

## **Chapter 1**

### **Introduction**

#### **Overview**

The linkages between social resources and physical and psychological well-being among older adults have been examined in numerous studies. In fact, researchers have viewed social resources as critical to well-being (Antonucci, 1990; George, 1996; Pinqart & Sörensen, 2000). Despite a great deal of research, empirical findings regarding their influences, to a great extent, remain inconclusive. In particular, Krause (1986) as well as others (Larson, 1974; Wood and Robertson, 1978) reported enhanced psychological functioning with increased support from others. Fagerström and her colleagues (2007) found a positive relationship of unsatisfactory social contacts with less reported satisfaction. In addition, Greenglass, Fiksenbaum, Eaton (2006) observed that social support was positively correlated with proactive coping and was inversely related to depression and functional disability.

Conversely, little or no effect of social contacts at all has been noted by other researchers (Cohen & Sokolovsky, 1980; Lee & Ellithorpe, 1982). More recently, Young (2006) reported findings that the effect of support on life satisfaction varied by source. In particular, family support family did not lead to higher levels of life satisfaction. In a

similar vein, Reinhardt, Boerner, and Horowitz (2006) that after controlling for the positive effect of perceived support, receiving instrumental support had a negative effect, while receiving affective support had a positive effect on well-being. Lyyra, T.M. & Heikkinen, R.L. (2006) divided perceived social support into assistance-related and non-assistance-related support. The mortality risk for those in the lowest non-assistance-related social support group was almost 2.5 times higher in women in the lowest tertile than in women in the highest tertile. Among men, perceived social support was not significant. In a study involving church-based support, Krause (2006) found that providing social support to other church members reduced the effects of the provider's financial problems while receiving support from other church members did not.

There are at least three potential reasons for these conflicting results. One reason may simply result from the multidimensional natures of both social resources and psychological well-being. Specifically, the relationship may vary based on the type of social resource (number of social interactions, type of support received, negative interactions, etc.) and the type domain of well-being (depression, life satisfaction, etc.). An additional explanation lies in the specific context in which these domains operate. Living arrangements figure prominently in this respect. In particular, the hypothesized underlying models of the relationship between social resources and well-being may not operate in the same manner for those living alone and those residing with others.

Finally, even wider elements of the social context may play a key role in understanding the linkage between social resources and well-being. In particular, past research has drawn heavily from a sociomedical perspective of health which posits that social structure, consisting of sociocultural system, social status, and relationships, is

hypothesized to influence health via (a) the exposure to health-promoting or pathogenic circumstances, (b) the individual's ability to resist the exposure of risk factors, and (c) access to health care (Kaplan, 1989). House and his associates (1994) extend this theory by proposing that social stratification of health and aging is produced by social and biological mechanisms influencing both the exposure to, and consequences of a set of psychosocial variables, including stress, social relations, health behavior, and sense of control. Stress and social relations are affected by age, gender, and socioeconomic status (SES), while health status is affected by age, gender, SES, stress, and social relations (George, 1996; House et al., 1994).

The goal of this dissertation is to improve the understanding of the relationship between social resources and well-being among older adults by examining the relationship between multiple dimensions of social relations on a variety of measures of well-being. Applicability of these models will be tested by examining the role that living alone plays in the relationships between these domains. Finally, based on the sociomedical perspective of health outlined above, the impact of social class and status will be evaluated via a closer examination of income, education, and gender.

The basic hypothesis is that poor psychological or physical well-being can be partially offset by social resources. However, this process depends on the wider social context and may evidence itself quite differently for individuals living alone versus those residing with others based on differences in social class and status (i.e., age, gender, and education).

## **Methods**

In the following section, the research format and the data set employed in these studies will be introduced. An overview of sampling issues as well as the rationale for the choice of dataset will be offered. Finally, a description of the measures included in the analyses will be presented.

### Format

The analyses of the dissertation will be presented in three papers. This option, which requires the completion of three publishable papers, provides an ideal mechanism for this particular study. Most importantly, the examination of the research problem outlined above naturally breaks into three major areas. Specifically, due to the number of domains of social resources and well-being under examination, the first paper proposes to address the goals of the research from a cross-sectional perspective. Building on the findings from these initial results, the second paper examines these relationships over time using two waves of data. The insights gleaned from both the cross-sectional and longitudinal portions of the research will then be examined in the third paper by focusing on the interaction of social class and status on these models, i.e. gender, income, and education.

### Data

The data will come from an NIA funded (Neal Krause, PI) three wave probability sample of noninstitutionalized English-speaking elderly household residents, who were 65 years of age and older at wave 1, retired, and living in the coterminous United States. Wave 1 interviews were conducted by Louis Harris and Associates in October 1992

through February 1993. A total of 1,103 interviews were successfully completed, reflecting a response rate of 69.1 percent. In 1996 (wave 2), 605 subjects were re-interviewed successfully. In 1998 (wave 3), 529 interviews were completed. Not counting 173 and 249 deaths at waves 2 and 3 respectively, this represents attrition rates of 35% and 38%. During the process of completing the dissertation, follow-up interviews for 269 individuals in 2003 became available.

This dataset has been chosen for three reasons. First, virtually no other data set contains such a rich source of measures of social resources and well-being in the American elderly. The richness of the data is reflected by its inclusion of multiple measures of each domain that are available for inclusion in the analyses. Further, each domain itself is measured by multiple indicators. This will allow a more flexible and thorough modeling of the relations between the key concepts under study. Finally, sufficient numbers of individuals living alone are available at each wave to undertake the analyses. Specifically, at wave 1 there were 345 individuals who identified themselves as living alone and 757 who indicated they resided with others. At waves 2 and 3, the number of those living alone decreased to 229 and 205, respectively.

### Measures

As noted above, multiple measures of social resources and well being are initially proposed as key components of the models. These measures include: (a) social contact with kin, (b) social contact with friends, (c) anticipated support, (d) emotional support provided and received, and (e) negative interaction (Krause, 1995b; Liang, Krause, and Bennett, 2001).

In the current proposal well-being will be assessed via measures of physical health as well as psychological well-being. Three measures of physical health will be included: (a) health conditions/diseases, (b) functional status, and (c) self-reported ill health (Liang, 1986). Health conditions/diseases will be examined in terms of total number of diseases as well as looking at serious or life-threatening diseases and chronic diseases separately (Ferraro and Farmer, 1999).

Two measures of mental health (psychological well-being) will be evaluated: depression and life satisfaction. Specifically, two domains of the CES-D, somatic symptoms and depressive symptoms will be examined separately (Radloff, L.S. (1977). Life satisfaction will be assessed via three items from the LSIA scale (Neugarten, Havighurst, and Tobin, 1961) and one global indicator of overall life satisfaction.

In addition, the heterogeneity of the sample will be controlled for in the first two papers by the inclusion of measures of age, gender, education, and income. Measures of gender, education, and income are also available for use in the third paper described above.

### **Analysis Strategies/Issues**

The analysis strategies and issues will be discussed in the following section. More specifically, the issue of missing data will be presented along with my chosen method of resolution. Then the types of data analyses included in the dissertation will be introduced.

#### Missing Data

In any longitudinal sample, serious problems can arise due to item-missing data at each wave. Historically, this has been a serious problem for measures of income, thus limiting the inclusion of income in subsequent data analyses. Missing data may also result due to dropouts in interim waves. These two types of missing data can seriously reduce the effective sample sizes of data analyses, resulting in a decrease in power. Both of these concerns will be addressed using the Multiple Imputation program developed by Joe Schaefer at Penn State.

Multiple imputation involves a regression-based approach and a data augmentation algorithm that incorporates random variation (Rubin, 1987). In particular, several (e.g., five) complete data sets are imputed and analyses are then run on each of these five data sets. Subsequently, estimates are averaged across the five imputations to generate a single point-estimate. Standard errors are then calculated using a formula that combines the average of the squared errors of the estimates and the variance of the parameter estimates across the five samples (Schafer, 1997; Schafer & Olsen, 1998).

### Data Analyses

A variety of techniques and strategies may be employed. In paper one, this involves evaluation of separate models for those living alone and those residing with others using structural equation modeling. Structural equation modeling will facilitate the examination of causal models involving the interrelationships among the separate social relation domains and well-being and the calculation of direct, indirect, and total effects. The interaction of living alone could be examined via the estimation of separate models and the imposing of various levels of equivalence constraints on the estimates. Paper two employs hierarchical regression analyses (Ordinary Least Squares) using interaction

terms for living alone by several social relation dimensions over a three year period.

Finally, paper three utilizes Hierarchical Linear Modeling (Raudenbush & Bryk, 2002) to examine the relationship of living alone by social structure on life satisfaction.

### **Preliminary Analyses**

To test the feasibility of the research plan, preliminary analyses were undertaken using hierarchical regressions on a portion of the wave 1 data only. Separate models were run for those living alone and those residing with others. Initial results tend to support the differential impact of social relations on well-being for those elderly living alone versus those who reside with others. In addition, specific domains of social relations evidence different effects depending on the well-being domain in question. Some notable findings are highlighted below.

#### Physical Health/Well-Being

In terms of functional disability, both contact with kin and contact with friends are significantly associated with lower levels of disability for those who live alone but not for those who reside with others. The same is true for contact with kin and total number of health conditions/diseases. In addition, being female is associated with lower levels of functional disability for those who live alone but not for those residing with others, while higher levels of education and income are related to lower disability for both groups. Improvement in self-rated ill health is related to higher education, being male, and greater anticipated support for those who reside with others but only anticipated support is associated with better health for those who live alone.



## Psychological Well-Being

Fewer depressive symptoms are related to higher education for those who live with others only. Conversely, higher anticipated support is linked with fewer depressive symptoms for those who live alone. For those who reside with others, fewer somatic symptoms are associated with more education and contact with friends, while contact with kin is significantly related to fewer somatic symptoms.

Finally, the differences regarding life satisfaction are also pronounced. For those residing with others, contact with friends and anticipated support are significantly related to greater satisfaction. However, for those living alone, higher income and anticipated support are associated with increased satisfaction, while higher education is related to lower reported life satisfaction.

### **Summary**

The preceding introduction to the following research outlines a brief and hopefully compelling rationale for the analyses undertaken in Chapters 2 through 4. In addition, the highlights from the preliminary analyses certainly point out that this line of research undertaken in this project is headed in the right direction.

## **Chapter 2**

### **Social Resources and Well-being in the Elderly: Are the Relationships the Same for Those Living Alone and Living with Others?**

#### **Introduction**

The linkages between social resources and physical and psychological well-being among older adults have been examined in numerous studies. In fact researchers have viewed social resources as critical to well-being (Antonucci, 1990; George, 1996), leading to the examination of the linkages between social resources and well-being among older adults in numerous studies with samples ranging from elderly living in single resident occupancy units (Cohen & Sokolovsky, 1980) to national probability samples (Liang, Krause, & Bennett, 2001).

Despite this wealth of research, empirical findings on the support and well-being relationship remain somewhat inconclusive. In particular, Krause (1986) as well as others (Larson, 1974; Wood and Robertson, 1978) reported enhanced psychological functioning with increased support from others. In a similar vein, Fagerström and her colleagues (2007) found a positive relationship of disappointing social contacts with less reported satisfaction. Conversely, little or no effect at all has been noted (Cohen & Sokolovsky, 1980; Lee & Ellithorpe, 1982), while some investigators have even shown that more support is associated with increases in distress (Barrera, 1981; Newsom & Schulz, 1998).

More recently, Young (2006) reported that the effect of support on life satisfaction varied by source. In particular, family support did not lead to increased life satisfaction. More recently, Young (2006) reported findings that the effect of support on life satisfaction varied by source. In particular, family support family did not lead to higher levels of life satisfaction. In a similar vein, Reinhardt, Boerner, and Horowitz (2006) that after controlling for the positive effect of perceived support, receiving instrumental support had a negative effect, while receiving affective support had a positive effect on well-being.

This proposed research addresses two potential reasons for these conflicting results. First, these equivocal findings may simply result from the multidimensional nature of both social resources and psychological well-being. In other words, the relationship may vary based on the type of social resource (social contacts, type of support received and provided, negative interactions, and anticipated support) and the domain of well-being (e.g., self-reported ill health, depression, life satisfaction, etc.) under study. A second explanation lies in the specific context in which these domains operate. Living arrangements figure prominently in this respect. In particular, the hypothesized underlying models of the relationship between social resources and well-being may not operate in the same manner for those living alone and those residing with others.

The remainder of the introduction will provide a rationale for the inclusion of living alone as a key type of social context and on key theoretical issues involving the multidimensional aspects of well-being and social support. Next, model specifications will be delineated and specific hypotheses presented. The data will then be presented

along with specific analytical issues involved in the paper. Finally, the results of the data analyses will be outlined followed by a discussion of the overall findings.

### Living Alone

Why is the concept of living alone a useful social context in which to study the relationships between social resources and well-being? According to the U.S. Census Bureau (Fields & Casper, 2001), the percentages of adults aged 65 or older who lived alone in 2000 were 17.0% for men and 39.6% for women. More specifically, among adults aged 65 to 74 years, 13.8% of men and 30.6% of women lived alone. At age 75 and older, these percentages increase to 21.4% and 49.4% for men and women, respectively. Based on the relatively large percentages noted above, living alone is clearly an integral part of living arrangement that deserves examination when studying social resources and well-being among the elderly. For example, social support, as a measure of the family's social environment is generally viewed as higher within the context of co-residence (Hughes & Waite, 2002). Given the link between social support and health, living with others has been associated with improved health (e.g., Antonucci 1990; Umberson, 1992; House, Umberson, & Landis, 1988; Lewis, Rook & Schwarzer, 1994).

A majority of the research in this area has focused on the strong effect of marital status on health. However, Hughes and Waite (2002) found a significant relationship between living arrangements and health two years later, independent of the effects of marital status. The lack of research that involves unmarried older adults is further exacerbated by problems in specifying the components and structure of social support as outlined above. Further, the underlying mechanism presumably involved in the

salubrious effects of being married is related to having a co-resident who can be a constant and immediate source of support. This overlooks the possibility that older people may not be married but nevertheless live with other individuals. So if the real underlying factor is some sort of residential isolation, then focusing on those who live alone may more accurately capture this factor. Toward this aim, understanding the linkages between social support and well-being within the context of living alone represents a necessary and unique area of research to be undertaken.

Exactly how might the effects of living alone manifest themselves with the framework of the relationships between social relations and well-being? First, people who live alone are somewhat restricted in their immediate physical availability of persons to turn to in times of need, as can be case with physical health problems. They can also be limited in the day-to-day availability of individuals with whom they can share confidences as well as concerns. Due to this limitation of availability of daily contacts, contacts provided by phone and letters may prove more critical for those living alone than for those residing with others. Frequently, those who live alone are solely responsible for overseeing their domicile expenses and upkeep. While some elderly living alone may be better off financially to handle their expenses and residence upkeep, the burden of arranging for present and future expenses and upkeep still falls on them. This potential burden may inhibit providing support to others by limiting the amount of money, goods, or other assistance available to exchange.

Expanding on the idea of limited availability of daily contacts with others, living alone may also be viewed as an indicator of social isolation or at least makes isolation more likely. Social isolation has been associated with poorer physical and psychological

well-being in the past. In addition, the role of social isolation in the aged has also been associated with increased risk of death (Seeman et. al, 1993; Sugisawa, Liang, and Liu, 1994).

Along with the limitations mentioned above, it should also be noted that living alone may have a positive effect on well-being by fostering an increased sense of independence. Wister (1990), in his research on living arrangements and informal support, reported that subjects who chose to live alone appeared, to some extent, to sacrifice some degree of mutual exchange for their privacy and independence. In turn they relied on friendship more than those living with others.

