Chapter 6
Influence of Living Arrangements of Community Dwelling Older Adults on the Association between Social Capital and Health

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6.1 Introduction

Recent estimates of the proportion of older adults aged 65 and over who are non-institutionalized and living alone in the USA range from just under one third (29%) in 2010 (AoA 2011) to just under a half (43%) (US Census Bureau, American Community Survey 2010). The proportion of older adults living alone has steadily risen over time, with 10% living alone in 1945 compared to 20% in 1960 (Victor et al. 2000). Similar trends have been occurring globally (Klinenberg 2012). These trends have occurred for various reasons, most notably due to increased longevity, low fertility and rising divorce rates (Klinenberg 2012; Chou et al. 2006). There are gender differences in terms of living arrangements, with living alone being higher among women at every age compared to men. In 2010, 37% of older women lived alone compared to 19% of older men (AoA 2011). The proportion of older adults living alone increases with age; this is particularly notable among older women. For example, in 2010 almost half (47%) of women aged 75 years and older lived alone (AoA 2011). These figures highlight the need to better understand the lives of older adults living alone. In particular, the impact of living alone on the association between neighborhood connectedness and health remains poorly understood. The focus of the study presented in this chapter was to examine this relationship by comparing older adults living alone to those living with others. These findings may help to further our understanding of how living alone shapes the interaction

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between the older person and their surrounding social environment, and how this ultimately influences their health.

6.1.1 Influence of Living Alone on the Lives of Older Adults

Living alone has been shown to have a negative impact on many facets of life, including lower levels of social support, poorer physical and mental health, higher rates of health service utilization, and increased risk of mortality. For example, in one study, residents of deteriorating neighborhoods reported lower anticipated support; this was particularly evident among older adults who lived alone (Thompson and Krause 1998). Another study found that older adults discharged from hospital and who lived alone were less likely to improve in functioning and more likely to be admitted to a nursing home, compared to peers who lived with others (Mahoney et al. 2000). Klinenberg writes "… no one struggles more with solitary living than recently widowed elderly, whose own risk of sickness, death, and institutionalization increases significantly immediately after a spouse dies" (Klinenberg 2012, p. 160). Indeed, research has shown that loneliness and living alone are significantly associated with each other, although "not all those who live alone are isolated, whilst most of the isolated live alone" (Victor et al. 2000, p. 410). Furthermore, older adults who live alone have also been found to have higher rates of depression, and therefore use mental health services more frequently (Chou et al. 2006). In terms of mortality a study of an adult population with atherothrombosis found that living alone was associated with increased risk of mortality, although, this was not found among participants aged 80 and over (Udell et al. 2012).

Despite the aforementioned negative impacts of living alone, definitive conclusions on the impact of living alone on health, well-being and survival has been limited by a lack of longitudinal studies, by inconsistencies in how living arrangements are defined, as well as by the exclusion of certain groups, such as men, ethnic minorities or the oldest-old (Davis et al. 1997). There are many studies that have found that for many of these domains described above, older adults living alone are no different from their peers who live with others. As Chou and colleagues point out, there are studies that have found no differences in depressive symptoms between elders living alone and elders living with others (Chou et al. 2006). Klinenberg reports on research conducted in England where older adults living alone did not experience more mental or physical illness than those living with others; furthermore "stated satisfaction with life was somewhat higher in those living alone" (Klinenberg 2012, p. 161). A longitudinal study conducted by Davis and colleagues found that women who lived alone, or whose living arrangement changed to living alone, did not experience a rise in mortality risk. Instead it was participants who lived with another person other than a spouse at baseline, or whose living arrangements changed from living with a spouse to living with another person who were at greatest risk (Davis et al. 1997). All of these examples highlight the fact that living alone does not always portend dire outcomes. Instead it begs the question, what buffers single elders against developing deteriorating health and well-being?

