Author's response to reviews

Title: Hypertension: Comparison of self reported data on hypertension and measured blood pressure in a tri-ethnic community

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Version: 5 Date: 24 July 2012

Author's response to reviews: see over
Thank you for your invitation to revise and resubmit our manuscript, titled “Hypertension: Development of a prediction model to adjust self-reported hypertension prevalence at the community level” for consideration for publication in the BMC Health Service Research Journal. We appreciate the thoughtful comments from the two reviewers. The revised manuscript is attached. Our specific responses to the comments are detailed in the pages below. If any additional clarification is needed or there are questions on the enclosed materials, please do not hesitate to contact me, the corresponding author, by email gmentz@umich.edu or by phone at (734) 647-5237.

Thank you for your consideration.

Sincerely,

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Manuscript word count: 3,388
Dr. Harold,

We thank the two reviewers for their careful and thoughtful comments on our revised manuscript (MS: 1220331110590054). We have revised the manuscript in response to the comments and suggestions made by the reviewers. Our revisions include, in response to comments from one reviewer, a change in our title to Hypertension: Development of a prediction model to adjust self-reported hypertension prevalence at the community level (changed from the original title: Hypertension: Comparison of self-reported data on hypertension and measured blood pressure in a tri-ethnic community). Below, we describe the itemized responses to each of the reviewer’s suggestions.

Reviewer #1: Reviewer's report
Title: Hypertension: Comparison of self reported data on hypertension and measured blood pressure in a tri-ethnic community
Version: 4 Date: 21 March 2012
Reviewer: José María Huerta
Reviewer's report:
Dear Editor,
I feel that the authors have adequately addressed all issues raised and have no further comments to make. The manuscript has been largely improved.
With kind regards,
José María Huerta.
Level of interest: An article of importance in its field
Quality of written English: Acceptable
Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests:
I have no competing interests to declare.
Response: We thank this reviewer for their thoughtful comments on the earlier version of the manuscript, and believe that the revised manuscript is much stronger as a result.

Reviewer #2: Reviewer's report
Title: Hypertension: Comparison of self reported data on hypertension and measured blood pressure in a tri-ethnic community
Version: 4 Date: 29 March 2012
Reviewer: Luisa Borrell
Reviewer's report:
MS: 1220331110590054 Hypertension: Comparison of self reported data on hypertension and measured blood pressure in a tri-ethnic community
The revised version of the manuscript (MS) shows some improvement but there are some residual issues from the previous and some new issues as a result of the revisions.
Specific comments

1) Introduction. This section while improved does not present a coherent argument for the underestimation of self-reported measures of hypertension and foremost the importance of development a prediction model.

Response: We have revised the introduction (Background) to clarify and enhance the coherence of our argument for variations in the estimation of hypertension using self-report measures, and for the development of a prediction model to adjust for underestimation in specific samples. The revised background section appears on pages 4-6 of the attached manuscript, and reads as follows:

(Revised Background)

Hypertension affects an estimated 30%\textsuperscript{1,34,35} of the population in the United States, and is associated with health outcomes such as cardiovascular disease, heart attack and stroke.\textsuperscript{2,6} Population estimates of hypertension prevalence are often assessed through large scale surveys which rely on participant self reports of previous clinical diagnosis of hypertension.\textsuperscript{3,7} Self-reported data is often more economically feasible and readily available (e.g., through telephone interviews\textsuperscript{26}) compared to clinically measured high blood pressure (HBP). However, given substantial evidence that awareness of hypertension is imperfect (for example, discrepancies between clinical measures and self-reported hypertension), reliance on self-reported data may contribute to inaccuracies in estimating population prevalence of hypertension.\textsuperscript{36,37,38,39} Furthermore, given evidence that awareness varies across various subgroups within the United States\textsuperscript{8,19,25,40}, reliance on self-reported data to estimate prevalence in small areas where population characteristics differ from national characteristics may contribute to inaccuracies in prevalence estimates.

