ARIC Manuscript Proposal # 1292

PC Reviewed: _10/_09/07	**Status: __A__**	**Priority: __2_**
SC Reviewed: _____	**Status: _____**	**Priority: ____**

1.a. Full Title:

Neighborhood Socioeconomic Status, Health Insurance, and Evidence-Based Pharmacologic Treatment of Myocardial Infarction: ARIC Community Surveillance

b. Abbreviated Title (Length 26 characters):

SES and Medicine Treatment

2. Writing Group:
Writing group members:

Kathryn Rose, Wayne Rosamond, Eric Whitsel, Chirayath Suchindran, Joy Wood, 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 Fall 2007. An abstract will be prepared for the October deadline of the 2008 American Heart Association Epidemiology and Prevention meeting. A draft of manuscript is expected during Summer 2008.

4. Rationale:

Pharmacologic treatments are efficacious for reducing morbidity and mortality post-myocardial infarction (MI)[1-4]. The prescription of evidence-based treatments such as aspirin, blood pressure and lipid-lowering medications is monitored for improving hospital quality of care for all patients[5]. Overall, the prescription of these effective pharmacologic agents has increased over time among patients post-MI[3,6-8]. However, during the time period of interest for this investigation, we expect to find that prescriptions for aspirin or other anti-platelet agents, beta-blockers, angiotensin converting enzyme (ACE) inhibitors, lipid-lowering medications and their combinations have increased while those for calcium channel blockers have decreased, paralleling trends previously observed in ARIC community surveillance[9].

Previous studies have shown that receipt of evidence-based pharmacologic treatments post-MI differ by race, gender, age, health insurance, and hospital type[10-23]. Hospital data in the United States (U.S.) do not generally include individual measures of SES, such as income, education or occupation. Several investigators have used insurance status as a proxy for individual SES[24-26], although the validity of this approach is not known. However, Medicaid coverage, with the exception of limited medical conditions (HIV/AIDS, chronic kidney disease, blindness) is only provided to patients below the federal poverty level[27], and thus, in the absence of other SES information, is likely a reasonable surrogate for low SES. In our ongoing work as part of ARIC ancillary study 2004.05, among ARIC community surveillance patients, 70% of Medicaid recipients live in low neighborhood SES (nSES) areas, as defined by census tract median household income[28,29].

While some researchers treat nSES as a surrogate for individual SES, evidence suggests that social and environmental contexts play independent roles in health outcomes[30,31]. The separate influence of nSES on health could be due to access to primary care, presence or absence of stressors such as noise and crime, and level of social support among neighborhood residents. Relatively little U.S. research currently exists on the relationship between nSES and prescription of evidence-based pharmacologic therapy post-MI. Rao and colleagues categorized nSES by income of the zip code of residence, and found that among Medicare beneficiaries, higher neighborhood income was correlated with higher rates of evidence-based medical treatment[32]. Meanwhile, a study in Canada found that access to cardiovascular medications did not differ between patients of different census-level nSES areas[33].

Thus, we propose to explore nSES as a potential barrier to receipt of evidence-based medical therapy post-MI. In addition, we will investigate whether type of health insurance is associated with the use of evidence-based pharmacologic treatments. Our other work in progress in the context of ARIC community surveillance has illuminated the influence of nSES on prehospital delay time[28], incident MI rates[29] and receipt of coronary revascularization procedures[34] in the context of definite or probable hospitalized MI. We will determine the independent and joint influence of nSES and health insurance on receipt of evidence-based agents post-MI, during the hospitalization or at discharge.

5. Main Hypothesis/Study Questions:

1. Are nSES and health insurance positively associated with use of pharmacologic therapy (aspirin or anti-platelet agents, beta blockers, calcium channel blockers, ACE inhibitors, lipid-lowering medications, and their combination) among hospitalized MI patients, given during the hospitalization or at discharge?
    a. Do positive, graded associations between nSES/health insurance and use of pharmacologic therapy, given during the hospitalization or at discharge, exist within and across study communities?
    b. Does race, age, gender, study community or whether events are incident or prevalent modify the nSES/health insurance-pharmacologic therapy association?
    c. If nSES/health insurance disparities exist, do they vary across time?

