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The Role of Social Capital on Health in Elderly People with the Advent of the Baby-boom Generation's Aging

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1. Introduction

Social capital has become a popular topic in the past decade particularly with the publication of Putnam's *Bowling Alone* (2000), and research links it with economic development, a well-functioning democracy, good education, and safe neighborhoods (Cook, 2000; Fukuyama, 1995; Putnam 2000). One of the areas that attracted extensive attention in recent years is in health. Macinko and Starfiled (2001) found only ten empirical studies on social capital and health prior to 2001. However, Kawachi et.al (2004) came across more than 50 papers that were published on this issue in 2002 alone.

A growing body of literature has analyzed the concept of social capital and its impact on health outcomes and has attracted the attention of both the academic and the policy communities. For example, greater social capital has been shown to be associated with better levels of general health and (subjective) well-being (Helliwell, 2003; Subramanian, Kim and Kawachi, 2002), lower cardiovascular and cancer mortality (Baum, 1997; Kawachi et al., 1997), and lower suicide rates (Kennedy, Kawachi, and Brainerd, 1998).

In this paper, we will explore social capital from the perspective of an individual resource and social connectedness, which refers to the relationships people

have with others[1]. People enjoy constructive relationships with others in their families, communities, churches, and workplaces. Families support and nurture those in need of care. Social connectedness is integral to wellbeing. People are defined by their social roles, whether as partners, parents, children, friends, caregivers, teammates, staff or employers, or a myriad of other roles. Relationships give people support, happiness, contentment and a sense they belong and have a role to play in society (Spellerberg, 2001). They also mean people have support networks in place that they can call on for help during times of illness or poor health.

Most of the recent studies found a positive relationship between social capital and health in general, but they are limited to descriptive studies. The focus here is on a theoretical approach to the role of social capital in producing health based on Becker's household production function. This study will test whether social capital has a positive impact on health status both directly through a more effective production of health and indirectly through utilizing the health care system better, using several measurements of social capital from the National Health and Nutrition Examination Survey (NHANES) 2001-2002 for a sample of those 60 years old and above.

[1] There is less agreement about whether social capital is a collective attribute of communities or societies, or whether the beneficial properties of social capital are associated with individuals and their social connectedness or relationships. However, we are not testing these two different perspectives in this paper. For the comparison, refer to Kawachi et.al (2004).

A main reason to consider social capital in light of social networks/ connectedness of elderly people is that networks might enhance positive outcomes for them. Previous research reflects strong themes about the importance of family members and friends in the lives of older adults. Social ties have been linked to beneficial health and social outcomes (Martire et al., 1999), to the maintenance of independence in later life (Bowling et al., 1991) and to responsive care for seniors with chronic long-term health problems (Havens et al., 2001). It is also timely to examine the relationship between social capital and better heath in elderly people with the advent of the baby-boom generation's aging. However, there has been little research on the impact of social connectedness in older adults, except Keating et al. (2005).

In the literature, studies utilize subjective self-rated health status to explore the relationship between social capital and health. However, NHANES 2001-2002 allows us to use several objective measures, including medical and laboratory examination results as well as self-rated health status. These objective measures will allow us to conduct a more rigorous study about the impact of social capital on health outcomes.

2. Theoretical Background

The proximate determinants of an individual's health usually are decisions made by the individual or by the household in which people live- given assets, prices,

and community endowments. Therefore, a natural starting point is the determination of individual health at the household level. With an extensive literature, for example, Behrman and Deolalikar (1988), this project is based on the standard household model with constrained maximization of a joint utility function. It is assumed that the household behaves as if it maximizes a utility function, which is a function of the goods and services consumed, health status of household members, and leisure[2].

A household behaves as if maximizing a utility function:

$$U = U(H^i, C^i, L^i), \quad i = 1,....,n \qquad (1)$$

where

H^i is the health of household member i,

C^i is the consumption of household member i,

L^i is the leisure of household member i, and

n is the number of individuals in the household.

