

ARIC Manuscript Proposal # 1533

PC Reviewed: 7/14/09
SC Reviewed: _____

Status: A
Status: _____

Priority: 2
Priority: _____

1.a. Full Title:

Neighborhood Socioeconomic Status and Out-of-hospital Fatal Coronary Heart Disease:
ARIC Community Surveillance

b. Abbreviated Title (Length 26 characters):

SES and Out-of-hospital Death

2. Writing Group:

Writing group members:

Foraker RE, Rose KM, Suchindran CM, Kucharska-Newton A, Whitsel EA, Ni H, others
welcome

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

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3. Timeline:

Analyses to begin in Summer 2009. We will prepare an abstract for the October deadline of the 2010 AHA Council on Epidemiology and Prevention meeting. A draft of manuscript is expected during Fall 2009.

4. Rationale:

Coronary heart disease (CHD) mortality has declined in recent decades[1-8]. These declines have been more pronounced in men compared to women[1-3, 5-8]. Similar declines were seen in out-of-hospital CHD-related deaths from 1986 to 1996 in New Jersey: from 28% to 22% among men, while such declines were not seen among women[5]. Racial disparities in out-of-hospital cardiac arrest also exist, as incidence appears higher and survival lower among blacks compared to whites[9].

Out-of-hospital CHD deaths are defined as deaths due to cardiac causes occurring outside of a hospital or upon arrival at the emergency room. The majority of CHD deaths are classified as out-of-hospital deaths[1, 7], although estimates vary by study and country. Deaths occurring out-of-hospital are not often addressed separately from in-hospital deaths in research reports[1], and investigations have generally been limited to younger populations (i.e., persons aged 55 or less[4]; 64 or less[1, 2, 7]; or 74 or less[3, 6, 8]). Meanwhile, sudden cardiac deaths (SCDs) are defined as such because they occur within one hour of the onset of symptoms. Extant literature suggests that up to half of all CHD deaths are sudden[10, 11]. Further, it is estimated that the majority of SCD cases occur out-of-hospital in the U.S.[9].

In ARIC community surveillance between 1987 and 1994, 64% of CHD-related deaths among men occurred out-of-hospital, while about half of such deaths occurred out-of-hospital among women[6]. These data also indicate that annual declines in CHD mortality from 1987 to 1994 were steepest among white men (4.7%), followed by white women (4.5%), black women (4.1%) and black men (2.5%), respectively[6]. Further, a recent investigation in ARIC community surveillance (1987-2004) suggests that SCDs have declined with time, yet trends differ by community and gender[12].

There is reported geographic variation in both out-of-hospital death and SCD in the U.S.[12-14]. Such regional differences may be at least partly due to factors associated with neighborhood socioeconomic status (nSES), and such disparities may increase over time. For example, in Scotland, out-of-hospital CHD mortality rates were higher among persons living in deprived socioeconomic areas compared to those living in more affluent areas[10]. The influence of nSES on out-of-hospital death and SCD could be due to health care access, presence or absence of environmental stressors, and level of social support among neighborhood residents. Understanding the association of neighborhood characteristics with out-of-hospital deaths has implications for impacting the organization of health care services to improve CHD outcomes. The association of nSES and out-of-

hospital CHD mortality has not yet been investigated in the ARIC community surveillance population. Thus, we will examine nSES and demographic factors associated with out-of-hospital CHD mortality and SCD in the four ARIC study communities.

5. Main Hypotheses/Study Questions:

1. Neighborhood SES is inversely associated with the rates of out of hospital, fatal CHD within and across study communities.
2. Neighborhood SES is inversely associated with the rates of out of hospital, sudden cardiac death (defined as death occurring within one hour of symptom onset) within and across study communities.
3. Neighborhood disparities in the rates of out-of-hospital death will exist by race and gender, and increase over time.

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).