6. Data (variables, time window, source, inclusions/exclusions):

Data sources:

ARIC community surveillance data will be analyzed over the time period 1993-2002. Neighborhood census tract-level SES variables are available in The Burden of CHD in Communities (ARIC ancillary 2004.05) study. Definite and probable MI events are of interest. Outcomes will include currently used and discharge medications (aspirin or anti-platelet agents, beta blockers, calcium channel blockers, ACE inhibitors, lipid-lowering medications, and their combination) given during hospitalization or at discharge. Covariates considered will include race, gender, center, age, type of health insurance, year of event, hospital type (teaching vs. non-teaching), and presence of cardiac pain, a predictor of medication prescription in other settings. Other variables will be primarily used to define contraindications for prescription of selected medications (Table 1).

Over 11,000 (weighted) incident (defined as first definite/probable MI occurring in the context of ARIC community surveillance with no reported history of prior MI) events and approximately 20,000 (weighted) prevalent MI events occurred in ARIC community surveillance between 1993 and 2002. We plan to use census tract-level median

household income as a measure of nSES. Health insurance will be characterized as: prepaid or prepaid plus Medicare, Medicare only, Medicaid only, Medicare and Medicaid, other and none as based on our previous work[28].

Exclusions:

Definite and probable MIs will be included since 1993. Prior to 1993, patient addresses were not routinely abstracted from the medical record, and thus cannot be reliably linked to census tract-level SES variables.

Medication-specific analyses will be conducted as well as those for combination therapy. Absolute and relative contraindications exist for the use of each medication, and therefore exclusions will be made where data are available (Table 1).

Analyses:

Pharmacologic treatment (yes/no) for each medication as well as combined medications is the outcome of interest. Patients with treatment contraindications will be excluded from the treatment-specific analyses in order to provide an estimate based on patients who are eligible for pharmacologic therapy. Odds ratios for pharmacologic treatment (and 95% confidence intervals) will be calculated using generalized estimating equations (GEE) to account for the clustering of observations by census tract. GEEs provide standard errors of the odds ratios which have been adjusted to take into account the dependence of observations made on patients from the same census tract[35]. All analyses will be weighted to account for the sampling of ICD-9-CM hospital diagnosis codes[36]. We will use SAS software (SAS Institute, Cary, NC) with the procedure GENMOD. We plan to repeat the analysis using GLIMMIX to investigate whether random slopes/intercepts are better than fixed effects for modeling multi-level, time dependent data.

Crude nSES/health insurance-treatment analyses will be conducted, the influence of covariates in a full model will be tested, and effect modification of the nSES/health insurance-treatment relationship will be explored.

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

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.cscc.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)?

MS 110 (Romm)
MS 216 (Lewis)
MS 395 (Rosamond)
MS 490 (Li)
MS 833 (Briley)
MS 1103 (Rose)

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

11.b. If yes, is the proposal

__x_ 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.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

1. Libby P. What have we learned about the biology of atherosclerosis? The role of inflammation. Am J Cardiol 2001;88(7B):3J-6J.
2. Hanna IR, Wenger NK. Secondary prevention of coronary heart disease in elderly patients. Am Fam Physician 2005;71(12):2289-2296.
3. Krause MW, Massing M, Kshirsagar A, Rosamond W, Simpson Jr. RJ. Combination Therapy Improves Survival After Acute Myocardial Infarction in the Elderly with Chronic Kidney Disease. Renal Failure 2004;26(6):715-725.