(All of these variables and others defined below may be vectors with multiple

[2] We construct the model "as if" the household maximizes a single preference function subject to a set of constraints. Behrman and Deolalikar (1988) considered the possibility of the bargaining and negotiations that actually occur in the household (Folbre, 1986; Jones 1983). Bargaining models, such as Manser and Brown (1980) and McElroy and Horney (1981) have been used instead. However, NHANES does not include questions of household formation and dissolution. The finding by Rosenweig and Schultz (1984), in which an alternative bargaining model has no different implications for empirical specification since the same structural and reduced-form relations for health result, provides a resolution. For detail, see Behrman and Deolalikar (1988) footnote 3.

dimensions.)

Health is a household-produced commodity. The health of the given i th individual is produced by a number of choices relating to the commodities consumed, health inputs, which do not affect utility except through health (e.g. health insurance), and the individual and household endowments:

$$H^i = H(\hat{C}^i, D^i, U^i, \Omega^i, S^i) \qquad (2)$$

where

H^i is the health outcome of the i th individual,

$\hat{C}^i$ is the consumption of the i th individual that affects health,

D^i is the observable characteristics including socio-demographic variables of the i th individual

U^i is the unobservable attributes, such as genetic endowment of the i th individual,

Ω^i is the characteristics of household, and

S^i is the social capital of i th individual .

To analyze the basic correlation between social capital and health, we estimate the following regression:

$$H_i^* = \beta' X + \gamma S + \varepsilon \qquad (3)$$

where H^*_i is the individual's actual health, **x** is a vector of explanatory variables, S is a vector of social capital, β' is the vector of coefficients, and ε is the error term. Explanatory variables include socio-demographic variables and genetic endowment

variables (X), and social capital (S). Detailed variable lists are found in the appendix.

3. Data

The National Center for Health Statistics (NCHS), part of the Centers for Disease Control and Prevention (CDC), has collected nationally representative health and nutrition surveys since the early 1960's. In each survey a nationally representative sample of the US civilian non-institutionalized population was selected using a complex, stratified, multistage probability cluster sampling design. Primary sampling units (PSU) are generally single counties, although small counties are combined to meet a minimum population size. Clusters of households are selected, the households are screened for demographic characteristics, a sample of households is selected, and one or more persons per household are selected[3].

Survey workers collected demographic data and information on general health, use of health services, and housing characteristics in an interview in the home. Nearly three-quarters of the participants also received a four-hour medical examination at a mobile Medical Exam Center (MEC). The MECs, including 12 physicians and other persons involved with the examinations, moved from city to city, preserving consistency

[3] Details of sampling and weight methodology are available at the Centers for Disease Control and Prevention (CDC) website, http://www.cdc.gov/nchs/nhanes.htm.

in the medical exam. In addition to the MEC examinations, a small number of survey participants receive an abbreviated health examination in their homes because they are not able to come to the MEC. The survey included many tools to induce those selected for the study to participate, especially those selected for the medical exam portion of the survey.

For NHANES 2001-2002, 11,039 persons were interviewed and 10,477 were examined in the MEC. Data were collected between January 2001 and December 2002. The data and corresponding documents for the survey interview and examination components are available from the CDC website.

4. Methods and Variables

NHANES household, interview, and examination data files were merged using the unique sequence number given to each participant. Samples were weighted using the procedure recommended in the NHANES documentation. In this study, a sample of those 60 years old and above will be analyzed. The total sample size is 1,684 and 815 of them are males and 869 are females.

[Insert Table 1 Here]

Dependent variable

We use several health outcome measures as dependent variables. The first

measure is peoples' self-rated health status. Measures of self-rated health are based on individual and robust predictors that have gained in popularity to forecast individual health outcomes, even in persons without prior health problems. Previous research has shown that self-rated health status has predicted such important patient outcomes as mortality and health system utilization (Hornbrook and Goodman, 1997; Idler and Benyamini, 1997; Miilunpalo et al. 1997; Curtis et al. 2002).

In the NHANES data, people were asked: "How is your health in general? Would you say it is excellent, very good, good, fair, or poor?" We converted the original 5-point scale to a dichotomous variable, with the value 1 representing excellent, very good, or good health, and the value 0 representing fair and poor health. A probit model is used for the empirical analysis.

Second, the current health status section (variable name prefix HSQ) of the NHANES questionnaire provides personal interview data on recent illness for the past 30 days, blood donations, and AIDS testing. We chose select recent illness measures, which indicated the number of days that a person's health condition was not good during the past 30 days. It was collected based on physical and mental health separately.

