**Local Environment, Chronic Disease Onset, and Aging in Place**

Faculty Research Fellowship Candidate: Gina S. Lovasi

Target funding opportunity:

Faculty Research Fellowships Relating to the Modifiability of Aging

http://www.aging.columbia.edu/about-columbia-aging-center/news-and-events/faculty-research-fellowships

Key words:

Chronic disease, healthy aging, cohort study, longitudinal change, residential environment

Submission planned for February 27, 2015

IRB review, parent study approval, and relationship to pending funding:

My current work with the CHS data is covered by protocol IRB-AAAI8403, to be modified/replaced if this fellowship or a pending NIA R01 proposal. An ancillary study to CHS has been approved as CHS AS#312; a parallel ancillary study to REGARDS approved as 2014-124(LOVASI).

**Project Abstract (1 page)**

While the aging process is modifiable in response to individual biology and behavior, modification of the aging process at the community or population level requires consideration of how the broader environment can shift aging processes. Policy strategies targeting local environments may play an important role in disease prevention, addressing health disparities, extending years of healthy life, and facilitating independent living. We propose to bring together commercially available residential history profiles and detailed population-based cohort data to examine the role of local business environments in CVD and racial disparities in CVD as they emerged across decades.

Longitudinal studies of local environments have been strongly recommended as a direction for future research to advance our understanding of causal neighborhood effects on health. Environments change and people move to new homes over time, and such temporal fluctuations represent opportunities to enhance our understanding of how place affects older adults’ lives. For older adults who relocate to a new home address, the corresponding change in the environment may represent both a stressful life event and an opportunity for changing health behaviors. However, careful attention is needed to acute health changes that may precipitate relocation, and which local environment features predict aging in place despite new health or functional limitations.

In the proposed project, we will generate preliminary data on the feasibility of linking longitudinal data to investigate how residential relocation and environment shape cardiovascular health and independent living among older adults. National geographic context data (population sociodemographic characteristics and rail transit infrastructure for the years 1990, 2000, and 2010 plus crime safety data from the year 2010) are available to be linked to individual residential address data from ongoing cohort studies, yet harmonized and comprehensive residential histories are not always available. This project would examine a commercial source of residential and personal profile data (from Lexis Nexis) for potential use in longitudinal geographic research in studies such as the Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study.

The REGARDS Study is a prospective population-based cohort study with oversampling of African Americans, allowing for examination of racial disparities. While the 30,239 REGARDS participants (49% age 65+ at baseline, 55% female, 42% African American) were enrolled recently (2003-2007), their recruitment from a broad geographic region (48 contiguous US states, oversampling Stroke Belt residents) makes them ideal for exploring the potential use of Lexis Nexis residential and personal profile data across the US. Longitudinal health and address data continue to be collected, along with major health events such as new onset cardiovascular disease. Commercially available personal profiles will be obtained and used to begin the process of characterizing residential environments over time, to strengthen external grant applications leveraging comprehensive cohort data to inform prevention efforts and to help us understand the role of the environment in modifying aging trajectories.

This fellowship application would support efforts to better establish feasibility of data linkage using personal identifiers, to ascertain the value of commercially available residential history data, and to develop preliminary data on residential mobility among older adults. Harmonization of longitudinal address data from self-reported and commercially available residential histories has the potential to be used further in characterizing the residential neighborhood environment over time within REGARDS and other large cohort studies.

**CV – insert**

**Summary of candidate’s most significant research accomplishments (200 words)**

Much of my work is framed around one question: How can we improve local environments to prevent cardiorespiratory problems and their risk factors? I have a strong interest in positive features of the environment that we might invest in to support population health across the life course. This focus is distinct from, and complementary to, much epidemiologic and environmental health research focusing on hazardous substances. Yet, it is crucial to remain open to discovering unintended health consequences, whether positive or negative, which might inform our strategy for changing the local environment. Beyond checking for the hypothesized exposure-outcome relationships, I have tried to understand for whom a given exposure is most health-relevant. This can inform targeting and tailoring of health promotion efforts to particular communities, and has implications for health disparities. Strategies to improve local environments may either exacerbate or ameliorate health disparities, which have been observed across a range of settings and have been targeted for elimination. As a result of my research, we now know that among built environment characteristics, safety is likely to be more salient in high poverty urban settings while walkable urban form and aesthetics have been more closely tied to risk factors in affluent settings.

