Published in final edited form as:

Soc Sci Med. 2012 September ; 75(5): 914–921. doi:10.1016/j.socscimed.2012.04.029.

Environmental Factors Associated with Primary Care Access Among Urban Older Adults

Miriam Ryvicker¹, William T. Gallo², and Marianne C. Fahs²

¹Center for Home Care Policy and Research, Visiting Nurse Service of New York

²School of Public Health, Hunter College

Abstract

Disparities in primary care access and quality impede optimal chronic illness prevention and management for older adults. Although research has shown associations between neighborhood attributes and health, little is known about how these factors – in particular, the primary care infrastructure – inform older adults' primary care use. Using geographic data on primary care physician supply and surveys from 1,260 senior center attendees in New York City, we examined factors that facilitate and hinder primary care use for individuals living in service areas with different supply levels. Supply quartiles varied in primary care use (visit within the past 12 months), racial and socio-economic composition, and perceived neighborhood safety and social cohesion. Primary care use did not differ significantly after controlling for compositional factors. Individuals who used a community clinic or hospital outpatient department for most of their care were less likely to have had a primary care visit than those who used a private doctor's office. Stratified multivariate models showed that within the lowest supply quartile, public transit users had a higher odds of primary care use than non-transit users. Moreover, a higher score on the perceived neighborhood social cohesion scale was associated with a higher odds of primary care use. Within the second-lowest quartile, non-whites had a lower odds of primary care use compared to whites. Different patterns of disadvantage in primary care access exist that may be associated with – but not fully explained by – local primary care supply. In lower-supply areas, racial disparities and inadequate primary care infrastructure hinder access to care. However, accessibility and elder-friendliness of public transit, as well as efforts to improve social cohesion and support, may facilitate primary care access for individuals living in low-supply areas.

Keywords

USA; access to healthcare; primary care supply; health disparities; older adults

Introduction

Disparities in access to and quality of primary care continue to be a barrier to optimal prevention and management of chronic illness for older adults in the U.S., despite the near universal coverage under the Medicare program (Gornick, Eggers, & Riley, 2004;

© 2012 Elsevier Ltd. All rights reserved.

Please direct correspondence to: Miriam Ryvicker, Center for Home Care Policy and Research, Visiting Nurse Service of New York, 5 Penn Plaza, 12th Floor, New York, NY 10001, Phone: 212-609-5775, miriam.ryvicker@vnsny.org. .

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

McWilliams, Meara, Zaslavsky, & Ayanian, 2009). High-quality ambulatory care can help to reduce the burden of chronic conditions and their associated complications. It is crucial for older adults who have multiple chronic conditions and may receive care from multiple providers across ambulatory, acute, post-acute, and long-term care settings. Nevertheless, research has shown that the delivery of these services to older adults is suboptimal, especially for underserved populations (Epstein, 2001; Fiscella & Epstein, 2008; O'Neil, Lake, Merrill, Wilson, Mann, & Bartnyska, 2010).

Efforts to identify mechanisms underlying health disparities have motivated a rapidly growing area of research examining the links between the characteristics of the neighborhoods in which people live and individual health outcomes. Research suggests that, due to decreased mobility, older adults are particularly sensitive to features of their local environments (Freedman, Grafova, & Rogowski, 2010; Freedman, Grafova, Schoeni, & Rogowski, 2008; Grafova, Freedman, Kumar, & Rogowski, 2008; Yen, Michael, & Perdue, 2009). For example, one study found that neighborhood economic advantage and greater walk-ability were associated with reduced risk of functional disability among older adults (Freedman et al., 2008). However, less is known about how older adults' health care use is informed by features of the local environment and, in particular, the local infrastructure for primary care delivery.

A parallel literature has focused on geographic variation in both potential health care access (e.g. supply) and realized access to care (e.g. utilization). In general, this work has focused on larger area levels, such as counties and metropolitan areas (Andersen, Yu, Wyn, Davidson, Brown, & Teleki, 2002; Basu & Mobley, 2010; Fisher, Wennberg, Stukel, Skinner, Sharp, Freeman et al., 2000; Fortney, Thill, Zhang, Duan, & Rost, 2001; Litaker, Koroukian, & Love, 2005; Mobley, Root, Anselin, Lozano-Gracia, & Koschinsky, 2006; Parchman & Culler, 1999; Shi & Starfield, 2001). Yet, little is known about how variations in the health care environment *within borders* – especially in dense urban areas – might influence health care access for vulnerable groups (Guagliardo, 2004). Although evidence suggests that supply variations cannot fully explain disparities in access (Alexander, Lee, Griffith, Mick, Lin, & Banaszak-Holl, 1999; Gaskin & Hoffman, 2000; Kirby & Kaneda, 2005; Ricketts, Randolph, Howard, Pathman, & Carey, 2001; Shi & Starfield, 2001), it is conceivable that older adults' ability to access health care may be sensitive to a combination of low availability and travel barriers, as has been found in rural and suburban areas (Fortney, Chumbler, Cody, & Beck, 2002; Mobley et al., 2006). Little is known about how environmental factors influence access to care among urban older adults.

This study aimed to identify environmental and socio-demographic factors associated with primary care visits among older adults in New York City (NYC). We achieved three main objectives using data from a survey of senior center attendees in NYC linked with geographic data on the supply of primary care physicians at the level of the Primary Care Service Area (PCSA) (Goodman, Mick, Bott, Stukel, Chang, Marth et al., 2003; Mobley et al., 2006). First, we examined whether primary care use among NYC older adults is sensitive to local variations in primary care supply. Second, we examined the differential sorting of individuals into PCSAs with different PCP supply levels by comparing the characteristics of individuals across supply quartiles. Third, we identified combinations of environmental and socio-demographic factors associated with access to primary care both across and within supply quartiles. This study advances our understanding of environmental barriers and facilitators of access to regular primary care that may help to prevent and manage chronic illness and disability among urban elders.