Third, data based on nine biomarkers were used to create an overall summary index of biological risk, to reflect the cumulative effect of physiological problems

across multiple systems. We created three subscales based on subsets of biomarkers reflecting inflammatory, metabolic and cardiovascular parameters. The inflammation subscale included C-reactive protein (mg/dL) and albumin (g/dL). The metabolic subscale included glycated hemoglobin (%), total cholesterol (mg/dL), HDL cholesterol (mg/dL), and Body mass index (kg/m^2). The cardiovascular subscale included systolic blood pressure (mm Hg), diastolic blood pressure (mm Hg), and heart rate (bt/min). For each of the variables, a dichotomous indicator was created, reflecting those with "high risk" values (assigned a score of "1") and "lower risk" values (assigned a score of "0"). Values assigning high and low risk were based on clinically accepted "high risk" criteria. The summary, multi-system score was created by summing the subscale scores.

[Insert Table 2 Here]

Independent variables

A key independent variable is the social capital measure. NHANES 2001-2002 includes a number of components of the questionnaire variable lists and one of them is social support. Table 3 shows the questionnaire lists for the 'social support' section used in the NHANES 2001-2002. Measures of social capital are number of emotional support sources, emotional/financial support from any source, and number of

close friends[4].

Other independent variables include socio-demographic variables and genetic endowment variables. First, a number of socio-demographic variables were controlled in the equation. The variables to be included are: Gender, Age, Race/Ethnicity, Country of Birth (Foreign born or not), Education, Annual Household Income, and Marital status. Second, we also include a few genetic endowment variables, such as family disease history. The variables are

- Blood relatives have diabetes
- Blood relatives have Alzheimer's

[Insert Table 3 Here]

5. Descriptive statistics

The descriptive statistics of all variables are presented in Table 4. The columns of Table 4 break out a sample of those 60 years old and above into three groups: total group, males only, and females only. The total sample size is 1,684 and 815 of them are males and 869 are females.

[Insert Table 4 Here]

[4] Emotional support includes talking over problems or helping study participant (SP) make a difficult decision. Financial support includes helping SP by paying any bills, housing costs, hospital visits, or providing him/her with food or clothes. Close friends mean relatives or non-relatives that SP feels at ease with, can talk to about private matters, and can call on for help.

Self-rated health status shows similar patterns between males and females. About 70% of study participants evaluate themselves as either in excellent, very good, or good health (70.8% for males and 69.3 % for females).

However, other health outcome measurements have a different distribution between males and females. Males usually show better health outcome than females. Males have 5.26 days of physical health that was not good during the past 30 days and 2.44 days of mental health that was not good during the past 30 days, while females have 6.61 days for poor physical health and 4.38 days for poor mental health. Males have less days of inactive days due to physical/mental health during the past 30 days (2.25 for males and 2.80 for females). Less than 5% of men had stomach or intestinal illness during the past 30 days, but almost twice as many women experienced it (7.6%). Regarding flu, pneumonia, or ear infection, in contrast to 4.1% of women, only 3.2% of males experienced these ailments during the past 30 days.

Females are generally older than males by one year, have lower household annual income, and fewer females completed education surpassing high school (33.7% for females and 39.3% for males). One interesting finding from the socio-demographic variables is marital status. Only 37.2% of females are married while 72.4% of males are married and this is mainly due to the fact that the sample is adults 60 years old and above: women live longer than men and some females stay widowed

once they lose their spouse. Also, a lower rate of second marriage for females may explain the gap.

The race/ethnicity variable is derived by combining responses to questions on race and Hispanic origin. Sixty two percent of total group are Non-Hispanic White, 16.6% Non-Hispanic Black, 15.5% Mexican American, 3.3% Other Hispanic, and 2.5% of them are other race, including multirace. This distribution still applies when the total sample is divided into males only and females only. Also it represents the national geographic distribution.

Regarding social capital related factors, both males and females express similar responses. First, 91.5% of males and 93.5% of females have someone to help with emotional support in the last 12 months. Common resources of emotional support are spouse, children, and friends. More women needed more emotional support than males (16.0% for females and 10.7% of males) and around 60% of both males and females needed either a lot or some more emotional support (60.9% for males and 61.6% for females). Women also received more financial support in the past year than men (75.7% for males and 82.4% for females). Males have more close friends than females (8.32 for males and 7.64 for females).

