Author's response to reviews

Title: Distance decay and persistent health care disparities in South Africa

Authors:

Zoe M McLaren (zmclaren@umich.edu)
Cally Ardington (cally.ardington@uct.ac.za)
Murray Leibbrandt (murray.leibbrandt@uct.ac.za)

Version: 2
Date: 13 July 2014

Author's response to reviews: see over
Dear Professor Balabanova,

Thank you very much for giving us this opportunity to revise our paper “Distance decay and persistent health care disparities in South Africa”. We are grateful to the referees for their careful and helpful comments. We have revised the paper, taking these comments into account where possible. Below we explain in detail how we have responded to each point of the reviewers. For ease of review we have included our responses to the reviewers comments in bold. Any excerpts from the revised text are included in italics.

In addition to this detail, we would like to highlight that the analysis now focuses on all South Africans and that the paper specifically focusses on racial and income disparities in proximity to health care.

We have edited the paper to adhere to the submission guidelines, particularly with respect to the format and style of the references.

Yours sincerely,

Zoe McLaren
Major Compulsory Revisions

1. In the second paragraph, the authors state that their approach allows them to ‘compare potential access to actual use’. I am not sure that this is the case as their data are based on respondent reported use of a particular facility rather than actual attendance data from the health facility in question.

The reviewer is correct that we compare potential access to reported rather than actual use. Following the advice of the other referee we have modified the paper to focus on racial disparities in proximity to health care and no longer model the determinants of using the closest clinic as the white sample for this outcome was too small to allow for meaningful comparisons between races.

2. Whereas the location data used to determine the location of the health care facility used is clearly described, the same is not true of the household location. Is this based on a measure coordinate of the household during data collection, or an address of the household? How accurate/precise were these measurements?

We now include the following description of the household location data: “During fieldwork, GPS co-ordinates of the household were taken using handheld GPS units and then transcribed onto the paper questionnaire.”

3. It is not completely clear to exactly which health care facility the distances were measured and which measurement was used in a particular analysis: There are potential two distance measurements involved:
   a. the distance from the respondent household to the closest health care facility (private/public?); and
   b. the distance from the respondents household to the health care facility they reported to have used most recently.

See response to comment 4 below.

4. The above problem is compounded by the statement: “We define the nearest facility as one that is no more than 0.5km from the nearest facility”. I do not understand this definition.

As explained in comment 1 we no longer examine distance from the respondent’s household to the facility that they have most recently used. This removes the concerns in 3b and 4. We have clarified our definition of distance to the closest health care facility in our Methods section as follows:

“We calculated the exact distance between households and their nearest public clinic using geographic positioning system (GPS) coordinates. We follow Tanser et al. (2001)[24] and use Euclidean distance as a measure of distance traveled. In South Africa, reliable geocoding is not available to
calculate travel time for respondents throughout the country. Rosero-Bixby (2004)[25] found the correlation between Euclidean distances and travel times to be high, but not perfect. In the absence of geocoding, Euclidean distance provides a good measure of travel costs.”

5. Figures 2 & 3 could benefit from confidence bands around the curve to visually assess the statistical significance of the trends presented.

As suggested by the other reviewer, we have replaced these two figures with tables showing regression output. The statistical significance of all coefficients is reflected in the tables.

Minor Essential Revisions
None

Discretionary Revisions
1. Although the use of Euclidian distance is acceptable for this analysis, an analysis using closest distance by road, although computationally more demanding, might be more insightful, especially in rural areas where access to the nearest health care facilities may be compromised by natural barriers or transport costs due to circuitous routes. The necessary information (road network data) are available in the public domain or from the same providers used for the health care facility location data.

Though the road network data are available in the public domain, it is computationally intensive to calculate road network differences for the observations in our sample. With the exception of cols 1-3 in Table 3, our results use distance ranges that are unlikely to be affected by such a change in methodology. In fact, Tanser et al. (2006) show that point estimates are similar between Euclidean distance and travel time models, though standard errors are reduced.