Methods

Data

Individual-level data were based on a survey of 1,870 community-dwelling older adults attending senior centers in NYC. The survey was conducted in 2008 as part of the Brookdale Demonstration Initiative in Healthy Urban Aging (funded by the NYC Department for the Aging), which aimed to assess the health and social well-being among senior center attendees. The survey instrument consisted of validated measures from national surveys such as the Behavioral Risk Factor Surveillance System Survey (BRFSS) and included: socio-demographic information; health status and chronic illness diagnoses; health behavior and chronic illness self-management; functional status; health service use and preventive services; quality of life; and perceptions of neighborhood attributes such as safety and social cohesion. Participants were selected using a representative sample of 56 senior centers out of 256 within the five boroughs of NYC; centers were stratified by borough and size and then randomly selected within strata. Every third eligible individual was selected for recruitment, with a response rate of 76.7%. Surveys were conducted face-to-face at the senior centers in English, Spanish, Chinese, Italian, and Russian. All study procedures were approved by the Institutional Review Board of the City University of New York, Hunter College.

Geographic data on the supply of primary care physicians was based on the Primary Care Service Area (PCSA) Project of the Dartmouth Institute for Health Policy and Clinical Practice (Goodman et al., 2003). The PCSA Project offers a national database of primary care resources for small areas based on primary care claims of Medicare beneficiaries aged 65 and older. PCSAs represent geographic approximations of markets for primary care services. The database assigns U.S. zip codes to PCSAs based on the location of the plurality of primary care services used by beneficiaries within each zip code (Goodman et al., 2003). The database includes information about the supply and characteristics of primary care and specialty providers at the PCSA level, as well as additional information about providers at the finer zip code level. The current study used the 2007 PCSA-level data on the supply of primary care physicians. The five boroughs of NYC contained a total of 52 PCSAs, most of which contained multiple contiguous zip codes.

Analytic sample

Participants in the senior center survey were assigned to a PCSA based on the zip code they reported for their home address. Of the 1,870 survey participants, 1,631 participants had valid zip codes that could be assigned to a PCSA. Of the 1,631, 111 participants were excluded due to the zip code's being outside of the five boroughs of NYC (specifically, other parts of New York State). An additional 260 were excluded for analysis due to incomplete data on key independent and dependent variables. The final sample for the current analysis included 1,260 participants residing in 49 of the 52 PCSAs within NYC.

Measures

Individual-level measures—The main outcome of interest was a dichotomous measure of whether the participant had been to a “primary care (general) doctor or community clinic/center” during the past 12 months, coded as ‘1’ for ‘yes’ and ‘0’ for ‘no’ or ‘don’t know.’ Analyses also examined the type of setting that participants reported as their usual source of care. Demographic measures included: age, sex, race, whether the participant was a non-English speaker, education and income level. Type of health insurance was included as a control variable, with three mutually exclusive categories in the domain of public insurance (Medicare only; Medicaid only; and dually eligible). We included an additional flag for whether the participant also stated that he or she had private insurance (privately purchased

or employer-based commercial insurance), which may co-exist with Medicare. A binary measure as a proxy for weak social support system was included as a control variable to help distinguish between social support and perceived neighborhood social cohesion (described below). This variable “limited contact with friends” was defined as being in contact with friends less than one day per week, whether in person, by phone, or through written communication.

Health characteristics included summary variables for the number of chronic conditions and functional limitations. The total number of chronic conditions was based on the sum of ‘yes’ answers when asked whether a doctor or health care professional has ever told the participant that he or she has (or had) a given condition, read from a list of 22 conditions. The sum of activities of daily living/instrumental activities of daily living (ADLs/IADLs) with which the participant had difficulty during the past 30 days was based on a list of 11 activities.

Perceptions of neighborhood safety and social cohesion were included in order to examine environmental facilitators and barriers to primary care use within service areas with varying levels of PCP supply. Neighborhood safety was assessed using three items to measure the respondent’s perceived level of neighborhood safety and violence. Respondents were asked to rate various statements regarding their neighborhood (i.e., whether people sell or use drugs, or if people are often mugged or attacked). The items were modified from the UNO-CAP questionnaire (National Institute of Mental Health, 1994), and a questionnaire entitled “Add Health” that was used in the National Longitudinal Study of Adolescent Health (Bearman, Jones, & Udry, 1997). Four Likert response categories range from “very true” (1) to “not at all true” (4). Summary scores ranged from 3 to 12, with higher scores representing higher levels of perceived safety.

Social cohesion was measured using a standardized scale of four questions obtained from three different survey instruments. The scale evaluates the cohesiveness of the respondent’s neighborhood by asking if neighbors get along with each other and if they can count on each other in emergency situations. Survey items were adapted from a validated scale (Sampson, Raudenbush, & Earls, 1997). Five Likert response categories from “very true” (1) to “not at all true” (4) resulted in a score ranging from 5 to 20, with higher scores indicating higher levels of social cohesion.

A measure of public transit use was also included as a proxy for access to transportation. The variable is coded as ‘1’ for ‘yes’ and ‘0’ for ‘no’ or ‘don’t know’ in response to the question “Do you use public transportation (e.g. subways, buses)?”

PCSA-level measure of primary care supply—The main measure of primary care supply was a PCSA-level variable for the age-sex adjusted rate of internal medicine physicians per 100,000 residents (based on U.S. census population). This variable is calculated by PCSA Project investigators using a previously established method that accounts for variations in population density and demographic composition across PCSAs (Wennberg, Cooper, Birkmeyer, Bronner, Bubolz, Campbell et al., 1999). In the PCSA Project dataset, the broader definition of primary care physicians includes internal medicine physicians, family practice physicians, and pediatricians. Having examined the distribution of the supply of internal medicine and family practice physicians in NYC, we chose to focus on internal medicine because it comprises the single largest group of physicians providing primary care to adults. In the NYC context, family practice physicians are a comparatively small group, and they provide services to patients across the lifespan, including pediatric, obstetric, and adult primary care services. Given the available measures in the PCSA dataset, we therefore considered internal medicine physicians to be the most relevant

measure of primary care supply for our study population. It should be noted that although some internists maintain a subspecialty and certification in geriatrics, it is not possible to determine this from the available data. However, the number of internists certified in geriatrics nationally is low (Geriatrics Workforce Policy Studies Center, 2011).

Analysis

First, we examined the distribution of physician supply and defined supply quartiles (described below). We then compared study participants' socio-demographic and health characteristics, perceptions of neighborhood attributes, and service use measures across supply quartiles, using chi-square tests for categorical variables and analysis of variance (ANOVA) for continuous variables. Next, we used generalized estimating equations to estimate a logistic regression equation of the likelihood of having been to a primary care provider/clinic within the past year. We estimated an initial model for the full analytic sample examining the effect of the supply quartile in which a participant lives, location of the usual source of care, and neighborhood factors on PCP use, controlling for other factors. Finally, we estimated separate models for each quartile to examine the combinations of factors associated with PCP use within each supply quartile. All multivariate models were adjusted for clustering of individuals within senior centers and PCSAs. All analyses were conducted using SAS Version 9.2 (SAS Institute Inc., Cary, NC); multivariate analyses used PROC GENMOD.