**SPECIFIC AIMS**

Neighborhood environments have potential to affect the health of older adults through economic resources, transit opportunities, safety, and the provision of products and services that affect individual dietary intake, physical activity patterns, and health care.[1](#_ENREF_1),[2](#_ENREF_2) Yet, previous studies linking place to health have been largely cross-sectional and limited in geographic scope. Longitudinal analyses of how environments change and how individuals respond to a new environment after relocating can be used to build more convincing causal evidence. However, as our work suggests,[3](#_ENREF_3) health problems may themselves precipitate relocation, requiring careful and innovative analytic strategies.

We propose to construct comprehensive residential history data to support a national, longitudinal investigation focused on the effects of the local environment on chronic disease, healthy aging, and racial disparities in these outcomes. National spatial data on population characteristics, transportation infrastructure, and crime are available for linkage once longitudinal address histories have been constructed and geocoded. These longitudinal context data will be explored within the context of the Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study.[4](#_ENREF_4) Commercially available data on residential and social history available from Lexis Nexis[11](#_ENREF_11),[12](#_ENREF_12) will be obtained for a subset of REGARDS participants (500 deceased older adults), allowing for examination of key limitations of questionnaire data on residential history. The 30,239 REGARDS participants were enrolled from a broad geographic region (48 contiguous US states) in 2003-2007 (49% age 65+ at baseline, 55% female, 42% African American). The feasibility of linking REGARDS data to Lexis Nexis data will be explored, to evaluate the feasibility of scaling up the linkage to include living participants for whom the confidentiality protections may need to be more strict. We propose to:

1. **Link commercially available residential history data to cohort records, and harmonize with address data from self-report collected retrospectively and during follow-up, characterizing residential mobility among 500 older adults**

Hypothesis 1A: Residential histories enhanced through linkage to a previously validated commercial source[11](#_ENREF_11) will capture more addresses and thus more relocation events, particularly in the year before death during which self-report may not have been feasible.

Hypothesis 1B: Residential relocation events will be more common for older adults immediately following CVD incident events or economic shifts such as bankruptcy (as documented through Lexis Nexis personal profiles).

1. **Geocode longitudinal address data and characterize neighborhood environment over time to allow investigation of differential residential mobility patterns by setting**

Hypothesis 2A: Residential areas with higher home ownership, more transit access or lower crime rates will predict residential stability for older adults (longer time to first relocation event during cohort follow-up).

Hypothesis 2B: Higher home ownership, more transit access and lower crime rates will attenuate the effect of race on residential stability.

**BACKGROUND AND SIGNIFICANCE**

*The importance of cardiovascular disease in an aging population* The number of US adults over age 65 is expected to double by the year 2040, reaching approximately 81 million. The rising medical expenses incurred by this aging population will put a spotlight on their health challenges including CVD.[5](#_ENREF_5),[6](#_ENREF_6) Although cardiovascular mortality has been decreasing in recent decades, cardiovascular disease (CVD) remains the most common cause of death in the US[7](#_ENREF_7) and globally[8](#_ENREF_8) and accounts for most lifestyle attributable deaths in the US.[9](#_ENREF_9) Prevention strategies outside the health care sector may help to limit escalating costs[7](#_ENREF_7),[12](#_ENREF_12) while reducing disease burden. Insufficient time and energy are reported as crucial barriers to a healthier, more active lifestyle.[15](#_ENREF_15),[16](#_ENREF_16) One promising solution is to use the built environment to blend healthy behaviors into our daily lives.[17](#_ENREF_17),[18](#_ENREF_18) Indeed, qualitative research has documented concerns among the elderly in response to neighborhood problems or insufficient access to services,[2](#_ENREF_2),[5](#_ENREF_5),[19](#_ENREF_19),[20](#_ENREF_20) concerns which may be particularly salient for older adults who spend more time in the neighborhood after retirement and may also have driving limitations.