4. Smith SC, Jr, Blair SN, Bonow RO, Brass LM, Cerqueira MD, Dracup K, Fuster V, Gotto A, Grundy SM, Miller NH, Jacobs A, Jones D, Krauss RM, Mosca L, Ockene I, Pasternak RC, Pearson T, Pfeffer MA, Starke RD, Taubert KA. AHA/ACC Guidelines for Preventing Heart Attack and Death in Patients With Atherosclerotic Cardiovascular Disease: 2001 Update: A Statement for Healthcare Professionals From the American Heart Association and the American College of Cardiology. Circulation 2001;104(13):1577-1579.
5. Bradley EH, Herrin J, Elbel B, McNamara RL, Magid DJ, Nallamothu BK, Wang Y, Normand S-LT, Spertus JA, Krumholz HM. Hospital Quality for Acute Myocardial Infarction: Correlation Among Process Measures and Relationship With Short-term Mortality. JAMA 2006;296(1):72-78.
6. Gislason G, Abildstrom SZ, Rasmussen JN, xF8;ren#Rasmussen S, Buch P, Gustafsson I, Friberg J, GadsbÃ¸ll N, KÃ¸ber L, Stender S, Madsen M, Torp-Pedersen C. Nationwide trends in the prescription of beta-blockers and angiotensin-converting enzyme inhibitors after myocardial infarction in Denmark, 1995-2002. Scandinavian Cardiovascular Journal 2005;39(1/2):42-49.
7. Ishikawa K, Kimura A, Taniwa T, Takenaka T, Hayashi T, Kanamasa K. Modification of Treatment Strategies Over a Period of 14 Years Has Markedly Reduced Cardiac Events Among Post-Myocardial Infarction Patients. Circulation 2002;66(10):881-885.
8. U.S. Preventive Services Task Force*. Aspirin for the Primary Prevention of Cardiovascular Events: Recommendation and Rationale. Ann Intern Med 2002;136(2):157-160.
9. Rosamond W, Folsom AR, Chambless LE, Goff Jr. DC, Taylor H. Trends and differences in medical treatments during hospitalized myocardial infarction in four United States communities: 1987-1997. Circulation 2000;102(18):4063 Suppl. S.
10. Barnato AE, Lucas FL, Staiger D, Wennberg DE, Chandra A. Hospital-level racial disparities in acute myocardial infarction treatment and outcomes. Med Care 2005;43(4):308-319.
11. Sonel AF, Good CB, Mulgund J, Roe MT, Gibler WB, Smith SC, Jr, Cohen MG, Pollack CV, Jr, Ohman EM, Peterson ED, for the CRUSADE Investigators. Racial Variations in Treatment and Outcomes of Black and White Patients With High-Risk Non-ST-Elevation Acute Coronary Syndromes: Insights From CRUSADE (Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes With Early Implementation of the ACC/AHA Guidelines?). Circulation 2005;111(10):1225-1232.
12. Vaccarino V, Rathore SS, Wenger NK, Frederick PD, Abramson JL, Barron HV, Manhapra A, Mallik S, Krumholz HM, the National Registry of Myocardial Infarction Investigators. Sex and Racial Differences in the Management of Acute Myocardial Infarction, 1994 through 2002. N Engl J Med 2005;353(7):671-682.
13. Sheifer SE, Escarce JJ, Schulman KA. Race and sex differences in the management of coronary artery disease. American Heart Journal 2000;139(5):848-857.
14. Simpson CR, Hannaford PC, Williams D. Evidence for inequalities in the management of coronary heart disease in Scotland. Heart 2005;91(5):630-634.
15. Reid FDA, Cook DG, Whincup PH. Use of statins in the secondary prevention of coronary heart disease: is treatment equitable? Heart 2002;88(1):15-19.
16. Pagley PR, Yarzebski J, Goldberg R, Chen Z, Chiriboga D, Dalen P, Gurwitz J, Alpert JS, Gore JM. Gender differences in the treatment of patients with acute myocardial infarction. A multihospital, community-based perspective. Arch Intern Med 1993;153(5):625-629.
17. Opotowsky AR, McWilliams JM, Cannon CP. Gender differences in aspirin use among adults with coronary heart disease in the United States. J Gen Intern Med 2007;22(1):55-61.
18. Maynard C, Althouse R, Cerqueira M, Olsufka M, Kennedy JW. Underutilization of thrombolytic therapy in eligible women with acute myocardial infarction. The American Journal of Cardiology 1991;68(5):529-530.
19. Mahon NG, McKenna CJ, Codd MB, O'Rorke C, McCann HA, Sugrue DD. Gender differences in the management and outcome of acute myocardial infarction in unselected patients in the thrombolytic era. The American Journal of Cardiology 2000;85(8):921-926.
20. MacLeod MCM, Finlayson AR, Pell JP, Findlay IN. Geographic, demographic, and socioeconomic variations in the investigation and management of coronary heart disease in Scotland. Heart 1999;81(3):252-256.
21. McCormick D, Gurwitz JH, Savageau J, Yarzebski J, Gore JM, Goldberg RJ. Differences in Discharge Medication After Acute Myocardial Infarction in Patients with HMO and Fee-for-Service Medical Insurance. Journal of General Internal Medicine 1999;14(2):73-81.