6.1.2 Living Alone and the Neighborhood

The important role of the neighborhood in the health and well-being of older adults is becoming increasingly recognized (Cramm et al. 2013; Norstrand et al. 2012; Wu and Chan 2012). Older adults tend to be more neighborhood-bound than younger adults or children for several reasons, including retirement and increased physical limitations (Wu and Chan 2012). Understanding the role of neighborhoods in the lives of older adults living alone may be particularly important because without a spouse or other member in the home, they may be especially reliant on neighborhood resources. Indeed, older adults who live alone spend on average 10 h/day alone; in the remaining time, however, they are more likely to socialize with their friends and neighbors than those who are married (Klinenberg 2012). Yet despite this, the 1995 Chicago heat wave demonstrated the dangers of living alone, in that many of the elderly who died were those living alone (Klinenberg 2002). Indeed, elderly men living alone were among those most likely to die. According to Klinenberg, the explanation lies in the fact that women tend to retain social relationships whereas elderly men do not. In the case of the Chicago heat wave, the social dimension was a critical aspect of the neighborhood that determined whether older adults living alone survived.

6.1.3 Living Alone and Social Capital

The social dimension of neighborhoods can be examined using the concept social capital, as it emphasizes the social relationships between groups of people (De Silva et al. 2005) and is "…a collective dimension of society external to the individual." (Lochner et al. 1999, p. 260). Social capital has been shown to have significant positive associations with a vast array of physical and emotional health outcomes for all ages, including older adults (Kawachi et al. 2008; Nyqvist et al. 2006). Indeed social capital may be particularly important for older adults (Cagney and Wen 2008; Nyqvist et al. 2006). As described above, this may be because this group is "…more tethered to their immediate surroundings [and so] the impact of the environment is likely greater" (Cagney and Wen 2008, p. 253). As far as the authors of this chapter are aware, how the relationship between social capital and health differs by living arrangements among older adults has not been examined. It is unclear from the literature whether living alone would result in increased or decreased social capital for the individual older person. For example, it could be argued that living alone may result in reduced connectedness to the neighborhood since without a spouse or other companion, this individual may reduce outreach to neighbors or neighborhood resources. Alternatively, it could be argued that without a spouse or other companion, the older person living alone may make an increased effort to reach out to others in the surrounding neighborhood. It is hoped this study provides new insight into how the lives of older adults living alone differ from those who live with others in terms of their possession of social capital and the association between social capital and health.

6.2 Methodology

In this study, the relationships between five indicators of social capital (trust, cohesion, support, participation, and interaction) with five health outcomes (self-rated health, Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), depressive symptoms, and stress) were examined by living arrangements (viz., living alone or living with others). In order to understand the influence of living arrangements on the relationship between social capital and health, this study was set up to answer two questions: (1) Does the possession of social capital differ by living arrangement? and (2) Does the relationship between social capital and health outcomes differ by living arrangement? In terms of the first question, we hypothesized that older adults living alone are more likely to experience lower levels of social capital, while acknowledging that the literature provides little guide on this. For the second research question, we hypothesized that indicators of high social capital are more likely to be significantly associated with better health among older adults living with others compared to those living alone. In other words, evidence for a positive impact of social capital on health will be more evident among older adults living with others compared to those living alone.

This study used cross-sectional data from the 2010 Community Health Data Base (CHDB) managed by Philadelphia Health Management Corporation. This survey has been conducted biennially since 1994 in five urban and suburban counties of southeastern Pennsylvania (Bucks, Chester, Delaware, Montgomery and Philadelphia). A wide range of questions are asked regarding socio-economic, physical and mental health and social capital-related information from respondents. If a randomly selected adult respondent is unable to be interviewed because of health impairments or language barriers, the interview is conducted with an adult proxy. For this study, all respondents who had an adult proxy respond for them were removed from the sample, as it is considered important to gain first-hand information from respondents themselves. Based on the 2010 CHDB, adult proxy respondents represent only 1 % of the total sample.

6.2.1 Sample

The sample consisted of 2314 adults aged 65 years and older from the five-county Southeastern Pennsylvania region, taken from the 2010 CHDB. Adults aged 65 and older were selected for this study because this is currently the age at which full retirement benefits set in (Medicare 2013). Just under half (44 %) lived alone. Compared to peers who lived with others, elders living alone were significantly more likely to be older, female, minority, less educated and poor. Elders living alone were also significantly more likely to be widowed or divorced/separated (See Table 6.1).