In addition to the issues outlined above that are inherent in living alone there are two related questions that need to be examined. Why might individuals who reside with others be advantaged in terms of social support in a way that does not evidence itself in typical measures assessing quantity of support exchanges? Further, how would this advantage express itself?

Bolger, Zuckerman, and Kessler (2000) raised the notion of invisible support as one way this advantage occurs without the individual's awareness that it has occurred. One example of invisible support includes supportive acts that are undertaken without the recipient's awareness (e.g., unexpected housework, car repairs, errands, etc.). Conversely, invisible support can occur with the recipient's knowledge of the acts, but without the recipient coding it as support (e.g., indirect advice given without focusing attention on the recipient's level of or inability to handle the stress). This type of invisible support would in turn buffer the effects of stress but also avoid any negative costs to self-esteem or self-efficacy that often results when a recipient is aware that he or

she is receiving support.

In essence, those who live with others can often be advantaged by receiving support from the individual(s) with whom they reside without even asking for it. In fact, this support may actually be invisible, and subsequently escape typical measurement tools. So those who live alone are less likely to have their social support needs recognized by others. Instead more overt requests for assistance must be made that may be potentially damaging to self-esteem, self efficacy, and ultimately, well-being (Eckenrode & Wethington, 1990). In fact, some older adults will rely on support only when their health declines, which further complicates an examination of change over time in relationships among support, well-being , and disability. In addition, Eckenrode and Wethington (1990) note that the psychological costs to the individual requesting support may include feelings of vulnerability, weakness, or failure.

### Well-Being

The assessment of well-being plays a critical role in assessing outcomes from intervention studies. The concept of well-being encompasses many domains. Often researchers rely on only measures of physical or mental health to assess well-being. However, according to the World Health Organization, health is a state of complete physical, mental, and social well-being (WHO, 1958). The problem is that researchers using this broad definition of health must operationalize it in more specific terms.

In the past, there has been considerable disagreement in the literature over how to conceptualize and measure physical health status in survey research (Liang, 1986). Researchers typically rely on one or more of the following approaches to measure physical health: a single item assessing global health status, summary scores reflecting

the number of chronic conditions, and scales that measure functional limitations. Even though multiple measures may be used in the sample study, investigators often fail to examine the interrelationships among these various health constructs.

Liang (1986) used chronic conditions, functional status, and self-rated ill health to represent the physical, social, and psychological dimensions of health, as defined by the World Health Organization (1958). He suggests the interrelations among these constructs may reflect an underlying process whereby older adults come to define themselves as ill.

Similarly, psychological well-being comprises many domains. In a discussion of the basic structure of psychological well-being, Ryff (1989) notes that research on psychological well-being routinely focuses on the distinction between positive and negative affect and life satisfaction. More important, she stresses the findings that positive and negative affect are distinct independent concepts and not opposite ends of the spectrum.

Ryff (1989) notes a general neglect in theory behind the development of many measures of life satisfaction and morale. However, she points out while the study of psychological well-being was not originally grounded strongly in theory, the structure of many measures has been widely studied. In particular, two frequently used measures of psychological well-being, the Life Satisfaction Index (LSI) and the Center for Epidemiologic Depression Scale (CES-D) are often used to measure positive and negative well-being, respectively. Further, both the LSI (Neugarten, Havighurst, and Tobin, 1966) and the CESD scale (Radloff, 1977) have been widely used and their structure examined and tested in older populations by numerous investigators (Liang, 1984; 1985; Stock, Okun, and Benin, 1986; Krause, Bennett, Van Tran, 1989; Krause and



Liang, 1992).

### Social Resources/Support

Social support has been defined by Cobb (1976) as information leading a person to believe that he or she is loved, esteemed, and that he or she is part of a network involving mutual obligation. However this definition is incomplete. While there are many measures available, Barerra (1986) proposed that social support be conceptualized as consisting of three domains: social embeddedness, enacted support, and perceived support. Social embeddedness comprises the connections that individuals have with their significant others and their social environment. Examples of social embeddedness include marital status, participation in organizations or groups, contacts with friends. Enacted support refers to the actual transfer of assistance (advice, aid, and affect) through interpersonal networks. Finally, perceived support deals with the perception of resource availability and adequacy in the case of need. For example, perceived support involves the subjective evaluations of transactions that might take place in the future (i.e., anticipated support) and satisfaction with support.

There is some evidence that perceived support is more important than actual social exchange in influencing psychological well-being and that the effects of received support are mediated by perceived support (Wethington & Kessler, 1986). In fact, recent analyses by Krause (1997) reported significant findings indicating that the negative effects of financial stress were buffered by anticipated support, but not by enacted support.

Attention has also been given to the negative as well as the positive side of social relations (Rook, 1997). Negative relations, marked by tension or dispute, cause

significant others to become critical, demanding, and burdensome. In fact, Rook's (1990a) review of the literature suggested that negative exchanges show stronger or more reliable associations with decreases in well-being than do positive social exchanges on increases in well-being. Ingersoll-Dayton, Morgan, and Antonucci (1997) showed that positive and negative social exchanges are respectively associated with increased positive and negative affects.

### Social Support and Well-Being

Why does social support affect health and well-being? A useful framework to examine this question is within the stress and well-being literature where researchers have addressed the role of social support and its affect on well-being by focusing on several mechanisms including: (a) control, (b) esteem, (c) the stress-buffering hypothesis, (d) immune functioning, (e) health behaviors, and (f) companionship. In the remainder of this section, each of these mechanisms will be briefly described.

Control. The concept of personal control has been represented in the literature in several ways. At a fundamental level, control refers to a generalized belief about one's ability to control events in their life. These beliefs are posited to directly affect the individuals ability to adapt or cope to the effects of stress on their physical or psychological well-being. Social support is hypothesized to buffer the effects of stress by increasing one's sense of personal control. An example of how this increase in control may be accomplished would be that belief in the future availability of support may allow an individual to feel more confident in their ability to control the situation because a safety net is available in a worst case scenario.

Self-Esteem. Self-esteem refers to an individual's overall feelings of self-worth.

In the advent of a stressful situation (e.g., divorce, job loss) one's self-esteem may become diminished. Social support is hypothesized to buffer these effects by increasing one's lowered feelings of self-esteem. This could be accomplished in a variety of ways. For example, anticipated support from one's social network may also enhance one's sense of being appreciated and loved thus increasing feelings of self-worth.

Stress-buffering hypothesis. The stress-buffering hypothesis maintains that the deleterious effects of stress on an individual's well-being can be offset by increased social support (Wheaton, 1985). However, Krause (1995a) points out that while the prevailing view regarding the stress-buffering effects of support is that support always reduces stress and more support is always more beneficial, the actual process is much more complex. In an article assessing the stress-buffering effects of support, Krause (1995b) points out three ways where this complexity may arise: (a) not all stress is bad and some may actually foster personal growth; (b) not all types of support may actually be effective in buffering the effects of stress; (c) and for those types that do buffer the effects of stress, the effects may differ substantially at various levels of support.

Immune functioning. One body of research focuses on the impact of stressors on the immune system and the resulting link between these immune system changes and disease susceptibility and progression (Kielcolt-Glaser & Glaser, 1995; Cohen, Tyrrell, & Smith, 1991). This area of research proposes that a strong support system may help reduce the influences of stress on immune functioning, thus resulting in improved health outcomes or longer survival.

Health behavior. During times of stress, individuals may try to reduce their tension or anxiety through the use of alcohol or drugs. Having access to support from

others during this stressful time may offset this need to pursue such an stress reduction avenue (Lisman, 1987). In addition, members of a social network may also serve as a role model for an individual during stressful times or may actually apply pressure on that individual to conform to certain social norms (Rook, et al., 1990b).

Companionship. One aspect of an older adults' social relationships that has been receiving greater attention is companionship. Companionship in this definition denotes a type of relationship rather than support. The effect that companionship has on the well-being of an older individual would be in the context of a person's everyday activities and plans rather than in the more specialized context of efforts to cope with stressful life events (Rook, 1990c; Rook & Ituarte, 1999).

### Summary

Given that the findings related to social relations and well-being are not totally uniform, there still remains an overall consensus that social relationships promote physical health and well-being (House, Landis, & Umberson, 1988). Noting this consensus, Rook (1997) further highlights the more recent focus on the negative side of social relations. In other words, while social support promotes well-being, it can also be a strain (Krause, 1995a). Again, although not completely convergent, the majority of studies investigating both positive and negative social relations have found that negative social relations have stronger effects on the well-being of the elderly than do positive relations (Rook, 1990a). In summary, while positive social relations appear to be important contributors to the health and well-being of the elderly, when both positive and negative relations are examined, negative relations often seem to have a more consequential negative effect on well-being (Rook, 1997).

In a key article that empirically addresses these conflicting views, Ingersoll-Dayton, Morgan, and Antonucci (1997) focus on the independent domains of positive and negative social exchanges, positive and negative domains of well-being using the Bradburn Affective Balance Scale (ABS) (Bradburn, 1969), and the impact of life events (e.g., illness, loss of spouse). Their findings indicate that positive and negative social exchanges are respectively associated with increased positive and negative affects. In addition, the presence of more life events increases the magnitude of the relationship between negative interactions and negative affect.

While certainly providing substantial information regarding the effects of positive and negative relations on well-being, two limitations from those noted by Ingersoll-Dayton and her colleagues (1997) are particularly important. First, only the Bradburn ABS was used as an outcome, therefore generalizability beyond the ABS needs to be determined. Second, positive relations were measured at the dyad level while negative relations were assessed at the network-level. Parallel measures should be assessed to further replicate their findings.

The current research is innovative in that it employs a truly unique dataset to address two of the concerns outlined above and thus further the understanding of the effects of social relations on well-being in the elderly. The dataset includes multiple measures of each domain of social relations and well-being with each domain itself is measured by multiple indicators. First, relationships among multiple domains of social relations on multiple domains of physical and emotional well-being will be assessed drawing heavily on previous work by Liang, Krause, and Bennett (2001). Second, social relations will be assessed at a network level instead of a mixture of dyad and network

levels. Such a comprehensive analysis is critical to our understanding of social relations and well-being and will move the current literature forward.

### **Model Specification**

Given the number of important domains of social resources/support identified in the literature, a key concern is how we conceptualize and model the interrelationships among the domains. To address this concern, with the addition of social contact with family and friends, the current paper's conceptual model builds on Liang, Krause, and Bennett's (2001) basic modeling of social support and its effect on depression.

#### Key Components

The central assumption of Liang, Krause, and Bennett (2001) is that the effects of social exchanges must be examined within the total context of social support. Specifically, the effects of support received and given on well-being are not simple or direct and in fact are mediated by other key dimensions of social support such as anticipated support and negative interaction. For example, having received financial or emotional support in a year may not directly affect well-being for that individual a year later. However, having received support a year ago may increase the individual's belief that support will be available in the future once again if needed. It is this higher level of anticipated support that is related to higher reported levels of well-being.

At a multivariate level, Liang, Krause, and Bennett (2001) found that support received and given were positively correlated and in turn are both directly and positively related to anticipated support. However, when support received and given were simultaneously included as predictors of negative interaction, they exhibited differential

effects. Specifically, receiving support is associated with reduced levels of negative interaction, while giving support is linked to increased negative interaction. In addition to its direct effect, Liang, Krause, and Bennett (2001) found that receiving support had a small indirect effect on anticipated support, resulting in a significant total effect. Conversely, support given decreased anticipated support indirectly through its positive effect on negative interaction, thus largely offsetting the positive direct effect of support given on negative interaction, resulting in a non-significant total effect.

Liang, Krause, and Bennett's (2001) findings thus provide support for their hypotheses that various dimensions of social support influence well-being directly as well as indirectly. In particular, while receiving support increases distress directly, it also indirectly reduces depressive symptoms through anticipated support. In spite of the significant indirect effect, support received still significantly increased depression at the total effect level. Providing support did not directly affect depressive symptoms, but did indirectly reduce distress through its association with negative interaction. However, providing support did not evidence a statistically significant total effect on depressive symptoms. Negative interaction is directly associated with increased distress as well as linked indirectly through its negative relationship with anticipated support. This results in a fairly substantial deleterious total effect on well-being. Finally, anticipated support directly reduced distress. In summary, receiving support had a modest total effect on depressive symptoms while support given did not. In addition, the total impact of negative interaction and anticipated support on depressive symptoms was greater.

In broad terms, the conceptual model proposed in the current paper specifies that well-being is directly affected by social embeddedness, enacted support, and perceived

support. In addition, social embeddedness and enacted support indirectly impact on well-being through perceived support. Therefore, it is crucial to take negative interaction and anticipated support into account when studying the relationships between social resources and well-being. However the process by which social embeddedness, enacted support, and perceived support impact on well-being is proposed to be different for those living alone as contrasted with those residing with others.

The analytical issue then becomes, given that the same broad conceptual model applies to those living alone and those residing with others, how will these differences be tested? First, living alone could be explicitly included as an exogenous variable in a structural equation model, and its effect on the various social resources and well-being measures tested. This specification would show whether living alone is related to how much support you get. While this approach may suffice as an initial approach, it is not sufficient to statistically examine the interaction effect of the differences in the model for those living alone and those living with others. It merely addresses the direct and indirect effect of living alone.

Theoretically, this paper proposes that while similar at a broad level, the processes by which social relations affect well-being are different for those living alone when compared to those residing with others. In other words, this specification shows whether the impact of support at comparable levels is differentially related to well-being and it reflects unmeasured factors involved in having to ask for support. In order to better address this issue, subgroup analysis within a structural equation model approach will be employed. Subgroup analysis will allow the comparison of the same model for the two separate groups (living alone and living with others) and statistical examination



of the similarities and differences in the two models. A further discussion of this approach is provided in the data analysis section.

So what are the hypothesized differences in these relationships? In the following section, two separate structural models are proposed to assess the effect of social relations on well-being in order to address this question. A discussion of the structure of each model will be presented first. Next, a series of research questions are offered that explicate specific relationships that are expected to be differentially expressed for those living alone compared to those living with others.

### Proposed Models

Figures 2.1 and 2.2 present the two structural equation models that are proposed to depict the general effects of social resources on physical health and psychological well-being, respectively. The notation used here is consistent with those devised by Jöreskog and Sörbom (1993). Specifically,  $\eta_i$  refers to a latent endogenous variable, and  $\zeta_i$  denotes the residual term representing the effects not explicitly included in the model.

In Figure 2.1, social resources are operationalized using results from previous research (Barerra, 1986; Liang, Krause, & Bennett, 2001). In particular, social embeddedness is reflected by one latent variable, contact with family and friends ( $\eta_1$ ). Further, enacted support is represented by support received ( $\eta_2$ ) and provided ( $\eta_3$ ) and perceived support is measured by negative interaction ( $\eta_4$ ) and anticipated support ( $\eta_5$ ). Finally, positive and negative psychological well-being is reflected by depression and life satisfaction ( $\eta_6$  and  $\eta_7$ ). The central thesis underlying this model is that the consequences of contacts ( $\eta_1$ ) and giving and receiving support ( $\eta_2$  and  $\eta_3$ ) on depression and life satisfaction ( $\eta_6$  and  $\eta_7$ ) are mediated by negative interaction ( $\eta_4$ ) and anticipated social

support ( $\eta_5$ ).

In addition to the endogenous variables specified above, four exogenous latent variables are also included: age ( $\xi_1$ ), sex ( $\xi_2$ ), education ( $\xi_3$ ), and most importantly living alone ( $\xi_4$ ). This specification implies that each of these four latent factors exerts effects on all measures of social relations and well-being.