Several studies have examined the validity of self-reported hypertension and its use for surveillance of hypertension trends. Studies using national data such as NHANES\textsuperscript{24,25} or large samples\textsuperscript{27,28} have suggested that self-reported data may underestimate hypertension prevalence\textsuperscript{26,36,37,38,39}. Given that some with hypertension are unaware or otherwise do not report the condition,\textsuperscript{3,8,9} Age, gender, education, geographic area, marital status, race and ethnicity have been found to be associated with accuracy of self-reported HBP.\textsuperscript{2,4,5,8,16,11-13} Studies that have attempted to gauge the extent of this problem have reported differences between clinically measured and self-reported HBP that range from 2.0\textsuperscript{8} to 27.0\%.\textsuperscript{8} Most studies designed to assess the accuracy of self-report data have compared self-reported high blood pressure to a ‘gold standard’\textsuperscript{9,14-18} such as measurements obtained from physical examinations using a mercury sphygmomanometer.\textsuperscript{12,19} The majority of these studies have been based on small samples; have relied on volunteers; include only persons in good health; or recruit participants of particular organizations (e.g., an HMO) or screening programs. These factors limit the ability to either generalize to broader populations or identify characteristics that may be associated with differential accuracy of the self-reported versus clinically measured HBP. One validation study has been based on a nationally representative sample\textsuperscript{20}, and this study identified a prediction model used to estimate prevalence of high blood pressure. These methods were developed for large-scale national samples, and require fairly sophisticated statistical expertise to implement.

However, there are well established differences in the rates, awareness and treatment of hypertension across racial and ethnic groups, by socioeconomic status, and across geographical areas within the United States.\textsuperscript{11,21} Thus, the applicability of national models within specific communities or areas may vary. In addition, the severity of the underestimation of self-reported data varies across different chronic diseases\textsuperscript{8,9} such as diabetes, stroke and heart attacks. Assessing the validity of self-reported data in estimating hypertension prevalence in specific geographic areas, and developing simple prediction models that correct for possible miss-reporting of HBP in self-reported data, can be essential to the creation of accurate population level estimates, and for population level efforts to effectively prevent or treat HBP within particular contexts. To date, no studies of which we are aware have developed such a correction model for self-reported data at local geographic levels.

Thus, our objective in this paper is to examine the accuracy of self-reported data in describing the prevalence of hypertension in racially and ethnically diverse urban community, and to develop a simple tool to correct self-reported data to more accurately reflect clinical prevalence of HBP. Specifically, we aim to:

Aim 1: Examine the extent to which reliance on self-reported data may miss-characterize hypertension prevalence in a multiethnic urban community.

Aim 2: Develop aprediction model to calibrate self-reported data to more closely correspond to the clinical prevalence of hypertension in a local community sample.

To address these aims, we draw on data from two multiethnic urban samples, the 2002 Healthy Environments Partnership (HEP) community survey\textsuperscript{22} and the NHANES 2001-2002 national survey, restricted to residents 25 years and older of metropolitan areas as described in the following section.

2) The introduction needs some editing, i.e., there are several words that could be replaced for a more appropriate one. For example, second sentence of first paragraph: Standard symptom….. are used to develop population based estimates of hypertension.

Response: As described in response to comment #1 above, we have substantially revised the introduction (Background). The phrase noted in comment #2 has been removed from the revised Background, which now reads as shown above.
3) The aims are still a bit disconnected from the statistical analyses. For instance, Aim 2 as stated gave the impression that the authors were going to show how far the self-reported measure was from the clinical measure based on particular characteristics included in the prediction model. However, this aim is addressed by showing specificity, sensitivity, accuracy and Kappa. The same issue applies to Aim 3 as again the reviewer was under the impression that the authors were going to use the prediction model calculated using NHANES data to assess or compare the quality of the estimates generated from the HEP data.

Response: We thank the reviewer for this comment, and believe that the revised Background section includes revised and improved aims (1 and 2) of the paper. We have modified the language in Aims 1 and 2 and removed Aim 3. These improvements with the additional information of Tables 2 and 4 (also submitted in the previous revised version of the paper) show how far the self-reported measure was from the clinical measure based on particular characteristics included in the prediction model for both the HEP and the NHANES samples. In Tables 3 and 5 (also available in previous revised version of the paper) we assess validity and agreement of the self-reported data for both samples using sensitivity and specificity, and measured of agreement such as Kappa statistics. Together, the additional information provided in Tables 2-5 with the revisions made to Aims 1 and 2, link the aims more clearly to the statistical analyses conducted.

