicate greater uptake of smoking by employed women. Third, given that data for this analysis comes from a reproductive health survey, it is possible that results for women are an underestimate. Web table 1 indicates that older (above 35 years of age) women are more likely use tobacco. However, patterns in this analysis match findings from other tobacco studies such as the GATS in India (IIPS)[5-6], providing a counter to this argument."

Reviewer Comment #4:
2. Describe weaknesses if any of asking questions on smoking from a reproductive health survey, in which women are first interviewed.
Authors' Response:
We present the limitations of using NFHS data, including that the primary purpose of data is to collect information on reproductive health and related health aspects. Two biases may be seen here. One as discussed above may be the 'social desirability' bias affecting women's tobacco use in their childbearing years, leading to underestimation in their prevalence estimates. Second, since women were sampled first, the male sample may be conditional on the sampling of their partners. While both of these are legitimate concerns, the NFHS (and demographic health surveys in general) are considered some of the most comprehensive and generalizable surveys for a diversity of health outcomes. These large and representative samples, covering the 'productive' age groups of 14-50 years provide not just assessments of current risk, but also act as surveillance for future morbidity. Previous studies assessing tobacco risks using sub-samples of this dataset (Rani, Bonu, Jha. 2003 and Subramanian et al. 2004) have demonstrated large-scale patterns of tobacco use and

consumption inequalities consistent with this analysis. Hence despite some caveats, the breadth and generalizability of this data to men and women in the age-group of 14-50 years all over India provides compelling evidence on tobacco use patterns.

Reviewer Comment #5:
3. Better description of each of the tables and their results, linked to the result section.
Authors' Response:
In line with the comment, we have elaborated on the explanation of the tables in the results section.

Reviewer Comment #6:
4. A major re-write might well help this paper get its interesting conclusions out to the reader."
Authors' Response:
In line with the above comment, we have elaborated on the methods, results and discussion sections. The discussion section provides an analytical overview of the findings linking it to the results noted in other major studies (5-7,10-15,22). We focus on the key salient findings:
- Clear inverse gradients among men in smoking and chewing by education, caste, wealth and residence.
- Sharp and rising differences by survey year among men, but percentage change estimates show that greater proportional rises among higher SES groups - higher education, urban, richer populations, previously unreported.
- Among women, low and declining risks of smoking and chewing – with an inverse gradient by SES; higher rates of chewing tobacco compared to smoking and increases in smoking with urbanization.
- Among women, greater decline in smoking and chewing rates by education. Unclear trends by wealth and caste.
- Multilevel regression analysis shows a significant changing trend by wealth, education and living environment for smoking among men and for chewing among women. Increases in smoking among younger men (15-24 years) and chewing among younger women (15-24 years).
These findings show a complex picture of economic and social transition in tobacco use in India, distinct from the trajectories of developed and other developing countries. We focus on some of the potential explanations of these in the discussion section. These will be of some interest to your readership.

Reviewer Comment #7:
"Repeated cross-sectional study is an appropriate method for trend study, but to study trend over time data at two point might not be sufficient. for trend analyses data at three point are required. Changes between two points might be due to chance only."
Authors' Response:
We acknowledge that having more time points would be ideal in making robust assessments regarding a trend. However, datasets and information on chronic diseases and risk factors from developing countries is rarely ideal, and best estimates of patterns in current and future health disparities need to be made from what is available. Given the large and representative sample (201,219 men and 255,028 women from all Indian states), it is unlikely that the socioeconomic patterns are due purely to chance. In recent times, with some discussion on the epidemiologic transition in India and the role of socioeconomic determinants in tobacco consumption in India, there has been unclear evidence on the direction of tobacco disparities over time. This study provides empirical evidence to that discussion. We would be happy to extent this analysis to the next rounds of NFHS surveys, as and when they are collected and become available.