*The emerging potential of prevention by design* The built environment includes features such as homes, transportation systems, and streetscapes that endure for years or decades, and thus have the potential to offer lasting influence on behavior and on health.[21](#_ENREF_21),[22](#_ENREF_22) Initial research linking the built environment to health has generated considerable interest and momentum, and has contributed to multi-sectoral policy discussions highlighting the relevance of regulatory, transportation, urban planning, and real estate development decisions for health.[23-26](#_ENREF_23) These policy efforts were informed in part by our team’s research showing density of healthy food stores,[27-29](#_ENREF_27) urban green spaces,[30](#_ENREF_30),[31](#_ENREF_31) and walkable built environments[32](#_ENREF_32),[33](#_ENREF_33) predict healthier lifestyles and lower BMI. Promising future research directions include characterizing dynamic environmentsand looking at group differences in how individuals respond to the environment.[34](#_ENREF_34),[35](#_ENREF_35)

*Key limitations of the previous literature on geographic determinants of CVD* While potentially important and actionable, the observed “health benefits” attributed to place characteristics based on cross-sectional associations may not be causal.[36](#_ENREF_36) Key threats to validity to consider are the potential for uncontrolled or residual confounding by socioeconomic context, and neighborhood selection shaped by health. Area-level socioeconomic indicators have been associated with chronic disease, and the association appears to persist after statistical control for individual-level SES[38-45](#_ENREF_38) and to be only partially mediated by individual risk factors and health behaviors.[40](#_ENREF_40),[46-51](#_ENREF_46) Particularly for older adults, consideration of wealth and home ownership may be needed to adequately control for SES. We propose to use longitudinal individual-level data on sociodemographic and risk factor data to limit bias due to confounding. Although there is reason to believe that associations between the built environment and chronic disease risk factors are bidirectional,[54](#_ENREF_54) few studies have been able to examine built environment effects on health over time.[55](#_ENREF_55) There is concern that self-selection may lead to bias in the largely cross-sectional built environment and health literature.[56](#_ENREF_56) However, in a recent meta-analysis, those studies that included some adjustment for self-selection yielded slightly stronger associations between the built environment and travel behavior,[57](#_ENREF_57) offering some support for a causal relationship. Longitudinal designs are among the strategies that can add to our understanding of causal effects of neighborhood built environment on health, and these may be particularly crucial for older adult health[37](#_ENREF_37),[58](#_ENREF_58),[59](#_ENREF_59) due to possible reverse causation bias.[60](#_ENREF_60)

*A special consideration for older adults: aging-in-place*

Beyond a role in primary prevention, local medical infrastructure[61](#_ENREF_61) and environments that facilitate healthy lifestyle choices[62](#_ENREF_62) may help to maintain independent living for aging individuals.[2](#_ENREF_2),[37](#_ENREF_37),[63](#_ENREF_63),[64](#_ENREF_64) The movement of older adults to a new environment in response to health challenges, could be conceptualized within a research framework as purely being an example of neighborhood self-selection and a threat to validity to be addressed in analyses. However, such patterns of residential mobility also warrant direct attention, as an opportunity to understand ways that age-friendly design[5](#_ENREF_5) can facilitate aging-in-place for older adults who want that to be an option. The proposed project would a novel source of residential history data from Lexis Nexis. Comparing these data with self-reported residential histories opens new opportunities to support linkage to longitudinal geographic data in other cohort studies, facilitating studies of neighborhood built environment characteristics that predict which individuals will remain in their home as they age.