Table 6.1 Characteristics by living arrangements

	Living alone (N = 1025) (%)	Living with others (N = 1289) (%)	ANOVA and χ^2(df)	p
Age: M (SD)	77 (7.5)	73 (7.0)	t = 10.48	0.000
Gender (female)	75	62	45.84 (1)	0.000
Race (non-white)	25	21	4.83 (1)	0.028
Education (< HS)	14	10	16.29 (4)	0.003
Poverty (200% FPL)	39	26	22.46 (2)	0.000
Marital status			1.2e+03 (3)	0.000
Married/living with someone	4	74		
Widowed	58	16		
Divorced/separated	19	5		
Single	20	5		
SC: cohesion			7.61 (3)	0.055
Strongly disagree	1	0		
Disagree	6	5		
Agree	62	61		
Strongly agree	31	34		
SC: support			12.72	0.005
Never/rarely	13	10		
Sometimes	24	24		
Often	27	33		
Always	36	33		
SC: trust			5.57	0.134
Strongly disagree	3	2		
Disagree	10	9		
Agree	64	63		
Strongly agree	23	27		
SC: participation			13.17	0.214
0	48	42		
1	26	27		
2	13	10		
3+				
SC: interaction			7.48	0.058
Once a week	9	12		
Few times a week	25	27		
Once a day	23	23		
Several times a day	42	37		
Self-rated health			10.28 (4)	0.036

Table 6.1 (continued)

	Living alone (N=1025) (%)	Living with others (N=1289) (%)	ANOVA and χ^2(df)	p
Poor	7	5		
Fair	19	16		
Good	34	36		
Very good	28	29		
Excellent	12	14		
No ADL	87	91	11.06 (1)	0.001
No IADL	70	79	21.09 (1)	0.000
No depressive symptoms	36	49	35.41 (1)	0.000

6.2.2 Measures

6.2.2.1 Physical Health Outcomes

Self-rated health, ADL and IADL were selected in the analysis as dependent variables reflecting physical health:

Self-rated health was measured by a single item where individuals were asked to rate their own health on a 5-point Likert scale, with a high number indicating better self-rated health.

ADL and *IADL* were taken from Part A of the Older American Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire (Duke University 1978). The ADL section measures the level of independence of a person based on eight basic activities (i.e. eating, dressing, grooming, walking, transferring, bathing, continence, and soiling). The IADL section measures tasks that are more complex than those needed for the ADLs (i.e. talking on the phone, walking, shopping, meal preparation, housework, taking medicine and handling money). For this study ADL and IADL scales were dichotomized with 0 representing no ADL/IADL limitations, and 1 representing one or more ADL/IADL limitations. This was because only 10.7% had one or more ADL and 25.4% had one or more IADL in the 2010 CHDB.

6.2.2.2 Emotional Health Outcomes

Depressive symptoms and stress were selected in the analysis as dependent variables reflecting emotional health:

Depressive symptoms were measured using a ten-item version of the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff 1977). Respondents

were asked to respond either yes or no to these ten symptoms in the past 2 weeks. For this study the CES-D ten item scale was also dichotomized, since the scale scores were severely non-normally distributed: 0 represents no symptoms and 1 represents one or more symptoms.

Stress was assessed using a single variable where individuals were asked to rate their level of stress over the past 1-year period on a 10-point Likert scale. A score of 1 represented no stress and a score of 10 represented an extreme amount of stress.

6.2.2.3 Social Capital Indicators

The five social capital indicators (obtained from the CHDB) used in this study were:

Support was assessed by "please rate how likely people in your neighborhood are willing to help their neighbors with routine activities, such as picking up their trash cans, or helping to shovel snow. Would you say that most people in your neighborhood are always, often, sometimes, rarely, or never willing to help their neighbors?" Response categories were recoded from 1 to 4, with 1 being rarely/never, 2 being sometimes, 3 being often and 4 being always.

Participation was assessed by "How many local groups or organizations in your neighborhood do you currently participate in, such as social, political, religious, school-related, or athletic organizations?" Responses categories ranged from 0 to 12 groups. Due to a very small number of cases in category responses six and higher, this variable was top-coded so response categories ranged from 0 to 6.

Cohesion was assessed by "Please tell me if you strongly agree, agree, disagree, or strongly disagree with the following statement: I feel that I belong and am a part of my neighborhood". Responses categories were coded 1 to 4, with 1 being strongly disagree, 2 being disagree, 3 being agree and 4 being strongly agree.

Trust was assessed by "Please tell me if you strongly agree, agree, disagree, or strongly disagree with the following statement: Most people in my neighborhood can be trusted." Response categories were also coded 1 to 4 with 1 being strongly disagree, 2 being disagree, 3 being agree and 4 being strongly agree.