Turning to Figure 2.2, the structural equation model is the same except that the self-rated ill health ( $\eta_6$ ) replaces depression and life satisfaction ( $\eta_6$  and  $\eta_7$ ). Again the general hypothesis is that the consequences of contacts ( $\eta_1$ ) and giving and receiving support ( $\eta_2$  and  $\eta_3$ ) on self-rated ill health ( $\eta_6$ ) are mediated by negative interaction ( $\eta_4$ ) and anticipated social support ( $\eta_5$ ).

### Research questions

While the models in Figures 2.1 and 2.2 (psychological and physical well-being) included in this paper will be analyzed separately, specific hypotheses for these analyses are presented more globally. There are numerous hypotheses that could be tested within the framework of the proposed models. Three specific key hypotheses reflective of the global research questions under study are presented below. The role of living alone is further explicated using underlines.

1. Higher levels of social contact (visits, phone calls, etc.), support received and given, and anticipated support are hypothesized to be directly associated with lower self-rated reports of ill health and depression but higher reported life satisfaction. Due to reduced opportunities for casual interactions and invisible support, social contacts are hypothesized to play a more significant role for those

living alone than those residing with others.

2. Greater amounts of negative interactions are expected to be directly related to decreased levels of anticipated support, increased levels of self-rated ill health and depression, and decreased life satisfaction. For those living alone, negative interactions are hypothesized to play a lesser role due to reduced daily casual interactions and an increased sense of autonomy.
3. More support provided is hypothesized to be related to increased negative interactions. Sole responsibility for domicile expenses and upkeep for those living alone make providing support to others especially burdensome and stressful. Therefore, the relationship is hypothesized to be more significant for those living alone than those residing with others.

## **Methods**

### Sample

The data for these analyses come from Wave 1 of an NIA funded (Neal Krause, PI) three wave probability sample of noninstitutionalized English-speaking elderly household residents, who were 65 years of age and older at Wave 1, retired, and living in the coterminous United States. Wave 1 interviews were conducted by Louis Harris and Associates (now Harris Interactive) in October 1992 through February 1993. A total of 1,103 interviews were successfully completed, reflecting a response rate of 69.1 percent.

This dataset is unique in that virtually no other data set contains such a rich

source of measures of social resources and well-being in the American elderly. The richness of the data is reflected by its inclusion of multiple measures of each domain that are available for inclusion in the analyses. Further, each domain itself is measured by multiple indicators. This will allow a more flexible and thorough modeling of the relations between the key concepts under study.

Numerous papers focusing on very specific research questions have employed this unique data (Krause 1995a; 1995b; 1997; Liang, Krause, & Bennett, 2001). This paper plans to widen the scope of the measures and to add living arrangement. Sufficient numbers of individuals living alone at Wave 1 were available to undertake the analyses. Specifically, at wave 1 there were 345 individuals who identified themselves as living alone and 757 who indicated they resided with others. Descriptive statistics for selected items are provided in Table 2.1.

Initial descriptive analysis of the data for the 1,103 elderly participants indicated that the portion of cases with missing data on an item ranged from 0% to 4.53%. Although the proportion of missing data for each item was quite small, using listwise deletion of cases would have resulted in only 800 participants (72.5%) with complete data. In an effort to avoid the potential bias associated with item nonresponse, multiple imputation was employed (Schaefer, 1997). Multiple imputation involves a regression-based approach and a data augmentation algorithm that incorporates random variation (Rubin, 1987). More specifically, three complete data sets were imputed and the analyses that follow were then run on each of these three data sets. Subsequently, estimates are averaged across the three imputations to generate a single point-estimate. Standard errors are then calculated using a formula that combines the average of the

squared errors of the estimates and the variance of the parameter estimates across the five samples (Schafer, 1997; Schafer & Olsen, 1998).

### Measures

As noted above, multiple measures of social embeddedness, enacted support and perceived support are initially proposed as key components of the models. In terms of social resources these measures include: (a) social contact with kin and social contact with friends, (b) tangible, emotional, and instrumental support provided and received, (c) anticipated support, and (d) negative interaction. Psychological well-being is measured by depression and life satisfaction while physical health is assessed by self-rated ill health. Specific details regarding the measurement of these domains are presented below.

In general, construction of the social support measures is based on Krause's (1995b) confirmatory second-order factor analyses of support received from and given to others and Liang's analysis of social exchanges (Liang, Krause, & Bennett, 2001). The social contact measures asked about types and frequency of contact with family or with friends. All social support measures, i.e. support received from and given to others, anticipated support and negative interaction are not source-specific. Specifically, each respondent was asked to think about their relationships in the last year and to respond to a series of questions regarding all of types of support described above. In order to best utilize all the rich information in the dataset and at the same time simplify the model estimation, the construction of composite measures are employed to assess social contacts, support received from others, and support provided to others (Liang, Lawrence, Bennett, & Whitelaw, 1990). For the purposes of the current paper, a composite measure is created by summing the scores on the items relevant to that measure.

Social contacts is measured by one latent variable comprising two linear composites separately assessing contacts with kin and contacts with friends. Each composite consists of three 4-point items. Specifically, the composite for contact with kin is assessed by the frequency in a week the subject: (a) went out to visit family, (b) had the family visit them, and (c) had contact by phone or letter with their family (might be most critical type for those living alone). Response categories for all three items are: not at all (1), once or twice (2), three to six times (3), and more than six times (4). Similarly, the composite for contact with friends involved three 4-point items: (a) went out to visit friends, (b) had friends visit them, and (c) had contact by phone or letter with friends. Response categories for the three contact with friends items are: never (1), once in awhile (2), fairly often (3), and very often (4).

Social support received from others during the past year is measured by three composites: (a) tangible support, (b) informational support, and (c) emotional support. Each composite was created by summing the scores on three, four, and four items, respectively. Tangible support comprises help with transportation, help with chores, and help with shopping. Emotional support involves being with a person during stressful times, comforting via physical affection, listening to a person, and expressing interest and concern. Informational support items included suggesting some action, providing information during a difficult situation, help with understanding situations, and explaining what they did in a similar situation. All items described above were coded very often (4), fairly often (3), once in a while (2), and never (1). Given that tangible support involved only three items, its composite ranges from 3 to 12. The composites for informational and emotional support range from 4 to 16. For each composite, a higher

score reflects greater support received.

Social support given to others consists of the same three composites, tangible, informational, and emotional, but this time reflecting support provided by the respondent to others in the past year. These composites are created in the same way as were the composites for support received. Again, higher scores reflect more support given.

Negative interaction comprises four items assessing unpleasant feelings associated with the contact with others during the past year. These items include: (a) too many demands, (b) critical of you, (c) prying into personal affairs, and (d) taking advantage of you. All four items are coded in the following manner: very often (4), fairly often (3), once in a while (2), and never (1). Higher scores reflect greater amounts of negative interaction reported by the respondent.

Anticipated support entails subjective evaluations of transactions that might take place in the future, should it be needed. The four 4-point scale items assessing anticipated support include anticipated support in terms of: (a) sick care, (b) financial help, (c) willingness to listen, and (d) informational assistance. All items were coded in the following manner: a great deal (4), some (3), a little (2), and not at all (1). All items are scored such that a higher score reflects greater levels of anticipated support.

Two measures of psychological well-being will be evaluated: depression and life satisfaction. Specifically, two domains of the CES-D, somatic symptoms and depressive symptoms are represented by two linear composites, negative affect and somatic symptoms, drawn from eight items from the CES-D scale that measures feelings during the past week. These two domains are measured separately because negative affect more accurately reflects depressive cognitions not the somatic component often found in

measures of depression (Krause, Bennett, & Van Tran, 1989). As with several of the social relation measures, construction of composite measures for the CES-D scale is used to simplify model estimation (Liang, Lawrence, Bennett, & Whitelaw, 1990).

Each composite comprises four 4-point scale items coded: most or all of the time [5-7 days] (4); occasionally or a moderate amount [3-4 days] (3); some or a little [1-2 days] (2); and rarely or none [less than 1 day] (1). Specifically, negative affect includes: (a) could not shake off blues, (b) felt depressed, (c) crying spells, and (d) felt sad. Somatic symptoms involve: (a) appetite was poor, (b) everything I did was an effort, (c) sleep was restless, and (d) and could not get going. All items are scored such that a higher score reflects higher levels of depression.

Life satisfaction will be assessed via three items from the LSIA scale and one global indicator of overall life satisfaction. The LSIA items include: (a) best years of my life, (b) look back on my life, fairly well satisfied, and (c) would not change my past life even if I could. Each item was coded on a 4-point scale [strongly disagree (1), somewhat disagree (2), somewhat agree (3), and strongly agree (4)]. In addition, a fourth item assessing satisfaction with life as a whole is included [not satisfied at all (1), not very satisfied (2), somewhat satisfied (3), very satisfied (4), and completely satisfied (5)]. Higher scores on all four items reflect greater reported life satisfaction.

Self-rated ill health is measured by three items assessing the individual's subjective ratings of their own health. Specifically, these items include: rating their overall present health [excellent (1), good (2), fair (3), and poor (4)], satisfaction with their health [completely satisfied (1), somewhat satisfied (2), not very satisfied (3), and not at all satisfied (4)], and their health compared to others their own age [better (1),



about the same (2), and worse (3)]. All items are scored such that a higher score reflects poorer self-ratings of health status.

Demographic Control Measures and Living Arrangement. The relationships between social relations and well-being were evaluated after statistically controlling for age, gender, and education. Age is treated as a continuous variable. Education was also scored as a continuous variable reflecting the total numbers of years of completed schooling. Sex was coded as a dummy variable with the value "1" representing male. Finally, a dummy variable was created to reflect current living arrangement with "1" reflecting those individuals who were living alone and "0" reflecting those who were living with others.

#### Data Analysis Strategies.

The current analysis involves the use of structural equation modeling (SEM) to test two separate models involving social relations and well-being, i.e. depression and life satisfaction (Figure 2.1) and self-rated ill health (Figure 2.2). All analyses for the model depicted in Figure 2.1 were completed first. Then the same strategy was employed to evaluate the model outlined in Figure 2.2 separately. Analyses for the model depicted in Figure 2.1 were completed in two parts to test the following: (1) the differential effects of social relations and well-being on depression and life satisfaction by living arrangement (living with others and living alone) as well as (2) the differential impact of social relations and well-being across living arrangement. To address part 1, the sample was pooled to include those living alone as well as those residing with others. Significance tests of the effects of the binary measure of living arrangement (living alone = 1) on the social relations and well-being constructs in Figure 2.1 were then estimated

with Version 8.50 of the LISREL statistical program (du Toit & du Toit, 2001).

Tests for the differential impact of social relations and well-being across the two living arrangement groups (living alone versus living with others) are not as straightforward. As stated previously, the relationships between social relations and well-being are expected to be more pronounced for those living alone, specifying that there is a statistical interaction effect of living arrangement on social relations and well-being (Bollen, 1989). A subgroup analysis employing LISREL 8.50 was used to test for these interactions by living arrangement. Specifically, the data were split into two groups: those elderly living alone and those elderly residing with others. The model depicted in Figure 2.1 was then estimated simultaneously on both groups. Specifically, a series of nested models were run which evaluated assumptions in both the measurement model as well as substantive living arrangement differences. Table 2.2 lists the series of nested models that were evaluated.

In Model 1 the parameters are allowed to vary freely across both subgroups, i.e. living with others and living alone. Model 1 serves as a baseline model against which all further models are evaluated. Models 2 and 3 are used to test whether or not the measurement properties of the two subgroups are the same. These two models are important in determining factorial invariance between the two subgroups. In other words, it evaluates whether those who live with others and those who live alone answer survey questions in the same way. Some investigators maintain it is hard to compare substantive findings across subgroups if the meanings of the construct differ (Liang and Bollen, 1985). Therefore evaluating factorial invariance is a necessary first step that will help interpret any substantive differences that may later emerge.

Factorial invariance is tested by first constraining the factor loadings to be equivalent in both subgroups (Model 2). The fit of Model 2 compared to the baseline Model (Model 1) is then evaluated to determine whether or not a significant change in chi-square values has occurred. If the change in chi-square values across models is not significant, the measurement errors associated with both subgroups are then specified as equivalent in addition to the factor loadings (Model 3). As before, the change in chi-square is examined to see if the measurement errors are invariant between the two subgroups. If the fit of the data is not significantly changed, these two constraints are left in place when Model 4 is tested.

After the above evaluation of factorial invariance is completed, the next step involves determining if significant differences in the substantive relationships depicted in Figure 2.1 exist between those who live with others and those who live alone. This two-step process begins with imposing simultaneous equivalence constraints on the relationships among the latent variables in Figure 2.1 (Model 4). Like the overall  $F$  test in ordinary least squares multiple regression, a significant overall difference in the substantive parameter estimates between the two subgroups in Model 4 is necessary before individual parameters may be examined. If an overall significant difference in chi-square values is observed, then it is permissible to systematically test each path in Figure 2.1 individually to determine exactly where these differences occur (not shown in Table 2.2). For example, one test would involve constraining just the relationship between social contacts and support received to be equivalent across the two subgroups.

## **Results**

In order to simplify the presentation of the large amount of findings associated with these two separate models, the complete results pertaining to depression and life satisfaction (Figure 2.1) will be presented first. This will be followed by a streamlined report of findings related to self-rated ill health (Figure 2.2) highlighting the similarities and/or differences in results between Figures 2.1 and 2.2.

### Differential Effects of Social Relations and Depression and Life Satisfaction

The results from the analyses involving the differential relationships among social relations and depression and life satisfaction by living arrangement (Figure 2.1) will be presented in three sections. In particular, the findings regarding the fit of the pooled latent variable model will be presented. Next, the psychometric properties of the measures will be reviewed. Finally, the substantive results will be outlined.

Overall fit of the model to the data. The fit of the latent variable model in Figure 2.1 to the data was somewhat mixed. The Bentler-Bonett Normed Fit Index (NFI; Bentler & Bonett, 1980) of .890 just misses the recommended cut-point of .900 as does the Tucker-Lewis coefficient (Tucker & Lewis, 1973) of .888. However, the standardized root mean square residual estimate of .0496 falls below the recommended ceiling of .0500 (Kelloway, 1998). In addition, while the Bollen's (1989) Incremental Fit Index (IFI) of .916 and the Goodness of Fit Index (GFI) of .938 are both greater than .900, the ideal value for these measures is 1.0. One reason that the fit of the model to the data is not as good as desired is that there are seven latent factors in Figure 2.1 and such a large number of factors makes it hard to get a good fit.

### Psychometric properties of the observed indicators.

The factor loadings and measurement errors associated with the model in Figure

2.1 are presented in Table 2.3. These coefficients provide important preliminary information regarding the psychometric properties of the model. In general, factor loadings in excess of .400 are indicative of a reasonably good reliability and validity (Krause, 2002). The factor loadings in Table 2.3 range from .499 to .803 indicating that the measures in the study exhibit adequate psychometric properties.

While the factor loadings and measurement errors presented in Table 2.3 provide some information regarding the reliability of each item, information regarding the reliability of the scales taken as a whole would be extremely useful. Rock, Werts, Linn, and Jöreskog (1977) provide a formula that allows the computation of such scale reliability estimates. Using this formula, the following reliability estimates for the measures were obtained: social contacts (.72); support received (.64); support provided (.74); negative interaction (.80); anticipated support (.83); depression (.72); life satisfaction (.72).

