

## ARIC MANUSCRIPT PROPOSAL FORM

Manuscript #454

1. a. Full Title: The relationship of neighborhood characteristics to incidence of cardiovascular disease in the ARIC cohort

b. Abbreviated Title: Neighborhoods and CVD incidence

2. Writing Group:

Lead: Ana V. Diez Roux

Address: Columbia Presbyterian Medical Center, Division of General Medicine  
622 West 168th Street  
PH9 East, Room 105  
NY NY 10032

Phone: (212) 305-5097

Fax: (212) 305-9349

E-mail: [diezrou@medicine1.cpmc.columbia.edu](mailto:diezrou@medicine1.cpmc.columbia.edu)

Nieto F.J.

Szklo M.

Tyroler H.A.

Chambless L.

Sorlie P.

Arnett, D.

Massing M.

Watson, R.

3. Timeline:

Submit proposal to Publications Committee	1-97
Complete preparation of data (neighborhood variables)	9-97
Complete Analysis	6-98
Submit draft to Publications Committee	12-98

4. Rationale:

Numerous studies have documented important differences by social class in cardiovascular disease incidence, prevalence, and mortality, but the factors responsible for these differences have not been fully established. Recently, CVD mortality rates have also been found to be higher in blacks than in whites, particularly at younger ages (NHLBI 1995). Part of the differences by social class may be attributable to differences in the neighborhood environments in which people live (Hian et al. 1987; Kaplan 1996).

Likewise, neighborhood-level factors may also partly explain racial differences in CVD. Area socioenvironmental characteristics have been shown to be related to CHD mortality (Wing et al 1988; 1992; Tyroler et al 1993), and cross-sectional analyses based on the ARIC cohort have suggested that CHD prevalence and the distribution of the three main CHD risk factors (blood pressure, smoking, and serum cholesterol) may also vary with neighborhood socioeconomic characteristics independently of individual-level indicators (ARIC manuscript no.180). The prospective follow up of the ARIC cohort provides a unique opportunity to build on preliminary cross-sectional analyses and investigate whether neighborhood environments are related to the incidence of cardiovascular disease, before and after adjustment for individual-level SES, as well as explore the contribution of neighborhood environments to racial/ethnic differences in CVD.

This proposal will be complementary to Mark Massing's proposal examining incidence of CVD by individual-level SES variables.

#### 5. Main hypotheses:

Increased neighborhood disadvantage is associated with increased incidence of cardiovascular events (CHD and stroke). These associations are partly independent of individual-level SES variables.

Differences in neighborhood environments mediate part of the racial differences in CVD incidence.

#### 6. Data:

Neighborhood indicators will be obtained from the 1990 US Census. In order to improve on previous cross-sectional analyses several strategies will be pursued:

*a) Addition of new neighborhood variables and elaboration of indices of neighborhood socioenvironmental characteristics*

If possible, additional neighborhood indicators appended from other sources (e.g. crime rates as an indirect indicator of environmental stress) will be added to the Census measures. The use of combined indices reflecting the socioenvironmental conditions prevalent in the areas will be explored.

*b) Use of alternative proxies for "neighborhoods"*

Two different census-based areas (census tracts and block-groups) will be used as proxies for neighborhoods and their results compared. Individual-level covariates including age, gender, race, income, education, occupation, and cardiovascular risk factors will be obtained from the baseline and follow-up visits of the ARIC cohort.

The following cardiovascular risk factors will be included in the analyses: LDL-cholesterol, HDL cholesterol, smoking status, hypertension status, waist-hip ratio, diabetes, fibrinogen, physical activity and Keys score.

Standard ARIC measures of incident CHD and stroke will be used in the analyses. Incident CHD will include: fatal CHD, clinically manifest MI, cardiac procedures, and silent MI (ECG diagnostic Q wave). Incident stroke will include: hospitalization or physician diagnosis of stroke or stroke death. Incident CHD and stroke will be explored together (as incident CVD) and separately. Analyses will initially include incident events through 1993. It is anticipated that additional incident data will become available before the manuscript is completed, and analyses will be repeated incorporating updated incidence data.

## 7. Analysis:

Neighborhood deprivation scores will be constructed based on previous literature and the distribution of the variables in the ARIC study. CVD incidence will initially be estimated for quartiles of the neighborhood score stratified by race and gender. Cox proportional hazards models will be used to estimate neighborhood effects before and after adjustment for individual-level SES measures (income, education and occupation) and after subsequent adjustment for cardiovascular risk factors. Initially baseline-level of risk factors will be included. The need to include time-dependent covariates will be investigated. The impact of neighborhood environments on racial differences will be examined by comparing race coefficients before and after the inclusion of neighborhood variables in the models. Appropriate statistical techniques will be used to account for possible correlation of outcomes within neighborhoods if this appears to be present in the data (Anderson et. al 1996). Analyses will be repeated after excluding persons with prevalent CHD or prevalent stroke at baseline.

Previous analyses have suggested that although correlated, individual-level and neighborhood measures were not so highly correlated as to preclude the investigation of their independent effects (correlation coefficients ranged from approximately 0.3 to 0.6). However, as an alternative strategy, categories jointly based on individual-level and neighborhood-level variables will be constructed and included in the models as dummy variables.

## REFERENCES

Wing S, Casper M, Riggan W, et al. Socioenvironmental characteristics associated with the onset of decline of ischemic heart disease mortality in the United States. *Am J Public Health* 1988;78:923-926.

Wing S, Barnett E, Casper M, Tyroler HA. Geographic and socioeconomic variation in the onset of decline of coronary heart disease mortality in white women. *Am J Public Health* 1992;82:204-209.

Haan M, Kaplan G, and Carnacho T. Poverty and health: prospective evidence from the Alameda County Study. *Am J Epidemiol* 1987;125:989-998.

Kaplan GA. People and places: contrasting perspectives on the association between social class and health. *Int J Health Serv* 1996;26:507-519.

Tyroler HA, Wing S, Knowles MG. Increasing inequality in coronary heart disease mortality in relation to educational achievement. *Ann Epidemiol* 1993;3(suppl):S51-S54.

Anderson RT, Sorlie P, Backlund E, Johnson N, Kaplan G. Mortality effects of community socioeconomic status. *Epidemiology* 1997;8:42-47.