Definition of physician supply quartiles—The average supply of primary care physicians per 100,000 across the 49 NYC PCSAs in which study participants resided was 56.6 (+/− 17.9) with a median of 53.1, ranging from 27.4 to 99.0. This compared with a national average of 21.9 (+/− 13.9) and a median of 19.3, ranging from 0 to 138.9. Although the national average contained outliers on both extremes of the distribution, the overall level of physician supply in NYC is higher than the U.S. average. Most of the NYC PCSAs with the highest supply levels were located in Manhattan and contained some of the city's major academic medical centers, which potentially accounts for the high density of PCPs in these service areas. Conversely, most of the PCSAs with the lowest supply levels were in the outer boroughs, and some were in outskirts of the boroughs that tend to be more residential and less commercially dense.

The 49 PCSAs represented in the analytic dataset were ranked in order of supply and divided into quartiles, with 13 PCSAs in the lowest quartile and 12 PCSAs in each of the second, third, and fourth quartiles. The quartiles were labeled from low to high supply levels, with Quartile 1 being lowest and Quartile 4 being highest. Among the 1,260 senior center clients in the analytic sample, 19% lived in Quartile 1, 32% lived in Quartile 2, 17% lived in Quartile 3, and 32% lived in Quartile 4.

Results

Participant characteristics and survey responses across supply quartiles

Demographic characteristics—Table 1 shows participant characteristics and survey responses both overall and by supply quartile. The mean age among study participants was 75.4 (ranging from 60 to 99), and 65% were female. The sample was racially diverse, with 40% white, 25% Hispanic, 21% Black, and 13% Asian, and there was significant variation in race across supply quartiles. Whereas Quartile 4 had the highest concentration of whites (46%; $p<0.001$), Quartiles 1 and 2 had higher concentrations of Blacks (34% and 21%, respectively; $p<0.001$). Quartile 3 had the highest concentration of Hispanics (34%) and Asians (23%) ($p<0.001$). Forty percent of all participants were non-English speakers, with a markedly greater proportion in Quartile 3 (59%; $p<0.001$).

Education levels were mixed, as 37% of participants had less than a high school education, while 30% had some college education or greater. Thirty percent of participants reported an income of less than \$10,000, albeit a quarter of the sample did not report their income. There was significant variation in education and income across supply quartiles. Quartiles 2 and 3 had the highest proportions of individuals with a high school diploma or less, whereas Quartile 4 had the highest concentration of college graduates. Quartile 3, which had the highest concentration of immigrants, had the greatest proportion with an income of less than \$10,000 (41%; $p<.001$).

All participants in the analytic sample reported that they had some form of health insurance. Ninety-five percent of participants were covered by Medicare and/or Medicaid, with greater proportions of Medicare only in Quartiles 1 and 2. A quarter of participants had some form of private insurance (e.g. employer-based or privately purchased managed care plan), which may coexist with Medicare and/or Medicaid. Quartile 3 had lower concentrations of private insurance holders.

Health characteristics—Participants had mean of 4.3 self-reported chronic conditions and 2.0 ADL/IADLs for which they needed assistance. These characteristics did not vary significantly across supply quartiles.

Neighborhood-related measures—Participants' perceptions of neighborhood safety were on the low end of the range from 3 (least safe) to 12 (most safe), with a mean of 6.6. Perceptions of safety varied significantly across supply quartiles ($p=0.001$), although the variation appears to be driven primarily by higher scores in Quartile 3 (mean 7.2). Perceptions of social cohesion were also in the lower half of the continuum, with a mean of 10.5 on a scale of 5 (least cohesive) to 20 (most cohesive). Social cohesion scores varied by quartile, with the highest scores in Quartile 4 ($p<.001$). Eighty-one percent of participants reported that they use public transit, with the lowest proportion in Quartile 2 (75%) and the highest in Quartile 4 (88%) ($p<.001$).

Primary care use and location of care—Overall, 57% reported that they went to a PCP or clinic within the past year. The proportions varied significantly by supply quartile ($p=0.002$). Only 50% of participants within Quartile 2 had a PCP/clinic visit, compared to proportions in the other quartiles ranging from 58% to 65%.

About half of the sample reported that they used a private doctor's office as their usual source of care, while 16% used a community clinic/health center, 10% used a hospital outpatient department/clinic, 11% used multiple locations, 4% used an emergency department, and 3% reported another or no location. The source of care did not vary significantly across quartiles, albeit the cell sizes in the latter two categories were small, and therefore it may be unlikely to detect significant cross-quartile differences in these two categories.

Predictors of PCP/clinic use

Full sample—Table 2 shows the results from a logistic regression for the full sample predicting the likelihood of having used a PCP or clinic within the past year. The supply quartile in which participants lived did not have a significant effect on the likelihood of having used a PCP or clinic within the past year after controlling for several factors in which there was variation by quartile. Higher scores for perceived neighborhood social cohesion were associated with a greater likelihood of PCP/clinic use ($OR=1.04$; $CI=1.00-1.09$). Non-English speakers had a significantly greater likelihood of PCP/clinic use ($OR=1.83$; $CI=1.33-2.51$). Participants with a high school diploma, some college education, or a college

diploma were more likely to use primary care than those without a high school diploma (OR=1.38, CI=1.01-1.89; OR=1.49, CI=1.03-2.16; and OR=1.55, CI=1.00-2.41, respectively).

The location of the usual source of care had a significant effect on primary care use, even while controlling for insurance status. Compared to those who went to a private doctor's office, participants were less likely to have been to a PCP/clinic within the past year if their source of care was a hospital outpatient department/clinic (OR=0.52; CI=0.34-0.79) or if they had multiple sources of care (OR=0.42; CI=0.27-0.64). Participants who went to a community-based clinic were also less likely to have used primary care, but this finding did not reach statistical significance. Unsurprisingly, those who reported that an emergency department was their usual source of care were less likely to have used primary care within the past year (OR=0.34; 0.18-0.63).