Interaction was assessed by "About how often do you talk with friends or relatives on the telephone?" Response categories included several times a day, once a day, a few times a week, once a week, less often than once a week, and never. Responses categories were recoded from 1 to 4, with 1 being once a week or less, 2 being few time a week, 3 being once a day and 4 being several times a day.

6.2.2.4 Demographic and Socioeconomic Covariates

Demographic and socioeconomic variables entered into the analyses were *age* in years (minimum 65 years); sex, 0 representing female and 1 representing male; race, with 0 representing White and 1 representing minority, (minority includes all non-whites plus all Hispanics of any race); *education,* coded along five response categories: less than a high school graduate (0–11 years), high school graduate

(12 years), some college (13–15 years), college graduate (16 years) and post-college (more than 16 years); *poverty* at 200% of the federal poverty guidelines dichotomized into poor (coded 1) and non-poor (coded 0); and *marital status,* recoded into four dummy variable (single, divorced, and widowed, with married being the comparison group). The federal poverty guidelines are created by the Department of Health and Human Services to serve as the threshold for eligibility for certain federally funded programs. These guidelines are sometimes referred to as the "Federal Poverty Level" (FPL). Poverty at 200% was selected for this study since it represents a more realistic representation of poverty than 100% (Elder Economic Security Initiative 2008).

6.2.3 Data Analysis

The first research question was tested by conducting Kruskal Wallis rank tests on the five indicators of social capital (trust, support, cohesion, participation and interaction) with the sample (>65 years) split by living arrangements (viz., living alone or living with someone). The second research question was tested by conducting binary logistic and ordinal logistic regression analyses for each of the five health outcomes (self-rated health, ADL, IADL, depressive symptoms, and stress) as dependent variables split by living arrangements. Standard socioeconomic indicators were accounted for as covariates in the analyses.

6.3 Results and Discussion

This study presented here focused on two questions; first, whether the possession of social capital differed by living arrangement, and second, whether the relationship between social capital and health outcomes differed by living arrangement. The findings (see Table 6.1) showed that social capital differed by living arrangement on only one indicator (viz., support; $p=0.005$). As expected, older adults living alone reported significantly lower levels of support. This mirrors previous research (Vézina 2011). Indeed older adults living alone have less access to support compared to those living with others in the same household. Instead, older adults living alone must turn to people outside their household for the fulfillment of instrumental and emotional support (Giervald et al. 2012). Reaching outside the home for support may be more difficult among older persons, especially for those who have physical limitations (e.g. difficulty with hearing, vision or walking).

The fact that social capital differed significantly by living arrangement on only one of the five indicators brings up an important point; that is, living alone among older adults does not imply reduced social capital. In other words, living arrangements for the most part do not influence the individual's perception of the social dimension of the neighborhood. Indeed this does make sense since social capital is accumulated throughout the lifespan, whereas the incidence of living alone is generally a recent phenomenon, (i.e. a result of widowhood). In this sample, over

Table 6.2 Self-rated health with all predictors (odds ratios with 95% interval confidence)

Age category	Live alone		Live with others	
Predictor	OR	95% C.I.	OR	95% C.I.
Age	0.98*	0.96; 1.00	0.97***	0.95; 0.99
Sex (male)	0.73*	0.53; 1.00	0.83	0.66; 1.06
Race (minority)	0.51***	0.37; 0.71	0.62**	0.46; 0.84
Education	1.10	0.97; 1.24	1.36***	1.22; 1.51
Poverty @ 200% (poor)	0.54***	0.40; 0.73	0.71*	0.53; 0.95
Marital status (married)				
Widowed	0.40*	0.20; 0.82	0.74	0.53; 1.03
Divorced/ separated	0.37**	0.18; 0.79	0.64	0.37; 1.09
Single	0.32**	0.16; 0.67	0.98	0.58; 1.64
SC: cohesion	1.15	0.89; 1.49	1.20	0.96; 1.51
SC: support	1.08	0.94; 1.25	1.12	0.99; 1.27
SC: trust	1.22	0.97; 1.54	1.34**	1.09; 1.65
SC: participation	1.14**	1.04; 1.26	1.05	0.97; 1.13
SC: interaction	0.93	0.82; 1.06	0.98	0.88; 1.10

***$p \leq 0.001$; **$p \leq 0.01$; *$p \leq 0.05$

half (58%) of those living alone were widowed. There is no way of telling from the dataset used in this study how many years these individuals have been widowed. However, based on Census data in 1999, Hollingsworth (2008) reported women are widowed on average for 14 years. The conclusion that the overall possession of social capital does not differ by living arrangements has important implications for health related interventions for community dwelling older adults; this is discussed in more detail below under implications of findings.