In conclusion, the current body of evidence linking neighborhoods to health offers only a limited basis for action. Older adults express divergent views about what design features are desirable.[5](#_ENREF_5) The proposed project will enhance our ability to assess how local environment characteristics relate to health outcomes and subsequent residential relocation of older adults throughout the US, with a focus on supporting external funding proposals to move this work forward.

**APPROACH**

This proposed project would allow us to acquire and geographically link data from key longitudinal data sources in the US as described in the following sections. Individual data are from the Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study,[4](#_ENREF_4) which has approved this ancillary study. To supplement addresses from participants, originally collected for cohort follow-up, commercially available residential and social histories will be obtained from Lexis Nexis. Residential addresses will be used to create personalized neighborhood definitions, and to link these to geographic data from national longitudinal sources. The PI has experience working with the GIS methods, and with analyses of geographically clustered and longitudinal data, as described in each of the following sections. However, her experience with specific data sources (REGARDS, Lexis Nexis personal profiles) is currently limited, and her capability to lead large research efforts using these data, will be greatly enhanced through the proposed work.

*Individual-level data on 30,239 US residents in REGARDS*

As a population-based, longitudinal cohort study, REGARDS recruited 30,239 individuals from the 48 contiguous states, oversampling African Americans (AAs) and persons living in the Stroke Belt region of the United States. Between January 2003 and October 2007, participant selection utilized commercially available lists (Genesys). A letter and brochure were sent to potential participants, followed by a phone call during which verbal consent was obtained. The participants self-reported demographics, risk factors, and previous history of cardiovascular disease. After the survey, participants were invited to schedule an in-home visit. Approximately 70% agreed to allow study personnel to come into their home to collect blood pressure, height, and weight measures, blood samples, and to perform an EKG. During the in-home visit, a medication inventory was recorded including all medications and supplements used within the past 2 weeks. Self-administered questionnaires including the Block98 Food Frequency Questionnaire (FFQ) (NutritionQuest™, Berkeley, CA) were used. Follow-up was conducted for all participants who completed the survey and in-home visit, with contact every 6 months to evaluate vital status and morbidity, and ongoing ascertainment CVD outcomes.[65](#_ENREF_65)

Participant addresses (including residential history collected using the “Places You Have Lived” questionnaire) in REGARDS have been used for broad geographic comparisons,[66-68](#_ENREF_66),[71](#_ENREF_71) and neighborhood characterization is ongoing and of interest to REGARDS investigators. Efforts to characterize residential histories will be closely coordinated with other REGARDS data collection. Ancillary studies are encouraged by REGARDS investigators, who are eager to share the study resource; 35 ancillary studies are currently active and the proposed project is part of an approved ancillary study.

*Lexis Nexis as a source of commercially available personal profiles including residential history*

To fill in the details on residential contexts, we will link to commercially available personal profiles from the batched comprehensive reporting offered by Lexis Nexis. Lexus Nexus reports will be used to enhance residential history, to develop a proxy for personal wealth based on property values and ownership[52](#_ENREF_52) (building on strategies used previously by our team[72](#_ENREF_72),[73](#_ENREF_73)), to assess the presence of cohabitating or nearby family members, and establish timelines for bankruptcies, employment, and driving licensure. The residential histories from Lexis Nexis (which include start and end month for each location, and precise sales dates for properties owned) have been validated against self-report.[74](#_ENREF_74) We anticipate access to Lexis Nexis data within 2-8 weeks (personal communication from Justin Cook, June 3, 2014).