Other control variables were also significant. As expected, having a greater number of chronic conditions and having greater ADL/IADL needs were associated with a greater likelihood of primary care use (OR=1.12, CI=1.07-1.18, and OR=1.10, CI=1.04-1.18, respectively). Individuals with private health insurance (most of whom also had Medicare or Medicaid) were less likely to use primary care (OR=0.63; CI=0.49-0.82).

Predictors of primary care use within supply quartiles—Table 3 shows the results from logistic regressions predicting the likelihood of primary care use within each supply quartile. In service areas with the lowest supply levels (Quartile 1), participants who used public transit had a significantly greater likelihood of using primary care (OR=2.40; CI=1.21-4.77). As in the full sample, those with higher social cohesion scores also had a greater likelihood of primary care use (OR=1.14; CI=1.04-1.26). Non-English speakers were more likely to use primary care (OR=2.17; CI=1.30-3.64).

In Quartile 2, which had the lowest rate of primary care use overall, non-white participants were significantly less likely to use primary care (OR=0.50; CI=0.29-0.89). Location of the usual source of care was also a strong predictor of primary care use; participants who used a community clinic (OR=0.47; 0.27-0.82), an emergency department (OR=0.18; CI=0.06-0.52), and multiple locations (OR=0.21; CI=0.09-0.47) were less likely than those who used a private doctor's office to have had a PCP/clinic visit within the past year.

In Quartile 3, which had the highest proportion of non-English speakers, participants who did not speak English had a significantly greater likelihood of using primary care (OR=2.72; CI=1.15-6.46). No other factors were significant within this quartile. In Quartile 4, participants with less frequent social contact were less likely to use primary care (OR=0.60; CI=0.41-0.89), a factor which was not significant in any other quartile or in the overall sample.

Discussion

This study aimed to identify environmental and socio-demographic factors associated with primary care visits among older adults in NYC. We achieved three main objectives. First, we examined whether the likelihood of older adults' primary care use differs according to local variations in primary care supply. Second, we compared the characteristics of individuals across supply quartiles to gain insight into the selection of individuals into service areas with different supply levels. Third, we examined demographic and environmental factors that facilitate and hinder primary care (PC) use both across and within supply quartiles. By providing evidence on the facilitators and barriers at different supply levels, the study findings support a multi-faceted concept of health care access that considers

the intersection of health care supply and infrastructure, the urban environment, and socio-demographic factors.

People living in PCSAs with different levels of primary care supply had different rates of primary care use, not adjusting for demographic, health, or other factors. However, this relationship did not follow a linear pattern. Rather, the quartile with the second-lowest supply levels had a lower rate of PCP use than all others, while the bottom and top quartiles were comparable to each other. These differences in primary care use were present despite the fact that participants were similar across quartiles in age, number of chronic conditions, and functional limitations – all of which have been shown to influence health service use (Andersen, 1995; Wolinsky, Miller, Geweke, Chrischilles, An, Wallace et al., 2007). The differences in demographic characteristics across quartiles suggest that individuals may sort into geographically defined service areas with varying levels of primary care supply according to racial, ethnic, and socio-economic characteristics. The results also suggest that variation in health care supply may be correlated with local variations in neighborhood characteristics, insofar as self-reported perceptions of social cohesion, safety, and the use of public transit may reflect some objective features of a local area's social capital, built environment, and availability of public transportation.

The model for the full sample illustrated the degree to which differences in primary care use by quartile may be attenuated by individual factors on which the quartiles vary. The findings indicate that little cross-quartile variation remains after accounting for socio-demographic factors, health characteristics, and the type of setting where the person receives most of her care. The latter represents a conception of healthcare access that goes beyond the quantity available and accounts for the structure of healthcare delivery – which may be associated with differences in timeliness, appropriateness, and continuity of care. Indeed, the findings suggest that individuals with access to a private doctor's office had a better chance of receiving at least one primary care visit within the past year than those who relied on other settings, such as a hospital-based outpatient department. This effect was significant while controlling for education level and type of insurance, both of which may be correlated with the ways in which an individual navigates the health care environment (Basu & Mobley, 2007; Burton, Weiner, Stevens, & Kasper, 2002; Moon & Shin, 2006; Sofaer, 2009). A prior study examining access to health services in an urban, low-income community in NYC found that the type of setting individuals reported as the usual source of care was not related to service use (Merzel & Moon-Howard, 2002). However, that study's measure for setting type used the classification from the Medical Expenditure Panel Survey (MEPS), which does not distinguish among different types of non-hospital settings – e.g. private doctor's offices and community clinics (Weinick, Zuvekas, & Drilea, 1997). Findings from the current study suggest that distinguishing between these two sources of care may reveal important relationships between setting type and utilization among older adults.

The full model also demonstrated a significant effect of an individual's perception of the degree of social cohesion in his neighborhood, which can be conceived as one subjective measure within the broader domain of neighborhood social capital. Although the size of this effect was modest, it is suggestive of some relationship between the strength of social support systems within a community and a person's realized access to care. This effect was statistically significant while controlling for the individual's frequency of social contact – a measure that was included as a way to isolate the potential effect of neighborhood cohesion (albeit perceived) from the strength of an individual's social support system. Although a large literature has examined the health effects of neighborhood social capital (Engstrom, Mattsson, Jarleborg, & Hallqvist, 2008; Franzini, Caughy, Spears, & Fernandez Esquer, 2005; Hutchinson, Putt, Dean, Long, Montagnet, & Armstrong, 2009; Kawachi, Kennedy, & Glass, 1999; Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997), less is known about the

effects of social capital on access to care. The effect of social cohesion seen in this study suggests that further investigation is needed to tease out the complex relationships between neighborhood social capital, an individual's access to social support, and realized access to health care.

The greater odds of primary care use among non-English speakers warrants further examination, as the reasons for this association are unclear. It is possible that individuals in this group are more likely to live in multiple-generation households with extensive social networks that facilitate greater access to care. However, additional sub-analyses would be required to disentangle the potential effects of nationality, language, social networks, and cultural factors on primary care use in the non-English speaking population. These subgroup analyses would require a substantially larger sample than what is available in the senior center survey used for this study.