6. Endogeneity and empirical results

Social capital measurements should be treated as endogenous variables in the analysis, since a person's health is likely to affect their social interaction. An estimation approach that does not explicitly address the simultaneous process will bias the estimated relationship between health outcome and the explanatory variables. The standard econometric procedure for handling endogeneity is some type of instrumental variables (IV) estimator, which is often employed in cross-sectional studies (Rosenzweig and Schultz, 1983; Gould and Lin, 1994). Mostly two-stage least squares (TSLS) is employed, assuming an appropriate instrument is available. Instruments should be theoretically correlated with the endogenous explanatory variables but not correlated with the error terms.

One potential variable available in NHANES that can be argued is correlated with social capital, but not with health, is the number of years the person has lived at their current address. This variable is similar to education level in that it reflects past choices by the individual, but at point in time (as in a cross-sectional survey) is a given.

We have obtained MLE estimates of the coefficients for the probit regressions with instrumental variables predicting overall health status, physical health and mental

health during the past 30 days separately[5]. The last two dependent variables can imply recent illness. 2SLS was utilized to obtain the estimate of the coefficients predicting index of biological risk factors. Regression results of the health demand equation are presented in Table 5.1-5.4. In general, blacks and Mexican Americans are in poorer health than whites. A similar pattern holds for people who were born in Mexico compared with U.S. born. Each table includes 5 separate regressions with one of five social capital measures: numbers of emotional support sources, emotional support from any source, financial support from any source, either emotional or financial support from any source, and number of close friends. Surprisingly, the social capital measures do not show significant results except in one case. The only exception is that more resources of emotional support can promote better overall health status, as shown in equation 1 in Table 5-1.

[Insert Tables 5-1 to 5-4 here.]

7. Conclusions

In terms of future research on this topic, we plan to use factor analysis to extract common factors in defining social capital. Factor analysis is a method of data reduction. It does this by seeking underlying unobservable (latent) variables that are reflected in the observed variables (manifest variables). In this study, we used a

[5] We used the *ivprobit* command in Stata and *Proc QLIM* command in SAS for the analysis.

summary index of biological risk factor using nine indicators. We will utilize other indexing methods and define separate inflammation risk, metabolic risk, and cardiovascular risk with other measures[6].

However, there may be a basic problem with our instrumental variable estimation. "The number of years the person has lived at their current address" may not be suitable. This variable may directly affect health and/or may not be sufficiently correlated with social capital. Since there are no other potential instruments in the NHANES data, there may be nothing that can be done to improve the instrumental variable estimator.

Another possibility is that social capital, at least in terms of the variables that are available to measure it in the NHANES data, do not affect health outcomes, at least the ones analyzed in this study. One may have to accept that the basic hypothesis regarding the effect of social capital on health may simply be rejected in this particular case.

[6] We actually analyzed separate regressions by inflammation, metabolic, and cardiovascular risk besides the summary index of biological risk. However, the result was not much different from ones with the summary index of biological risk.

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Table 1. Definition of data set