4) It is unclear whether the clinical measures of hypertension were collected the same way in HEP and NHANES. This needs to be stated.

Response: Thank you for this comment. We have inserted text that now states clearly that measures were taken and calculated in the same way for both the HEP and the NHANES samples. The revised text appears on page 6 of the revised paper and reads as follows:

Clinically measured high blood pressure. (CH) was constructed as follows, for both the HEP and the NHANES survey data. Three measures of systolic and diastolic blood pressure were obtained using a portable cuff device (Omron model HEM 711AC) that passed Association for the Advancement of Medical Instrumentation standards. In both the mean of the second and third reading were calculated for systolic and diastolic blood pressure readings. CH was defined as mean systolic blood pressure >140 and/or mean diastolic blood pressure >90 and/or self-report of current treatment with antihypertensive medication.

5) The authors used the term Latino instead of Hispanic (which was used in the previous version). However, these terms are used interchangeable and the issue here is whether the sample truly represents Hispanics/Latinos or just Mexican Americans. Given the sample size in NHANES and the Hispanic population in Detroit, it is likely that the sample is comprised of Mexican Americans and it should be called just that.

Response: We appreciate the reviewer’s attention to detail and concern for accuracy on this point. We have examined the sub-identities or countries of origin identified by the participants in both studies classified as Hispanic or Latino

For the HEP sample, 75.8% of those included in this category identified as Mexican, and 24.2% identified as Other Hispanic (Cuban, Puerto Rican, from Central America or from South America).

For the NHANES sample, among those who identified as Hispanic or Latino, 84.7% identified as Mexican, and 15.3% identified as Other Hispanic.

Thus, while the reviewer is correct that the majority of Hispanic/Latino participants in the HEP and NHANES survey identified as of Mexican American, this label does not accurately reflect the self-reported identifications of one quarter of the HEP sample and one sixth of the NHANES participants.

Given the diversity of participants reflected in the two samples, we have retained the broader label of Hispanic, and have indicated the proportion who identified as Mexican American within each sample (see page 10 of the revised paper).

6) It is unclear why the authors used non-Hispanic black as the reference as most studies used non-Hispanic white. Please remove the coding used during analyses from the independent variables description (page 5).

Response: Non-Hispanic Black was chosen as the reference group because it’s the largest group size for the HEP sample, and affords the most robust standard errors for the re-calibration step of the process. To address the reviewers’ comments, we ran models using non-Hispanic White as the referent, and there were no differences in the patterning of the results. We have added a sentence in the description of the measures to note the decision to use non-Hispanic Black as the referent group in page 7 of the revised manuscript.

Also, we have removed coding when describing independent variables (page 7 in revised manuscript).
7) Sensitivity and specificity are not measures of agreement per se and perhaps the authors want to note that.

Response: We have changed the wording in the manuscript to remove references to sensitivity or specificity as measures of agreement. For example, the revised description of the statistical procedures used in addressing Aim 1 (page 7) now reads as follows:

Assessment of validity and concordance between self-reported and clinically measures HBP (Aim 1). Statistical measures of 1) sensitivity (percent fitting the medical criteria for hypertension who reported that they had the condition); 2) specificity (percent not fitting the medical criteria who reported they do not have the condition); 3) accuracy or overall level of agreement (percent for whom the medical criteria and self-reported are in agreement; and 4) Cohen’s Kappa coefficient with adjustment for chance agreement were used to assess the validity and concordance between of self-reported and clinical measure hypertension within each urban sample (HEP and NHANES urban).

Each statistical measure was calculated for the full sample, and also stratified by each of the independent variables considered for this analysis (e.g. age, gender, race and ethnicity, education and household income).

8) The discussion shows improvement but still does not compare the study findings with previous studies. There are several studies addressing this issue for diabetes and perhaps they can be used as comparison for this study’s findings.