The regression results for each supply quartile represent different patterns of disadvantage in primary care access, especially in the bottom two quartiles. In areas with the lowest physician supply levels, using public transit significantly increased the likelihood of using primary care. This suggests that accessibility and elder-friendliness of public transit may be an important facilitator in access to primary care in areas of lower supply. Conversely, it suggests that there is an underserved group who is disadvantaged by an inability to access or use public transit to travel to a PCP. Although prior research suggests that transportation may play a role in health care access for rural elders (Billings, Anderson, & Newman, 1996; Mobley et al., 2006; Nemet & Bailey, 2000), few studies have examined this relationship in the context of dense urban areas. Even in a city known for its extensive public transit system, neighborhoods may differ in the accessibility and elder-friendliness of public transit – including the locations of bus stops and subway stations, the reliability and frequency of buses, and the routes available from a given location (Finkelstein, Garcia, Netherland, & Walker, 2008; Rundle, Roux, Free, Miller, Neckerman, & Weiss, 2007). It is also noteworthy that the significant effect of greater perceived social cohesion was only present in the lowest-supply quartile, suggesting that stronger social networks may be an especially important facilitator of primary care access for individuals living in areas with low primary care availability. Understanding the intersection of transportation, the built environment, social networks, and the local healthcare environment may be an important step in promoting elder-friendly communities both in NYC and other U.S. cities.

In Quartile 2, location of the usual source of care was a major driver of primary care use, suggesting that the primary care infrastructure in these service areas may be particularly fragmented. Considering that nonwhites in Quartile 2 had a significantly lower likelihood of using primary care, our results suggest that these service areas have subgroups deeply affected by a combination of a weak primary care infrastructure and racial disparities in access. Moreover, the presence of racial disparities – even while controlling for the location of the usual source of care, education, and insurance status – suggests that further investigation is needed to better understand the mechanisms driving disparities in primary care access among urban older adults.

Some important study limitations are worth noting. Findings are based on a sample of senior center attendees and therefore may not be generalizable to other populations of older adults, especially those who have complex medical and functional needs that may prevent them from attending senior centers. The sample is restricted to those whose self-reported zip codes successfully linked to the PCSA data; this constraint may have introduced bias if participants with linked data systematically differed from those without linked data. A comparison of the characteristics of individuals with and without successful linkages suggests some demographic differences between the two groups, namely in that the non-

linked group had a greater proportion of non-English speakers. Nevertheless, the linked and non-linked groups did not differ in the main outcome of interest (primary care use), which ameliorated concern about selection bias. Additionally, the cross-sectional design of the study does not allow us to draw causal inference; we have therefore taken care to interpret the observed relationships as associations. Our variable for primary care use was a relatively crude measure of access. With only a binary measure of primary care use, we were unable to examine rates of primary care visits or timeliness of care. These limitations are common to previous studies that rely on similar self-reported access measures (Andersen et al., 2002). Further investigation is needed to examine environmental factors associated with primary care use using more detailed service use data from other sources.

Finally, there are limitations to the methods used by the Dartmouth Institute to define PCSAs – the geographic unit of the PCP supply variable which formed the basis of our supply quartiles (Goodman et al., 2003). For example, the PCSA definition relies on Medicare utilization data; populations covered by Medicaid and other forms of insurance may have different travel patterns, with different boundaries that might otherwise define a service area. Additionally, there is variation across locales in the degree to which individuals seek health care within the PCSA borders; in particular, Goodman et al. (2003) observed more border-crossing in urban areas. It is therefore possible that our study population varied in the degree of localization in seeking health services. Future research using more detailed service use data might examine travel to providers in different subgroups of older adults in order to more fully understand who is more likely to cross PCSA borders – and in particular, whether travel patterns are associated with variations in access across different socio-economic and racial-ethnic groups.

Conclusion

Findings from this study suggest that variations in primary care supply cannot fully explain variations in realized access to care. The nuanced picture illustrated in these findings underscores the importance of developing a multi-faceted concept of access, as well as disaggregating measures of healthcare access and outcomes from larger units of analysis used in prior research (Andersen et al., 2002; Basu & Mobley, 2010; Fisher et al., 2000; Fortney et al., 2001; Shi & Starfield, 2001) – such as states and counties – to more granular levels of analysis. Although this study used a supply measure at the level of the Primary Care Service Area – which often contains several contiguous zip codes – future analysis could disaggregate even further to examine different aspects of primary care access at the neighborhood level. Further research is needed to better understand how variations in the primary care infrastructure at a finer level contribute to disparities in primary care access. In a study conducted in the late 1990s, Prinz and Soffel (2003) examined the availability of private physician offices and institutional primary care providers in nine low-income NYC neighborhoods through a combination of street canvass and survey data collected from providers. They found low availability of private practice physicians in these neighborhoods, as well as wide variation across neighborhoods in supply, available office hours, languages spoken by providers, and structural characteristics of institutionally-based ambulatory care sites (Prinz & Soffel, 2003). This type of neighborhood-level examination of the local primary care infrastructure is crucial for achieving a better understanding of the environmental factors that influence healthcare access, particularly in underserved communities. However, to our knowledge, such data are not widely available in a format that could be used for research purposes.

Moreover, accessibility and elder-friendliness of public transit – an important aspect of neighborhood built environment – may facilitate access for individuals living in low-supply areas by enabling travel to other service areas. Further research is needed to better

understand the multiple relationships between accessibility of public transportation, other features of the neighborhood's built environment (such as walk-ability), individual-level factors that may influence travel to providers (such as physical function and social support), and utilization of the health services. Using longitudinal and multi-level analytic approaches, this line of inquiry may be an important step toward building elder-friendly cities and reducing disparities in health care access and health outcomes.

Acknowledgments

The Health Indicators Project, which provided the survey data analyzed in this study, was funded by the New York City Mayor's Office and administered by the NYC Department for the Aging. The analysis described was supported by Grant Number K01AG039463 from the National Institute on Aging. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Aging or the National Institutes of Health. The authors gratefully acknowledge the contributions of Nina Parikh, Dana Friedman, and Matthew Caron in providing data management and assistance and Huei-Wern Shen in providing programming support for key survey variables.