VARIABLES	DEFINITIONS	Mean	SD
Dependent Variables			
1) Overall	=1 if overall health status is excellent, very good, or good; else=0 (fair or poor)	0.700	0.011
2) Phyhealth	=1 if numbers of physical health was not good during the past 30 days >0; else =0	0.363	0.012
3) Menhealth	=1 if numbers of mental health was not good during the past 30 days >0; else =0	0.249	0.011
4) Biorisk	summary index of biological risk (inflammation, metabolic, and cardiovascular factors)	1.927	0.034
Independent Variables			
Age	Age at Screening	72.774	0.190
Male	=1 if survey participant (SP) is male	0.476	0.012
Race			
White (reference variable)	=1 if SP is Non-Hispanic White	0.623	0.011
Black	=1 if SP is Non-Hispanic Black	0.168	0.008
Mexican	=1 if SP is Mexcican American	0.155	0.008
Other	=1 if SP is Other Hispanic American, Asian, or Multirace	0.053	0.005
Education			
LSHS (reference variable)	=1 if level of educationis less than high school	0.394	0.489
HS	=1 if level of education is high school,inlcuding GED	0.235	0.424
MTHS	=1 if level of education is more than high school	0.363	0.481
Country of Birth			
USborn (reference variable)	=1 if country of birth is US	0.858	0.009
Mexicobn	=1 if country of birth is Mexico	0.067	0.006
Otherbn	=1 if country of birth is somewhere else	0.073	0.006
Married	=1 if marital status is either married or lived with partners	0.563	0.012
HHINC	Annual Household Income (Recode)	5.720	0.073
Famhis	=1 if either blood relatives have disbetes or blood relatives have Alzheimer's	0.495	0.012
Social capital measures			
Ssnum	Numers of sources that give emotional support (mean=1.92, Stdev=1.29)	1.947	0.031
Emoss	=1 if anyone to help with emotional support	0.941	0.929
Finss	=1 if anyone to help with financial support	0.826	0.006
Anyss	=1 if either Emoss=1 or Finss=1	0.960	0.009
Numfriends	Number of close friends (mean=7.19, Stdev=7.01)	7.103	0.163
Instrumental variable			
Longres	=1 if years of residence at the current address >2 years	0.867	0.008

Source: NHANES 2001-2002, age 60 and above

Table 2. Clinically-defined "high risk" criteria for biologic risk factors

Indicators	*High-risk cutoff point*
Inflammation	
Albumin	< 3.8 g/dL
C-reactive protein	≥ 0.3 mg/dL
Metabolic	
Body mass index	≥ 30.0 kg/m^2
Total cholesterol	≥ 240 mg/dL
HDL cholesterol	< 40 mg/dL
Glycated Hemoglobin	≥ 6.4 %
Cardiovascular	
Heart Rate	≥ 90 bt/min
Systolic Blood pressure	≥ 140 mm Hlog g (ref. 45)
Diastolic Blood pressure	≥ 90 mm Hg (ref. 45log)

Table 3. Social support questionnaire variable list

Item #	Data File	Component	Questionnaire
980	SSQ-B	Social support	Anyone to help with emotional support
981	SSQ-B	Social support	Spouse gives most emotional support
982	SSQ-B	Social support	Daughter gives most emotional support
983	SSQ-B	Social support	Son gives most emotional support
984	SSQ-B	Social support	Sibling gives most emotional support
985	SSQ-B	Social support	Parent gives most emotional support
986	SSQ-B	Social support	Other relative gives most emotional support
987	SSQ-B	Social support	Neighbors give most emotional support
988	SSQ-B	Social support	Co-workers give most emotional support
989	SSQ-B	Social support	Church members give most emotional support
990	SSQ-B	Social support	Club members give most emotional support
991	SSQ-B	Social support	Professional give most emotional support
992	SSQ-B	Social support	Friends give most emotional support
993	SSQ-B	Social support	Others give most emotional support
994	SSQ-B	Social support	No one gives most emotional support
995	SSQ-B	Social support	Needed more support past year
996	SSQ-B	Social support	How much more support needed
997	SSQ-B	Social support	Anyone to help with financial support
998	SSQ-B	Social support	Number of close friend