Reviewer Comment #8:
“Methodology refers ref no. 7 & 8, it could be briefly described in this paper. so that reader could understand the methodology without going through the paper.”
Authors’ Response:
The methodology for the surveys has been discussed in some detail in the Methods section.
“Data was analysed from two rounds of the Indian National Family Health Survey (NFHS 2 & 3) conducted during 1998-99 and 2005-6. The NFHS is a nationally representative cross-sectional survey that is collected and managed by the Indian Institute of Population Sciences (IIPS) in Mumbai, India. These surveys provide vital sources of information on demographic, health and socioeconomic behaviour of Indian households. Data from men and women in the age group of 15-49 years was used from both survey rounds to ensure comparability. Data is representative of all Indian states (except the small Union Territories), hence covering almost 99 per cent of the country’s population. The surveys were collected using multistage cluster random sampling techniques. Rural and urban areas are sampled separately and a uniform sample design was followed in each state; states and PSUs are considered as levels. Individual questionnaires for men and women were used to interview usual residents of the household or visitors who stayed in the house the night before. Further details on sample design , including sampling framework and sample implementation, are provided in the basic survey reports by IIPS [8-9].”

Reviewer Comment #9:
“Abstract does not highlight any data, only conclusive findings are given. It shows risk which is not mentioned in the main body of the paper.”
Authors’ Response:
Revisions to the abstract have been made. Quantitative findings have been included in the abstract. ‘Risk’ has been removed.

Reviewer Comment #10:
Methodological limitations reduce the credibility of data.
Authors’ Response:
We have presented the limitations of using this data in the discussion section of the paper. Briefly these include: 1) cross-sectional nature of the survey, limiting the scope for causal inferences; 2) lack of data on type of tobacco along with volume data to provide stratified analysis of tobacco consumption, and 3) data comes from a reproductive health survey, where women are sampled first, which may provide an underestimate of women’s prevalence due to social desirability bias and underestimates in male smoking due to conditional dependence of male and female samples. Despite these caveats, we stress that the NFHS has proven to be representative and generalizable, and continues to be used in a number of studies to assess both tobacco and other health outcomes[5-6]. Moreover our findings are consistent with estimates from other studies using the NFHS as well as other surveys assessing the burden of tobacco and its drivers in India[2,22]

Reviewer Comment #11:
Results are not sufficiently described. All tables are not referred in the text.”
Authors’ Response:
Results are described in detail in the revised draft. All of the tables (1-3) have been discussed in the text. Table 1 provides results from analyzing prevalence of smoking, chewing and dual use of tobacco among men and women by socioeconomic determinants. Tables 2 and 3 provide results from multilevel regression analyses, providing hypothesis tests for fixed and random parameters in the models. Web table 1 shows the prevalence results by other covariates of interest including residence, age, marital status and religion. Figures 1-2 show the percentage change estimate for smoking and

chewing among men and women by education and wealth. Figure 3 provides adjusted probability estimates from the regression model.

Reviewer Comment #12:
“1. In the first sentence of the abstract, '...prevalence of tobacco..' may be changed to '...prevalence of tobacco use...'.”
Authors’ Response:
This has been revised in the new draft.

Reviewer Comment #13:
“2. Why Household and Year were not considered as levels in the multilevel models.”
Authors’ Response:
The above comment pertains more fundamentally to the purpose of the study and choice of variables. Multilevel methods are useful statistical and substantive techniques that incorporate nesting structures in the data for a richer examination of relationships between exposures and outcomes. We consider state and local areas as levels in the analysis for the following reasons. First, tobacco consumption patterns in a large and diverse country like India are likely affected by geographic/spatial distributions. Second, tobacco consumption is socioeconomically and culturally patterned by region, and tobacco and health policies fall under the realm of state and local district authorities. Hence both state and local areas are important units for examining variation for this outcome.
The use of year (time) as a level would be useful if we were considering longitudinal patterns, and were interested in the tobacco consumption among same individuals over time (individuals nested in time) – which is not possible with repeated cross-sectional surveys (individuals nested in geographical units). Households may be used as a level of analysis, if the purpose of the research was to examine whether individuals within a household shared a common exposure to tobacco. This would in turn increase the levels in the analysis to four, making the analysis cumbersome and not add any value to the analysis. The purpose of the paper is to examine individuals’ risk for consuming tobacco linked with larger socioeconomic determinants, and not whether risks in the household are interconnected. The latter is an interesting research question by itself but lies outside the purview of our paper.