Response: We have revised the discussion section in response to this comment. Specifically, we have incorporated discussion of our findings in relation to previous studies described in the background section, with a particular focus on comparisons of our findings to other studies that have examined the accuracy of self-reported hypertension as an estimate of clinical prevalence of HBP. The revised discussion section reads as follows:

Findings reported here suggest that self-reported data underestimate the prevalence of high blood pressure in the NHANES urban sample by 8.1% and in the HEP local community sample by 10.4%. These underestimates are larger than those reflected in the full NHANES 2001-2002 sample of 7.5%, suggesting that the degree of underestimation of hypertension prevalence based on self-reported data may be larger in urban compared to national samples. Furthermore, prevalence of hypertension appears to be higher in the two community samples used in this analysis (33.8% and 40.1% for the NHANES urban and HEP samples respectively), compared to the 30.4% reported for the NHANES 2001-2002 full sample. These results suggest that the application of national rates, or the use of corrections derived from national samples, may not be appropriate to estimate hypertension prevalence in some urban communities.

We found the highest levels of HBP, and the greatest discrepancies between self-reported and clinically measured HBP, in the HEP community sample. This community is characterized by a higher proportion of residents with lower socioeconomic status, and by a greater proportion of Hispanic and non-Hispanic Black participants compared to the NHANES urban sample. The higher levels of HBP, and the greater discrepancy between self-reported and clinically measured HBP in this sample may reflect more restricted access to health care providers compared to the NHANES urban or the NHANES national sample. Our finding are consistent with results reported in the literature when considering large samples, simulations or national sample such as the NHANES sample. We extend these by showing the under-estimation of hypertension for self-reported data can be even larger in small communities. The range of the underreporting for the HEP sample of 7.3% to 13.9% fell within the range of 0.2% to 27% reported in other studies that have assessed the validity and concordance of self-reported data when considering small samples like the one used in this paper. The wide range of under-reporting complicates the generalization of findings from one community to another. Thus, developing a prediction model that will allow re-calibration of self-reported data for small samples seems reasonable and appropriate.

Our second aim was to examine the feasibility of using prediction models to correct for underestimates of prevalence of HBP using self-reported data. The application of prediction models derived from the NHANES urban sample to data from the HEP community sample resulted in re-adjusted estimates of sensitivity and specificity. These adjusted estimates were then used to obtain improved estimates of the probability if hypertension that more closely correspond to clinically measured levels of HBP in this community. Final re-calibrated estimates of hypertension, 38.1% and 40.5% for the HEP sample, using both Method 1 (equations (1) and (2)) and Method 2 (equation (3) and (4)) resulted in estimates that were much closer to population prevalence of hypertension, 40.1%. These findings suggest that prediction models similar to those used here can be applied to obtain more accurate estimates of hypertension prevalence in local communities.

In this case, we created and applied a prediction model based on national metropolitan (as an approximation of urban) data to a local multi-ethnic urban community. Based on the findings reported here, we suggest that prediction models can be used to adjust self-report HBP data to obtain more accurate estimates of HBP prevalence by following the procedures described below:

1. Using NHANES 2001-2002 data similar to the researcher’s data set, predict the probability of clinical hypertension stratified by self-reported hypertension, i.e., using SRi and Xi. Apply the coefficient estimates of the logistic models into the researcher’s sample (in our case the HEP sample) to re-calibrate sensitivity and specificity estimates using equations (1) and (2).
2. Estimate the probability of self-report HBP using equation (3) for each participant.
3. Estimate the probability of clinically measured HBP using equation (4) for each participant.
4. Using the threshold value of 0.50 classify each respondent into one of two groups: has clinically measured HBP or not.

9) Please consider changing the title to reflect the content of the paper.

*Response:* Thank you for this comment. We have revised the title of the paper to read as follows:

Hypertension: Development of a prediction model to adjust self-reported hypertension prevalence at the community level.

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

*We have reviewed the manuscript thoroughly to address language corrections and typographical errors throughout.*

Statistical review: Yes, and I have assessed the statistics in my report.