Source: NHANES 2001-2002

Table 4. Descriptive Statistics: NHANES 2001-2002

Variables	Total group			Males			Females		
	N	Mean or %	Stdev	*N*	Mean or %	Stdev	*N*	Mean or %	Stdev
Dependent Variables									
Overall Health	*1684*			*815*			*869*		
Excellent		9.5%			10.6%			8.5%	
Very Good		24.3%			24.4%			24.2%	
Good		36.2%			35.8%			36.6%	
Fair		23.8%			22.9%			24.6%	
Poor		6.1%			6.1%			6.0%	
Don't know		0.1%			0.1%			0.1%	
# of Days not good									
Physical health	*1683*	5.95	12.25	*815*	5.26	11.79	*868*	6.61	12.63
Mental health	*1682*	3.44	10.10	*815*	2.44	7.49	*867*	4.38	11.98
# of Inactive Days	*1681*	2.53	9.04	*815*	2.25	8.04	*866*	2.80	9.89
Independent Variables									
Age	*1872*	71.06	1138.00	*891*	70.44	1033.99	*981*	71.52	1220.00
HH Annual Income (coded)[a)]	*1643*	6.63		*804*	7.13		*839*	6.24	
Married	*1868*	54.0%		*889*	72.4%		*979*	37.2%	
Race/Ethnicty									
Non-Hispanic White	*1164*	62.2%		*557*	62.5%		*607*	61.9%	
Non-Hispanic Black	*310*	16.6%		*147*	16.5%		*163*	16.6%	
Mexican American	*291*	15.5%		*137*	15.4%		*154*	15.7%	
Other Hispanic	*61*	3.3%		*27*	3.0%		*34*	3.5%	
Other Race - Including Multirace	*46*	2.5%		23	2.6%		23	2.3%	
Education									
LT HS	*738*	39.5%		*362*	40.7%		*376*	38.4%	
HS Grad (Including GED)	*439*	23.5%		*175*	19.7%		*264*	27.0%	
MT HS	*679*	36.4%		*349*	39.3%		*330*	33.7%	
Refused	*4*	0.2%		*1*	0.1%		*3*	0.3%	
Don't know	*8*	0.4%		2	0.22		6	0.61	
Emotioanl Support									
Anyone helps	*1727*	92.5%		*813*	91.5%		*914*	93.5%	
Spouse	*817*	43.6%		*550*	61.7%		*267*	27.2%	
Daughter	*801*	42.8%		*300*	33.7%		*501*	51.1%	
Son	*620*	33.1%		*260*	29.2%		*360*	36.7%	
Sibling	*286*	15.3%		104	11.7%		182	18.6%	
Parent	*27*	1.4%		*14*	1.6%		*13*	1.3%	
Relatives	*224*	12.0%		*78*	8.8%		*146*	14.9%	
Neighbor	*74*	4.0%		*25*	2.8%		*49*	5.0%	
Co-worker	*21*	1.1%		10	1.1%		11	1.1%	
Church	*149*	8.0%		62	7.0%		87	8.9%	
Club member	*9*	0.5%		*6*	0.7%		*3*	0.3%	
Professional	*30*	1.6%		*9*	1.0%		*21*	2.1%	
Friends	*454*	24.3%		*172*	19.3%		*282*	28.7%	
Others	*56*	3.0%		*21*	2.4%		*35*	3.6%	
Needed more emotional support	*233*	13.5%		*87*	10.7%		*146*	16.0%	
How much more									
A lot	*50*	21.5%		*19*	21.8%		*31*	21.2%	
Some	*93*	39.9%		*34*	39.1%		*59*	40.4%	
A little	*90*	38.6%		*34*	39.1%		*56*	38.4%	
Financial support	*1872*	79.2%		*891*	75.7%		*981*	82.4%	
How many close friends	1840	7.94	1122.27	878	8.32	1214.42	962	7.64	1029.12

Source: NHANES 2001-2002
Sample: Adults who are 60 years old and above
a) Codes are following:
1 - $0 to $4,999; 2 - $5,000 to $9,999
3 - $10,000 to $14,999; 4 - $15,000 to $19,999
5 - $20,000 to $24,999; 6 - $25,000 to $34,999
7 - $35,000 to $44,999; 8 - $45,000 to $54,999
9 - $55,000 to $54,999; 10 - $65,000 to $74,999
11 - $75,000 and over

Table 5-1. Health demand equation (Dependent variable: Overall Health Status)

	Equation 1 (Obs=1,474)		Equation 2 (Obs=1,456)		Equation 3 (Obs=1,419)		Equation 4 (Obs=1,463)		Equation 5 (Obs=1,462)	
	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|
age	-0.011	0.097*	-0.006	0.857	-0.027	0.207	-0.027	0.858	-0.023	0.929
male	0.221	0.215	-1.023	0.721	0.359	0.459	2.235	0.885	-1.051	0.939
black	-0.417	0.003***	-0.474	0.547	-0.619	0.058*	-0.223	0.897	-16.247	0.941
mexican	-0.495	0.004***	-1.128	0.616	-0.381	0.076*	1.841	0.904	-9.539	0.939
otherrace	-0.545	0.033**	0.825	0.824	-0.418	0.196	-2.722	0.865	-7.905	0.938
mexicoborn	-0.759	0.001***	-4.194	0.679	-0.558	0.070*	5.513	0.895	-6.256	0.934
otherborn	0.036	0.873	0.005	0.996	0.116	0.669	0.102	0.965	-7.461	0.943
hs	(dropped)[a]		(dropped)		(dropped)		(dropped)		(dropped)	
mths	(dropped)		(dropped)		(dropped)		(dropped)		(dropped)	
married	-0.439	0.038**	1.157	0.751	-0.145	0.322	-2.363	0.877	8.970	0.942
hhinc	0.114	0.001***	0.347	0.528	0.049	0.586	-0.372	0.913	0.967	0.932
famhis	-0.009	0.927	-0.218	0.728	-0.069	0.563	0.107	0.946	0.245	0.959
Social capital measures										
ssnum	0.851	0.080*								
emoss			-39.213	0.725						
finss					4.843	0.354				
anyss							107.935	0.883		
numfriends									-5.824	0.941