Reviewer Comment #14:
3. Mention that the prevalence is in percentage (?) in Table 1.
Authors’ Response:
This has been revised in the new draft.

Reviewer Comment #15:
4. Are the results presented in Table 1 and in the Figures 1-3, survey weighted and age-adjusted? Please clarify with footnotes if required.”
Authors’ Response:
Results in table 1 are survey-weighted and age-adjusted. This was mentioned in the methods section of the paper, but is also included as a footnote in the table.

We hope that the responses and revisions in the paper address all the concerns of the review team. We thank you again for your considered comments on our paper as we resubmit the paper to BMJ Open.

VERSION 2 – REVIEW

REVIEWER	Dr. Meerjady Sabrina Flora Associate Professor of Epidemiology National Institute of Preventive and Social Medicine Mohakhali, Dhaka-1212, Bangladesh There is no conflict of interest.
REVIEW RETURNED	14-Aug-2012

THE STUDY	Abstract- in the design section the study is written as cross-sectional survey. in my opinion it should be written 'secondary analyses of second and third National Family and Health Survey data' as the surveys were not conducted by the current authors. in the setting and participants section only participants are given in an incomplete sentence. in the result section first sentence- SES gradient is shown only by education data. in the next sentence again it is written that 'Similar gradients observed by education'. it is confusing. mixing of present and past tense in result section is observed. result should be written in past tense. Data is plural, use of 'was' after data should be reconsidered.

REVIEWER	P. Sankara Sarma Professor Sree Chitra Tirunal Institute for Medical Sciences and Technology INDIA No competing interests.
REVIEW RETURNED	31-Jul-2012

- The reviewer completed the checklist but made no further comments.

VERSION 2 – AUTHOR RESPONSE

Reviewer Comment #1:
“in the design section the study is written as cross-sectional survey. in my opinion it should be written 'secondary analyses of second and third National Family and Health Survey data' as the surveys were not conducted by the current authors.”
Authors’ Response:
We have revised the design section in the abstract as per the suggestion of the reviewer i.e. “Secondary Analyses of second and third National Family Health Survey (NFHS) data”. The design for the surveys is cross-sectional. We acknowledge that we have analyzed the data but have not conducted the surveys.

Reviewer Comment #2:
“in the setting and participants section only participants are given in an incomplete sentence.”
Authors’ Response:
This has been revised in the abstract to include the full sentence: “Data were analyzed from 201,219 men and 255,028 women over two survey rounds”. It has previously been written as a phrase keeping in mind the word limit constraints of the section.

Reviewer Comment #3:
“in the result section first sentence- SES gradient is shown only by education data. in the next sentence again it is written that 'Similar gradients observed by education'. it is confusing.”
Authors’ Response:
We thank you for pointing this out. This has been corrected in the new version and the new text reads as follows. “Among men (2005-6), gradients in smoking by education (illiterate: 44% vs. postgraduates: 15%) and chewing (illiterate: 47% vs. postgraduate: 19%) were observed. Inverse gradients were also observed by wealth, living environment and caste.”

Reviewer Comment #4:
“mixing of present and past tense in result section is observed. result should be written in past tense. Data is plural, use of 'was' after data should be reconsidered.”
Authors’ Response:
We have addressed this in the revised draft. All the changes are visible in the version with track changes.

Once again, we thank you for your suggestions and comments