1. Title: Socioeconomic Status and Incident Coronary Heart Disease

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3. Timeline:

Submit Proposal to Publications Committee 10/96
Complete Analysis 3/97
Submit First Draft to Publications Committee 7/97
Submit to Journal 10/97

4. Rationale:

The relation of socioeconomic status (SES) to clinically manifest cardiovascular diseases (CVD) such as coronary heart disease (CHD) and stroke has been well documented. ARIC has recently published its first cross-sectional analysis of the association of SES to prevalent CHD and to prevalent atherosclerosis as assessed by carotid artery intima to media wall thickness (IMT) (Diez-Roux et al., AJE, 1995). This study revealed that increased IMT in lower social classes could be completely explained statistically by the major risk factors (i.e., age, gender, serum cholesterol, cigarette smoking, blood pressure, diabetes mellitus, and obesity). In contrast, only one third of the increased prevalence of CHD in lower social classes was statistically explained by the same risk factors. The magnitude of the association between SES and incident CVD has not been examined in ARIC.

The proposed analysis would attempt to confirm previously documented association between SES and incident CVD and identify possible explanatory risk factors in these associations. The incident CVD endpoints used in this analysis will be angina pectoris, CHD, and stroke. Understanding and quantifying these SES associations in ARIC would allow for comparisons of SES effects in terms of prevalence versus incidence and would demonstrate temporality in these associations. The importance of various SES-associated risk factors as explanatory variables on causal pathways to CVD may be compared. Trends toward increasing disparities between social classes in factors such as medical care, income, and cardiovascular disease suggest that a more complete understanding of social inequalities in CVD is needed to identify appropriate public health policies and interventions in the prevention of these diseases.

Hypotheses:
1) There is an inverse relationship between SES and incident CVD regardless of its clinical manifestation in ARIC.
2) Social inequalities in the distribution of the major risk factors fail to completely explain this relationship.

Data:

Surrogate SES measures will include educational attainment, income, and occupation. Standard ARIC definitions for incident and prevalent CHD and stroke (being developed) will be used. Incident CHD events in this study will include fatal CHD, clinically manifest myocardial infarction, cardiac procedures, and ECG diagnostic Q-wave at visit 2 or visit 3 (i.e., unrecognized MI). All incident CHD events from 1987 to 1993 will be included. CHD events through 1994 will be included if available. Incident stroke events will include hospitalization for and/or physician diagnosis of stroke and death attributable to stroke from 1987 to 1994. Follow-up time in days to incident CHD and stroke will be known. Incident angina will be based on the Rose angina score assessed from annual follow-up telephone interviews and/or the use of medications for angina assessed at visit 2 and visit 3. Participants with these CVD manifestations at baseline examination will be considered prevalent cases within each category of CVD as defined above and will be excluded from analysis. The following variables from visit 1, visit 2, and visit 3 will be considered as covariates in this analysis: age, race, gender, field center, examination date, systolic and diastolic blood pressure, medications, smoking status and history, total cholesterol, LDL, HDL, triglycerides, weight, height, waist:hip ratio, serum glucose, diabetes history, ECG voltages, physical activity, average carotid artery IMT.

Analysis:

All of the following analyses will be performed for each SES measure including educational attainment, income, and occupation. Separate analyses will be performed for incident stroke, CHD, and angina. Additionally, incident CHD and stroke will be analyzed together. An initial univariate analysis will evaluate the distributions of SES surrogate variables and covariates. Stratified analyses will be performed for the entire eligible cohort and by race and by gender. A survival analysis will be performed to evaluate socioeconomic differences in follow-up time to events for incident CHD and stroke together and separately. Multivariate analyses will be performed with Cox proportional hazards modeling incorporating time dependent covariates from each field center visit for CHD and stroke. The hazards ratio, expressing the relative risk of CHD and/or stroke events in low versus high SES groups, will be determined from each model before and after adding terms for major CVD risk factors. Since specific follow-up time will not be available for incident angina, modeling will be performed using logistic regression techniques stratified by visit with covariates measured at visits prior to the event. Models will be run and results reported by gender and by race.

Power:

Approximately 470 incident CHD events have occurred through 1993, 155 incident stroke events (not including deaths attributable to stroke) through 1994, and 300 incident angina events through visit 3 have occurred in eligible cohort participants. About 25% of these may be classified as low SES according to the criteria of having less than high school education or earning in the four lowest categories of family income. Treating SES as a dichotomous variable, this study will be able to detect a relative risk of 1.5 for CHD and less than 2.0 for stroke assuming 80% power and 0.05 significance level using proportional hazards models according to the method of Shoenfield (Biometrics 39;1983). Stratification by race, gender, and IMT will increase the minimal detectable relative risk under the above assumptions according to the following table. Analysis with the CHD and stroke combined should be capable of detecting a relative risk of 1.5 to 2.0 even after stratification by race or gender.
<table>
<thead>
<tr>
<th>Stratum Size (Number of Events)</th>
<th>470</th>
<th>250</th>
<th>200</th>
<th>150</th>
<th>100</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal Detectable Relative Risk</td>
<td>1.5</td>
<td>1.7</td>
<td>1.8</td>
<td>2.0</td>
<td>2.4</td>
<td>3.4</td>
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