1. **Full Title:** ARIC CHD Risk Prediction from Behavioral, Psychosocial, and Socioeconomic Factors

   **Abbreviated Title (Length 26 characters):** Behav, SES, psy/soc & Risk

2. **Writing Group (list individual with lead responsibility first):**

   **Lead:** LE Chambless
   
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   **Writing group members:** Ana Diez-Roux, Javier Nieto, Gerardo Heiss, Aaron Folsom, Tom Moseley, Lyn Steffen

3. **Timeline:** Analysis can start now, with a goal to prepare a draft manuscript by the end of 2004.

4. **Rationale:** ARIC and many other studies have assessed the predictability of risk factors for CHD, starting with the “traditional” risk factors smoking, blood pressure or hypertension, total cholesterol or LDL cholesterol, HDL cholesterol, and diabetes status, possibly considering the addition of new biological markers. One use for these risk prediction models is to assist policy makers and clinicians in decision-making, by optimizing prevention-oriented policies and treatments for target groups and patients, respectively. An extension to this work is to incorporate the behavioral, psychosocial, and socioeconomic factors that affect CHD risk and potentially modify the effect of (other) traditional risk factors.

   At least two approaches can guide this formulation. One is to quantify the direct associations and predictability of the behavioral, psychosocial, and SES factors themselves, regardless of the pathways and metabolic impairments (i.e., traditional risk factors) that mediate such associations. If these factors and the traditional risk factors were equally predictive, such risk assessment may be cheaper than the use of biomarkers and more widely applicable to public health. An additional approach is to consider the “established,” traditional risk factors in the context of these additional factors, as elements that can condition or modify the associations and predictability of the “established” risk factors. Context-dependent effects are not only plausible but they have
been demonstrated. However, they have not been explicitly tested for their ability to enhance risk prediction in meaningful ways. Easily available questionnaire items could enhance predictivity, such as individual level socioeconomic status or family history of premature heart attack.

5. **Main Hypothesis/Study Questions:** For each race (B,W) by sex combination:
   (a) Behavioral factors alone or behavioral plus psychosocial factors are equally predictive of CHD risk as the “traditional” risk factors, as measured by area under the ROC curve (AUC). (Factors not contributing to AUC for any race/sex group will be dropped from further consideration.)
   (b) Individual level socioeconomic factors do not increase AUC beyond that from the behavioral plus psychosocial factors.
   (c) Neighborhood level socio-economic factors do not increase AUC beyond that from the behavioral, psychosocial, and individual level socioeconomic factors.
   (d) Family history of premature heart attack does not increase AUC beyond that from the behavioral, psychosocial, and individual and neighborhood level socio-economic factors.
   (e) The predictivity of the “traditional” risk factor score to predict CHD varies by level of behavioral or psychosocial factors (At an unfavorable level of a trait or behavior predictivity (AUC) from the traditional risk factors will be higher).
   (f) The predictivity of the “traditional” risk factor score to predict CHD varies by level of individual-level socio-economic factors (At an unfavorable level of an individual-level socio-economic factor predictivity (AUC) from the traditional risk factors will be higher).
   (g) The predictivity of the “traditional” risk factor score to predict CHD varies by level of area-based socio-economic factors (At an unfavorable level of an area-based socio-economic factor predictivity (AUC) from the traditional risk factors will be higher).
   (h) The behavioral/psychosocial/socioeconomic factors can replace sex and race as stratification factors for CHD risk prediction.

Note: The analysis for e-f would be done one behavioral/psychosocial/socioeconomic factor at a time, or by level of an overall behavioral/psychosocial /socioeconomic score.

