ARIC Manuscript Proposal #2356

PC Reviewed: 5/13/14  Status: A  Priority: 2
SC Reviewed: _________  Status: _____  Priority: ____

1.a. Full Title: Foreclosures, Neighborhoods and Heart Attacks: The Atherosclerosis Risk in Communities Surveillance

b. Abbreviated Title (Length 26 characters):
Title: Foreclosure and MI

2. Writing Group:
Writing group members: (author order to be determined)
Tansel Yilmazer, Randi Foraker, Michael Betz, Wayne Rosamond, others welcomed

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

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3. Timeline:
April 2014: submit proposal to Steering Committee for approval
Sept 2014: obtain Steering Committee approval; preliminary analyses; 
Sept-Dec 2014: conduct analyses; 
Jan 2015: draft manuscript 
Feb 2015: distribute to co-authors

4. Rationale:

The recent foreclosure crisis has had a dramatic impact on neighborhoods and communities. Some neighborhoods experienced a decline in property values followed by a decay of the physical condition of properties. Areas with higher burden of foreclosures encountered an increase in many neighborhood-level stressors including crime rates, poverty, stress and violence. Finally, the availability of outlets for nutritious food and quality health care services declined in areas affected by foreclosures. These factors create a combination of social and biological pathways through which foreclosures can lead to an increase in MI rates.

Past research demonstrated the critical nature of the issue that foreclosures do cause serious problems for communities through the adverse effects of deteriorating structural changes and diminished resources at the community level. However, the consequences of foreclosures on the cardiovascular health of community residents remain unknown. Understanding the effect of foreclosures on the development of CHD is especially important, since CHD is the leading cause of death in the United States (U.S.),[1] and the socioeconomic environment in which individuals live is a contributing factor to the development of CHD.[2, 3] A substantial literature links nSES to the incidence of CHD, even after accounting for individual-level SES, medical history and health behaviors.[4]

In the studies of the impact of foreclosures on communities, the findings vary across neighborhoods, suggesting that nSES can also affect the impact of foreclosures.[5, 6] Areas with a high density of foreclosures include both outer suburban tracts with high nSES and distressed tracts in inner cities or inner-ring suburbs with lower nSES. However, evidence suggests that lower nSES communities suffered more from serious socioeconomic losses than higher nSES areas. A better understanding of the interaction of foreclosures and nSES on health is important to develop appropriate neighborhood-level risk reduction strategies.

We benefit from the ARIC study’s rigorous and thorough investigation of non-fatal MI events; the amount of data surpasses several other published studies. Furthermore, the systematic sampling of MI events in the four communities produces generalizable results that will likely identify gaps and inform development of targeted public health interventions to reduce the burden of MI.

5. Main Hypothesis/Study Questions:

**Aim 1:** Characterize the effect of foreclosures on MI rates in four U.S. communities. Our working hypothesis is that living in a neighborhood with a higher rate of foreclosures is associated with higher rates of MI.

**Aim 1.a:** Investigate one- and two-year lag periods for the effect of foreclosures on MI rates. We postulate that the association between foreclosures and MI rates increases over time.

**Aim 1.b:** Describe the effect of foreclosures on MI rates within strata of nSES. We theorize that nSES affects the impact of foreclosure on MI rates such that high foreclosure/low nSES
areas will have the highest MI rates compared to the effects of high foreclosure or low nSES alone.

We will assemble data on foreclosures and age-adjusted MI rates from four U.S. communities. Our MI outcome data will be drawn upon the ARIC community surveillance of CHD-related hospital discharges. ARIC community surveillance has documented rates and trends in CHD in four U.S. communities by age, race, and gender for over 20 years.[7, 8] In ARIC community surveillance, the four communities are investigated to determine the long-term trends in hospitalized MI and CHD deaths in approximately 470,000 men and women aged 35-84 years. We propose to extend this work to examine rates and trends in the incidence of hospitalized MI by neighborhood socioeconomic and housing conditions and to determine if these differences vary by community, race, gender, or year of MI event. Neighborhood-level disparities in the burden of MI according to foreclosure rates have not been systematically addressed in U.S. surveillance efforts because of the lack of readily-available socioeconomic and housing data in medical databases. However, patients’ addresses are universally collected for follow-up and billing in ARIC surveillance, allowing linkage to U.S. Census-based socioeconomic data and foreclosure data that will be obtained.

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).

Foreclosure rates reached historically high levels in the U.S. during the recent economic crisis. A record 2.82 million homes faced foreclosure in 2009, a 21 percent rise from 2008 and a 120 percent jump from 2007.[9] The foreclosure crisis represents a significant shock to neighborhoods. At the same time, neighborhoods affect health and contribute to disparities in health. We aim to contribute to the existing literature by examining the impact of foreclosures on MIs within strata of nSES. We will combine data from two different sources: a comprehensive data set on MI rates in four U.S. communities (Washington County, Maryland; the city of Jackson, Mississippi; Forsyth County, North Carolina and suburbs of Minneapolis, Minnesota) and the rate of neighborhood foreclosures in these four communities. Neither of these data sources is publicly available. We will link data sets from two sources: the Atherosclerosis Risk in Communities Study (ARIC Community Surveillance) and RealtyTrac. Using these two data sets, we will be able to conduct an analysis of the association between foreclosures and MIs at the zip code level.