Older adults living alone differed significantly from those living with others on key socioeconomic characteristics (see Table 6.1). Specifically, older adults living alone were significantly more likely to be older, female, minority, less educated, and poor at the 200% FPL (see definition on p. 11). As expected, there were significant differences between the two groups in terms of marital status, in that older adults living alone were more likely to be widowed, divorced or single. Older adults living alone also fared worse on all health indicators.

The second question, which focused on whether the relationship between social capital and health differed by living arrangement, was partially supported in that differences by living arrangements in terms of the relationship between social capital and health outcomes were found on three of the five health outcomes, namely self-rated health, depressive symptoms and stress. Differences by living arrangement were also found for ADL, in that cohesion was a significant predictor; since the odds ratio was 0, however, the impact of cohesion could not be interpreted. Results are only presented for self-rated health (Table 6.2) and stress (Table 6.3) in

Table 6.3 Stress with all predictors (odds ratios with 95% interval confidence)

Age category	Live alone		Live with others	
Predictor	OR	95% C.I.	OR	95% C.I.
Age	0.99	0.97; 1.01	0.97***	0.95; 0.99
Sex (male)	0.71*	0.53; 0.97	0.64***	0.51; 0.80
Race (minority)	0.49***	0.36; 0.68	1.01	0.75; 1.36
Education	1.07	0.95; 1.21	1.09	0.98; 1.21
Poverty @ 200% (poor)	1.31	0.97; 1.76	1.12	0.84; 1.50
Marital status (married)				
Widowed	0.78	0.40; 1.52	0.96	0.69; 1.33
Divorced/ separated	1.23	0.62; 2.47	1.48	0.86; 2.53
Single	0.77	0.39; 1.53	0.59	0.35; 1.01
SC: cohesion	0.99	0.76; 1.28	0.72**	0.58; 0.89
SC: support	0.97	0.84; 1.11	0.97	0.86; 1.09
SC: trust	0.73**	0.58; 0.91	0.88	0.72; 1.07
SC: participation	0.95	0.86; 1.04	0.97	0.90; 1.04
SC: interaction	1.14*	1.00; 1.30	1.06	0.95; 1.18

***$p \leq 0.001$; **$p \leq 0.01$; *$p \leq 0.05$

this chapter as these outcomes demonstrated most clearly differences by living arrangement. Due to limited space, results for ADL, IADL and depressive symptoms are not shown here; they can be requested from the corresponding author.

6.3.1 Self-Rated Health

Models for self-rated health, one for living alone and one for living with others (see Table 6.2), demonstrated that after controlling for demographic and economic characteristics, two social capital indicators were significant predictors of self-rated health. The fit of both models was highly significant in terms of predicting self-rated health, predicting 5% of the total variance for older adults living alone ($R^2 = 0.05$, F(13, 763) = 112.13, $p < 0.000$) and living with others ($R^2 = 0.05$, F(13, 1061) = 165.31, $p < 0.000$). Among older adults living alone, participation was a significant predictor of self-rated health; in other words an increase in participation in groups was associated with a 14% (Odds ratio (OR) = 1.14) increase in odds of more positive self-rated health. Furthermore, in terms of demographic and economic measures, being younger, female, White or not poor increased the odds of more positive self-rated health. Marital status was also significantly associated with self-rated health. Older adults living alone who were widowed, divorced/separated

or single were worse off in terms of self-rated health when compared to those who were married.

Among older adults living with others, trust was a significant predictor of self-rated health; in other words, an increase in trust of neighbors was associated with a 34% (OR = 1.34) increase in odds of more positive self-rated health. In addition, in terms of demographic and economic measures, being younger, White, more highly educated, and not poor increased the odds of more positive self-rated health among older adults living with others.