References

- Alexander JA, Lee SY, Griffith JR, Mick SS, Lin X, Banaszak-Holl J. Do market-level hospital and physician resources affect small area variation in hospital use? *Medical Care Research and Review*. 1999; 56(1):94–117. [PubMed: 10189779]
- Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *Journal of Health and Social Behavior*. 1995; 36(1):1–10. [PubMed: 7738325]
- Andersen RM, Yu H, Wyn R, Davidson PL, Brown ER, Teleki S. Access to medical care for low-income persons: how do communities make a difference? *Medical Care Research and Review*. 2002; 59(4):384–411. [PubMed: 12508702]
- Basu J, Mobley LR. Do HMOs reduce preventable hospitalizations for Medicare beneficiaries? *Medical Care Research and Review*. 2007; 64(5):544–567. [PubMed: 17881621]
- Basu J, Mobley LR. Impact of local resources on hospitalization patterns of Medicare beneficiaries and propensity to travel outside local markets. *Journal of Rural Health*. 2010; 26(1):20–29. [PubMed: 20105264]
- Bearman, J.; Jones, J.; Udry, R. The national longitudinal survey of adolescent health. Carolina Population Center; Chapel Hill, NC: 1997.
- Billings J, Anderson GM, Newman LS. Recent findings on preventable hospitalizations. *Health Affairs (Millwood)*. 1996; 15(3):239–249.
- Burton LC, Weiner JP, Stevens GD, Kasper J. Health outcomes and medicaid costs for frail older individuals: a case study of a MCO versus fee-for-service care. *Journal of the American Geriatric Society*. 2002; 50(2):382–388.
- Engstrom K, Mattsson F, Jarleborg A, Hallqvist J. Contextual social capital as a risk factor for poor self-rated health: a multilevel analysis. *Social Science and Medicine*. 2008; 66(11):2268–2280. [PubMed: 18314238]
- Epstein AJ. The role of public clinics in preventable hospitalizations among vulnerable populations. *Health Services Research*. 2001; 36(2):405–420. [PubMed: 11409820]
- Finkelstein, R.; Garcia, A.; Netherland, J.; Walker, J. Toward an Age-Friendly New York City: A Findings Report. New York Academy of Medicine; 2008.
- Fiscella K, Epstein RM. So much to do, so little time: care for the socially disadvantaged and the 15-minute visit. *Archives of Internal Medicine*. 2008; 168(17):1843–1852. [PubMed: 18809810]
- Fisher ES, Wennberg JE, Stukel TA, Skinner JS, Sharp SM, Freeman JL, et al. Associations among hospital capacity, utilization, and mortality of US Medicare beneficiaries, controlling for sociodemographic factors. *Health Services Research*. 2000; 34(6):1351–1362. [PubMed: 10654835]
- Fortney J, Chumbler N, Cody M, Beck C. Geographic access and service use in a community-based sample of cognitively impaired elders. *Journal of Applied Gerontology*. 2002; 21(3):352–367.

- Fortney J, Thill JC, Zhang M, Duan N, Rost K. Provider choice and utility loss due to selective contracting in rural and urban areas. *Medical Care Research and Review*. 2001; 58(1):60–75. [PubMed: 11236233]
- Franzini L, Caughy M, Spears W, Fernandez Esquer ME. Neighborhood economic conditions, social processes, and self-rated health in low-income neighborhoods in Texas: a multilevel latent variables model. *Social Science and Medicine*. 2005; 61(6):1135–1150. [PubMed: 15970226]
- Freedman VA, Grafova IB, Rogowski J. Neighborhoods and chronic disease onset in later life. *American Journal of Public Health*. 2010:e1–e8.
- Freedman VA, Grafova IB, Schoeni RF, Rogowski J. Neighborhoods and disability in later life. *Social Science and Medicine*. 2008; 66(11):2253–2267. [PubMed: 18329148]
- Gaskin DJ, Hoffman C. Racial and ethnic differences in preventable hospitalizations across 10 states. *Medical Care Research and Review*. 2000; 57(Suppl 1):85–107. [PubMed: 11092159]
- Geriatrics Workforce Policy Studies Center. Comparison of Number of Certificates Awarded to Number of Active Certificates in Geriatric Medicine (Family Medicine and Internal Medicine). 2011.
- Goodman DC, Mick SS, Bott D, Stukel T, Chang CH, Marth N, et al. Primary care service areas: a new tool for the evaluation of primary care services. *Health Services Research*. 2003; 38(1 Pt 1): 287–309. [PubMed: 12650392]
- Gornick ME, Eggers PW, Riley GF. Associations of race, education, and patterns of preventive service use with stage of cancer at time of diagnosis. *Health Services Research*. 2004; 39(5):1403–1427. [PubMed: 15333115]
- Grafova IB, Freedman VA, Kumar R, Rogowski J. Neighborhoods and obesity in later life. *American Journal of Public Health*. 2008; 98(11):2065–2071. [PubMed: 18799770]
- Guagliardo MF. Spatial accessibility of primary care: concepts, methods and challenges. *International Journal of Health Geographics*. 2004; 3(1):3. [PubMed: 14987337]
- Hutchinson RN, Putt MA, Dean LT, Long JA, Montagnet CA, Armstrong K. Neighborhood racial composition, social capital and black all-cause mortality in Philadelphia. *Social Science and Medicine*. 2009; 68(10):1859–1865. [PubMed: 19324485]
- Kawachi I, Kennedy BP, Glass R. Social capital and self-rated health: a contextual analysis. *American Journal of Public Health*. 1999; 89(8):1187–1193. [PubMed: 10432904]
- Kawachi I, Kennedy BP, Lochner K, Prothrow-Stith D. Social capital, income inequality, and mortality. *American Journal of Public Health*. 1997; 87(9):1491–1498. [PubMed: 9314802]
- Kirby JB, Kaneda T. Neighborhood socioeconomic disadvantage and access to health care. *Journal of Health and Social Behavior*. 2005; 46(1):15–31. [PubMed: 15869118]
- Litaker D, Koroukian SM, Love TE. Context and healthcare access: looking beyond the individual. *Medical Care*. 2005; 43(6):531–540. [PubMed: 15908847]
- McWilliams JM, Meara E, Zaslavsky AM, Ayanian JZ. Differences in control of cardiovascular disease and diabetes by race, ethnicity, and education: U.S. trends from 1999 to 2006 and effects of medicare coverage. *Annals of Internal Medicine*. 2009; 150(8):505–515. [PubMed: 19380852]
- Merzel C, Moon-Howard J. Access to health services in an urban community: does source of care make a difference? *Journal of Urban Health*. 2002; 79(2):186–199. [PubMed: 12023494]
- Mobley LR, Root E, Anselin L, Lozano-Gracia N, Koschinsky J. Spatial analysis of elderly access to primary care services. *International Journal of Health Geographics*. 2006; 5:19. [PubMed: 16700904]
- Moon S, Shin J. Health care utilization among Medicare-Medicaid dual eligibles: a count data analysis. *BMC Public Health*. 2006; 6:88. [PubMed: 16595021]
- National Institute of Mental Health. Cooperative agreement for a multi-site study of mental health service use, need, outcomes and costs in child and adolescent populations (UNO-CAP). National Institutes of Health; Rockville, MD: 1994.
- Nemet GF, Bailey AJ. Distance and health care utilization among the rural elderly. *Social Science and Medicine*. 2000; 50(9):1197–1208. [PubMed: 10728841]
- O’Neil SS, Lake T, Merrill A, Wilson A, Mann DA, Bartnyska LM. Racial disparities in hospitalizations for ambulatory care-sensitive conditions. *American Journal of Preventive Medicine*. 2010; 38(4):381–388. [PubMed: 20307806]