Substantive findings. Estimates of the substantive relationships proposed in Figure 2.1 are presented in Table 2.4. First, the data reveal that living alone affects social ties. In particular, those who live alone are more likely to report a higher frequency of social contacts ( $\beta = .123, p < .01$ ) and negative interaction ( $\beta = .073, p < .05$ ). They also report receiving less social support ( $\beta = -.113, p < .01$ ), providing less support ( $\beta = -.108, p < .01$ ), and anticipating less support in the future ( $\beta = -.143, p < .001$ ). In terms of well-being, compared to those residing with others, those individuals who live alone report more feelings of depression ( $\beta = .090, p < .05$ ) and less life satisfaction ( $\beta = -.127, p < .01$ ).

In addition to the findings related specifically to living arrangement, results

provided in Table 2.4 also provide support for the key theoretical relationships among social relations and well-being depicted in Figure 2.1. Specifically, those elderly reporting higher frequencies of social contacts are more likely to report greater amounts of support received ( $\beta = .341, p < .001$ ) as well as more anticipated support ( $\beta = .196, p < .001$ ). Higher amounts of reported support received is also linked to greater anticipated support ( $\beta = .339, p < .001$ ). In turn, higher frequencies of social contacts and anticipated support are related to decreased feelings of depression ( $\beta = -.135, p < .05$  and  $\beta = -.237, p < .001$ , respectively) and increased reports of life satisfaction ( $\beta = .265, p < .001$  and  $\beta = .305, p < .001$ , respectively). In addition, those elderly receiving more support also report less feelings of depression ( $\beta = -.452, p < .001$ ).

Although this core sequence begins to shed light on how multiple dimensions of support work jointly to influence well-being, there may be more to the overall picture than this. In particular, the relationships among support provided to others, negative support, and psychological well-being may be more complex than they appear initially. Looking again at Table 2.4, providing support to others is significantly related to increased reports of negative interaction ( $\beta = .510, p < .001$ ) which is in turn linked with decreases in anticipated levels of support ( $\beta = -.289, p < .001$ ), increased reports of depression ( $\beta = .214, p < .001$ ), and reductions in life satisfaction ( $\beta = -.226, p < .001$ ).

#### Differential Impact of Social Relations and Depression and Life Satisfaction

In the following sections, results from the analyses involving the differential impact perspective will be outlined. First, tests of the nested models will be reviewed. Then substantive living arrangement differences in the relationships among social relations and depression and life satisfaction will be presented.

Nested Models. Table 2.5 presents selected goodness-of-fit measures for the tests of the nested models. Examining the results for the baseline model (Model 1), the fit is again somewhat mixed. The NFI (Bentler & Bonett, 1980) value is .91, the GFI is .91, and the IFI value is .92. However, the Tucker-Lewis coefficient (Tucker & Lewis, 1973) of .896 just misses the .900 threshold. In addition, the standardized root mean square residual estimate of .058 exceeds the recommended ceiling of .0500 (Kelloway, 1998). Overall, given the large number of domains assessed, the fit is adequate enough for further hypothesis testing

Models 2 and 3 reflect the two parts of the test of factorial invariance. When the factor loadings are specified at equivalent (Model 2) for those living with others and those living alone, the resultant incremental chi-square statistic of 51.073 is significant ( $df = 15, p < .001$ ). Similar in interpretation to an overall F statistic, this difference indicates overall inequivalence. Similarly, specifying the measurement errors as equivalent (Model 3) also results in a significant incremental chi-square of 82.561 ( $df = 25, p < .001$ ).

At this point, some researchers would claim that additional tests of equivalence among the theoretically important betas cannot be undertaken. However, other researchers point out that it is not clear whether partial or total inequivalence at the measurement level has any impact on interpreting differences at the beta level (Reise, Widman, & Pugh, 1993). In fact, no systematic Monte Carlo studies examining this issue have been reported to date.

Given this lack of a consensus, further tests involving the substantive living arrangement differences (Model 4) were undertaken. Specifically, all the substantive

relationships outlined in Figure 2.1 were specified as invariant between both subgroups of living arrangement. A significant incremental chi-square of 45.947 ( $df = 19, p < .001$ ) indicates that these substantive relationships differ significantly across subgroups. In order to determine exactly where differences by living arrangement occur among these 19 substantive relationships, a series of separate tests for each individual beta ( $df=1$ ) were undertaken without specifying factorial invariance. Only three of the betas were significantly different between the two groups.

Substantive Living Arrangement Differences. Given that only 3 of the 19 substantive relationships specified in Figure 2.1 were significantly different between the two living arrangement groups, complete tables of these results are not included here. Data will be provided for only the 3 significant living arrangement differences. Tables outlining the complete set of estimates are available upon request from the author. In the following discussion, two sets of estimates will be provided to highlight the differences between the two groups. Normally standardized estimates are of great use in examining measures with no inherent natural metric. However, comparing typical standardized estimates across subgroups is difficult because differences in the variance of the latent constructs may become confounded with differences in the substantive relationships between the latent variables across subgroups. In order to make direct comparisons of these estimates possible, the LISREL software uses pooled variances in order to estimate common metric standardized estimates. In the following discussion, the common metric completely standardized estimates will be presented first, followed by the unstandardized regression coefficients.

First, the positive impact of social contacts on support received was significantly



greater for those living alone (common metric completely standardized estimate = .505;  $b = .511$ ;  $p < .001$ ) than for those residing with others (common metric completely standardized estimate = .245;  $b = .247$ ;  $p < .001$ ). The difference between the unstandardized estimates in the two subgroups is significant at the .01 level. As was noted in the section reporting results from the pooled sample, those who live alone report less support received than those who reside with others (see Table 2.4). However, while significant for both subgroups, the impact of social contacts on support received is about twice the magnitude for those living alone when compared to those living with others. For those who live alone, maintaining social contacts within their social network is much more critical for receiving support from others.

Second, the magnitude of the beta for the positive effect of support received on anticipated support was significantly greater for those living alone (common metric completely standardized estimate = .551;  $b = .210$ ;  $p < .001$ ) than for those residing with others (common metric completely standardized estimate = .232;  $b = .088$ ;  $p < .001$ ). The difference between the unstandardized estimates in the two subgroups is significant at the .01 level. Again, while significant for both subgroups, the impact of having previously received social support on anticipating the availability of future support is about twice the magnitude for those living alone when compared to those living with others. Clearly, for both groups receiving support in the past is integral part of assessing the possibility for anticipating future support from others. However, those who live with others may also rely on the mere presence of other household members when making evaluations of future support. Those who live alone must always seek future support from those outside their household. Therefore, for those living alone, past experience

with support received from others may provide a more concrete base from which predictions of anticipated support can be made more accurately.

Finally, the magnitude of the beta for the effect of anticipated support on depression was larger for those who live alone (common metric completely standardized estimate =  $-.385$ ;  $b = -1.039$ ;  $p < .001$ ) than for those residing with others (common metric completely standardized estimate =  $-.155$ ;  $b = -.418$ ;  $p < .01$ ). The difference between the unstandardized estimates in the two subgroups is significant at the .05 level. For those who live alone, the magnitude of the effect of anticipation of future support on reduced feelings of depression is again twice as large as that for those living with others. Those who live alone may be more acutely aware of their need for others and how much their well-being depends on the people they know. This leads back to support being more urgent among those who live alone.

When taken as a whole, the pattern of the three significant differences across living arrangements enhances the findings of the core sequence revealed in the examination of the differential effects of living alone (Table 2.4). In particular, those individuals who maintain higher frequencies of social contacts receive greater social support which leads to higher amounts of anticipated support. These higher expectations of support are in turn related to improved well-being. Further examination differences by living arrangement, point out the critical nature of these relationships for those who live alone.

#### Differential Effects of Social Relations and Self-Rated Ill Health

In the following sections, results pertaining to the model of social relations and self-reported ill health specified in Figure 2.2 will be presented. To minimize

redundancy, results consistent with those reported above will only be briefly noted. Only those results specific to self-related ill health or those different from the above results involving depression and life-satisfaction will be delineated. Issues related to overall fit of the data to the model will be discussed first, followed by psychometric properties of the model. Finally, substantive results relevant to self-rated ill health will be reviewed.

Overall fit of the model to the data. The fit of the latent variable model in Figure 2.2 to the data was somewhat better than the fit associated with Figure 2.1 but still mixed. The Bentler-Bonett Normed Fit Index (NFI; Bentler & Bonett, 1980) of .896 just misses the recommended cut-point of .900 as does the Tucker-Lewis coefficient (Tucker & Lewis, 1973) of .886. However, the standardized root mean square residual estimate of .049 falls below the recommended ceiling of .0500 (Kelloway, 1998). In addition, the Bollen's (1989) Incremental Fit Index (IFI) of .917 and the Goodness of Fit Index (GFI) of .940 are both greater than .900.

Psychometric properties of the observed indicators. The factor loadings and measurement errors associated with the model in Figure 2.2 are presented in Table 2.6. The factor loadings in Table 2.6 range from .523 to .851 indicating that the measures in the study exhibit adequate psychometric properties. Reliability estimates for the social relation measures are almost identical to those reported for the model specified in Figure 2.1, so they will not be reported here. The reliability for self-rated ill health was .805.

Substantive findings. Estimates of the substantive relationships proposed in Figure 2.2 are presented in Table 2.7. Once again, the data reveal that those who live alone are more likely to report a higher frequency of social contacts ( $\beta = .122, p < .01$ ) and negative interaction ( $\beta = .072, p < .05$ ). They also report receiving less social

support ( $\beta = -.114, p < .01$ ), providing less support ( $\beta = -.108, p < .01$ ), and anticipating less support in the future ( $\beta = -.142, p < .001$ ). In contrast to the results involving depression and life satisfaction, living arrangement was not directly associated to reported ratings of poor health.

The results involving relationships among the key social relation constructs in the model involving self-rated ill health (Table 2.7) are almost identical to those reported for psychological well-being (Table 2.4). Specifically, those elderly reporting higher frequencies of social contacts are more likely to report greater amounts of support received ( $\beta = .343, p < .001$ ) as well as more anticipated support ( $\beta = .196, p < .001$ ). Higher amounts of reported support received is also linked to greater anticipated support ( $\beta = .343, p < .001$ ). In turn, higher frequencies of social contacts and anticipated support are related to decreased self-rated ill health ( $\beta = -.175, p < .01$  and  $\beta = -.171, p < .001$ , respectively). However, those elderly receiving more support also report greater self-rated ill health ( $\beta = .395, p < .001$ ).

Turning to the role of providing support to others and negative interactions, providing support is significantly related to increased reports of negative interaction ( $\beta = .513, p < .001$ ) which is in turn linked with decreases in anticipated levels of support ( $\beta = -.287, p < .001$ ). Support provided to others is significantly related to improved ratings of health ( $\beta = -.199, p < .01$ ). Negative interaction was not directly associated with self-rated ill health. However, decomposition of the effects into direct, indirect, and total effects (not shown here) reveal that negative interaction exerts a significant total effect on self-rated ill health through its effect on anticipated support. More specifically, higher amounts of negative interaction are related to poorer self-rated ill health (total effect =

.109,  $p < .01$ ) through its relationship to reductions in anticipated support (indirect effect = .049,  $p < .01$ ).

### Differential Impact of Social Relations and Self-Rated Ill Health

In the following sections, results from the analyses involving the differential impact perspective for the model specified in Figure 2.2 will be reported. Results of the subgroup analyses involving nested models will be briefly reviewed. Then substantive living arrangement differences in the relationships among social relations and self-rated ill health will be presented.

Nested Models. Table 2.8 presents selected goodness-of-fit measures for the tests of the nested models. Similar to the results for psychological well-being, examination of the results for the baseline model (Model 1) reveal that the fit is again somewhat mixed. The NFI (Bentler & Bonett, 1980) value of .88 slightly under the recommended cut-point of .900 as is the value of .89 for the Tucker-Lewis coefficient (Tucker & Lewis, 1973). In addition, the standardized root mean square residual estimate of .057 exceeds the recommended ceiling of .0500 (Kelloway, 1998). However, the GFI (.91) and the IFI (.92) are both above the .900 level.

Results from the tests of the nested models involving self-rated ill health were identical to those for depression and life satisfaction. Briefly, when the factor loadings are specified at equivalent (Model 2) for those living with others and those living alone, the resultant incremental chi-square statistic of 34.549 is significant ( $df = 13$ ,  $p < .001$ ). Similarly, specifying the measurement errors as equivalent (Model 3) also results in a significant incremental chi-square of 47.626 ( $df = 22$ ,  $p < .001$ ). Finally, specifying all the substantive relationships outlined in Figure 2.1 as equivalent between both subgroups of

living arrangement (Model 4) resulted in a significant incremental chi-square of 37.333 ( $df = 14, p < .001$ ) indicating that these substantive relationships are not invariant.

Substantive Living Arrangement Differences. To determine where the significant differences emerged among the 14 substantive relationships, a series of separate tests for each individual beta ( $df=1$ ) were undertaken without specifying factorial invariance. Only two of the betas were significantly different between the two groups. Once again, the positive impact of social contacts on support received was significantly greater for those living alone (common metric completely standardized estimate = .505;  $b = .515$ ;  $p < .001$ ) than for those residing with others (common metric completely standardized estimate = .245;  $b = .250$ ;  $p < .001$ ). The difference between the unstandardized estimates in the two subgroups is significant at the .01 level, once again highlighting the role of maintaining social contacts in receiving support.

Second, the magnitude of the beta for the positive effect of support received on anticipated support was significantly greater for those living alone (common metric completely standardized estimate = .553;  $b = .207$ ;  $p < .001$ ) than for those residing with others (common metric completely standardized estimate = .236;  $b = .089$ ;  $p < .001$ ). The difference between the unstandardized estimates in the two subgroups is significant at the .01 level.

## **Discussion**

This paper proposed to further the understanding of the effects of social relations on well-being by examining the relationships between multiple domains of network-level social relations on multiple domains of physical and psychological well-being. Further,

these relationships were examined within the broader social context of living arrangements, i.e. living alone versus living with others.

Based on the results of the differential effects of social resources on well-being (see Tables 2.4 and 2.7), those who live alone report a slightly higher frequency of contacts than those who reside with others. However, those who live alone are disadvantaged in terms of support received and anticipated support, reporting significantly less actual support received as well as anticipated (Tables 2.4 and 2.7). Therefore, it is not surprising that when the impact of living arrangement on well-being and self-rated ill health is examined, the key pathways within social relations where interactions are found consist of: (1) social contacts on received support and (2) received support on anticipated support.

Looking at the relationship between the first of these two key pathways, social contacts have a much larger positive impact on support received for those who live alone than for those residing with others. In fact, the magnitude of the standardized beta is over twice as large for those living alone. Why might this occur and why is it important? The successful maintenance of an active social network provides a springboard from which an individual may draw support when it is needed. While this is true for all the older persons in this analysis, it is potentially more crucial for those who live alone. Those elderly who reside with others have a readily available source of contacts within the household with whom social exchanges may be made. For those who live alone, the day-to-day availability of individuals with whom they can share confidences, concerns, as well as other support is limited to social contacts outside their residence. In other words, those who live alone must actively pursue contacts with their family and friends in order

to maintain their social networks. This successful active pursuit may foster increased feelings of personal control and self-esteem.

Another way to look at these findings is within the context of social capital (Deutsch, 1975). Social capital specifies that a person receives benefits by virtue of membership alone in social networks or other social structures. Therefore, maintaining an active social network is key to the availability of support both received and anticipated. For those who live alone, all social contacts with family and friends come from those residing outside their homes. Therefore, those elderly who live alone need to be more proactive in maintaining social ties than do those who have a readily available source within their households. Again, the successful pursuit may lead to higher levels of personal control and positive self-esteem.