6. **Data (variables, time window, source, inclusions/exclusions):** The analysis will be based on Visit 2 data and follow-up since Visit 2, since several of the variables of interest are available only at Visit 2. The traditional risk factors from Visit 2 are smoking (cursmk21, forsmk21), total or ldl cholesterol (lipb01 or LDL21), HDL cholesterol (lipb03a), diabetes (at 126, diabts23), age (V2age21), systolic blood pressure (sbpb21) and hypertension medication use (hyptmd21). In addition the race (racegrp) and sex (gender) variables from Visit 1 will be needed. The behavioral variables include cursmk21, forsmk21, cigarette years (cigtyr21), ethanol use (ethanl24), sport activity index (sprt_i02), leisure activity index (lisr_i01, percentage of calories from saturated fat (p_sfat), dietary fiber (dfib), total weekly servings of fruit and of vegetables and of refined grain and of whole grain, and dietary “quality” indices derived from the food frequency questionnaire (such as prudent diet, western, diet, Mediterranean diet..) We would adjust the dietary variables for total caloric intake (tcal). Note that data on diet and physical activity are not available for the whole cohort at Visit 2, so we would use the Visit 1 variables. Psychosocial variables from Visit 2 are from the Health and Life Profile forms A, B, and C.
These include the ISEL and Lubben scales on social support, the Maastricht scale on vital
eexhaustion, and the Spielberger trait anger scale. New (to ARIC) variables would have to be
derived for social support, guided by publications on these scales. For the Maastricht scale we
would use a 2/1/0 scoring for each question and summing all scores, as in ARIC MS621. For the
Spielberger trait anger scale we would follow ARIC MS626 in using the subscale on anger
temperament. Marital status and self-perceived health status will also be included.

The SES variables are from Visit 1: the 3 level education variable (elevel02), family income
(hom62). The neighborhood (census block) variables to be used, from Visit 1 address, are
median value of dwellings and median household income.

The family history of premature heart attack (father by age 55, mother by age 65) would be
derived for Visit 1 from the family history questions on the HOM questionnaire.

All risk factor variables would be categorized, with quartiles or other more natural
categorizations. Most factors would be expected to show a monotonic effect on CHD, if any,
and when this is lacking consideration will be given to collapsing categories.

The outcome of interest would be in_01sp, incident CHD before 31Dec01, defined by
hospitalized MI, fatal CHD, silent MI by ECG, or coronary revascularization. The exclusions
would be missing or known prior CHD (prvchd05 not 0), race not black or white, race not white
at Minn or Wash, or missing data on one of the traditional risk factors or one of the behavioral or
psychosocial risk factors, additionally excluding those with incident CHD follow-up ending
before visit 2.

The table below shows the number of events by race and sex, starting from each visit. Of
particular interest to this proposal, starting follow-up at Visit 2 we have 126, 135, 288, and 658
events for BF, BM, WF, and WM, respectively, and would do race/sex-specific analysis.
Sample size, number of events, and follow-up time for incident CHD (incl silent MI and procedures), by race, sex, and visit of follow-up start

<table>
<thead>
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<th>race</th>
<th>sex</th>
<th>Sample size</th>
<th>Events</th>
<th>Follow-up</th>
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<td>830  658  473 278</td>
<td>11.8  9.3  6.7  4.1</td>
</tr>
</tbody>
</table>
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
(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

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://bios.unc.edu/units/cscc/ARIC/stdy/studymem.html

_____x__ Yes  _______ No

There is overlap, as discussed in #10 below.

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)?

Ms537 (Maastricht scale and incident MI, McGovern, 11/97, priority 2)
Ms538 (Social support and incident MI, McGovern, 11/97, priority 2, withdrawn)
Ms692 (Dimensions of Social support and risk of CHD, Moseley, priority 2, 08/25/99)
Ms625 (Vital exhaustion and CHD, Williams (Deferred))

Each of these papers is to focus on just a small part of the entire array of behavioral variables considered in the current proposal. We will not attempt to show the effect of the individual variables not adjusting for all the others. These papers were also approved long enough ago that they would be expected to be published before the paper from this new proposal. This new writing groups includes Dr. Moseley, the lead for ms692, who can not only advise on subject matter but also on considerations of overlap.