- Parchman ML, Culler SD. Preventable hospitalizations in primary care shortage areas. An analysis of vulnerable Medicare beneficiaries. *Archives of Family Medicine*. 1999; 8(6):487–491. [PubMed: 10575386]
- Prinz TS, Soffel D. The primary care delivery system in New York's low-income communities: private physicians and institutional providers in nine neighborhoods. *Journal of Urban Health*. 2003; 80(4):635–649. [PubMed: 14709711]
- Ricketts TC, Randolph R, Howard HA, Pathman D, Carey T. Hospitalization rates as indicators of access to primary care. *Health Place*. 2001; 7(1):27–38. [PubMed: 11165153]
- Rundle A, Roux AV, Free LM, Miller D, Neckerman KM, Weiss CC. The urban built environment and obesity in New York City: a multilevel analysis. *American Journal of Health Promotion*. 2007; 21(4 Suppl):326–334. [PubMed: 17465178]
- Sampson RJ, Raudenbush SW, Earls F. Neighborhoods and violent crime: a multilevel study of collective efficacy. *Science*. 1997; 277(5328):918–924. [PubMed: 9252316]
- Shi L, Starfield B. The effect of primary care physician supply and income inequality on mortality among blacks and whites in US metropolitan areas. *American Journal of Public Health*. 2001; 91(8):1246–1250. [PubMed: 11499112]
- Sofaer S. Navigating poorly charted territory: patient dilemmas in health care “nonsystems”. *Medical Care Research and Review*. 2009; 66(1 Suppl):75S–93S. [PubMed: 19074306]
- Weinick, RM.; Zuvekas, SH.; Drilea, SK. *Access to Health Care-Sources and Barriers*. 1996. Agency for Health Care Policy and Research; Rockville, MD: 1997.
- Wennberg, JE.; Cooper, MM.; Birkmeyer, JD.; Bronner, KK.; Bubolz, TA.; Campbell, DE., et al. *The Dartmouth Atlas of Health Care*. The Center for the Evaluative Clinical Sciences, Dartmouth Medical School; 1999. *The quality of medical care in the United States: A report on the Medicare program*.
- Wolinsky FD, Miller TR, Geweke JF, Chrischilles EA, An H, Wallace RB, et al. An interpersonal continuity of care measure for Medicare Part B claims analyses. *Journals of Gerontology B: Psychological Sciences and Social Sciences*. 2007; 62(3):S160–168.
- Yen IH, Michael YL, Perdue L. Neighborhood environment in studies of health of older adults: a systematic review. *American Journal of Preventive Medicine*. 2009; 37(5):455–463. [PubMed: 19840702]

Research highlights

- elder-friendliness of public transit may facilitate primary care access for elders in areas with low physician supply.
- Racial disparities and inadequate primary care infrastructure hinder access in lower-supply areas.
- Concepts of healthcare access should be multi-faceted and should include neighborhood environmental factors.
- Research on the links between the built environment and healthcare access is crucial for building elder-friendly cities.

Table 1
Participant demographics, clinical characteristics, neighborhood measures and primary care use by physician supply quartile

	Total (N=1260)	Quartile 1 (N=240)	Quartile 2 (N=398)	Quartile 3 (N=214)	Quartile 4 (N=408)	p-value
Demographic characteristics						
Age, M (SD) (range: 60-99)	75.4 (7.8)	75.4 (7.5)	75.7 (7.8)	75.4 (7.7)	75.1 (8.0)	0.775
Female, %	64.5	67.5	63.3	65.9	63.2	0.648
Nonwhite, %	60.5	68.8	58.0	68.7	53.7	<.001
Race by category, %						
White	39.5	31.3	42.0	31.3	46.3	<.001
Black	20.6	33.8	21.4	10.8	17.2	<.001
Hispanic	24.5	18.9	26.1	34.1	21.3	<.001
Asian	12.8	12.1	7.8	22.9	12.8	<.001
Other	2.6	4.2	2.8	0.9	2.5	0.194
Non-English speaking, %	39.9	27.5	36.7	58.9	40.4	<.001
Foreign-born, %	55.2	44.5	50.8	65.0	51.5	<.001
Education level, %						
Less than high school	36.8	33.8	37.9	44.4	33.3	0.035
High school	33.5	35.8	37.4	33.6	28.2	0.036
Some college	12.1	12.5	11.8	10.8	13.0	0.865
College or greater	17.6	17.9	12.8	11.2	25.5	<.001
Income, %						
Less than \$10,000	30.2	29.2	22.6	41.1	32.6	<.001
\$10,000 to less than \$20,000	24.2	24.6	23.6	21.0	26.2	0.536
\$20,000 to less than \$35,000	12.3	12.5	13.6	9.8	12.3	0.609
\$35,000 or greater	8.3	7.5	9.1	4.2	10.3	0.063
Income missing	24.9	26.3	31.2	23.8	18.6	0.001
Public insurance type, %						
Medicare only	59.2	60.0	65.8	55.1	54.4	0.006
Medicaid only	4.6	3.8	3.5	6.5	5.2	0.311
Dual eligible	31.4	33.3	24.9	36.5	33.8	0.008
Has private insurance, %	25.4	27.1	27.1	18.7	26.2	0.101