Tanser et al. (2001, 2006) show that road network data is unlikely to produce precise estimates of travel distance for rural residents, who tend to walk approximately Euclidean distances, and public transportation users, who travel along pre-set routes. We have added the following note to this effect in the Limitations section:

“Our estimates of the relationship between distance to health facilities on utilization would be more precise if the NIDS data included information on the mode of transport used to travel to the clinic.”

Reviewer’s report
Title: Distance decay and persistent health care disparities in South Africa
Version: 1 Date: 28 April 2014
Reviewer: Mark Siedner
Reviewer's report:
Summary:
The authors present an analysis of a demographic health survey paired with home GPS coordinates in South Africa (National Income Dynamics Study) to assess relationships between distance from health centers, race, socioeconomic status, and health care access. Primary analyses include 1) general description of how sociodemographic characteristics differ by relative distance to health facilities; and 2) correlates of health care access (recent visitation and use of nearest health facility) among a sub-sample of Black Africans in low income strata. While well written, of sound message and a critical topic for program planning and health service research, their manuscript has some limitations, which can likely be mitigated with further analysis considerations.

Major Comments:

1) Why did the authors limit their estimation sample to Black African respondents in the three lowest income strata? It seems the goal of this report is to test the hypothesis that race and/or income are associated with distance to health centers and have significant impacts on health care access. Thus, a more valid analysis might include all races and income strata, and to estimate how each of these characteristics is correlated with their outcomes of interest. If the sample is restricted to this sub-group, it is inherently impossible to measure the effect of race or broad income inequality (highest vs lowest strata) on health care access.

As suggested by the referee we have amended the paper to include all races and income strata in our analyses and discussion.

2) Many of the conclusions cannot be derived from the restricted analyses presented. For example, the authors state that “respondents in the poorest income quintiles are more likely to live further from the nearest health facility,” — yet aside from a Figure, this data is not shown (and not tested statistically); “we find distance decay in health consultations and attended births, which is largest for the poorest Black African respondents,” — yet again there are no presented data on attended birth use by income or distance to clinic. Additionally all statements about income, race and access to care have only been made within a sub-population of Black Africans in the lowest income strata. Statements comparing health access and distance to clinic by race and income should be supported by models that include all races and show comparative differences by race and income.

In this revision we have been careful to restrict our conclusions to results that are presented in the paper. We have removed the figures on distance decay in health consultations and attended births and instead present regression results for these outcomes. As stated above, the analysis now includes all race and income groups.

3) Overall – while informative, I would suggest a more expansive group of analyses. The authors select rational health indicators with univariable (by race) comparisons presented in Table 1. But they restrict their multivariable analyses to black race, selected income quintiles only, and select only two health
indicators for Table 3 (having a health consultation in past year) and Table 4 (using the closest health facility). Importantly, neither of their multivariable model outcomes of interest are measures of distance to clinic, so definitive predictors of distance to clinic are not made. Moreover, because they do not include race or the full range of income in their multivariable analyses, the impact of race and income cannot be fully extrapolated. With many thousands of survey respondents, their data is rich and can be exploited to make more specific conclusions. I would suggest the following:

a. Select primary outcomes of interest. I would divide these into 1) distance to clinic as an outcome; and 2) health care utilization (clinic visit in past year, attended birth in past year, etc) and include distance as an explanatory variable in the latter set of analyses

b. Perform both univariable and multivariable analyses (adjusted for explanatory variables that the authors include, such as age, self-reported health, medical insurance, education, household size, income, etc.). While stratification by gender and urban/rural seems reasonable, other variables (e.g. income, race, self-reported health status) should be included in all analyses to allow for better discernment if the health disparities in race are independent of socioeconomic status, and vice-versa. If such an analyses is limited by colinearity – than these statement should be made. This analysis strategy will enable a clearer understanding if the inequalities in access are income or race related (or both)

c. Assess for by-race interaction terms for the impact of distance to clinic on health outcomes

We have followed the referee’s advice and reorganised our paper as suggested in this comment.

