ARIC MANUSCRIPT PROPOSAL FORM

FOR ADMINISTRATIVE USE ONLY

Manuscript #526A

| | Date Rec'd | Date Approved | Prty |

Publications Committee:

Steering Committee:

1.a. Full Title: The relationship between the local food environment and dietary intake in ARIC

 b.   Abbreviated Title (Length 26): Diet and locality in ARIC

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

> Lead: Kimberly Morland
> Address: University of North Carolina at Chapel Hill
>   Department of Epidemiology
>   CB# 7400, McGavran-Greenburg Hall
>   Chapel Hill, NC 27599-7400
>
> Phone: (919) 967-6646   Fax: (919) 966-2089
> Electronic Email Address: kmorland@sph.unc.edu
>
> Members of Writing Group: Wing S, Diez-Roux AV, Tyroler HA, Sorlie P

3. Time Line:

Submit proposal to Publication Committee	9-97
Complete data collection/data entry	1-99
Complete data analysis	9-99
Submit draft to Publications Committee	12-99

4. Background:
The relationship between diet and cardiovascular disease has been well established. However, efforts to modify individuals' diets by education has been largely unsuccessful (Carleton, 1995; Farquhar, 1990; Luepker 1996). This suggests that there are other contributing factors which either reduce motivation to adopt a healthful diet or make changes difficult or impossible to achieve. Determinants of food purchasing patterns suggest diet is affected by the local food environment. However the relationship between the local food environment and individuals' food consumption has not been studied.

FACTORS INFLUENCING INDIVIDUALS' DIETS:

Research shows the diets of individuals are influenced by several factors: preferences, cost and locality as described below.

PREFERENCES: Individual preferences, mediated by knowledge or culture, have an influence on food consumption (Conner, 1994). For instance, the change in the U.S. regulatory policy in 1985, allowing producers to discuss the relationship between diet and disease, has led to improvements in food choices by some individuals (Ippolito, 1994). Other research has shown that education attatinment is associated with healthier diets (Shimakawa, 1994). In addtition, knowledge of the relationship between health and dietary fat has been shown to influence food choice (Carlson, 1994).

Food preferences are also influenced by cultural factors. The social environment in African American and Caucasian cultures may increase or reduce motivation to adopt healthful diets (Stayman, 1989). Other research on the location of spending shows that neighborhood food spending is associated with community attachment (Cowell, 1994; Brown, 1992).

COST: Another barrier which prevents individuals from attaining a healthful diet is the cost of food. Some researchers have found the undernutrition of the urban poor is linked to the cost of food (U.S. Select Committee on Hunger, 1990). Food costs more for persons of low socio-economic status because purchases are made in smaller quantities than for wealthier individuals and there is more of a reliance on processed food. Other survey research has shown that urban dwellers pay 3-37% more for groceries in their local food environment compared to the same goods purchased in large suburban supermarkets. (U.S. Select Committee on Hunger, 1992)

LOCALTIY: Finally, the locality of food stores is linked to the food purchases of individuals. For instance, an analysis of the Food Stamp Program, Aid to Families with Dependent Children and Supplemental Security Income has shown that even beneficiaries receiving combined aid, continue to be unable to purchase food to meet their nutritional needs (U.S. Select Committee on Hunger, 1988). These authors speculated that the migration of supermarkets out or urban areas and lack of transportation contribute to the undernutrition of the poor. Other researchers have concurred with these findings, indicating a sharp decline of supermarkets in low income areas (Curtis, 1995). This has forced residents to depend on small stores with a limited selection of food at substantially higher prices than supermarkets.

In addition to those in poverty, research has shown that grocery shopping among the elderly is restricted to their immediate neighborhoods (Smith, 1991). These data indicate that the urban dwellers are spatially disadvantaged compared to suburban dwellers because is a lack of local supermarkets in their neighborhoods and a lack of automobile transportation. Proximity to grovery stores contributes to the wellness of the elderly population (Smith, 1995).

Therefore, the convenience of food has become an important factor. Single parent families have increased the popularity of convenience foods (Wynn, 1990). McDonalds, who feeds seven percent of the United States population each day, has a corporate mission to build a restaurant within a four minute walk or drive from every American (Gabriel, 1997).