When examining the outcomes for self-rated health, it was clear that trust was important for those living with others whereas participation was important for those living alone when predicting self-rated health. It is possible that participation in organizations was especially important for those living alone for self-rated health outcomes in that participation was a proxy for socializing outside the home. However, it is difficult to be certain about this because it is impossible to know what kind of activities the individual carried out as a member of a local organization in the neighborhood. For example, participation could reflect monetary membership (requiring no activity outside the home), or it could reflect more active and social participation involving direct socialization with other members of the organization. Trust in neighbors on the other hand was important for self-rated health among older adults living with others. It is surprising that trust was not significantly associated with self-rated health among those living alone. While there were no differences in the level of possession of trust by living arrangement (see Table 6.1), it is possible that those who lived with others gained from the trust they felt in neighbors as a result of the dyadic relationship in their own home. In other words, simply by living with others may have made the older individual more likely to engage with neighbors, and so reap the benefit of these trusting relationships through reciprocity and collaboration.

6.3.2 Stress

Three social capital indicators were significant predictors of stress, (see Table 6.3), after controlling for demographic and economic characteristics among older adults living alone or with others. The fit of both models was highly significant in terms of predicting stress, explaining 2% of the total variance for older adults living alone ($R^2 = 0.02$, F(13, 750) = 48.34, $p = < 0.000$) and 1% of the variance for older adults living with others ($R^2 = 0.01$, F(13, 1046) = 60.59, $p < 0.000$). Both trust and interaction were significant predictors of stress level among older adults living alone. Specifically, an increase in trust was associated with a 27% (Odds ratio (OR) = 0.73) decrease in the odds of increased stress level, while an increase in interaction with others over the phone was associated with a 14% (OR = 1.14) increase in odds of increased stress level. In addition, demographic and economic measures (being male or minority) were significantly associated with decreased level of stress among older adults living alone.

Among older adults living with others, cohesion was a significant predictor of stress level. In other words, an increase in cohesion was associated with a 28% (OR = 0.72) decrease in odds of increased stress level. In terms of demographic and economic measures, older adults living with others who were older in age and male experienced a decrease in odds of increased stress level.

In terms of the outcomes for stress, one surprising finding was that interaction (OR = 1.14) was associated with increased stress. This was unexpected, since much of the social network and support literature has reported the positive impact of networks on various dimensions of physical and mental health (White et al. 2009; Lubben and Gironda 2003). It is important to note that interaction measured phone calls with both family and friends. It was not possible to examine these two types of interactions separately; this is a noteworthy point since the dynamic over the phone may differ with family versus friends. Furthermore, this measure did not include neighbors. This brings up an important limitation of this measure for this study. The detrimental impact of this measure on stress may also be due to the fact that interactions over the phone do not provide the benefit that direct fact-to-face interactions do. Ultimately, an important question to ask is whether these interactions over the phone were supportive or burdensome. It is for this reason that quality rather than quantity may be a critical point to consider. In other words, "It is not the quantity but the quality of your relationship that matters" (Pope 2012, para #3). This will be discussed further in the section on future considerations.

Cohesion, a measure of the sense of belonging to the neighborhood, was found to have a strong positive impact (OR = 0.72) on level of stress among older adults living with others. As with trust, which was found to be important for self-rated health only among older adults living with others, it was puzzling why cohesion was only significantly associated with stress among older adults living with others. Again, the explanation may be that by living with someone this may increase the likelihood of interacting with neighbors. It is likely that by interacting with neighbors this may influence the sense of belonging.

6.3.3 ADL and Depressive Symptoms

The results for ADL and depressive symptoms are described next; and as stated above, results can be requested from the corresponding author. The fit of both models (viz., for living alone and living with others) for ADL were highly significant, predicting 10% of the total variance for older adults living alone ($R^2 = 0.10$, F(13, 767) = 52.58, $p < 0.000$) and 9% of the variance for older adults living with others ($R^2 = 0.09$, F(13, 1062) = 60.07, $p < 0.000$). In terms of social capital, interaction was significantly associated with ADL only among older adults living alone. However, the odds ratio for interaction was 0 ($p = 0.05$); therefore, the impact of interaction on ADL was negligible and therefore difficult to interpret. In addition, being older, female and poor were significantly associated with increased likelihood of increased ADL. Despite a highly significant model fit for ADL among older adults living

with others, none of the predictors (demographic, economic or social capital) were significantly associated.

