ARIC Manuscript Proposal #2646

PC Reviewed: 10/13/15 Status: A Priority: 2
SC Reviewed: _________ Status: _____ Priority: ____

1.a. Full Title: Measuring Changes in SF-12 Status Over Time

b. Abbreviated Title (Length 26 characters): Changes in SF-12 Over Time

2. Writing Group:
   Writing group members: Jason Rotter, Sally Stearns, Benjamin Capistrant, others welcome

I, the first author, confirm that all the coauthors have given their approval for this manuscript proposal. __JR__ [please confirm with your initials electronically or in writing]

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3. Timeline:

All data are currently available and the SF-12 measures have already been merged from Visit 5 and the GNC telephone interview. Therefore, we anticipate completing the
analysis by December 2015. Depending on the results, we hope to submit a manuscript from Aim 1 and either Aim 2 or Aim 3 for the 2016 AcademyHealth Annual Research meeting (abstracts due in January 2016).

4. Rationale:

Measures of health status can have enormous value to researchers looking to capture subjective and self-reported changes in health over time. These measures can provide a strong supplement to clinical measures of health status often derived without patient perspective. The SF-12 questionnaire, which is a validated measure of health status constructed from the lengthier SF-36, measures self-reported physical and mental health (Ware 1996). Both forms have been used across different populations and modes of administration (Larson 2008, Lim 1999). However, validation of an instrument in separate contexts does not guarantee that some people will respond the same for telephone versus in-person administration, in which case the use of the difference in measures over time as an outcome could be suspect. Others have considered modes of administration when looking at HRQoL measures finding some differential effects (Hanmer 2007; Weinberger 1994).

The SF-12 was administered to ARIC cohort participants at visit 5 (June 2011 to Aug 2013). Single measures of functional health status are less useful for analysis than repeated measures over time. Without another cohort visit planned for some time, the questionnaire was added to the cohort semi-annual follow-up general interview (GNC) from January 2014 to March 2015. The questionnaire was administered in person during Visit 5 but over the phone for the GNC.

A first-order question in analyzing the change over time between Visit 5 scores and GNC scores would be ‘does administering the questionnaire in person compared to over the phone result in person-specific differences in response that could be misinterpreted as a change in outcome over time?’ This question is difficult to answer when many factors may contribute to a change in score. However, the ARIC study provides a unique opportunity to test for non-random differences between in-person and telephone administration because the Annual Follow-up (AFU) telephone interview asked participants each year to indicate whether their health status was Excellent, Good, Fair, or Poor (EGFP). By predicting the key self-reported health measures from the in-person SF-12 assessment at Visit 5 as a function of the trajectory of EGFP reports from prior years, we can assess the extent to which predicted versus actual reports of health status at the GNC differ based on the trajectory of EGFP reports prior to the GNC.

If we find evidence of any potential systematic bias between in-person to telephone administered the SF-12, then such evidence would be important to share with other investigators considering combining alternative methods of administration of the SF-12. If we do not find evidence of bias, then we can begin to reliably answer questions about functional health status change over time and its determinants in the ARIC cohort.
5. **Main Hypothesis/Study Questions:**

The study will address the following objectives:

1. A statistical assessment of bias between telephone and in-person administration of the SF-12 in the ARIC cohort.
   a. Estimate models using SF-12 measures (physical and mental separately) as the dependent variable and the last three AFU EGFP measures as predictors (controlling for time-invariant demo and socioeconomic factors, e.g., age, gender, race/site)
   i. 
   b. Test models for systematic bias between visit 5 and the GNC using two different alternative methods (described in more detail below)

2. If the tests show evidence of possible bias from telephone administration (i.e., non-random differences between predicted and actual GNC measures), we will explore alternative mechanisms for difference in scores.

3. If the tests do not show evidence of possible bias, we will conduct preliminary exploratory analyses to assess changes in SF-12 health status (physical and mental) between visit 5 and the GNC.

6. **Design and analysis (study design, inclusion/exclusion, outcome and other variables of interest with specific reference to the time of their collection, summary of data analysis, and any anticipated methodologic limitations or challenges if present).**

**Population of interest**

For these analyses we will restrict our sample to participants who have SF-12 scores both in visit 5 and at the GNC. Additionally we may need to remove individuals with irregular AFU follow up in the periods prior to visit 5 and the GNC. This will be explored in the data analysis.

**Outcomes and methods**

For the first study aim we will look to predict SF-12 measures by measures of overall health from AFU surveys in the last 3 periods, controlling for key covariates. The general model predicting visit 5 SF-12 scores may look like:

\[
SF12^{phys} = F(age, X, i.EGFP_1, i.EGFP_2, i.EGFP_3, SF12date)
\]
Where \( \mathbf{X} \) represents a vector of relevant covariates such as gender, race/site, education, etc. EGFP represents categorical dummies for each of the possible health status states from the AFU for period 1, 2, and 3, prior to the SF12. Theory driven interactions and transformations will be explored. Specifically, we will consider including interactions between EGFP scores themselves (to control for individual trends) and interactions with age (since individual interpretations of ‘excellent, good, fair or poor’ health may change with age).