	Total (N=1260)	Quartile 1 (N=240)	Quartile 2 (N=398)	Quartile 3 (N=214)	Quartile 4 (N=408)	p-value
Limited contact with friends (< 1x/week), %	17.7	19.2	16.6	16.8	18.4	0.816
Clinical and functional characteristics						
Number of chronic conditions, M (SD)	4.3 (2.6)	4.4 (2.7)	4.3 (2.5)	4.5 (2.8)	4.2 (2.6)	0.438
Number of ADLs/IADLs needs, M (SD)	2.0 (2.1)	2.1 (2.1)	2.0 (2.0)	2.2 (2.1)	1.9 (2.1)	0.293
Neighborhood-related measures						
Perceived safety, M (SD) (range: 3-12)	6.6 (2.4)	6.7 (2.5)	6.4 (2.3)	7.2 (2.6)	6.5 (2.3)	0.001
Perceived social cohesion, M (SD) (range: 5-20)	10.5 (3.1)	10.4 (3.0)	9.9 (3.1)	10.7 (3.2)	10.9 (3.1)	<.001
Use public transit, %	80.7	82.5	74.6	76.2	88.0	<.001
Primary care use						
Used PCP/clinic within the past year, %	57.1	58.3	49.8	64.5	59.8	0.002
Location of usual source of care, %						
Private doctor's office	55.1	59.2	54.8	57.9	52.2	0.413
Community clinic/health center	16.1	17.9	17.6	11.2	16.2	0.171
Hospital outpatient clinic/departments	10.2	7.1	8.8	10.3	13.2	0.057
Emergency department	4.4	3.3	4.5	6.1	3.9	0.508
Multiple locations	11.4	9.2	12.3	12.2	11.5	0.652
Other or none	2.9	4.6	2.0	2.3	2.9	0.281

Table 2
Logistic regression of use of PCP/Clinic in the past year for total sample (N=1260)

Variable	OR	95% CI
Supply quartile (ref=Q1)		
Supply quartile 2	0.72	0.47-1.09
Supply quartile 3	1.08	0.68-1.70
Supply quartile 4	1.01	0.67-1.50
Neighborhood safety	0.99	0.93-1.06
Neighborhood social cohesion	1.04	1.00-1.09 *
Use public transit	1.22	0.87-1.71
Age	1.00	0.99-1.02
Female	1.00	0.78-1.28
Nonwhite	0.85	0.62-1.18
Non-English speaking	1.83	1.33-2.51 ***
Education (ref=less than HS)		
High school	1.38	1.01-1.89 *
Some college	1.49	1.03-2.16 *
Completed college	1.55	1.00-2.41 *
Public insurance (ref=Medicare)		
Medicaid	1.89	0.99-3.60
Dually eligible	1.07	0.79-1.43
Private insurance	0.63	0.49-0.82 ***
Usual SOC (ref=private office)		
Community clinic	0.73	0.51-1.04
Hospital outpatient clinic or dept.	0.52	0.34-0.79 **
ER	0.34	0.18-0.63 ***
Multiple sources	0.42	0.27-0.64 ***
Other or none	0.43	0.19-0.99 *
Number of chronic conditions	1.12	1.07-1.18 ***
Number of ADLs/IADLs needs	1.10	1.04-1.18 **
Limited contact with friends	0.82	0.61-1.11

Note: All models adjust for clustering of individuals within PCSAs and senior centers. OR=odds ratio. CI=confidence interval. Ref=reference category. SOC=source of care.

*
p<0.05

**
p<0.01

p<=0.001

Table 3
Logistic regression of use of PCP/Clinic in the past year by supply quartile

Variable	Quartile 1 (N=240)		Quartile 2 (N=398)		Quartile 3 (N=214)		Quartile 4 (N=408)	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Neighborhood safety	0.98	0.90-1.06	1.06	0.95-1.19	0.98	0.84-1.14	0.94	0.79-1.12
Neighborhood social cohesion	1.14	1.04-1.26**	1.04	0.96-1.13	1.03	0.92-1.15	1.04	0.97-1.13
Use public transit	2.40	1.21-4.77*	1.64	0.95-2.82	0.76	0.37-1.59	0.86	0.35-2.13
Age	0.99	0.94-1.05	1.01	0.98-1.03	0.97	0.93-1.01	1.02	0.99-1.06
Female	1.18	0.49-2.85	1.10	0.80-1.51	0.87	0.42-1.80	0.94	0.60-1.48
Nonwhite	0.56	0.20-1.58	0.50	0.29-0.89*	0.81	0.30-2.22	1.38	0.87-2.18
Non-English speaking	2.17	1.30-3.64**	1.68	0.88-3.21	2.72	1.15-6.46*	1.58	0.87-2.85
Education (ref=less than HS)								
High school	2.66	1.07-6.63*	1.27	0.75-2.15	1.05	0.52-2.14	1.41	0.84-2.37
Some college	0.71	0.23-2.22	2.08	1.10-3.93*	1.96	0.76-5.03	1.69	0.82-3.48
Completed college	2.79	0.94-8.28	0.73	0.40-1.35	1.36	0.35-5.37	2.29	0.99-5.26
Public insurance (ref=Medicare)								
Medicaid	0.92	0.20-4.21	4.98	1.64-15.1**	2.13	0.43-10.7	1.23	0.43-3.50
Dually eligible	1.54	0.88-2.67	0.71	0.39-1.29	0.73	0.40-1.32	1.51	0.88-2.62
Private insurance	0.52	0.28-0.97*	0.69	0.43-1.09	0.71	0.36-1.37	0.69	0.47-1.02
Usual SOC (ref=private office)								
Community clinic	1.39	0.58-3.32	0.47	0.27-0.82**	0.40	0.15-1.02	1.10	0.64-1.90
Hospital outpatient clinic/dept.	0.50	0.17-1.50	0.48	0.22-1.02	0.63	0.26-1.52	0.50	0.24-1.06
ER	2.8	0.14-55.8	0.18	0.06-0.52**	0.46	0.07-3.05	0.22	0.09-0.56**
Multiple sources	0.46	0.16-1.29	0.21	0.09-0.47***	0.61	0.25-1.49	0.58	0.30-1.12
Other or none	0.66	0.11-3.80	0.15	0.03-0.84*	0.29	0.05-1.89	0.62	0.15-2.64
Number of chronic conditions	1.19	1.07-1.31***	1.17	1.05-1.29**	1.01	0.90-1.12	1.14	1.05-1.24**
Number of ADLs/IADLs needs	1.17	0.98-1.39	1.14	1.05-1.24**	1.09	0.93-1.28	1.08	0.95-1.23
Limited contact with friends	1.01	0.47-2.18	0.94	0.52-1.74	1.09	0.40-2.93	0.60	0.41-0.89*

Note: All models adjust for clustering of individuals within PCSAs and senior centers. OR=odds ratio. CI=confidence interval. Ref=reference category. SOC=source of care.

* p<0.05
** p<0.01
*** p<=0.001