Source: NHANES 2001-2002, age 60 and above

* Denotes significance at the 10% level
** Denotes significance at the 5% level
*** Denotes significance at the 1% level
1. Dependent variable is overall health (=1 if oveall health status is excellent, very good, or good; = 0 if overall health status is fair or poor). Independent variables are age, gender, race (ref=non-hispanic white), country of born (ref= us born), education (ref=less than high school), marital status, household income, family disease history, and a social capital measure. Probit model with instrumental variable (years of residence at the current address) was utilized for an analysis.
a. It was dropped due to collinearity in SAS.

Table 5-2. Health demand equation (Dependent variable: Physical Health)

	Equation 1 (Obs=1,468)		Equation 2 (Obs=1,450)		Equation 3 (Obs=1,413)		Equation 4 (Obs=1,457)		Equation 5 (Obs=1,456)	
	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|
age	0.005	0.374	0.001	0.992	0.020	0.360	0.013	0.825	0.004	0.937
male	-0.357	0.023**	0.438	0.841	-0.558	0.256	-1.139	0.802	0.069	0.971
black	0.006	0.963	0.082	0.883	0.189	0.544	-0.124	0.867	4.875	0.884
mexican	0.345	0.021**	0.739	0.655	0.291	0.128	-0.647	0.884	2.796	0.872
otherrace	0.169	0.435	-0.657	0.801	0.074	0.800	0.96	0.825	2.381	0.88
mexicoborn	0.037	0.85	2.181	0.767	-0.147	0.623	-2.448	0.833	1.95	0.886
otherborn	0.124	0.507	0.149	0.846	0.091	0.706	0.045	0.961	2.371	0.882
hs	(dropped)		(dropped)		(dropped)		(dropped)		(dropped)	
mths	(dropped)		(dropped)		(dropped)		(dropped)		(dropped)	
married	0.205	0.273	-0.766	0.771	-0.145	0.322	0.879	0.834	-2.761	0.884
hhinc	-0.018	0.271	-0.156	0.723	0.049	0.586	0.164	0.858	-0.283	0.872
famhis	-0.034	0.669	0.109	0.817	-0.069	0.563	-0.117	0.862	-0.107	0.913
Social capital measures										
ssnum	-0.514	0.222								
emoss			24.323	0.764						
finss					-4.173	0.427				
anyss							-42.537	0.834		
numfriends									1.783	0.884

Source: NHANES 2001-2002, age 60 and above

* Denotes significance at the 10% level
** Denotes significance at the 5% level
*** Denotes significance at the 1% level
1. Dependent variable is physical health (=0 if numbers of physical health was nood good during the past 30 days is zero; else = 1). Independent variables are age, gender, race (ref=non-hispanic white), country of born (ref= us born), education (ref=less than high school), marital status, household income, family disease history, and a social capital measure. Probit model with instrumental variable (years of residence at the current address) was utilized for an analysis.