Separate linear models for physical and mental SF12 scores will be estimated with distribution assumptions tested. These models will be compared for their predictive power using \( r^2 \) values to see if EGFP scores explain more of the variation in physical or mental health. This comparison will provide an assessment of whether reports of health status in EGFP form are more reflective of physical or mental health.

We will take two different approaches for assessing potential bias between visit 5 and GNC SF12 scores. Briefly: Approach #1 compares predicted SF-12 scores to actual; Approach #2 compares whether the parameter estimates of prior self-reported health differ between using in-person Visit 5 SF-12 versus GNC telephone SF-12 as outcomes.

**Approach #1**
1. Using the parameter estimates from the regression models using visit 5 SF12 scores as the dependent variable, we will predict SF-12 outcomes using data on the EGFP and other socio-demographic characteristics for the three years prior to the telephone SF-12 GNC interview.

2. We will then compare predicted to actual SF-12 GNC measures using statistical tests.
   a. For the SF-12 physical and mental health measures, we will test for whether the difference between actual and predicted GNC values is a normal distribution with mean 0 and std dev of 1.
   b. Skewing or a shift in the distribution would indicate (but not conclusively demonstrate) the possibility of some systematic “bias” between the responses to telephone and in-person administration given by some people.

**Approach #2**
1. We will model SF12 scores from the GNC in a similar fashion as the visit 5 scores using the equation outlined above with data from 3 prior EGFP measures.

2. We will then use a Hausman test (Wooldrige 2010) to assess differences in the estimated parameters between the predicted model using SF12 visit 5 scores and the predicted model using SF12 GNC scores. A difference in parameter estimates would provide evidence of systematic bias between in-person and telephone SF12 scores.
Aim 2 is only needed if either of the above approaches shows evidence of differences in the scores on the trajectory of self-reports prior to Visit 5 or the GNC. In this case, we will further assess whether the difference between predicted and actual GNC SF-12 measures (controlling for all measures above) is a function of:

- Baseline (visit 5) self-reported health status
- Subjective social status at Visit 5
- Mini-mental status at Visit 5
- Other Visit 5 measures (e.g., access to care and satisfaction with care, change in marital status within last two years such as death of spouse, etc.)

The goal of Aim 2 in the presence of possible bias is to understand and identify factors associated with variation in the scores.

Aim 3 is appropriate when no differences or systematic bias is found from aim 1 (i.e., when Aim 2 is not relevant). The goal of aim 3 will be to begin to explore clinically and policy relevant questions around factors associated with changes in health status in the ARIC cohort. We will explore differences based on factors listed above as well as:

- Chronic disease measures or onset of health event (MI, medical diagnosis)
- Medications being taken and self-reported medication adherence

Assuming we proceed to doing Aim 3, a full list of determinants will be built from the literature and expert opinion in the initial phases of the study.

Limitations
It is important to recognize the limitations of health status measures such as the SF-12 in a population. While they have demonstrated power in conveying information directly from the patient in a number of contexts, a single measure like EGFP may not do a good job of predicting more complex or multi-dimensional measures such as the SF-12, limiting broader conclusions from this analysis. We still believe it is important to test for these differences however we can to inform future work with HRQoL measures in ARIC.

Another specific limitation to using annual EGFP scores are the ‘missed’ events which may happen between the most recent AFU survey and SF-12 measure. Any events which significantly alter health and occur after our last measure of health status will complicate our ability to predict the SF12 score. However, to the extent that these events happen randomly in the population being studied, they may not affect the comparisons proposed other than adding random noise.

7.a. Will the data be used for non-CVD analysis in this manuscript? _X_ Yes
___ No
b. If Yes, is the author aware that the file ICTDER03 must be used to exclude persons with a value RES_OTH = “CVD Research” for non-DNA analysis, and for DNA analysis RES_DNA = “CVD Research” would be used? __X__ Yes
_____ No
(This file ICTDER has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript?
_____ Yes  __X__ No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER03 must be used to exclude those with value RES_DNA = “No use/storage DNA”?
_____ Yes  _____ No

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status. ARIC Investigators have access to the publications lists under the Study Members Area of the web site:
http://www.cscu.unc.edu/ARIC/search.php

_____ X__ Yes  _______ No

10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?

11.a. Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data? _____ Yes  __X__ No

11.b. If yes, is the proposal
_____ A. primarily the result of an ancillary study (list number*__________)
_____ B. primarily based on ARIC data with ancillary data playing a minor role (usually control variables; list number(s)* __________ __________ __________)

*ancillary studies are listed by number at http://www.cscu.unc.edu/aric/forms/

12a. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.

12b. The NIH instituted a Public Access Policy in April, 2008 which ensures that the public has access to the published results of NIH funded research. It is your responsibility to upload manuscripts to PUBMED Central whenever the journal does

13. Per Data Use Agreement Addendum for the Use of Linked ARIC CMS Data, approved manuscripts using linked ARIC CMS data shall be submitted by the Coordinating Center to CMS for informational purposes prior to publication. Approved manuscripts should be sent to Pingping Wu at CC, at pingping_wu@unc.edu. I will be using CMS data in my manuscript _____ Yes _____ No.
REFERENCES


Lim L, Fisher JD. Use of the 12-item Short-Form (SF-12) Health Survey in an Australian heart and stroke population. Quality of Life Research 1999;8: 1–8.

