1.a. Full Title: The impact of neighborhood racial residential segregation on cigarette smoking in the Atherosclerosis Risk in Communities Study

b. Abbreviated Title (Length 26 characters): Segregation and smoking

2. Writing Group:

Writing group members: Miranda R. Jones, Elizabeth A. Platz, Corinne E. Joshu, Other interested ARIC investigators

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

First author: Miranda R. Jones
Address: 615 N. Wolfe Street
Office E6518
Baltimore, MD, 21205
Phone: (443) 287-5147 Fax: (410) 614-2632
E-mail: mjone132@jhu.edu

ARIC author to be contacted if there are questions about the manuscript and the first author does not respond or cannot be located (this must be an ARIC investigator).

Name: Elizabeth A. Platz
Address: 615 N. Wolfe Street
Office E6132
Baltimore, MD 21205
Phone: (410) 614-9674 Fax: (410) 614-2632
E-mail: eplatz1@jhu.edu

3. Timeline:
Data analysis – 6 months
First draft of manuscript – 6 months

4. Rationale:
In the US, race/ethnicity is highly correlated with residential location, with whites and minorities often living segregated from one another.1,2 This differential residential location (i.e., racial residential segregation) may produce important differences in disease risk.1 Racial residential segregation can result in lower risk for health outcomes by fostering social networks3,4, reinforcing positive health behaviors5, and limiting the exposure of minority populations to
discrimination. Racial residential segregation could also potentially increase risk for adverse health outcomes by limiting access to economic and health resources, limiting access to quality health care and increasing psychosocial stress and exposure to health hazards including environmental toxicants and negative health behaviors. One such negative health behavior is smoking, which is the leading cause of preventable mortality in the US. Indeed, racial residential segregation has been associated with smoking among pregnant black women. To date, no studies have examined the influence of racial residential segregation on smoking behavior in general populations. Individuals may adopt negative behaviors such as smoking to buffer or reduce the chronic stress of discrimination. Higher segregation may also reflect structural attributes associated with smoking such as less stringent tobacco control policies, targeted marketing of tobacco products or limited access to smoking cessation treatment.

Racial residential segregation is multidimensional. In particular, 5 dimensions have been proposed: concentration, evenness, exposure, clustering and centralization. Previous studies, however have mostly examined a single measure of racial residential segregation or only a single dimension. Examining multiple measures and dimensions of racial residential segregation can give insight into potential mechanisms underlying the association between residential segregation and health behaviors, including smoking.

Between 1987-1989, ARIC recruited 15,792 adults aged 45-64 years from 4 US communities: Forsyth Co., NC; Jackson, MS; Minneapolis, MN; and Washington Co., MD. Two communities (Washington Co., MD and Minneapolis, MN) recruited mostly white participants and all participants recruited from Jackson, MS were black. Forsyth Co., NC recruited both black and white participants. Home addresses for ARIC study participants have been geocoded with high accuracy and previously linked to census tract and census block group data from the years 1990 and 2000 US Censuses to examine associations with neighborhood socioeconomic status and local food environments. Using the same methods, we will link home address for ARIC participants to data from the 2010 US Census.

The ARIC study represents an ideal opportunity to study the impact of neighborhood level factors to smoking behaviors. Understanding the role of racial residential segregation to cigarette smoking can facilitate the identification of policies or neighborhood-level interventions to address the characteristics of segregated neighborhoods that lead to adverse health behaviors and outcomes. These findings can inform additional strategies for preventing and reducing disparities in smoking-associated diseases in the US by identifying potential points of intervention at the neighborhood level. In particular, this project can directly inform opportunities for intervention in ARIC communities.

5. Main Hypothesis/Study Questions:
To examine associations of neighborhood racial residential segregation, across multiple measures, with cigarette smoking.

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).
Study design
Cross-sectional analysis.

Inclusion/exclusion
All ARIC participants with geocoded home address data and data on smoking status at the baseline study visit will be included.