The overall model fit for depressive symptoms was significant only for older adults living with others ($R^2 = 0.04$, F(13, 1013) = 47.50, $p < 0.000$). In this model support was significantly associated with depressive symptoms. Specifically, support was associated with a 19% ((OR) = 0.81) decrease in odds of an increased number of depressive symptoms. On the other hand, being poor and widowed increased the odds of an increased number of depressive symptoms. The model for depressive symptoms among older adults living alone could not be interpreted, since the overall fit for the model was non-significant. Finally, none of the social capital indicators for IADL were significantly associated for older adults living alone or with others.

The role of social capital in terms of ADL and depressive symptoms was less striking. As described above, the impact of interaction on ADL among older adults living alone could not be interpreted since the odds ratio was 0. A significant association, yet un-interpretable impact, could suggest that through intervention, social capital could be an avenue for improving ADL, if interaction is channeled appropriately. This is discussed further below in the section on implications of findings. In terms of depressive symptoms, high support was significantly associated with a reduction of these symptoms among older adults living with others. Support, a measure of how likely people in the neighborhood are willing to help neighbors with routine activities, could be described as reflecting instrumental support. No social capital indicators were associated with depressive symptoms among older adults living alone. Indeed the model fit was not significant. It is possible that this may be because the sample size ($N = 713$) was too small.

IADL was the only health outcome for which none of the social capital indicators were significantly associated, by either living arrangement. Research examining the association between social capital and functional limitations in general is mixed. Some studies on ADL and IADL have been inconclusive (Bowling and Stafford 2007; Nyqvist et al. 2006; Seeman et al. 1996), while others have found significant associations (Imamura et al. 2012; James et al. 2011). In this study, it is puzzling that no significant associations were found for IADL, especially among older adults living with others. This is surprising because, as argued previously in this paper, the mere fact of living with someone may increase the likelihood of interacting with ones neighbors. Hence, it would be fair to assume that at least the social capital indicator, support, (which was significantly higher among those living with others compared to those living alone) would have a positive impact on IADL for this group of older adults.

6.3.4 Study Limitations

There are numerous limitations that should be considered when interpreting these findings. First and most importantly, the dataset for this study was cross-sectional. This means that no definitive statements can be made about the direction of association between social capital and health. It is possible, and very likely, that there are

bi-directional associations between social capital and health, as has been reported in recent studies (Sirven and Debrand 2012). It is also important to consider how the social capital questions were formulated; in some questions in this study, it was hard to decipher exactly what they were measuring. For example, the indicator interaction was difficult to interpret because a high number of interactions may be less important than few but supportive ones. Interaction measured number of phone interactions with friends and relatives; it did not include neighbors specifically. This is another important consideration when interpreting the findings for this dimension of social capital.

Finally, the sample of older adults examined in this study came from both urban and suburban neighborhood settings. The combination of these two types of dwellings should ideally have been examined separately, since the association between social capital and health by living arrangements may play out differently depending on the degree of urbanization (Norstrand and Xu 2012). In this study the elders were examined as a single group in order to ensure a sufficient sample size.

6.3.5 Implications of Findings

The findings of this study suggest that the possession of various indicators of social capital in general does not differ by living arrangements, except for support. Thus, whether the older adult lives alone or with others, this individual is likely to report similar levels of trust, cohesion, interaction and participation. However, older adults living alone reported significantly lower levels of support. It is important to acknowledge that the indicators of social capital in this study were based on individuals' self-report or perception, and were not objective measures. Yet, it is considered reasonable to assume that these measures of social capital reflect an accurate perception of reality. Indeed the literature continues to use Birren and Remner's (1980) argument that mentally healthy people have an accurate perception of reality (Cavanaugh and Blanchard-Fields 2011). Assuming the reported levels of social capital reflect reality, these findings suggest interventions aimed at older adults living alone should focus on augmenting support provided by neighbors. Although support was not associated with any health outcomes among older adults living alone, it is possible that by increasing the support provided to elders living alone, this could lead to increases among other indicators of social capital, such as participation, trust and interaction. Participation and trust were found to be positively associated with better health outcomes. Interaction, on the other hand, was negatively associated; in other words, an increase in interaction was associated with worse health. This highlights the need to ensure that interventions aimed at increasing social capital must be done in a manner that ensures such an increase does indeed lead to positive outcomes.