5. Rationale: Although there is some research characterizing the food purchasing patterns of individuals, the relationship between the local food environment and individuals' food consumption has not been studied. The usefulness of knowing if individuals' food consumption is influenced by their local food environment has both clinical and public health benefits. From a clinical perspective, it is important to know if the dietary guidelines being described are actually achievable. If a restricted local food environment inhibits or prevents dietary change, then clinicians may assign a different therapy. The benefit to public health is the opportunity to intervene at an organizational level, while still educating individuals to the relationship between diet and risk for cardiovascular disease. Health education has been unable to manifest long term dietary changes in individuals which would affect risk for cardiovascular disease (Carleton, 1995; Farquhar, 1990; Luepker, 1996). These prevention programs may be more effective by considering the local food environment. The most effective interventions are those which use a multi-disciplinary approach. Intervening on the food environment by making healthful foods more convenient may be an efficient way to change the dietary habits of populations and prevent future cardiovascular disease events.

6. Main Hypothesis: The primary aim of this research is to evaluate how an individual's local food environment (density of supermarkets, corner markets, fast food and non fast food restaurants) is associated with his or her food consumption. The primary hypothesis is that individuals living in areas with a restrictive food environment are more likely to consume foods higher in fat, cholesterol and sodium and consume fewer fruits and vegetables compared to individuals living in a less restrictive food environment. A restrictive food environment is defined as a local food environment containing primarily a high density of fast food restaurants and corner markets and few or non supermarkets. A less restrictive food environment is one that a) contains an equal density of supermarkets, corner markets, fast food and non fast food restaurants or b) contains a higher density of supermarkets than the other types of food stores.

7. Data (variables, time window, source, inclusions/exclusions): Overview: A secondary data analysis using the baseline data from the Atherosclerosis Risk in Communities (ARIC) Study will be used to investigate the association between a restrictive food environment and individual's food consumption data collected at the baseline interview in 1986-1989. In addition, we will collect the addresses of food stores and restaurants for each of the communities. Finally, aggregate information about neighborhoods will be collected from the 1990 Bureau of the Census. The outcome variables will be derived from individuals' food frequency

questionnaires, estimating an intake of each of the following: percent of calories from fat, cholesterol(mg), sodium(mg), and servings per day of fruits and vegetables. The independent variables for density of supermarkets, corner markets, fast food and non-fast food restaurants will be derived from the collection of food and restaurant addresses from city and county tax and licensing departments. These data will then be entered into a FoxPro database and merged to the database with the residence addresses of the ARIC participants. We will then derive an area density for supermarkets, corner markets, fast food restaurant and non-fast food restaurant based on a defined geographical boundary representing individuals' neighborhoods using MapInfo. We will also consider the transportation constraints of individuals by attaining a global measure of public transportation from city and county transportation departments and an aggregate measure of personal transportation from the 1990 U.S. Bureau of the Census.

PRIMARY DATA SOURCES AND ENTRY PROCEDURES: Data for this research will be collected from four different sources:

ARIC BASELINE INTERVIEW: Individual food frequency, demographic and health information of ARIC participants will be used.

TAX AND LICENSING DEPARTMENTS: Food store and restaurant addresses will be collected from city and county tax licensing departments. Names of food establishments and their addresses will be received in an elctronic ascii file whenever possible. Data received on paper will be key data entered into a FoxPro database. Each food store and restaurant will be given a type code: supermarket, corner market, other market, fast food and non-fast food restaurant. These type codes will be determined from the name of the establishment when possible. Phone call contact will be make to the food establishments is a) the name of the establishments does not clearly identify the type and/or b) the address received is a P.O. Box. A questionnaire will be developed to ask a standardized set of questions if contact is necessary.

1990 U.S. BUREAU OF THE CENSUS: Data from the 1990 U.S. Bureau of the Census will be used to a) identify block groups and b) provide aggregate level information characterizing the block groups (percent of population below poverty level, percent urban/rural, percent of population 65 years or older and information about housing such as percent of dwelling which are rentals and information on crowding). This data will be used in unison with the food store/restaurant data in deriving an exposure assessment. The characteristics of the block groups will be collected from published reports of the 1990 Census and key data entered into a FoxPro database.

CITY AND COUNTY DEPARTMENTS OF TRANSPORTATION: Maps of bus routes will be collected from the city and county departments of

transportation. Individuals living in areas with public transportation available will receive a code for the distance to the nearest bus stop or terminal.

8. Exposure Status: Because the relationship between the density of markets and restaurants with food consumption has not previously been investigated, the best way to define exposure is not clear. We have determined two ways to define the exposure, each with strengths and limitations.