Exposure: Racial residential segregation
We will use geocoded baseline home address data and census-tract data from the 1990, 2000 and 2010 US Census to implement measures of neighborhood racial residential segregation (Table 1). Non-Hispanic whites will be the majority (reference) population and non-Hispanic blacks will be the minority population (these are the two racial groups recruited into ARIC). For each measure of racial residential segregation, levels will be categorized as low, moderate or high using established cutpoints or tertiles for measures for which no established cutpoints exists.

Outcome: Smoking status
Information of smoking behavior was assessed by participant self-report during the baseline study visit. Participants will be categorized as never smokers, former smokers, and current smokers at the baseline study visit. For current and former smokers, information of the number of cigarettes per day, age of smoking initiation, age at quitting and pack-years of smoking will also be obtained.

Statistical analysis
At baseline, 26% and 32% of ARIC participants were current and former smokers, respectively. We will use mixed-effects logistic regression to estimate the odds of being a current cigarette smoker at baseline comparing levels (low/moderate/high) of neighborhood racial residential segregation (in 1990, 2000, 2010) as assessed using each measure. We will first conduct analyses comparing the odds of being a current smoker vs. a nonsmoker by level of neighborhood racial residential segregation among all participants. We will repeat analyses separately by age groups and by sex. To examine the impact of racial residential segregation on smoking cessation, for participants that reported ever smoking, we will also estimate the odds of being a current smoker vs. a former smoker. Models will include a census-tract specific random intercept to account for...
the clustering of individuals and will be adjusted for demographics (age, sex, race, and individual and neighborhood-level socioeconomic status) and census-tract population size.

All statistical analyses will be performed using R statistical software.

Challenges
Three of the ARIC communities were homogenous by race when they were recruited in the late 1980s. Based on Census data, these cities/counties have undergone demographic shifts from 1990 to 2010; they are no longer primarily white or black communities and we do not anticipate insufficient variation in racial residential segregation in these ARIC sites. According to the 2000 U.S. Census, the percentage of white residents was 89.7% in Washington Co., MD, 65.1% in Minneapolis, MN, 27.8% in Jackson, MS and 68.5% in Forsyth Co., NC; the percentage of black residents was 7.8% in Washington Co., MD, 18.0% in Minneapolis, MN, 70.6% in Jackson, MS and 25.6% in Forsyth Co., NC.46 Nevertheless, if the variation proves insufficient when using data for all census years proposed (i.e., US Census 1990, 2000 and 2010), then we will restrict our primary analyses of associations of racial residential segregation with smoking and cancer outcomes to racial residential segregation measures estimated using data from census year(s) for which there variation.

7.a. Will the data be used for non-CVD analysis in this manuscript?  X__ Yes ______ No

b. If Yes, is the author aware that the file ICTDER03 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?  X__ Yes ______ No
(This file ICTDER 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 ICTDER03 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)?
• Proposal# 455 (first author: Ana V. Diez-Roux): The relationship of neighborhood characteristics to trends over time in cardiovascular risk factors in the ARIC cohort
• Proposal# 398 (first author: Ana V. Diez-Roux): Neighborhood differences in diet
• Proposal# 1638 (first author: Rachel Huxley): Burden of smoking-related morbidity and mortality and benefits associated with smoking cessation in a middle-aged US population: The Atherosclerosis Risk in Communities Study

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 (list number* 2011.07 and 1995.04)
   ____  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/

12a. 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.

12b. The NIH instituted a Public Access Policy in April, 2008 which ensures that the public has access to the published results of NIH funded research. It is your responsibility to upload manuscripts to PubMed Central whenever the journal does not and be in compliance with this policy. Four files about the public access policy from http://publicaccess.nih.gov/ are posted in http://www.cscc.unc.edu/aric/index.php, under Publications, Policies & Forms. http://publicaccess.nih.gov/submit_process_journals.htm shows you which journals automatically upload articles to PubMed central.

13. Per Data Use Agreement Addendum, approved manuscripts using CMS data shall be submitted by the Coordinating Center to CMS for informational purposes prior to publication. Approved manuscripts should be sent to Pingping Wu at CC, at pingping_wu@unc.edu. I will be using CMS data in my manuscript ____ Yes  _X__ No.
REFERENCES