Detailed methods for ascertaining and classifying MI events for ARIC surveillance investigation are described in detail elsewhere.[10, 11] Hospitalized MI events are identified by ARIC study staff via retrospective review of sampled CHD-related discharges among white and black residents 35 to 84 years of age.[10, 12] An event is classified as an incident MI when there is no indication of prior MI in the medical history.[13] Our measures of nSES will include zip code-level median household income and percentage of minority residents. Median household income will be classified into tertiles (low, medium, high) using community-wide (overall) cut-points, and considering the values of nSES for each of the zip codes within the ARIC study communities.[14] Similarly, the zip codes will be classified into two categories (low, high) according to the fraction of Black (and Hispanic) residents. We will use 2000 and 2010 zip code population counts normalized to conform to 2000 zip code boundaries to calculate age-,
and race-specific population estimates for each zip code for inter- and post-censal periods (Table).[13]

Table. Characteristics of the eligible ARIC study population: 2000 Census[13]

<table>
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<tr>
<th>Race-gender composition, N</th>
<th>Washington Co, MD</th>
<th>Minneapolis, MN</th>
<th>Jackson (city), MS</th>
<th>Forsyth Co, NC</th>
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<tbody>
<tr>
<td>Black women</td>
<td>1,330</td>
<td>4,694</td>
<td>26,976</td>
<td>18,181</td>
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<tr>
<td>Black men</td>
<td>1,220</td>
<td>4,380</td>
<td>21,545</td>
<td>15,175</td>
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<tr>
<td>White women</td>
<td>29,048</td>
<td>48,329</td>
<td>8,491</td>
<td>53,272</td>
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<tr>
<td>White men</td>
<td>27,033</td>
<td>45,168</td>
<td>7,127</td>
<td>47,887</td>
</tr>
<tr>
<td>Total population*</td>
<td>58,631</td>
<td>102,571</td>
<td>64,149</td>
<td>134,515</td>
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*Limited to white and black persons 35-74 years of age.

Data on foreclosures at the zip code level for the four ARIC study communities will be acquired from RealtyTrac. RealtyTrac is a leading foreclosure monitoring and marketing company that collects data from public records at the local level. Data from RealtyTrac have been widely used by researchers studying foreclosures.[15, 16] The result of this data assembly effort will provide 9,600 (hospitalized) MI observations for approximately 100 zip codes in four ARIC communities over 6 time periods (years 2005-2010), and 4 age (35-44, 45-54, 55-64, 65-74), 2 gender (female, male) and 2 race (white, black) groups.

We will estimate a series of models to relate the age-adjusted MI rates to foreclosures and other neighborhood characteristics. Specifically, in order to achieve Aim 1.a we will estimate models of the following form:

\[
MI_{zt} = \alpha_0 + \alpha_1 F_{zt-1} + \alpha_2 F_{zt-2} + nSES_z \alpha_3 + \lambda_\text{age} \alpha_4 + \mu_z + \epsilon_{zt},
\]

where \(MI_{zt}\) is the occurrence MI in zip code \(z\) in year \(t\) divided by the population at the zip code. The variables of interest are \(F_{zt-1}\) and \(F_{zt-2}\), the number foreclosures in the zip code in the last two years. We use time-lagged foreclosure measures since the impact of foreclosures are felt in the neighborhoods with a time lag. The vector \(nSES\) includes three indicators for income tertiles and two indicators for the fraction of minorities at the zip code level. Indicators for each zip code, \(\mu_z\), control for any time-invariant zip code level factors that may be correlated with both foreclosures and MIs. The vector \(\lambda_{\text{age}}\) includes indicator variables for age, gender and race. This vector absorbs the different health conditions for each of these groups. The vector \(\epsilon_{zt}\) represents a random error term. Finally \(\alpha_0, \alpha_1, \alpha_2, \alpha_3\) and the vector \(\alpha_4\) are the estimated coefficients.

According to our working hypothesis in Aim 1.a we expect to find that the estimated coefficients \(\alpha_1\) and \(\alpha_2\) are positive.

We will achieve our Aim 1.b by estimating the following model:

\[
MI_{zt} = \alpha_0 + \alpha_1 F_{zt-1} + \alpha_2 F_{zt-2} + nSES_z \alpha_3 + F_{zt-1} \ast nSES_z \alpha_4 + F_{zt-2} \ast nSES_z \alpha_5 + \lambda_\text{age} \alpha_6 + \mu_z + \epsilon_{zt},
\]

This model will include the interaction variables between foreclosures and nSES, \((F_{zt-1} \ast nSES_z\) and \(F_{zt-2} \ast nSES_z\). According to our working hypothesis in Aim 1.b, we expect to find that both
the estimated coefficients $\alpha_4$ and $\alpha_5$ are positive (since low nSES are coded with higher indicators), and that the components of the estimated vector corresponding to low nSES (low income, high minority) communities are larger than the components of the estimated vector corresponding to high nSES (high income, low minority) communities.

REFERENCES