4) Is HIV data available (self-reported if not seroprevalence) in their datasets? Given the adult prevalence of HIV and its widespread impact on health care utilization, dependence, etc. it would seem a likely confounder for much of their analysis. This is particularly important for their Table 4 analysis for correlates of use of the nearest health facility.

Unfortunately HIV seroprevalence data is not available and there were no direct questions about HIV in the survey. Adult respondents were asked about seven chronic conditions (not including HIV). They were then asked if they had any other major illnesses or disability. Only 1% of respondents mentioned HIV as a major illness or disability.

Minor Comments:

1) The data, which derive from 2008, while informative, are somewhat out of date. A mention of this as a potential limitation in the discussion section seems warranted. These relationships might have changed in numerous ways since the time of the data collection. Most importantly, rapid scale-up of ART provision along with recent national prioritization to decentralize HIV care from PEPFAR to government clinics is likely to determine health care utilization in important ways.

In 2008 South Africa had reached approximately 40.2% ART coverage (Adam and Johnson, 2009).
We added the following statement to our Limitations section:

“The scale up and decentralization of ART provision since 2008 is likely to have reduced the racial disparities evident in our study as HIV+ individuals, who are much more likely to be Black African, are able to meet their health care needs at nearer clinics. However, distance disparities evident in 2008 may have long-lasting effects on health disparities.”

2) Figure 1 is difficult to interpret. Please label both the x and y-axis. Also it appears the y-axes are on different scales, which is misleading.

Figure 1 has been replaced by a figure showing the distribution of distance of the nearest clinic by race within urban and with rural areas. We have labelled both axes and have ensured the scales for both the x and the y axis are the same for the rural and the urban figures.

3) Table 1 proportions can be compared statistically (using ANOVA or chi-squared tests) to estimate differences in target characteristics (distance to clinic, self-reported health, etc).

We now include indicators of statistically significant proportions in the updated Tables 1 and 2.

4) The columns in Table 3 and 4 are not labeled and difficult to interpret.

These tables have been changed substantially with the revisions. We have been careful to clearly label the columns of the new tables.

5) Figures 3 and 4 should likely have y-axis with an origin at 0%.

Figures 3 and 4 have been removed from the paper and replaced with regression output shown in Tables 4 and 5.

6) The conclusion statement about quality of health care, while likely accurate, cannot be supported by any available data in this manuscript.

We removed this statement referencing quality of care from the conclusion. Instead, we discuss care quality as it relates to decentralization and the shadow price of using health care. See response to item 8 below.

7) The manuscript would likely benefit from more discussion of potential reasons for (perceptions of quality of care, see Ware et al, Plos Medicine), stigmatization of disease states and its impact on health seeking behavior (see Tsai et al, Plos Medicine), and considerations of health service availability by clinical site (e.g. HIV only provided at certain centers).

We used the framework of the shadow price of accessing health care (McIntyre et al. 2009) to incorporate these points into the discussion of policy implications. See response to item 8 below.
8) The manuscript would likely benefit from further considerations of strategies to improve distance related health disparities. When health care sector areas would need to be strengthened (human resources, decentralization of services, greater access to specialist, transportation reimbursements, etc)

We added the following to the discussion of potential policy implications:

“Decentralization of services is one way to reduce travel time and ameliorate disparities, especially if the quality of care is maintained through the decentralization.

Second, reducing the shadow price of using a service (i.e. the full opportunity cost; see McIntyre et al. 2009) by, for example, improving the quality of care (Ware et al. 2013), decreasing stigmatization of disease states (Tsai et al. 2013), providing transportation vouchers or increasing the range of health services available at each health point will raise the benefit received per visit and increase the willingness to travel.”

9) How was income assessed? Were wealth strata weighted to national standards are divided within the cohort?

Households were classified into per capita income quartiles taking the household weights into account (i.e. the number of households differs slightly across quartiles). The household weights account for sample design, non-response and post-stratification. Weighted estimates are designed to be nationally representative.