    The first way is to calculate the density of fast-food, non-fast food, corner markets, supermarkets and other markets for each census tract or block group, then assign density values to individuals based on their residence. This strength of this definition is a clear geographical boundary of neighborhood. However, although, geographical census blocks are defined from population density, it is possible that the defined blocks do not adequately represent the purchasing arena for rural and possibly suburban dwellers. We have therefore considered an alternate definition of exposure status which would allow the geographical boundary to vary based on population instead of geographic boundaries. The strength of this definition is the ability to quantify urban, suburban and rural dwellers. But the limitation is in the abandonment of the group level characteristic (i.e., neighborhood). We will likely utilize both exposure assessments to identify the most robust definition of local food environment, minimizing the variability within local food environments.

    Once the density scores have been calculated for supermarkets, corner markets, other markets, fast food and non fast restaurants within each local environment, then the local environments can characterized into restricted levels based on the variety of food establishments and their density.

9. Data Analysis: Since this project involves both individual and group level characteristics, we will use multi-level modeling in our analysis. Although there are many different approaches to multi-level modeling and software available, we will use hierarchical linear modeling which has been used previously in an investigation of neighborhood characteristics within the ARIC study (Diez-Roux, 1997).

<div align="center">REFERENCES</div>

Brown RB. Characteristics of outshoppers in a more and a less viable rural sevice/trade center. Rural Sociological Society 1992.

Carleton RA, Lasater TM, Assaf AR, Feldman HA, McKinlay S, et.al. The Pawtucket Heart Health Program: community changes in cardiovascular risk factors and projected disease risk. American Journal of Public Health 1995;85:777-85.

Carlson KA, Gould BW. The role of health knowledge in determining dietary fat intake. Review of Agricultural Economics 1994;16:373-86.

Conner M. Accounting for gender, age and socioeconomic difference in food choice. Appetite 1994;23:195.

Cowell DK, Green GP. Community attachment and spending location: the importance of place in household consumption. Social Science Quarterly 1994;75:637-55.

Curtis KA, McCellan S. Falling through the safety net: poverty, food assistance and shopping constraints in an American city. Urban Anthropology 1995;24:93-135.

Diez-Roux AV, Nieto F, Muntaner C, Tyroler HA, Comstock GW, Shahar E, Cooper LS, Watson RL, Szklo M. Neighborhood environments and coronary heart disease: a multi-level analysis. American Jounral of Epidemiology 1997;146:48-63.

Farquhar JW, Fortmann SP, Flora JA, Taylor CB, Haskell WL, Williams PT, Maccoby N, Wood PD. Effects of community wide education on cardiovascular disease risk factors: the Stanford five-city project. Journal of the American Medical Association 1990;264:359-365.

Gabriel T. Will 55 cent hamburgers cheapen the diet? The New York Times. Wednesday, March 5, 1997.

Ippolito PM, Mathios AD. Nutrition information and policy: a study of the U.S. food production trends. Journal of Consumer Policy 1994;17:271-305.

Luepker RV, Rastam L, Hannan PJ, Murray DM, Gray C, Baker WL, Crow R, Jacobs DR, Pirie PL, Mascioli SR, Mittelmark MB, Blackburn H. Community education for cardiovascular disease prevention: morbidity and mortality results from the Minnesota Heart Health Program. American Journal of Epidemiology 1996;144:351-62.

Nelson J. Peri-urban malnutrition, a neglected problem: patterns and approaches. Assignment-Children 1978;43:25-46.

Shimakawa T, Sorlie P, Carpenter MA, Dennis B, Tell GS, Watson R, Williams OD. Dietary intake patterns and sociodemographic factors in the Atherosclerosis Risk in Communities Study. Preventive Medicine 1994;23:769-80.

Smith GC. Grocery shopping patterns of the ambulatory urban elderly. Environment Behavior 1991;23:86-114.

Smith GC, Gauthier JJ. Evaluation and utilization of local service environments by residents of low rent senior citizen apartments. Canadien Journal of Urban Research 1995;4:305-23.

Stayman DM, Deshpande R. Situational ethnicity and consumer behavior. Journal of Consumer Research 1989;16:361-71.

U.S. House of Representatives Select Committee on Hunger. Obtaining food: shopping constraints on the poor. U.S. government printing office, Washington D.C. 1987.

U.S. House of Representatives Select Committee on Hunger. Food security in the United States. U.S. government printing office, Washington D.C. 1990.

U.S. House of Representatives Select Committee on Hunger. Urban Grocery Gap U.S. government printing office, Washington D.C. 1992:20-21.

Wynn RL, Bowering J. Homemaking practices and evening meals in married and separated families with young children. Journal of Divorce and Remarriage 1990;14:107-23.