Maintaining an active social network may also prove more important for those who live alone by increasing the potential for support to buff the negative effects of stress on well-being. In addition, the positive influences of their network members may reflect more strongly on in their pursuit of positive health behaviors. For those living with others, the existence of their network may be taken for granted to some extent.

Looking at the relationship between the second of the two key pathways noted above, support received has a much greater positive impact on anticipated support for those elderly who live alone as compared to those who reside with others (over twice as large), although it is still significant for both groups. This finding suggests that those who live alone base their assessments of availability of future support in times of need in actual support that they have received in the past and/or are currently receiving. In other words, those who live alone may rely more heavily on concrete examples of support



received, when making evaluations of future support. Having an outside source of companionship may prove extremely important in these evaluations. Those who live with others may in part base their assessments of anticipated support on the mere presence of others within their households.

When looking at social relationships and depression, a third significant interaction emerges. Compared to those living with others, higher levels of anticipated support (over twice as large) for those who live alone are related to a more pronounced decrease in feelings of depression. Keeping in mind that the relationship between greater anticipated support and reduced feelings of depression is significant regardless of living arrangement, why might this effect be so much more pronounced for those who live alone? Anticipated support promotes confidence in one's own abilities, increasing positive feelings of control and esteem. When people live alone, they must rely on themselves more than those who live with others. Therefore, the reassurance afforded by anticipated support carries greater weight.

While there was a significant interaction effect of living arrangement on the relationship between anticipated support and depression, the same was not true for life satisfaction and self-rated ill health. Why might this make sense? Depression as assessed by the CESD scale reflects a state, assessing reported feelings of depression with the last week. Life satisfaction, as measured by the LSIA scale, reflects assessments looking back across the life-course. For the elderly, living alone may be a recent development predicated by changes in marital status or health, and therefore more likely to affect more current assessments of well-being (i.e., depression), than more retrospective assessments (i.e., life satisfaction). The lack of a significant living

arrangement interaction for anticipated support on self-rated ill health is not so easily explained. The three self-rated ill health items used in this study reflect the respondent's evaluation of their current physical health status. Perhaps older adults, regardless of living arrangements, rate their health using external comparison derived from their social networks or from some perceived societal standard for their age. In fact one of the three items asks the respondent to rate their health compared to others their own age. This more external evaluation is not as affected by internal evaluations of anticipated support based on concrete examples of support received in the past as was the case with depression.

Although no significant living arrangement interaction effects involving support provided and negative interactions were observed in this study, there are three findings that deserve special attention. First, providing support to others is significantly related to increased reports of negative interaction which is in turn linked with decreases in anticipated levels of support. Perhaps providing support to others works as a stressor of sorts, imposing perceived demands of attention and effort on the older person, which may lead to the opportunity for more negative interactions. Negative interactions in turn work to downgrade the amount of support an individual might expect in the future.

Second, providing support to others was linked to increased reports of depression, but was not related to ratings of life satisfaction. On the other hand, providing support to others is significantly related to improved ratings of health. Again viewed as a stressor of sorts, providing support to others may unduly burden the individual, resulting in greater feelings of depression. Given the life-course overview implicit in life satisfaction, it is reasonable that providing support in the past year would be unlikely to exert a significant

effect of ratings of overall satisfaction. The significant relationship between providing support to others and reduced self-rated ill health may be the result of unspecified reciprocal linkages between these two latent variables. While actively providing support to others may promote better health, it may be equally true that being in better health allows an individual the opportunity to provide more support to others. Longitudinal data would be necessary to disentangle such reciprocal linkages.

Finally, negative interaction was associated with increased reports of depression and less reported life satisfaction, but was not related to self-rated ill health. It seems likely that unpleasant interactions with friends and family may affect one's internal evaluations of their own worth or that of their social networks thus eroding psychological well-being. In terms of self-rated ill health, an individual's assessment of his or her own health remains unaffected. Most literature on negative interactions is on psychological well-being. Health changes more slowly, so effects of negative interactions on health may emerge with longitudinal data. The process by which this may occur is reflected in the research proposing that strong social networks may help reduce the effect of stress on immune functioning, thus improving health outcomes or survival. In this case, the reverse is true for psychological well-being and over a longer period of time, may be true for physical health.

In reviewing the findings presented in this paper, it should be kept in mind that factorial invariance between the living arrangement subgroups (living alone and living with others) was not achieved. The factorial structures of the two groups were in fact significantly different. As noted previously, some researchers feel that factorial invariance is necessary before more substantive relationships may be examined. On the

other hand, other researchers point out that it is not clear whether partial or total inequivalence at the measurement level has any impact on interpreting differences at the beta level (Reise, Widman, & Pugh, 1993). To reiterate, we know of no reported systematic Monte Carlo studies to date that have addressed this issue and thus the issue remains unresolved.

It may be informative to further examine this issue of inequivalence between these two groups at the measurement level by asking why this inequivalence might make sense. It is possible that the items used here to evaluate one's social relations may just mean different things for those living alone versus living with others. In other words, the social context in which these scales are administered may affect the respondent's interpretation of the question as it applies to him or her.

Another potential explanation of why this inequivalence makes sense lies in the notion of invisible support (Bolger, Zuckerman, and Kessler, 2000). As noted earlier, invisible support is support that is given to an individual without that individual's awareness that it has occurred or with the recipient's knowledge of the acts, but without the recipient coding it as support. For those who live with others, this could result directly in underestimations of actual support exchanges as well as anticipated support and so they answer questions on support differently..

This research has contributed to our understanding of social relations and well-being in four ways. First, we have improved upon the work of Ingersoll-Dayton, Morgan, and Antonucci's (1997) by including a full complement of measures of social relations in assessing multiple domains of well-being, including psychological measures as well as self-rated ill health.

Second, we further improved upon their work by consistently using network-level measures of social relations. Within this improved framework, we have replicated their analysis showing that positive and negative social exchanges are respectively associated with increased positive and negative affects, thus supporting the notion that the presence of negative interactions may actually represent a stressor.

Third, while replicating their results in terms of psychological well-being, we found that negative interactions do not play a significant direct role in self-rated ill health. Instead it is through its diminishing of anticipated support that negative interaction further increases self-rated ill health.

Fourth, and most importantly, we have examined the role that living arrangement, viewed as one type of social context, plays in the relationships between social resources and well-being. The significant living arrangement interactions in the key pathways, i.e. social contacts on support received, support received on anticipated support, and anticipated support on well-being, highlight the need for maintenance of a strong network and receiving support especially for those living alone. This provides distinct areas that interventions can focus upon in an effort to improve well-being of the elderly who live alone. This is crucial given the large and growing numbers of elderly in the U.S. who live alone.

Several limitations should be noted. Self-rated ill health was the only measure of physical health included in the study. Additional factors such as disease and/or functional status could not be investigated because there were not enough numbers of elderly living alone to include these additional factors.

Second, factors reflecting the positive aspects that may influence or are inherent

in living alone were not included. These factors may provide extremely useful information on why some older adults who live alone do well while others fare poorly. Further analyses should contain measures capturing these factors, e.g. sense of autonomy, independence, self-esteem, and choice of living alone.

Finally, the current analyses were based on cross-sectional data only. This raises two areas of concern. First, availability and need for social support are not constant and changes in these resources are not reflected in the current analyses. Further, psychological and physical well-being can be affected by numerous events in a person's life, e.g., widowhood, retirement, etc. Once again, due to the already large size of the proposed models, these measures were not included in the analysis.

A second concern with reliance on cross-sectional data lies in the problem of reciprocal linkages. In the current specifications, the causal ordering of the model implies that social resources affect well-being. One example is that greater amounts of support reduce feelings of depression or improve health. In fact, the reverse causal ordering has also been examined. Increased feelings of depression or physical illness cause our support systems to kick in, thus increasing the amount of support an individual receives. In order to fully evaluate which (or both) of the proposed causal sequences is accurate, at least three waves of longitudinal data are required to examine the reciprocal linkages between social resources and well-being. The examination of such reciprocal linkages is critical in fully understanding just how these processes work.

The critical linkages among social resources and physical and psychological well-being among older adults have been examined in numerous studies. While the findings are not totally in agreement, there remains an overall consensus that social relationships

tend to promote physical health and well-being (House, Landis, & Umberson, 1988). The current study built upon previous research to examine the multiple facets of social relations among the elderly and their relationship to positive and negative well-being within the social context of living arrangements. The analyses presented here have replicated and extended findings on the relationship of positive and negative social resources and interactions on well-being in the elderly. Most importantly, the key role of social contacts, received support, and anticipated support for the elderly who live alone has been identified. With the growing numbers of elderly, especially women, living alone, understanding how living arrangements affect social resources and well-being provides extremely valuable information on where and how successful health and well-being interventions may be best applied, e.g., increasing contacts by expanding the social network. Further, the results may help inform policy makers where they may focus their effort to change the environment to create more supportive neighborhoods that meet the changing support needs of older adults as they age in place. In this regard, our analyses provide important information for such future interventions.

Figure 2.1. A Model of Social Relations and Psychological Well-Being

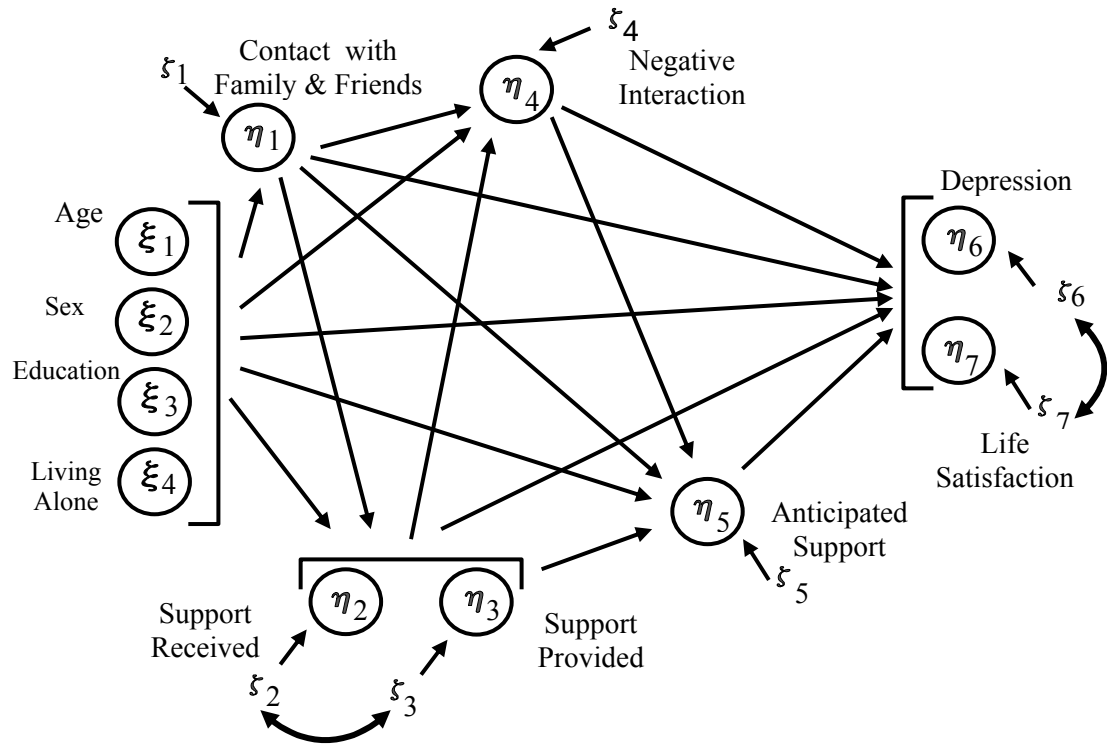




Figure 2.2. A Model of Social Relations and Self-Rated Poor Health

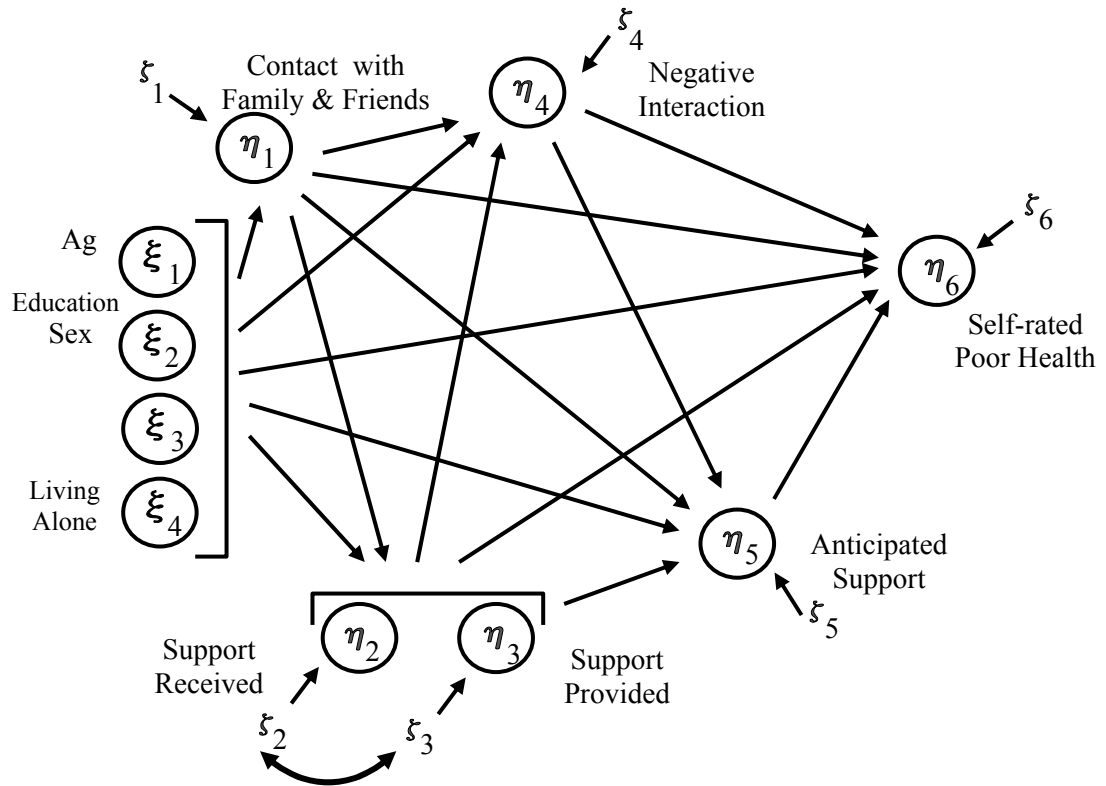


Table 2.1. Selected Descriptive Statistics for Those Living With Others and Those Living Alone

Variable	Living With Others (n=758)	Living Alone (n=345)
Age		
Mean (SD)	73.43 (6.32)	76.76 (7.01)***
Education		
Mean (SD)	11.55 (3.67)	11.09 (3.28)*
Gender (0=female; 1=male)		
Mean (SD)	.47 (.50)	.19 (.40)***
Race (0=nonwhite; 1=white)		
Mean (SD)	.92 (.26)	.90 (.30)
Contact with family (higher = greater contact)		
Mean (SD)	7.37 (2.20)	7.45 (2.24)
Contact with friends (higher = greater contact)		
Mean (SD)	7.02 (2.29)	7.57 (2.36)***
Self-rated ill health (higher = poorer health)		
Mean (SD)	2.33 (.89)	2.30 (.89)
Number of serious health conditions		
Mean (SD)	.84 (.85)	.84 (.85)
Number of chronic health conditions		
Mean (SD)	1.30 (1.07)	1.32 (1.18)

Note: SD = Standard Deviation \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Table 2.2. Nested Model Tests

Model	Description
1	Baseline model involving no equivalence constraints imposed across groups consisting of those living alone and those living with others
2	Factor loadings are constrained to be equivalent across groups
3	Measurement error terms constrained to be equivalent across groups
4	All substantive parameter estimates (i.e., all paths in the structural equation model are constrained to be equivalent across groups

Table 2.3 Standardized Factor Loadings ( $\lambda$ 's) and Measurement Errors ( $\theta_e$ 's)  
for the Endogenous Factors ( $\eta$ 's): Well-Being

	Factor Loadings	Measurement Errors
n <sub>1</sub> : Social Contacts		
y1: contacts with kin <sup>a</sup>	.729	.468
y2: contacts with friends	.774	.401
n <sub>2</sub> : Support Received		
y3: tangible support received <sup>a</sup>	.520	.730
y4: emotional support received	.672	.548
y5: informational support received	.639	.592
n <sub>3</sub> : Support Provided		
y6: tangible support provided <sup>a</sup>	.643	.587
y7: emotional support provided	.760	.423
y8: informational support provided	.690	.524
n <sub>4</sub> : Negative Interaction		
y9: too many demands <sup>a</sup>	.734	.461
y10: critical of you	.690	.524
y11: prying into personal affairs	.658	.568
y12: taking advantage of you	.748	.441
n <sub>5</sub> : Anticipated Support		
y13: sick care <sup>a</sup>	.737	.457
y14: financial help	.622	.613
y15: willingness to listen	.803	.355
y16: informational assistance	.800	.361
n <sub>6</sub> : Depression		
y17: negative affect <sup>a</sup>	.721	.480
y18: somatic symptoms	.771	.406
n <sub>7</sub> : Life Satisfaction		
y19: best years of my life <sup>a</sup>	.499	.751
y20: look back on my life, fairly well satisfied	.719	.484
y21: would not change past life even if I could	.569	.677
y22: overall satisfaction	.715	.488

Note: all estimates significant at  $p < .001$ .

