ARIC Manuscript Proposal #2622

PC Reviewed: 9/8/15      Status: A      Priority: 2
SC Reviewed: __________  Status: ____  Priority: ____

1.a. Full Title: Widening the Scope: Examining the generalizability of ARIC CHD Surveillance Results to Broader Populations

b. Abbreviated Title (Length 26 characters): CHD surveillance generalizability

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

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3. Timeline:

Analyses will begin once the manuscript proposal is approved.
4. **Rationale:**

Coronary Heart Disease (CHD) imparts a significant public health burden both domestically and worldwide.\(^1\) In the U.S., CHD is a leading cause of mortality, accounting for approximately 370,000 deaths annually.\(^2\) The burden of prevalent CHD also is high – 15.4 million in 2013\(^3\)-thereby imparting significant (and rising) health care costs in addition to putting large segments of the population at increased risk for heart failure,\(^3,4\) cardiac arrhythmias,\(^5\) and sudden death.\(^6\)

Data describing the domestic CHD burden are often provided by surveillance systems leveraging national vital statistics, community-based studies, prospective studies, and health care delivery systems. Together, these studies have documented declines in CHD incidence and mortality since the late 1990s.\(^7,8\) Despite the documented utility of CHD surveillance to inform on CHD trends, existing surveillance systems routinely exclude large segments of the total population or may not provide a complete picture on CHD incidence.\(^9\) For example, CHD surveillance efforts using Medicare data are restricted to populations \(\geq 65\) years of age, missing approximately 19% of CHD deaths that occur among populations \(< 65\) years of age,\(^9,10\) and lacking the ability to detect any increases in CHD mortality among younger women.\(^11\) National CHD surveillance systems such as the National Hospital Discharge Survey (NHDS) also are available, facilitating widespread generalizability, but are restricted to unvalidated ICD-9 codes, cannot estimate incidence, and do not capture out-of-hospital events, potentially missing 74% of CHD deaths.\(^12,13\) In contrast, Atherosclerosis Risk in Communities (ARIC) investigators have conducted community CHD surveillance using validated methods that capture inpatient and outpatient CHD (1987-present; ages 35-74) in four U.S. communities (MS, MD, MN, and NC) with large African American and Caucasian populations.\(^14\) Yet, no study has examined the degree to which ARIC Surveillance results are generalizable to larger target populations. As increasing the scale of surveillance systems to encompass regional or national populations remains infeasible despite repeated calls for a national system to monitor CHD incidence,\(^15-18\) we propose to examine the generalizability of the four ARIC community populations to regional and national U.S. populations. We also will compare fatal CHD attack rates estimated in ARIC (1990-2010) to national fatal CHD attack rates estimated by the NHDS. We expect these results will inform future efforts examining the feasibility of calibrating ARIC community surveillance findings to broader populations.

5. **Main Hypothesis/Study Questions:** This descriptive study has the following aims:

1. Assess the similarity of ARIC community populations to larger target populations by comparing the age (35-74 years), race/ethnic (African American and Caucasian), and sex distributions of each ARIC study community (1990, 2000, and 2010) to each community’s state population and the U.S. population.
   a. Additionally, assess the similarity of more recent and age inclusive ARIC community population distributions to larger target populations by comparing the age (35-84 years), race/ethnic, and sex distributions of each ARIC study community (2005-2010) to each community’s state population and the U.S. population.
2. Test for differences in 20-year (1990-2010) ARIC surveillance and NHDS CHD mortality rate (CHD events/year) trends by race (African American and Caucasian), sex, age (10-year), and ARIC study community.

STATISTICAL METHODS

We will examine the generalizability of ARIC community surveillance data using three data sources: ARIC community surveillance data (1990-2010), U.S. Census data (1990, 2000, and 2010) and NHDS data (1990-2010).

To address specific aim 1, we will first compare age (35-74)-, race-ethnicity, and sex distributions across the four ARIC communities (Forsyth County, NC; Jackson, MS; Minneapolis, MN; and Washington County, MD), their respective states, and the U.S. population (1990, 2000, and 2010) using population pyramids, as shown below. Similar analysis will be done comparing age (35-84), race-ethnicity, and sex across the ARIC communities, their respective states, and the U.S. population (2005-2010). Notably, NHDS allows aggregation to counties, county equivalents (e.g. parishes or independent cities), towns, or townships, facilitating examination of the Jackson, Washington Co, and Forsyth Co. ARIC sites. For the Minneapolis site, we will first examine the feasibility of obtaining township-specific NHDS data, although such data may not be uniformly available. In the case of such data unavailability, we will compare ARIC sites with selected county level data as an approximation of ARIC sites for comparison purposes.

Figure. Population pyramids for Jackson, Mississippi, and the U.S. for 2010

To address specific aim 2, we will use ARIC surveillance and NHDS data to calculate annual CHD mortality rates. Annual age-, race/ethnicity-, sex-, and community-specific CHD attack rates per 1000 persons will be estimated by interpolation and extrapolation of population denominators from the 1990-2010 US census; Washington County, MD will contribute data from 1995 onwards. For ARIC, CHD mortality attack rates will be standardized across 1990-2010 using the imputation method previously described by Rosamond et al., (2012). NHDS CHD mortality will be defined using underlying cause of death codes. We will then use Poisson regression models to test the difference between 20-year ARIC surveillance and NHDS CHD mortality rates stratified by age, race-ethnicity, and sex across MS (African Americans and Caucasians), NC (African Americans and Caucasians), MN (Caucasians), MD (Caucasians), and the U.S. populations (African Americans and Caucasians).
We are aware that the methods used by NHDS and ARIC to assess CHD mortality rates have different levels of accuracy. We will therefore work with coauthor Wayne Rosamond, who has an approved ARIC manuscript proposal to evaluate concurrence between ICD-9 identified events compared to validated events in ARIC Surveillance, to gauge the influence of different measurement methods.

All analyses will be performed using SUDAAN and SAS version 9.4 (SAS Institute, Inc., Cary, North Carolina) and account for complex sampling, when appropriate.

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).

ARIC Surveillance:

Exclusions: Races other than black or white (Washington Co, MD; Minneapolis, MN).

Stratification variables:

1) Age: 10-year age groups (range: 35-74 years); 35-84 years in sensitivity analysis
2) Sex: either male or female
3) Race: either black or white
4) Study community

7.a. Will the data be used for non-CVD analysis in this manuscript? _____ Yes  ___X__ 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? _____ Yes  _____ No
(This file ICTDER03 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 at:

http://www.cscia.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)?
This manuscript is related to MS #1909 (Rosamond, Evaluation of International Classification of Disease-Ninth Edition (ICD-9) codes for Determining Subclasses and Anatomic Location of Myocardial Infarction in the Community). Dr. Rosamond is a member of the writing group and has approved of this proposal.

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.cscc.unc.edu/aric/forms/

12. 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.
REFERENCES


surveillance system to support the prevention and management of heart disease and stroke: a scientific statement from the American Heart Association Councils on Epidemiology and Prevention, Stroke, and Cardiovascular Nursing and the Interdisciplinary Working Groups on Quality of Care and Outcomes Research and Atherosclerotic Peripheral Vascular Disease. *Circulation*. 2007;115:127-55.