Linkage requires sharing of personal identifying information with an outside commercial entity; the most complete and accurate matching requires name, social security number, and date of birth. This linkage is initially planned to be only among deceased participants (N = 500 for REGARDS) for whom the likely bias from missing address data is greatest, and for whom the risk related to any breach of confidentiality is reduced. Our experience with this subset will inform discussion of future linkage involving living study participants. No health information will be shared, and procedures will be developed in collaboration with REGARDS personnel to protect participant confidentiality. Access to identifying information will be limited, and will be subject to restrictions from the institutional review boards at Columbia University Medical Center and University of Alabama. Linkage to Lexis Nexis address data is being used for cohort tracking by the Hispanic Community Health Study/Study of Latinos (Robert Kaplan, personal communication 9/25/14), suggesting that linkage to data from living participants may be feasible in future studies, a possibility which we will investigate.

*Personalized neighborhood definitions centered around multiple individual-level addresses*

The scale of environment measurement is potentially important because of the modifiable areal unit problem: as our team has shown previously,[75](#_ENREF_75),[76](#_ENREF_76) the observed associations may differ depending on the scale and zoning of geographic units for context measurement. One kilometer circular or network buffers are a common choice when studying walking environments and destinations,[32](#_ENREF_32),[77-81](#_ENREF_77) and will be the primary neighborhood definition. We will also consider a larger radius of 5 kilometers which may be relevant for food stores and medical facilities likely to be accessed by private vehicle. Thus, 1 and 5 kilometer network buffers will be defined around each address, as well as administrative units defined based on 2010 boundaries: county, ZIP code tabulation area, and census tract. For each buffer or administrative area defined around a residential address, geographic areas will be characterized based on spatial overlay with point data, or through a weighted average based on the spatial overlay[82](#_ENREF_82) with polygon data.

*National geographic data sources*

Longitudinal national data on residential population characteristics, street networks, and transit access are available throughout the study period and throughout the US, and have been used extensively by our interdisciplinary team (specific publications and projects are described at beh.columbia.edu). Neighborhood residential composition will be estimated from the US Population Census[83](#_ENREF_83) and the American Community Survey data which have been compiled into a longitudinal format for 1970-2010.[84](#_ENREF_84) Public transportation infrastructure data are from a database of subway, light rail, and commuter rail stations compiled by the Center for Transit-Oriented Development (CTOD) (available at http://toddata.cnt.org/). Both the longitudinal census data and transit data have been processed in detail and cleaned to address missing data by co-investigator Kathryn Neckerman (an established quantitative sociologist who co-directs the Built Environment and Health team and has worked closely with the PI since 2006), with consultation from multiple public sources and websites to capture the rail transportation access changes over time, including year of station openings and closures. Longitudinal data are also available on traffic fatalities (Fatality Analysis Reporting System[85](#_ENREF_85)), extending data which have been used in the NYC area by the PI.[31](#_ENREF_31),[86-88](#_ENREF_86) Recent data on crime rates at the block group level are available through CrimeRisk (from ESRI, for the years 2010 and 2012). The primary source of CrimeRisk was a careful compilation and analysis of the Federal Bureau of Investigation (FBI) Uniform Crime Report Databases.

*Statistical analyses*

A range of approaches will be used to account for the spatially clustered and longitudinal data, and to leverage these data to test causal relationships. Analyses will be conducted using Stata 12.1 (Stata Corp., College Station, Texas) and R 3.1.2. (R Foundation for Statistical Computing, Vienna, Austria) with Cluster robust standard errors[89](#_ENREF_89),[90](#_ENREF_90) or other strategies to account for geographically correlated residuals used throughout. Because of the potential multiple comparison problem and possible sensitivity of study results to the spatial measurement scale,[91](#_ENREF_91),[92](#_ENREF_92) we will specify *a priori* neighborhood exposure definitions in all data requests submitted to the parent study publications committees (as required by REGARDS), with planned sensitivity analyses.

1. **Link commercially available residential history data to cohort records, and harmonize with address data from self-report collected retrospectively and during follow-up, characterizing residential mobility among 500 older adults**

Hypothesis 1A: Residential histories enhanced through linkage to a previously validated commercial source[11](#_ENREF_11) will capture more addresses and thus more relocation events, particularly in the year before death during which self-report may not have been feasible.