Data sources:

ARIC community surveillance data will be analyzed over the time period 1992-2002. Decedents' addresses were obtained from death certificates and geocoded to the census tract to approximate nSES. Out-of-hospital deaths have been ascertained from death certificate data from the four ARIC study communities, and additional data will be obtained from the Death Certificate Form (ICD-10 codes) and the community surveillance event file [age, race, gender, study community, death classification, SCD (timing of death), sampling weight, year of death]. Within the four ARIC study communities, out-of-hospital deaths are defined as those occurring outside of the hospital, among community members in nursing homes, or persons declared dead on arrival, who die in outpatient departments or emergency rooms, as well as those admitted without vital signs[15]. SCD will be defined as those with a definite or possible CHD death classification which occurred within one hour from the onset of symptoms. It should be acknowledged that the timing of death is not expected to be available for approximately 13% of cases[12], and therefore deaths with unknown timing will be excluded from the SCD analyses.

SES Exposures:

The census tract-level nSES measure selected for study from the 2000 US Census is median household income (nINC). nINC is available through the ARIC ancillary study *The Burden of CHD in Communities* (AS 2004.05) for the years 1992-2002. Covariates include race, gender, age, study community and year of death (time).

Outcome:

Out-of-hospital death rates are the outcomes of interest for these analyses (1992-2002). Specifically, denominators will consist of race- and gender-specific census tract population counts for the year 2000 for persons aged 35-74 from the four ARIC study communities. Out-of-hospital deaths will comprise the numerator. Age-, race- and gender-specific year 2000 census tract population counts will be used to standardize out-of-hospital death rates. A subset of analyses will also be conducted for out-of-hospital SCD rates.

Data Analysis:

Within and across the four ARIC study communities, race- (Jackson, MS and Forsyth County, NC only) and gender-specific out-of-hospital death rates will be calculated by tertile of nINC. Geographic information system techniques will be used to display out-of-hospital death and SCD rates on maps of each of the four ARIC study communities.

Poisson regression will be used, which takes into account spatial autocorrelations. This will be implemented using GLIMMIX, as done for ARIC MS 1102 (definite and probable myocardial infarction rates, under review, *Annals of Epidemiology*). The data will include observed and expected out-of-hospital deaths, age-standardized, within each census tract. In order to examine if SES effects vary across time, these models will be further extended to include time (year of death) and time interactions. A subset of analyses will also be conducted for out-of-hospital SCDs, occurring within one hour of onset of symptoms.

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 ICTDER02 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 N/A

(This file ICTDER02 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 ICTDER02 must be used to exclude those with value RES_DNA = "No use/storage DNA"?

____ Yes ____ No N/A

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.csc.unc.edu/ARIC/search.php>

☒ 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)?

MS 44 (ARIC): The decline of ischaemic heart disease mortality in the ARIC Study communities

MS 158 (Taylor): Black-white differences in out-of-hospital deaths due to myocardial infarction

MS 338 (Rosamond): Trends in the incidence of myocardial infarction and in mortality due to coronary heart disease, 1987 to 1994

MS 535 (Ni): Trends in sudden coronary death, 1987-1995

MS 628 (Saito): Comparison of fatal coronary heart disease occurrence based on population surveys in Japan and the USA: data from the Oita Cardiac Death Survey, Japan and the Atherosclerosis Risk in Communities Study

MS 864 (Borrell): Neighborhood characteristics and mortality in the Atherosclerosis Risk in Communities study

MS 1102 (Rose): Neighborhood SES disparities in rates and temporal trends in rates of MI in ARIC surveillance

MS 1330 (Rosamond): Community Trends in CHD Mortality, MI incidence, and case fatality from 1987 to 2004

MS 1333 (Kucharska-Newton): Socioeconomic indicators and the risk of sudden cardiac death

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

11.b. If yes, is the proposal

☒ **A. primarily the result of an ancillary study (AS 2004.05)**

☐ **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.csc.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

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13. Nichol, G., E. Thomas, and C.W. Callaway, *Regional variation in out-of-hospital cardiac arrest incidence and outcome*. JAMA, 2008. **300**(12): p. 1423-31.
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15. ARIC, *Surveillance Component Procedures*. 2009, Atherosclerosis Risk in Communities Study.