22. Clarke KW, Gray D, Keating NA, Hampton JR. Do women with acute myocardial infarction receive the same treatment as men? BMJ 1994;309(6954):563-566.
23. DeWilde S, Carey IM, Bremner SA, Richards N, Hilton SR, Cook DG. Evolution of statin prescribing 1994-2001: a case of agism but not of sexism? Heart 2003;89(4):417-421.
24. Ayanian JZ, Kohler BA, Abe T, Epstein AM. The Relation between Health Insurance Coverage and Clinical Outcomes among Women with Breast Cancer. N Engl J Med 1993;329(5):326-331.
25. Shen JJ, Wan TT, Perlin JB. An exploration of the complex relationship of socioecologic factors in the treatment and outcomes of acute myocardial infarction in disadvantaged populations. Health Serv Res 2001;36(4):711-732.
26. Harnick DJ, Cohen JL, Schechter CB, Fuster V, Smith DA. Effects of practice setting on quality of lipid-lowering management in patients with coronary artery disease. Am J Cardiol 1998;81(12):1416-1420.
27. Rosenbaum S. Medicaid. N Engl J Med 2002;346(8):635-640.
28. Foraker RE, Rose KM, McGinn AP, Suchindran CM, Rosamond WD, Goff Jr. DC, Whitsel EA, Wood JL. Neighborhood Socioeconomic Status, Health Insurance, and Prehospital Delay Time for Acute Myocardial Infarction: Atherosclerosis Risk in Communities (ARIC) Surveillance. Circulation 2007;115:e214-e301.
29. Rose KM, Suchindran CM, Li KP, Wood JL, Foraker RE, Whitsel EA, Rosamond WD, Heiss G. Variation in Rates of Incident Myocardial Infarction by Neighborhood Socioeconomic Characteristics: The Atherosclerosis Risk in Communities Surveillance. Circulation 2007;115(e214-e301).
30. Krieger N, Chen JT, Waterman PD, Soobader M-J, Subramanian SV, Carson R. Geocoding and Monitoring of US Socioeconomic Inequalities in Mortality and Cancer Incidence: Does the Choice of Area-based Measure and Geographic Level Matter?: The Public Health Disparities Geocoding Project. Am. J. Epidemiol. 2002;156(5):471-482.
31. Marmot MG. Understanding social inequalities in health. Perspect Biol Med 2003;46(3 suppl):S9-23.
32. Rao SV, Schulman KA, Curtis LH, Gersh BJ, Jollis JG. Socioeconomic Status and Outcome Following Acute Myocardial Infarction in Elderly Patients. Arch Intern Med 2004;164(10):1128-1133.
33. Pilote L, Tu JV, Humphries K, Behouli H, Belisle P, Austin PC, Joseph L. Socioeconomic status, access to health care, and outcomes after acute myocardial infarction in Canada's universal health care system. Med Care 2007;45(7):638-646.
34. Rose KM, Heiss G, Li KP, Rosamond W, Suchindran C, Wood JL. Socioeconomic Characteristics and Variation in Rates and Temporal Trends in the Use of Invasive Coronary Procedures in ARIC Community Surveillance. ARIC Manuscript Proposal 2005.
35. Bryk A, Raudenbush A. Hierarchical Linear Models: Applications and Data Analysis Methods. Newbury Park, CA: Sage Publications, 1992.
36. White AD, Folsom AR, Chambless LE, Sharret AR, Yang K, Conwill D, Higgins M, Williams OD, Tyroler HA, Investigators TA. Community surveillance of coronary heart disease in the Atherosclerosis Risk in Communities (ARIC) Study: Methods and initial two years' experience. Journal of Clinical Epidemiology 1996;49(2):223-233.

Table 1. Examples of absolute and relative contraindications for selected pharmacologic treatments for MI

Aspirin or anti-platelet agents	Beta Blockers	Calcium Channel Blockers	ACE or ATII Inhibitors	Lipid-Lowering Medications
Dying within 6 h of admission Stroke CNS hemorrhage Peptic ulcer disease Warfarin use Coagulopathy End stage liver disease	Dying within 6 h of admission Asthma Chronic obstructive pulmonary disease End stage renal disease Heart failure Bradycardia	Dying within 6 h of admission Heart failure Bradycardia	Dying within 6 h of admission End stage renal disease	Dying within 6 h of admission End stage liver disease