Hypothesis 1B: Residential relocation events will be more common for older adults immediately following CVD incident events or economic shifts such as bankruptcy (as documented through Lexis Nexis personal profiles).

Data sources will be compared using descriptive statistics. Generalized linear models will be used to predict the number of addresses recorded, for which we expect a Poisson error distribution may provide an adequate starting point. The period of time considered will initially extend from cohort follow-up to present, and we will consider extending this period for one, two, and three decades before enrollment to understand how self-reported residential history data compared with commercial sources over time, particularly for the period of retrospective versus prospective reporting.

1. **Geocode longitudinal address data and characterize neighborhood environment over time to allow investigation of differential residential mobility patterns by setting**

Hypothesis 2A: Residential areas with higher home ownership, more transit access or lower crime rates will predict residential stability for older adults (longer time to first relocation event during cohort follow-up).

Hypothesis 2B: Higher home ownership, more transit access and lower crime rates will attenuate the effect of race on residential stability.

The role of health in precipitating moves to a new home address among older adults is understood conceptually, but has received little direct attention. Yet if certain local support independent living and successful management of health challenges, those characteristics could be incorporated into recommendations for age friendly cities and communities. Crucially, the Lexis Nexis personal profile data including residential history, property ownership, and social transitions such as bankruptcy will help to complement the CHS and REGARDS cohort data on social contexts and address changes. Implications of using additional Lexis Nexis data will be explored through sensitivity analyses.

In addressing questions with moving to a new address as the outcome, we will consider two complementary analytic strategies: case-crossover and survival analysis. A case-crossover design will be considered in order to focus on comparisons within individuals, controlling for stable personal characteristics. Self-reported moving among older adults has been previously analyzed by the PI using this approach.[3](#_ENREF_3) In parallel to this previous investigation, we will use refined residential history to consider the evidence for different CVD event types as precipitating relocation, comparing nonfatal myocardial infarction versus chronic disease outcomes with more gradual onset (e.g., congestive heart failure) or less severe in functional consequences (e.g., revascularization), allowing evaluation of the specificity of any observed associations. As a parallel approach to investigate time to the first relocation to a new home address during follow-up, survival analysis (Cox proportional hazards models) with time-varying social and health predictors will be used. The proportional hazards assumption will be tested. Competing-risks regression[93](#_ENREF_93) will also be considered as an alternative to account for competing risks (death or institutional living).

Among those who move to a new home address, generalized linear models will be considered to evaluate predictors of the distance moved (based on comparing coordinates of initial and subsequent address), to consider whether the predictors of residential stability also predict shorter moving distance.

Analyses are planned to include adjustment for individual- and area-based indicators of demographic characteristics, with restriction on or adjustment for prior health conditions. The rich datasets available on individual sociodemographic characteristics, neighborhood socioeconomic characteristics, and neighborhood population density will be used to address the possibility of confounding by baseline or time-varying characteristics. Missing survey covariate data will be filled in through multiple imputation to limit bias and loss of sample size.[95](#_ENREF_95),[96](#_ENREF_96)

Because of our interest in understanding racial disparities CVD, all analyses will consider stratification by individual race or area-based racial composition. Stratified analyses will be conducted with interaction p-values based on a Wald test or likelihood ratio test after interaction terms are added to the main analysis. We will also examine whether any race-outcome associations are attenuated[97](#_ENREF_97),[98](#_ENREF_98) in models as the neighborhood environment measures of interest are added, which would be compatible with neighborhood environments mediating the race-outcome association.