The findings of this study also suggest that associations between various dimensions of social capital and health differ by living arrangements. These findings emphasize the need for targeted interventions that take into account whether the older adult lives alone or with others. Overall, interventions targeted at persons living

alone may want to ensure greater opportunity for participation in organizations and building trusting relationships with surrounding neighbors. Both of these indicators of social capital were associated with good health outcomes for elders living alone. Interventions targeted at persons living with others should also focus on developing trusting relationships, as well as support and cohesion since all three of these indicators of social capital were associated with good health outcomes for this group of older adults. All of these social capital indicators seem to point towards ensuring positive and helpful interactions between neighbors. This could be established by arranging events that bring neighbors together, such as block parties, leaf sweeping or snow clearing. Also, one could arrange for a set-up whereby a group of people on the same street as the frail elder agree to provide support when needed.

The social capital indicator – interaction – was found to have detrimental impact on stress. It is possible that interactions over the phone were perceived as burdensome and unwanted. Instead of minimizing this dimension of social capital, it may be better from a health intervention perspective to focus on developing techniques which ensure these interactions provide more positive instrumental and emotional support, which the literature has found to be beneficial for health (Groenou and Tilburg 1997).

According to this study, social capital may be important for the health and well-being of older adults living alone as well as living with others. Investing in interventions, whether medical and/or social, may strengthen the health of older adults in the community and is of vital importance in view of the continued growth in the numbers of older persons aging in place. Social capital presents as one possible way of improving the quality of life of older persons in our communities. This study has provided a detailed analysis of the nature of the relationship between various indicators of social capital with both physical and mental health, and what this may mean for using social capital as a tool to maximize the health of community dwelling older persons (taking into account living arrangement).

6.3.6 Considerations for Future Research

Future research needs to develop questions that better measure social capital in the neighborhood. Harpham has suggested using measures based on observations made in the neighborhood (2008). Some ideas include, the number of bikes left unlocked on the street; proportion of windows in the neighborhood protected by metal bars; number of voluntary organizations in the neighborhood; and whether an addressed stamped letter, left on the sidewalk, gets mailed. Another area to consider for future research, especially using qualitative research, is to gain a clear understanding of how the social environment is perceived by the older person. Older persons should be asked what the neighborhood means to them, and what aspects of neighborhoods they consider to be important (also see Chap. 7). Too often, as in this study, the results are difficult to interpret. It is possible that the lack of interpretability of some of the measures may explain the inconclusive findings. Also, we need a better

understanding of what constitutes neighborhood in geographical terms. Do older persons think of their neighborhoods as consisting of several streets? Or do they think of their neighborhood in terms of the size of a town or a city?

This study suggests that various indicators of social capital are beneficial for health, viz. support, trust, cohesion and participation. The next step now is to develop interventions that truly can target these aspects of neighborhood life. We still do not have an adequate understanding of how one can, for example, build trust. Future research needs to test various approaches to building these dimensions of social capital that are well suited to the target population. Also in the future, intervention studies should use random assignment in order to test whether augmenting social capital does benefit the health of older adults living alone as well as those living with others. Consideration should also be given to the *pre-conditions* necessary for building social capital: For example, whether residents are positively minded towards neighborhood collaboration. Knowledge about the historic and political characteristics of the neighborhood might be important to know as they may either assist or block social capital building. Finally, more research using path analysis needs to be done in order to get a better understanding of the pathways that link social capital and health. This might provide a fuller picture of the role individual demographic and economic characteristics of the older person play in this association. For example, it is possible that gender and education may be important characteristics to consider. Gender differences in terms of the possession and use of social capital have been reported (Norris and Englehart 2003). Furthermore, a study conducted by the first author looking at social capital and health among older Chinese found that education might be important for using social capital (Norstrand and Xu 2012). A clearer understanding of the linkages between social capital and health may make it possible to ensure developing interventions that truly meet the unique characteristics of the individual.

6.4 Conclusions

The findings of this study are based on a sample of older adults living in five urban and suburban counties of southeastern Pennsylvania (Bucks, Chester, Delaware, Montgomery and Philadelphia). The sample of older persons may be considered a fair representation of older persons living in both urban and suburban settings. The findings support previous research that has found significant associations between social capital and health. In the study presented in this chapter, the role of living arrangement was examined, and the results highlight the fact that whether the older person lives alone or lives with others, the social capital profile does not differ, with one exception. Support was reported to be higher among older adults living with others. The results also highlight the need to account for living arrangement when examining the relationship between social capital and health, as these associations did differ by living arrangements. Therefore, this suggests that when developing interventions that use social capital as a tool for augmenting health, the living arrangements of the individual should be taken into account.

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