<sup>a</sup>Factor loadings set to 1.0 in the unstandardized solution.

Table 2.4. Relationships Between Social Relations and Well-Being Pooled Sample (N=1,103)

Independent variables	Social Contacts	Support Received	Support Provided	Negative Interaction	Anticipated Support	Depression	Life Satisfaction
Age	-.146*** (-.033)	.083* (.019)	-.139*** (-.038)	-.052 (-.005)	-.028 (-.003)	.051 (.012)	-.015 (-.001)
Sex	-.116** (-.363)	-.166*** (-.523)	-.101** (-.378)	.008 (.010)	.037 (.046)	-.025 (-.085)	.022 (.033)
Education	.161*** (.068)	-.110** (-.047)	.124*** (.063)	-.078* (-.013)	.036 (.006)	-.082* (-.037)	-.039 (-.008)
Living Alone	.123** (.402)	-.113** (-.372)	-.108** (-.425)	.073* (.092)	-.143*** (-.186)	.090* (.318)	-.127** (-.200)
Social Contacts		.341*** (.343)	.486*** (.584)	-.159** (-.061)	.196*** (.078)	-.135* (-.146)	.265*** (.128)
Support Received				-.066 (-.025)	.339*** (.134)	.452*** (.483)	-.106 (-.050)
Support Provided				.510*** (.163)	.115 (.038)	-.167** (-.150)	-.010 (-.004)
Negative Interaction					-.289*** (-.300)	.214*** (.600)	-.226*** (-.283)
Anticipated Support						-.237*** (-.641)	.305*** (.367)
Multiple R <sup>2</sup>	.077	.151	.338	.175	.317	.286	.273

Note: Standardized regression coefficient are presented with the metric (unstandardized) regression coefficient below in parentheses.

\* p < .05; \*\*p < .01; \*\*\*p < .001.

Table 2.5. Goodness-of-Fit Measures for Tests of Nested Models

Model	Chi-square	df	Chi-square change	GFI	Bentler		Tucker-Lewis		SRMSE
					NFI	Coefficient	Bollen IFI		
1	1094.010	460		.91	.91	.90	.92	.058	
2	1145.083	475	51.073***	.91	.87	.89	.92	.064	
3	1227.644	500	82.561***	.89	.86	.89	.91	.066	
4	1273.591	519	45.947***	.88	.85	.89	.91	.080	

\*\*\*  $p < .001$

Table 2.6. Standardized Factor Loadings ( $\lambda$ 's) and Measurement Errors ( $\theta_e$ 's)  
for the Endogenous Factors ( $\eta$ 's): Self-Rated Ill Health

	Factor Loadings	Measurement Errors
n <sub>1</sub> : Social Contacts		
y1: contacts with kin <sup>a</sup>	.731	.465
y2: contacts with friends	.771	.405
n <sub>2</sub> : Support Received		
y3: tangible support received <sup>a</sup>	.523	.726
y4: emotional support received	.680	.538
y5: informational support received	.627	.607
n <sub>3</sub> : Support Provided		
y6: tangible support provided <sup>a</sup>	.646	.582
y7: emotional support provided	.759	.424
y8: informational support provided	.687	.528
n <sub>4</sub> : Negative Interaction		
y9: too many demands <sup>a</sup>	.740	.452
y10: critical of you	.684	.531
y11: prying into personal affairs	.653	.574
y12: taking advantage of you	.750	.438
n <sub>5</sub> : Anticipated Support		
y13: sick care <sup>a</sup>	.735	.459
y14: financial help	.623	.612
y15: willingness to listen	.803	.356
y16: informational assistance	.801	.359
n <sub>6</sub> : Self-Rated Ill Health		
y17: present health status <sup>a</sup>	.851	.275
y18: satisfaction with present health	.780	.392
y19: health compared to others your own age	.644	.585

Note: all estimates significant at  $p < .001$ .

<sup>a</sup>Factor loadings set to 1.0 in the unstandardized solution.

Table 2.7. Relationships Between Social Relations and Self-Rated Ill Health Pooled Sample (N=1,103)

Independent Variables	Dependent Variables					
	Social Contacts	Support Received	Support Provided	Negative Interaction	Anticipated Support	Self-Rated Ill Health
Age	-.147*** (-.033)	.084* (.019)	- .140*** (-.038)	-.051 (-.005)	-.028 (-.003)	.033 (.004)
Sex	-.117** (-.365)	-.166*** (-.527)	-.099** (-.376)	.007 (.009)	.037 (.047)	.053 (.082)
Education	.160*** (.068)	-.111** (-.048)	.124*** (.064)	-.079* (-.013)	.038 (.006)	-.165*** (-.035)
Living Alone	.122** (.402)	-.114** (-.379)	-.108** (-.426)	.072* (.092)	-.142*** (-.185)	-.026 (-.042)
Social Contacts		.343*** (.347)	.486*** (.585)	-.159** (-.062)	.196*** (.078)	-.175** (-.087)
Support Received				-.072 (-.028)	.343*** (.135)	.395*** (.194)
Support Provided				.513*** (.165)	.114 (.037)	-.199** (-.082)
Negative Interaction					-.287*** (-.295)	.060 (.077)
Anticipated Support						-.171*** (-.214)
Multiple R <sup>2</sup>	.076	.153	.339	.176	.319	.227

aStandardized regression coefficient

bMetric (unstandardized) regression coefficient

\* p < .05; \*\*p < .01; \*\*\*p < .001.



Table 2.8. Goodness-of-Fit Measures for Tests of Nested Models: Self-Rated Ill Health

Model	Chi-square	df	Chi-square change	GFI	Tucker-Lewis			
					Bentler NFI	Coefficient	Bollen IFI	SRMSE
1	951.126	346		.91	.88	.89	.92	.057
2	985.675	359	34.549***	.91	.88	.89	.92	.061
3	1033.301	381	47.626***	.90	.87	.90	.91	.063
4	1070.634	395	37.333***	.82	.87	.90	.91	.078

\*\*\* p < .001

## Chapter 3

### **The Interaction of Living Alone and Social Resources: How Does it Effect Well-being in the Elderly Over Time?**

The current paper proposes to address the relationships among multiple domains of network-level social relations on multiple domains of physical and emotional well-being within the context of living arrangement over time. Research on well-being among the elderly has shown significant relationships among the type and amount of an individual's social support and social ties and well-being in old age (House, Landis, & Umberson, 1988; Rowe & Kahn, 1998; Ryff, 1989). Social support can offer a person a more positive view of themselves and their abilities (i.e., mastery, control, and social competence). These in turn can affect an individual's risk of experiencing stressful life events (Antonucci, 1990). Hence, supportive relations protect and prepare individuals to cope with stress prior to its occurrence.

However, social support is a complex multidimensional construct. As such, it is not always clear which dimensions or facets of support are associated with well-being and which types of social support may exert distinct effects on well-being. For example, the belief that significant others will help in time of need (i.e., anticipated support) can offset the noxious effects of stress (Krause, 2001). However, negative interactions affect well-being adversely because of their relatively rare unpleasant encounters, attribution of

malicious intent or indifference, and drain of psychic resources (Rook & Pietromonaco, 1987).

With increasing numbers of elderly projected in the future along with increasing estimated costs of their health care, understanding health status in the elderly as well as potentially successful interventions to halt or reduce the progression of disease and its increasing disability should be a major concern to public health professions. What are some of the key factors that researchers need to examine in terms of disease and disability prevention? Kaplan (1997) identifies several behavioral, social, socioeconomic, and socioenvironmental factors that are key in primary as well as secondary prevention.

Focusing on social factors and socioeconomic status (SES), House and his associates (1988) have linked social networks and social support to mortality. In addition, the role of social isolation in the aged has also been associated with increased risk of death (Seeman et. al, 1993; Sugisawa, Liang, & Liu, 1994). Kaplan (1997) further reports research linking the relationship of social networks and support on disease and functional status, as well as numerous studies linking SES with mortality, physical functioning, and disability. However, much more research is needed to understand the complex, recursive interactions between health status and behavioral, social, psychological, and socioenvironmental factors (Kaplan & Strawbridge, 1994).

Another key context in which we can study how these social psychological factors operate involves living arrangement, or more specifically living alone. Why is living alone important? According to the U.S. Census Bureau (Fields & Casper, 2001), the percentages of older adults aged 65 or older who lived alone in 2000 were 17.0% for

men and 39.6% for women. More specifically, among older adults aged 65 to 74 years, 13.8% of men and 30.6% of women lived alone. At age 75 and older, these percentages increase to 21.4% and 49.4% for men and women, respectively.

Previous research (see chapter 2) shows that living arrangement, viewed as one type of social context, plays an important role in the relationships between social resources and well-being. The significant living arrangement interactions in the key pathways, i.e., social contacts on support received, support received on anticipated support, and anticipated support on well-being, highlight the need for maintenance of a strong network and receipt of support especially for those living alone. This provides distinct areas that interventions can focus upon in an effort to improve well-being of the elderly who live alone. This is crucial given the large and growing numbers of elderly in the U.S. who live alone.

#### Current analysis plans

The current research examines the interaction of living alone and social relations on physical and emotional well-being over time. Previous research (chapter 2) showed that the key living alone interactions were the pathways involving social contacts on support received, support received on anticipated support, and anticipated support on well-being. These key pathways (i.e., living alone by social contacts, living alone by support received, and living alone by anticipated support) will provide the starting point for examining three longitudinal interaction effects of living alone and social resources on well-being.

Due to the number of interactions proposed, it would not be possible to break the sample into subgroups with sufficient sample sizes to yield reliable results using

structural equation modeling. Therefore, Ordinary Least Squares regression (OLS regression) will be used to examine the longitudinal models currently under study. Dependent variables will include life satisfaction, depression, self-rated ill health, functional status, serious health conditions, and chronic health conditions. Finally, given the unequal time intervals between wave 1 and wave 2 (4 years) and wave 2 and wave 3 (2 years), only the first time interval will be included in the current analyses. While it would be feasible to run analyses involving the interval from wave 1 to wave 3 analyses, it is hard to find a compelling rationale for why these effects would even be expected to last for 6 years. In addition, the sample for wave 3 is greatly reduced by death and attrition..

## **Methods**

### Sample

The data for these analyses come from the first two waves of an NIA-funded (Neal Krause, PI) multi-wave probability sample of noninstitutionalized English-speaking elderly household residents, who were 65 years of age and older at Wave 1, retired, and living in the coterminous United States. Wave 1 interviews were conducted by Louis Harris and Associates (now Harris Interactive) from October 1992 through February 1993. A total of 1,103 interviews were successfully completed, reflecting a response rate of 69.1 percent. In 1996 (wave 2), 605 subjects (55 percent) were re-interviewed successfully. This represents in an attrition rate of 45 percent. Excluding those who died prior to wave two (173), the attrition rate drops to 35 percent. Sufficient numbers of individuals living alone at wave 1 and responding at wave 2 are available

(n=163) to undertake the analyses. Therefore the current analyses will only involve all 605 subjects who were successfully interviewed at both Wave 1 and 2.

This dataset is unique in that virtually no other data set contains such a rich source of measures of social resources and well-being in the American elderly. The richness of the data is reflected by its inclusion of multiple measures of each domain that are available for inclusion in the analyses. Further, each domain itself is measured by multiple indicators, providing more reliable measures. This will allow a more flexible and thorough modeling of the relations between the key concepts under study.

Descriptive statistics for selected items in the analyses are provided in Table 3.1.

Initial descriptive analysis of the data for the 605 elderly participants indicated that with the exception of income (with 17.69 % missing data), the proportion of cases with missing data on the remaining items ranged from 0% to 4.53%. Although the proportion of missing data for each item was quite small, the use of listwise deletion of cases would have resulted in only 351 participants (58.02%) with complete data. In an effort to avoid the potential bias associated with item nonresponse, multiple imputation was employed (Schafer, 1997). Multiple imputation involves a regression-based approach and a data augmentation algorithm that incorporates random variation (Rubin, 1987). More specifically, three complete data sets were imputed and the analyses that follow were then run on each of these three data sets. Subsequently, estimates were averaged across the three imputations to generate a single point-estimate. Standard errors were then calculated using a formula that combined the average of the squared errors of the estimates and the variance of the parameter estimates across the five samples (Schafer, 1997; Schafer & Olsen, 1998).

## Measures

As noted above, multiple measures of social embeddedness, enacted support and perceived support are initially proposed as key components of the models. In the previous cross-sectional analyses presented in chapter two, significant interaction effects were found to be associated with living alone and social contact with kin and friends, living alone and emotional support received, and living alone and anticipated support. While these relationships could change over time, i.e. dimensions that were not significant in cross-sectional analyses may be significant over time, it is not possible to analyze all possible interactions over time given the limited sample size. Therefore, the longitudinal analyses will focus only on these three measures of social resources. Psychological well-being is measured by depression and life satisfaction while physical health is assessed by functional status, self-rated ill health, and serious and chronic health conditions. Specific measurement of these domains is presented below and descriptive statistics for each measure are reported in Table 3.1.

In general, construction of the social support measures is based on Krause's (1995b) confirmatory second-order factor analysis of support received from and given to others and Liang's analysis of social exchanges (Liang, Krause, & Bennett, 2001). The social contact measures asked about types and frequency of contact with family or with friends. Measures of support received from others and anticipated support are not source-specific. Specifically, each respondent was asked to think about their relationships in the last year and to respond to a series of questions regarding all of types of support described above.

Social contacts are measured at time 1 by a single composite scale comprising

contacts with kin and contacts with friends. Specifically, the variable is created by summing the responses across six 4-point items for contact with kin is assessed by the frequency in a week the subject: (a) went out to visit family, (b) had the family visit them, (c) had contact by phone or letter with their family, (d) went out to visit friends, (e) had friends visit them, and (f) had contact by phone or letter with friends. Response categories for the six contact items are: never (1), once in awhile (2), fairly often (3), and very often (4). The scale ( $\alpha = .65$ ) ranged from 6 to 24, with a higher score reflecting a higher frequency of contacts.