By working with rich longitudinal data, testing assumptions, evaluating competing hypotheses, and assessing association specificity, we will seek to add to our current understanding of the temporal sequence, direction of causation, and effect modification patterns relevant to the implications of neighborhood change for CVD health and health disparities. The robustness of study results across modeling strategies will be tested. In some cases, confidence in the hypothesized causal relationship could be clarified by exploring the specificity of the link, as we have done previously.[99](#_ENREF_99)

*Strengths and Limitations*

The current proposal will collect new information on geographic and social context using longitudinal data from commercial and governmental sources, and combine this with individual-level data from a well-characterized cardiovascular cohort study. While longitudinal and prospective, the proposed project is an observational study, so the possibility of unmeasured or residual confounding remains. Analyses that rely on within-unit comparisons over time, including case-crossover designs,[100](#_ENREF_100) are particularly well-suited to establishing the sequence of events. However, longitudinal designs would often be vulnerable to the same biases from confounding that most critically jeopardize inference from cross-sectional data. Confounding by a common prior cause could contribute to both exposure and outcome concurrently or at staggered times, and thus lead to patterns of exposure-outcome correlation apparent in either cross-sectional or longitudinal designs. We hope that our analyses predicting patterns of exposure (based on moving to a new address) will shed light on such processes. Yet even studies that follow the residential relocation of individuals over time,[54](#_ENREF_54) thus examining changes in both exposure and outcome, would be subject to time-varying confounding by demographic transitions such as divorce or retirement, and by resources and preferences that have an ongoing influence. Although REGARDS has an especially rich set of traditional risk factors and subclinical measures of disease, a cautious interpretation of the findings is appropriate. We hope that by supplementing available information with commercially available personal profiles, we will better understand any potential bias. Our planned linkage to commercially available personal profile data to complement study data is, however, only planned for a subset of deceased individuals, and will not represent the residential and social histories of the full cohort.

**IMPACT**

When we construct the physical and social environments that surround us, we create a health context for our lives. To a large extent, the health relevant aspects of the contexts we create are the unintended consequences of policies and actions designed for the pursuit of other social and economic goals. Nevertheless, we have the capacity to shape those contexts to enhance health and well-being. Without accurate information on the health effects of the local environment, investments may be misdirected. Longitudinal studies that link changing neighborhoods with health trajectories can help to overturn incorrect assumptions and establish whether neighborhood change precedes the health change of interest. The proposed study leverages the extensive standardized data on cardiovascular risk factors and subclinical disease measures that have already been collected at great expense, as well as the standardized assessment of cardiovascular events in both cohorts. This proposal supports linkage and analysis of data to characterize neighborhood contexts and cardiovascular health outcomes experienced by older adults in the US over more than two decades, addressing key limitations of prior research. We have an unprecedented opportunity to characterize persistent and emerging disparities in access to neighborhood contexts, incident CVD, and aging in place following CVD.

**FUNDING STRATEGY**

The overarching goal of this research is to generate actionable knowledge on the role of the local business environment in reducing CVD and supporting independent living for an aging and racially diverse population.This is closely aligned with the PI’s career trajectory and funding strategy. Our recent R01 submission to the National Institute on Aging (RAG049970A under PA13-292) received a 13th percentile score in February 2015, just missing the payline of 12th percentile for early stage investigators. The aims of this R01 project included work with two cohorts (REGARDS and the Cardiovascular Health Study, CHS) and two commercially available longitudinal data sources (personal profiles from Lexis Nexis and longitudinal point-level data on all US businesses from the National Establishment Time Series (NETS) dataset) in order to

1. Evaluate the role of higher density of healthy food sources in preventing CVD incidence and explaining disparities
2. Identify the contribution of local destinations of daily living to reducing CVD incidence and disparities
3. Quantify the role that local health facilities can play in tertiary prevention and related disparities following CVD

This fellowship application would support efforts to better establish project feasibility and develop preliminary data, and in particular to harmonize longitudinal address data from self-reported and commercially available residential histories to be used in characterizing the residential neighborhood environment over time. Work with REGARDS and Lexis Nexis data have been prioritized for this fellowship because they were the data sources with which the PI had least familiarity. Thus, we thought that the preliminary data with greatest potential to improve our funding prospects would involve both of these remarkable resources, allowing for a sharper and more compelling description of study approach in future external funding proposals.