Table 5-3. Health demand equation (Dependent variable: Mental Health)

	Equation 1 (Obs=1,469)		Equation 2 (Obs=1,451)		Equation 3 (Obs=1,414)		Equation 4 (Obs=1,458)		Equation 5 (Obs=1,457)	
	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|
age	-0.009	0.149	-0.005	0.848	-0.024	0.284	-0.02	0.841	-0.01	0.906
male	-0.117	0.471	-1.097	0.640	0.095	0.850	1.319	0.899	-0.824	0.882
black	-0.129	0.309	-0.201	0.762	-0.335	0.318	0.038	0.978	-9.271	0.923
mexican	-0.140	0.381	-0.627	0.727	-0.082	0.715	1.527	0.880	-5.004	0.922
otherrace	-0.165	0.476	0.917	0.765	-0.169	0.618	-1.755	0.872	-4.348	0.923
mexicoborn	0.048	0.824	-2.704	0.748	0.271	0.406	4.616	0.871	-3.379	0.927
otherborn	0.022	0.913	-0.002	0.999	0.104	0.708	0.069	0.968	-4.263	0.926
hs	(dropped)		(dropped)		(dropped)		(dropped)		(dropped)	
mths	(dropped)		(dropped)		(dropped)		(dropped)		(dropped)	
married	-0.325	0.096*	-0.766	0.771	-0.112	0.463	-1.738	0.868	5.121	0.925
hhinc	-0.031	0.088*	-0.156	0.723	-0.099	0.296	-0.386	0.868	0.487	0.927
famhis	0.142	0.103	0.109	0.817	0.130	0.299	0.242	0.830	0.348	0.897
Social capital measures										
ssnum	0.634	0.159								
emoss			-31.171	0.735						
finss					4.786	0.379				
anyss							-42.537	0.834		
numfriends									-3.379	0.923

Source: NHANES 2001-2002, age 60 and above

* Denotes significance at the 10% level
** Denotes significance at the 5% level
*** Denotes significance at the 1% level
1. Dependent variable is physical health (=0 if numbers of mental health was not good during the past 30 days is zero; else = 1). Independent variables are age, gender, race (ref=non-hispanic white), country of born (ref= us born), education (ref=less than high school), marital status, household income, family disease history, and a social capital measure. Probit model with instrumental variable (years of residence at the current address) was utilized for an analysis.

Table 5-4. Health demand equation (Dependent variable: Biological Risks)

	Equation 1 (Obs=1,438)		Equation 2 (Obs=1,419)		Equation 3 (Obs=1,386)		Equation 4 (Obs=1,427)		Equation 5 (Obs=1,430)	
	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|	Estimate	Pr > |Z|
age	-0.013	0.009***	-0.002	0.985	-0.021	0.258	-0.011	0.046**	-0.015	0.316
male	-0.054	0.679	0.497	0.925	0.069	0.877	-0.041	0.844	-0.124	0.509
black	0.309	0.003***	0.511	0.775	0.212	0.489	0.349	0.011**	-0.702	0.879
mexican	-0.122	0.129	0.374	0.928	-0.145	0.314	-0.016	0.948	-0.704	0.796
otherrace	-0.268	0.113	-0.719	0.865	-0.227	0.322	-0.271	0.237	-0.832	0.755
mexicoborn	0.206	0.558	3.533	0.902	0.324	0.240	0.564	0.526	-0.192	0.920
otherborn	-0.070	0.247	0.154	0.936	-0.035	0.854	-0.031	0.866	-0.642	0.812
hs	(dropped)		(dropped)		(dropped)		(dropped)		(dropped)	
mths	(dropped)		(dropped)		(dropped)		(dropped)		(dropped)	
married	-0.023	0.865	-0.572	0.918	0.049	0.611	-0.001	0.999	0.663	0.818
hhinc	-0.065	0.001***	-0.232	0.874	-0.099	0.224	-0.081	0.145	-0.003	0.991
famhis	0.254	0.001***	0.003	0.999	0.228	0.008***	0.211	0.127	0.297	0.302
Social capital measures										
ssnum	0.173	0.614								
emoss			28.386	0.908						
finss					2.025	0.673				
anyss							4.100	0.698		
numfriends									-0.397	0.825

Source: NHANES 2001-2002, age 60 and above

* Denotes significance at the 10% level
** Denotes significance at the 5% level
*** Denotes significance at the 1% level
1. Dependent variable is biological risks (=summation of inflammation, metabolic, and cardiovascular risk factors). Independent variables are age, gender, race (ref=non-hispanic white), country of born (ref= us born), education (ref=less than high school), marital status, household income, family disease history, and a social capital measure. 2SLS model (; instrumental variable=years of residence at the current address) was utilized for an analysis.