Social support received from others during the past year is measured by a single composite comprising tangible support, informational support, and emotional support. The composite was created by summing the scores on 10 items: (a) help with transportation, (b) help with chores, (c) help with shopping, (d) being with a person during stressful times, (e) comforting via physical affection, (f) listening to a person, (g) expressing interest and concern, (h) suggesting some action, (I) providing information during a difficult situation, and (j) help with understanding situations. All items described above were coded very often (4), fairly often (3), once in a while (2), and never (1). The received support composite scale scores ( $\alpha = .81$ ) ranged from 10 to 40, with a higher score reflects greater support received.

Anticipated support entailed subjective evaluations of assistance that might be provided in the future should it be needed. The four 4-point scale items assessing anticipated support include anticipated support in terms of: (a) sick care, (b) financial help, (c) willingness to listen, and (d) informational assistance. All items were coded in the following manner: a great deal (4), some (3), a little (2), and not at all (1). All items



are scored such that a higher score reflects a greater level of anticipated support. The anticipated support composite scale scores ( $\alpha = .81$ ) ranged from 4 to 16, with a higher score reflecting greater support anticipated.

Two measures of psychological well-being were evaluated: depression and life satisfaction. Specifically, depression is assessed at time 1 and time 2 via eight 4-point items from the CES-D scale (Radlof, 1977) which reflect somatic symptoms and depressive symptoms: (a) could not shake off blues, (b) felt depressed, (c) crying spells, (d) felt sad, (e) appetite was poor, (f) everything I did was an effort, (g) sleep was restless, and (h) and could not get going. Each item is coded: most or all of the time [5-7 days] (4); occasionally or a moderate amount [3-4 days] (3); some or a little [1-2 days] (2); and rarely or none [less than 1 day] (1). The depression composite scale scores ( $\alpha = .84$ ) ranged from eight to 32, and was scored such that a higher score reflected higher levels of depression.

Life satisfaction at time 1 and time 2 will be assessed via three items from the LSIA scale and one global indicator of overall life satisfaction. The LSIA items include: (a) best years of my life, (b) look back on my life, fairly well satisfied, and (c) would not change my past life even if I could. Each item was coded on a 5-point scale [strongly disagree (1), somewhat disagree (2), unsure (3), somewhat agree (4), and strongly agree (5)]. In addition, a fourth item assessing satisfaction with life as a whole is included [not satisfied at all (1), not very satisfied (2), somewhat satisfied (3), very satisfied (4), and completely satisfied (5)]. Scores on the life satisfaction composite ( $\alpha = .70$ ) ranged from 3 to 15 with higher scores reflecting greater reported life satisfaction.

In addition to the two measures of psychological well-being, four measures

assessing different aspects of physical health will also be examined. Functional status at time 1 and time 2 is measured by a 14 item scale composite including (Katz) Activities of Daily Living (ADL), Instrumental ADL, and (Nagi) fitness items. More specifically these items include: (a) bathing yourself, (b) dressing yourself, (c) feeding yourself, (d) getting in and out of bed, (e) shopping for personal items, (f) using the telephone, (g) taking a train or a bus, (h) climbing 2-3 flights of stairs, (i) walking about 1/4 of a mile, (j) doing heavy work around the house, (k) standing for 2 hours, (l) stooping, crouching, or kneeling, (m) reaching over your head, and (n) using your fingers to grasp a handle, and lifting or carrying something weighing 25 pounds. Subjects were first asked if they had any difficulty performing each of the above tasks (yes or no) and if so how much difficulty. All responses were coded as follows: no difficulty (0), a little (1), some (2), a lot (3), and unable to do (4). Scores on the functional status composite ( $\alpha = .90$ ) ranged from 0 to 56 with higher scores reflecting greater impairment.

Self-rated Ill health at time 1 and time 2 is measured by three items assessing the individual's subjective ratings of their own health. Specifically, these items include: rating their overall present health [excellent (1), good (2), fair (3), and poor (4)], satisfaction with their health [completely satisfied (1), somewhat satisfied (2), not very satisfied (3), and not at all satisfied (4)], and their health compared to others their own age [better (1), about the same (2), and worse (3)]. Scores on the self-rated ill health composite scale ( $\alpha = .78$ ) ranged from 3 to 11 with higher scores reflecting poorer self-ratings of health status.

Finally, information on acute and chronic conditions derived from a checklist of 12 conditions (13 for men, including prostate trouble) was grouped according to Ferraro

and Farmer (1999). An index of serious conditions was generated at time 1 and time 2 by a simple count of the following diseases: cancer, diabetes, heart disease, and hypertension. A simple count of the remaining conditions (arthritis/rheumatism, eye diseases, respiratory diseases, ulcers, liver diseases, kidney diseases, urinary tract disorders, prostate trouble, and other major health problems) reflecting chronic conditions was also created at time 1 and time 2.

Demographic Control Measures. The relationships between social relations and well-being were evaluated after statistically controlling for age, gender, and education at time 1. Age is treated as a continuous variable. Education was also scored as a continuous variable reflecting the total number of years of completed schooling. Finally, gender was coded as a dummy variable with the value "1" representing male. Means and standard deviation for all items in the analyses are presented in Table 3.1.

#### Data Analysis Strategy

The major hypothesis for this research maintains that the beneficial relationship between social resources and well-being over time may not operate in the same manner for those living alone and those residing with others (Hughes & Waite, 2002). This perceived imbalance poses a risk to individual health. Given the link between social support and health, living with others has been associated with improved health (e.g., Antonucci 1990; Umberson, 1992; House, Umberson, & Landis, 1988; Lewis, Rook & Schwarzer, 1994).

If social relationships are beneficial to health, then those who live alone may be at risk. But the impact of living alone may depend upon a person's ability to maintain active social ties with others in the community. In order to evaluate this hypothesis,

statistical interactions between each dimension of social resources (i.e., social contacts, support received, and anticipated support) and living arrangement (i.e., living alone versus living with others) and their impact on well-being (i.e., depression, life satisfaction, self-rated ill health, functional health, serious health conditions, and chronic health conditions) were examined separately. In order to avoid multicollinearity associated with interaction terms, the independent variables were centered on zero before interaction terms were computed. More specifically, the following OLS equation was used to test for the interaction effects on life satisfaction (SAT):

$$SAT_2 = a + b_1SAT_1 + b_2REC_1 + b_3ANT_1 + b_4CON_1 + b_5ALONE_1 + b_6(ALONE_1 \times REC_1) + b_7(ALONE_1 \times ANT_1) + b_8(ALONE_1 \times CON_1) + \Sigma b_i Z_i. \quad (1)$$

In the above equation,  $SAT_1$  and  $SAT_2$  denote life satisfaction at Waves 1 and 2, respectively;  $REC_1$  is support received at Wave 1;  $ANT_1$  is anticipated support at Wave 1;  $CON_1$  is social contacts at Wave 1; and  $ALONE_1$  is living alone at Wave 1.  $Z_i$  stands for the control variables (i.e., age, gender, education, and income). Finally,  $a$  is the intercept and  $b_i$  are regression coefficients.

A two-step hierarchical approach was used to estimate equation 1. In step 1, the additive effects of the independent variables were entered (i.e.,  $SAT_1 + REC_1 + ANT_1 + CON_1 + ALONE_1$ , and  $Z_i$ ). In step 2, the tests for the statistical interaction between the social resources measures and living alone were performed by entering the multiplicative terms to the model (i.e.,  $ALONE_1 \times REC_1$ ,  $ALONE_1 \times ANT_1$ , and  $ALONE_1 \times CON_1$ ). In the event that the coefficient associated with the interaction term is significant, it is important to see if the direction of the effect is in the hypothesized direction. This is achieved using the formulas provided by Aiken and West (1991) and Hosmer and

Lemeshow (1989; see p.69). To show how this works, an example using the interaction between living alone and social contacts and its relation to changes in life satisfaction is used in the following. Negative effects of living alone on life satisfaction will become progressively weaker for older adults who maintain strong social ties with others. If this is the case, the effect on changes in life satisfaction should be in a positive direction for those living with others as well as those living alone, the effect should be larger for those living alone. Using estimates from Equation 1, this effect can be shown by a series of hand calculations using the formula:

$$b_{ALONEI} = b_4 + b_8(ALONE_1) \quad (2)$$

In this equation,  $b_{ALONEI}$  represents the effect of living alone on change in life satisfaction.

## Results

The findings from this study are presented in two main sections. In the first section, results from an analysis of potential bias from attrition are presented. The second section will discuss the results examining the hypothesized interaction effects of living alone and social resources on each specific well-being measure, i.e., life satisfaction, depression, functional status, self-rated ill health, serious health conditions and chronic health conditions.

### Effects of Sample Attrition

As noted earlier, data for this study came from the first two waves of a probability sample of noninstitutionalized English-speaking elderly household residents, who were 65 years of age and older at Wave 1 (October 1992 - February 1993), retired, and living

in the coterminous United States. In 1996 (Wave 2), 605 subjects were re-interviewed successfully while 173 respondents had died before Wave 2. In addition, 325 Wave 1 participants did not participate at Wave 2. Non-random loss of participants over time in panel studies can bias empirical findings. Therefore, while the focus of the current analyses involves only those 605 subjects who were successfully interviewed at both waves 1 and 2, the potential bias of attrition must also be examined. In order to accomplish this, a multinomial logistic regression analysis was undertaken that included all of the Wave 1 independent variables included in the study. Multinomial logistic regression was used instead of binary logistic regression in able to discern any differential effects of attrition due to death and due to non-response versus respondents (reference category). If any significant effects are noted, it would be reasonable to assume that death and/or non-response did not occur at random.

Results from the attrition analysis that are presented in Table 3.2 reveal that the loss of subjects over time was not random. In terms of sociodemographic variables, being older (Odds Ratio [OR] = 1.116;  $p < .001$ ) and male (OR = 3.632;  $p < .001$ ) at Wave 1 were associated with a higher risk of dying by Wave 2 than being a respondent. In addition, those individuals reporting more functional limitations (OR = 1.038;  $p < .01$ ) and greater self-rated ill health (OR = 1.218;  $p < .01$ ) at Time 1 were more likely to die by Wave 2 than be a respondent. Turning to attrition due to non-response, males at Wave 1 were more likely to not participate at Wave 2 (OR = 1.367;  $p < .05$ ) than be respondents. Further, those individuals reporting greater amounts of social contacts (OR = .946;  $p < .01$ ) and fewer chronic health conditions (OR = .861;  $p < .05$ ) at Wave 1 were less likely to be non-respondents at Wave 2. Finally, those individuals having greater

self-rated ill health (OR = 1.152;  $p < .01$ ) were more likely to be a non-respondent at Wave 2. Even though many of the independent variables did not exhibit significant effects due to attrition, the potential bias associated with the nonrandom effects reported above need to be kept in mind when reviewing study findings.

### Living Alone, Social Relations, and Well-Being

Tables 3.3 through 3.8 contain both the unstandardized and standardized regression coefficients obtained when testing the interaction effects of living alone and three social relation measures on six separate measures of well-being: life satisfaction, depression, functional limitations, self-rated ill health, serious health conditions, and chronic health conditions. The top portion of these tables contains the additive effects of the various Wave 1 predictors on the six measures of well-being at wave 2 (Model 1). The bottom portion contains estimates associated with the testing of the three interaction terms (Model 2). More specifically, Model 2 includes the three interaction terms, Alone X Received Support, Alone X Anticipated Support, and Alone X Social Contacts were evaluated. In the following, standardized results concerning the six dependent measures of well-being will be presented separately.

Life Satisfaction. Examination of Model 1 in Table 3.3 reveals that in terms of additive effects, the only significant predictor of life satisfaction at Wave 2 is life satisfaction at Wave 1. More specifically, those reporting greater life satisfaction at Wave 1 also reported higher ratings of satisfaction at Wave 2 (beta = .454;  $p < .001$ ). This effect remains (beta = .455;  $p < .001$ ) when the interaction terms are added in Model 2. In addition, the interaction effect of alone X social contacts at Wave 1 is also significant (beta = .160;  $p < .05$ ), indicating that greater social contacts for those living

alone at Wave 1 are related to increased life satisfaction at Wave 2 even when previous life satisfaction is controlled. Further examination of the significant interaction term (Aiken and West, 1991) reveals that while the estimates for those living with others (beta=.003; Beta = .003; ns) and those living alone (beta= .163; Beta = .176;  $p < .01$ ) are both in the hypothesized positive direction, only the larger estimate associated with living alone is significant (see bottom of Table 3.3 for comparison).

Depression. Turning to Table 3.4 we find similar results. In particular, the major significant predictor of depression at Wave 2 is depression at Wave 1: those reporting greater feelings of depression at Wave 1 also reported higher ratings of depression at Wave 2 (beta = .360;  $p < .001$ ). In addition, greater numbers of years of education were related to decreased feelings of depression at Wave 2 (beta = -.109;  $p < .05$ ). The effects for depression and education remained (beta = .357;  $p < .001$  and Beta = -.118,  $p < .05$  respectively) when the interaction terms are added in Model 2. As was the case with life satisfaction, the interaction effect of alone X social contacts at Wave 1 is also significant (beta = -.249;  $p < .05$ ), indicating that greater social contacts for those living alone at Wave 1 are related to decreased reports of depression at Wave 2 even when previous depression is controlled.

Closer examination of the interaction term via Aiken and West's (1991) procedure should result in larger negative estimates for living alone versus living with others. This is in fact the case. While the estimates for those living with others (Beta = -.009; ns) and those living alone (beta = -.258; Beta=-.215;  $p < .05$ ) are both in the hypothesized negative direction, only the much larger estimate associated with living alone is significant (see bottom of Table 3.4 for comparison).



Functional limitations. Examination of Model 1 in Table 3.5 indicates several significant predictors of functional limitations at wave 2. Once again functional limitations at Wave 1 proved to be the most significant predictor of functional status at Wave 2: those reporting greater limitations at Wave 1 also reported more limitations at Wave 2 (beta = .693;  $p < .001$ ). In addition, more advanced age at Wave 1 was related to reporting more functional limitations at Wave 2 (beta = .227;  $p < .001$ ). Further, being male (beta = -1.475;  $p < .05$ ), greater numbers of years of education (beta = -.206;  $p < .05$ ), and higher reported income (beta = -.370;  $p < .001$ ) were related to decreased reports of limitations at Wave 2. These effects remained basically unchanged in Model 2 when the three interaction terms were added. Unlike life satisfaction and depression, the interaction effect of living alone X received support at Wave 1, not alone X social contacts, is significant (beta = .267;  $p < .05$ ), indicating that greater support received for those living alone at Wave 1 are related to increased reports of limitations at Wave 2 even when previous functional limitation is controlled.

Originally, it was hypothesized that closer examination of the living alone X received support interaction term (Aiken and West, 1991) should result in larger significant negative estimates for living alone versus living with others. This did not prove to be the case. The estimates for those living with others (beta=.025; Beta = .015; ns) and those living alone (beta=.292; Beta = .177; ns,  $t=1.69$ ) were neither significant nor in the hypothesized negative direction. This finding regarding the interaction term might reflect the increased use of support by those who experienced increases in functional limitations (see bottom of Table 3.5 for comparison).