**BUDGET – INSERT**

**BUDGET JUSTIFICATION**

**PERSONNEL**

**Gina S. Lovasi, PhD, MPH, Principal Investigator**, is an Assistant Professor in the Department of Epidemiology at Columbia University Mailman School of Public Health. Her experience in epidemiology includes leading several grant-funded research projects and publication of more than 50 peer-reviewed manuscripts, many of which cover topics of relevance to this proposal. She has experience supervising GIS linkage studies and statistical analyses. Salary support is requested for two years for the PI’s proposed research and supervision activities. Dr. Lovasi will work with her team to finalize geographic and statistical analysis approaches designed to address the proposed research aims. Dr. Lovasi will direct all aspects of the research program and interpretation of data.

**OTHER PERSONNEL**

**Daniel Sheehan, MA**, Senior Geographic Information Systems Analyst (10% effort) salary support is requested for both years. As a member of the Built Environment and Health Project research group Daniel Sheehan builds, maintains and processes geospatial databases for environmental health-related projects. Danny earned a BA in Geography from Geneseo and completed his MA in Geography/ Specialization in GIS from University at Buffalo. Prior to joining the BEH GIS research team, he worked as a GIS Analyst for engineering firms, managing engineering design data and analyzing impacts on the built social and natural environment as part of the EIS process. Mr. Sheehan has previously with longitudinal spatial data, including harmonization of cohort address data and the development of metrics and dynamic visualizations. He will be responsible for geographic analysis of business and built environment data, documentation of geographic data sources obtained and variables created, and he will be engaged in the creation of publication quality maps or dynamic visual representations (video or animation) of the geographic analysis methods and results.

**To Be Hired, MS or MPH**, Project Coordinator (20% effort) salary support is requested for all years. The project coordinator will work with the PI and other investigators of the Built Environment and Health group in the management of administrative and research activities and will assist in planning and coordinating project efforts including: data management, documentation of data processing, supervised statistical analysis, communication with research collaborators and contributing to research manuscripts.

*All personnel costs for staff are projected at a 3% increase in continuing years.*

**SUPPLIES:**

Computer Software and Upgrades: Funds are requested for two PC laptops, one for the project coordinator and one for the PI.

**Data purchase:** The purchase of the Lexis Nexis personal profile and residential history data for a sample of 500 REGARDS participants (Cost estimated at $1,416.50). This data is required to complete the proposed work, and will also serve as preliminary data on this type of linkage should the PI or other investigators at the Mailman School of Public Health, the Columbia Population Research Center, or the broader Columbia University community wish to use this unique resource for health-relevant research.

**Miscellaneous:** Funds are requested to support miscellaneous office supplies including telecommunications and mailing costs, and printer toner.

**TRAVEL:**

**Visit to University of Alabama to initiate collaboration:** Funds are requested for 2 study personnel to travel to the REGARDS Operations Center at University of Alabama in each year. Meetings during year 1 will be planned to plan IRB modification, establish confidentiality protection protocols, and coordinate data linkage and variable creation. Meetings during year 2 will be planned to discuss documentation of harmonized data, interpretation of study findings, and future funding applications.

**Conference travel:** Funds are requested for 2 study personnel to travel to one conference (American Heart Association Epidemiology Council) in the second year. Attendance at this conference will allow presentation of research data and ongoing contacts with professional colleagues, including those engaged with REGARDS and other large cohort studies which offer a wealth of data to further investigate the modifiability of aging by geographic context.

**OTHER EXPENSES**:

**Page charges:** Several journals that may be appropriate targets for publication assess page charges, and others provide color figures or open access to selected articles at the author’s expense. Since publications generated by this proposal are anticipated to occur near the end of the award period, allocation for page charges is requested in the second year.

**FUNDING PERIOD:** 2 years

**Cited Literature**

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