Self-rated ill health. Table 3.6 presents results relevant to self-rated ill health. In

Model 1, self-rated ill health at Wave 1 proved to be the only significant predictor of self-rated ill health at Wave 2: those reporting poorer health at Wave 1 also reported poorer health at Wave 2 (beta = .588;  $p < .001$ ). This effect remained basically unchanged in Model 2 when the three interaction terms were added. Similar to life satisfaction and depression the interaction effect of living alone X social contacts at Wave 1 is significant (beta = -.099;  $p < .05$ ), indicating that greater social contacts for those living alone at Wave 1 are related to more favorable ratings of physical health at Wave 2 even when previous self-rated ill health is controlled. In addition, living alone is now significantly related in Model 2 to greater self-rated ill health at wave 2 (beta = 1.646;  $p < .05$ ).

Once again it is hypothesized that examination of the interaction term via Aiken and West's (1991) procedure should result in larger negative estimates for living alone versus living with others. While the estimates for those living with others and those living alone were both significant at the  $p < .01$  level, the estimate for living with others (beta=.038; Beta = .070;  $p < .01$ ) was positive while the estimate for those living alone (beta= -.061; Beta = -.114;  $p < .01$ ) was larger in magnitude and in the hypothesized negative direction (see bottom of Table 3.6 for comparison).

Serious Health Conditions. As noted in the measurement section, serious health conditions and chronic health conditions were evaluated separately. Model 1 in Table 3.7 reveals several significant predictors of serious health conditions at wave 2. Serious health conditions at Wave 1 proved to be the most significant predictor of serious health conditions at Wave 2: those reporting greater number of serious conditions at Wave 1 also reported greater numbers at Wave 2 (Beta = .505;  $p < .001$ ). A higher level of support received at Wave 1 is also related significantly to more serious health conditions

(beta = .016;  $p < .05$ ). There were no significant living arrangement interactions associated with serious health conditions at Wave 2.

Chronic Health Conditions. Turning to Table 3.8, we find similar results. In particular, the major significant predictor of chronic conditions at Wave 2 is chronic conditions at Wave 2 at Wave 1: those reporting greater numbers of chronic health conditions at Wave 1 also reported greater numbers of chronic health conditions at Wave 2 (beta = .531;  $p < .001$ ). In addition, more reported support received at Wave 1 was related to greater numbers of chronic health conditions at Wave 2 (beta = .021;  $p < .01$ ). The effects for wave 1 chronic conditions and support received (beta = .531;  $p < .001$  and beta = .031,  $p < .001$  respectively) persisted when the interaction terms were added in Model 2. The interaction effect of living alone X social contacts at Wave 1 is also significant (beta = -.062;  $p < .05$ ), indicating that greater social contacts for those living alone at Wave 1 are related to decreased numbers of chronic conditions at Wave 2 even when previous chronic conditions are controlled (see bottom of Table 3.8 for comparison).

As was the case with self-rated ill health, examination of the interaction term via Aiken and West's (1991) procedure resulted in significant estimates for both those living with others and those living alone. However, the estimate for those living with others (beta = .018; Beta = .050;  $p < .001$ ) was in a positive direction while the estimate for those living alone (beta = -.044; Beta = -.123;  $p < .001$ ) was in the hypothesized negative direction.

## **Discussion**

The overall goal of this research was to examine the interaction of living alone and social relations on physical and emotional well-being over time. To this end, the key pathways identified in chapter two (social contacts on support received, support received on anticipated support, and anticipated support on well-being) provided the starting point for examining three interaction effects of living alone and social resources over time on well-being in paper two. These interactions are living alone by social contacts, living alone by support received, and living alone by anticipated support. In the following, the three key findings will be discussed.

The first notable finding that the largest predictor of well-being at Time 2 is well-being at Time 1. This indicates that while physical and psychological well-being is not static over time, both constructs exhibit a great deal of stability consistent with results from several longitudinal studies of life satisfaction (Bauer & Okun, 1983; Bowling, Farquar, & Grundy, 1996).

Regarding the specific research question addressed in this paper (i.e., the significance of interactions between living alone and social relations on well-being over time), the second key finding is that even when controlling for T1 covariates and well-being, several significant interactions between living alone and social relations emerged. By far, the most prevalent of these significant interactions was living alone by social contacts.

The interaction effect of living alone X social contacts indicated that greater social contacts for those living alone at Wave 1 are related to increased life satisfaction at Wave 2. Further examination of the significant interaction term (Aiken & West, 1991) revealed that while the estimates were both in the hypothesized positive direction, only

the larger estimate associated with living alone is significant. Similarly, the interaction effect of alone X social contacts at Wave 1 is also significantly associated with decreased reports of depression. Once again, examination of the interaction term showed that while both were in the hypothesized negative direction, only the much larger estimate associated with living alone was significant.

In addition, the significant interaction effect of living alone X social contacts at Wave 1 indicated that greater social contacts for those living alone at Wave 1 are related to more favorable ratings of physical health at Wave 2. Closer examination of the interaction term indicated that while the estimates for those living with others and those living alone were both significant, living with others was positive while living alone was larger in magnitude and in the hypothesized negative direction.

As was the case with self-rated ill health, a closer look at the significant interaction term for living alone X social contacts on chronic conditions at Time 2 (Aiken & West, 1991) resulted in significant estimates for both those living with others and those living alone and the estimate for those living with others was in a positive direction while the estimate for those living alone was in the hypothesized negative direction.

In terms of the other two interaction terms, alone X received support and alone X anticipated support, two interesting results were noted. Unlike the other well-being indicators described above, the interaction effect of alone X received support, not alone X social contacts, on functional limitations was significant indicating that greater support received for those living alone at Wave 1 are related to increased reports of limitations at Wave 2. However closer examination of the interaction term revealed that the estimates for those living with others and those living alone were neither significant nor in the

hypothesized negative direction. Finally, the interaction of alone X anticipated support proved to be insignificant for all measures of well-being.

In addition to the key findings noted above, it should be mentioned that the significant relationships between other covariates and physical well-being at Time 2 varied greatly from those same relationships with the psychological well-being measures at Time 2. More specifically, several covariates other than well-being at time 1 evidenced significant relationships with the different indicators of physical well-being at Time 2. In addition to functional status at Time 1, older age, female gender, lower reported education, and less income were related to change in health over time. Also greater reported amounts of received support was associated with greater reported serious and chronic conditions, and this relationship remained significant after the interaction terms were added to the equations. Neither anticipated support nor social contacts were linked to physical well-being at Time 2.

In contrast to the results regarding physical well-being, only one significant relationship between a covariate (other than psychological well-being at Time 1) and psychological well-being at Time 2 was supported by the data. Specifically, lower reported education was associated with higher reported depression at Time 2. This would seem to indicate that psychological well-being may be more stable in the elderly than physical well-being.

Two limitations need to be addressed at this time. First, it should be noted that these findings pertain to a time span of three years. Longer periods of time that include time lagged variables may be needed to see if these trends remain the same and if they in fact represent reciprocal linkages. Second, OLS was used in the current analyses as a

parsimonious method to examine the interactions of living arrangement and social contacts on well-being over time. The apparent stability of psychological well-being over time as compared to physical well-being may be more closely looked at via the use of hierarchical linear modeling (Raudenbush & Bryk, 2002) where trajectories of well-being as well as intra individual changes may be examined (Liang et al, 2003; Liang et al., 2005).

In conclusion, the role of living lone and its interaction with social contacts has proven to be consistent over time. This complements the cross-sectional findings in the chapter two by further emphasizing the need for maintenance of social contacts among the elderly in maintaining well-being over time. This is especially true for those who live alone either by choice or by circumstances. However, it is important to reflect on why significant findings emerged with the social contact measures, but not the measures of received support or anticipated support. Perhaps part of the reason lies in focusing on the juncture between the underlying constructs these measures are thought to capture and the social needs of those who live alone. Social contact measures merely assess whether an interpersonal connection was made with significant others, whereas received support measures what was actually provided once contact was made, and anticipated support deals with beliefs about supportive exchanges in the future. Almost by definition, those who live alone are at risk of spending more time away from other people. Perhaps the sheer contentment, joy, and relief of coming into contact with others best speaks to the needs of those who live by themselves. Simply put, what those who live alone may need most is the mere presence of others - not assistance of any kind or promises of help in the future.

Table 3.1. Descriptive Statistics for Items in the Analyses

Covariates	Mean	Standard Deviation
Wave 1 Variables (N=1103)		
Living Alone (1 = lives alone)	.379	
Age	73.291	5.740
Sex (1 = male)	.347	
Education (years)	11.905	3.500
Income	4.815	2.387
Received Support	20.697	6.196
Anticipated Support	10.194	2.158
Social Contacts	15.037	3.489
Depression	11.252	4.071
Life satisfaction	15.491	3.210
Serious Conditions Wave1	.783	.825
Chronic Conditions Wave 1	1.441	1.272
Functional Status Wave 1	6.015	9.218
Self-Rated Ill Health Wave 1	5.354	1.838
Wave 2 Variables (N=605)		
Depression	11.561	4.178
Life Satisfaction Wave 2	15.127	3.216
Serious Conditions Wave 2	.831	.825
Chronic Conditions Wave 2	1.628	1.254
Functional Status Wave 2	7.832	10.205
Self-Rated Ill Health Wave 2	5.653	1.886



Table 3.2. Odds Ratio=s (OR) for Multinomial Logistic Regression Analysis of Attrition (N=1103)

Covariates	Odds Ratios	
	Death	Non-response
Age	1.116***	1.016
Gender (1=male)	3.632***	1.367*
Education	.952	.970
Income	.921	.999
Living Alone	1.423	1.318
Received Support	1.026	1.019
Anticipated Support	1.038	.967
Social Contacts	.951	.946**
Life Satisfaction	.994	1.045
Depression	.970	.998
Functional Limitations	1.038**	1.017
Self-rated Ill Health	1.218**	1.152**
Serious Conditions	1.237	.878
Chronic Conditions	.938	.861*

\* p < .05; \*\* p < .01; \*\*\* p < .001

Table 3.3. Regression Coefficients for OLS Hierarchical Regressions Predicting Wave 2 Life Satisfaction (N=605)

Covariates	Life Satisfaction W2	
	Unstandardized	Standardized
<b>Model 1</b>		
Age	-.011	-.020
Gender (1=male)	-.033	-.005
Education	-.042	-.046
Income	.084	.063
Life Satisfaction	.454***	.453
Received Support	-.032	-.062
Anticipated Support	.015	.010
Social Contacts	.054	.059
Living Alone	-.376	-.053
$R^2$	.244***	
<b>Model 2</b>		
Age	-.014	-.024
Gender (1=male)	-.048	-.007
Education	-.038	-.041
Income	.088	.065
Life Satisfaction	.455***	.454
Received Support	-.046	-.088
Anticipated Support	.042	.028
Social Contacts	.003	.003
Living Alone	-2.432	-.343
Alone X Received	.036	.114
Alone X Anticipated	-.113	-.164
Alone X Social Contacts	.160*	.361
$R^2$ ( $R^2$ change)	.251(.008)	
Breakdown of interaction term by living arrangement	Unstandardized Beta	Standardized Beta
lives with others (0)	0.003	0.003
lives alone (1)	0.163	0.176**

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Table 3.4. Regression Coefficients for Hierarchical OLS Regressions  
Predicting Wave 2 CESD (N=605)

Covariates	CESD W2	
	Unstandardized	Standardized
<b>Model 1</b>		
Age	.013	.017
Gender (1=male)	-.510	-.058
Education	-.109*	-.091
Income	-.053	-.030
CESD	.360***	.350
Received Support	.029	.043
Anticipated Support	-.080	-.041
Social Contacts	-.080	-.067
Living Alone	-.034	-.037
$R^2$	.178***	
<b>Model 2</b>		
Age	.015	.020
Gender (1=male)	-.535	-.061
Education	-.118*	-.099
Income	-.056	-.032
CESD W1	.357***	.348
Received Support	.028	.042
Anticipated Support	-.052	-.027
Social Contacts	-.010	-.008
Living Alone	3.336	.362
Alone X Received	.040	.096
Alone X Anticipated	-.074	-.082
Alone X Social Contacts	-.249*	-.431
$R^2$ ( $R^2$ change)	.188(.009)	
Breakdown of interaction term by living arrangement	Unstandardized Beta	Standardized Beta
lives with others (0)	-0.009	-0.007
lives alone (1)	-0.258	-0.215*

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Table 3.5. Regression Coefficients for OLS Hierarchical Regressions  
Predicting Wave 2 Functional Status (N=605)

Covariates	Functional Status W2	
	Unstandardized	Standardized
<b>Model 1</b>		
Age	.227***	.127
Gender (1=male)	-1.475*	-.069
Education	-.206*	-.071
Income	-.370*	-.086
Functional Status	.693***	.626
Received Support	.074	.045
Anticipated Support	-.030	-.006
Social Contacts	-.023	-.008
Living Alone	-.265	-.012
$R^2$	.537***	
<b>Model 2</b>		
Age	.229***	.128
Gender (1=male)	-1.613*	-.075
Education	-.221*	-.076
Income	-.365*	-.085
Functional Status	.690***	.623
Received Support	.025	.015
Anticipated Support	.088	.019
Social Contacts	.063	.022
Living Alone	4.132	.183
Alone X Received	.267*	.266
Alone X Anticipated	-.416	-.190
Alone X Social Contacts	-.387	-.274
$R^2$ ( $R^2$ change)	.543(.007**)	
Breakdown of interaction term by living arrangement	Unstandardized Beta	Standardized Beta
lives with others (0)	0.0246	0.015
lives alone (1)	0.2916	0.177

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Table 3.6. Regression Coefficients for OLS Hierarchical Regressions Predicting Wave 2 Self-Rated Ill Health (N=605)

Covariates	Self-rated Ill Health W2	
	Unstandardized	Standardized
<b>Model 1</b>		
Age	-.015	-.045
Gender (1=male)	-.002	-.001
Education	-.019	-.035
Income	-.063	-.080
Self-rated Ill Health	.588***	.573
Received Support	.003	.008
Anticipated Support	.009	.010
Social Contacts	.012	.022
Living Alone	.161	.039
$R^2$	.354***	
<b>Model 2</b>		
Age	-.015	-.045
Gender (1=male)	-.028	-.007
Education	-.023	-.042
Income	-.063	-.080
Self-rated Ill Health	.592***	.577
Received Support	-.005	-.018
Anticipated Support	.039	.045
Social Contacts	.038	.070
Living Alone	1.646*	.396
Alone X Received	.047	.251
Alone X Anticipated	-.096	-.236
Alone X Social Contacts	-.099*	-.382
$R^2$ ( $R^2$ change)	.365(.010*)	
<hr/>		
Breakdown of interaction term by living arrangement	Unstandardized Beta	Standardized Beta
lives with others (0)	0.038	0.070**
lives alone (1)	-0.061	-0.114**

\* p < .05; \*\* p < .01; \*\*\* p < .001

Table 3.7. Regression Coefficients for OLS Hierarchical Regressions Predicting Wave 2 Serious Health Conditions (N=605)

Covariates	Serious Conditions W2	
	Unstandardized	Standardized
Model 1		
Age	-.005	-.031
Gender (1=male)	.003	.002
Education	-.007	-.028
Income	.006	.016
Serious Conditions	.505***	.505
Received Support	.016**	.117
Anticipated Support	-.015	-.038
Social Contacts	-.007	-.031
Living Alone	-.058	-.032
$R^2$	.283***	
Model 2		
Age	-.004	-.030
Gender (1=male)	-.002	-.001
Education	-.007	-.031
Income	.006	.016
Serious Conditions	.504***	.504
Received Support	.014*	.105
Anticipated Support	-.019	-.050
Social Contacts	.002	.009
Living Alone	.125	.068
Alone X Received	.011	.135
Alone X Anticipated	.014	.078
Alone X Social Contacts	-.036	-.318
$R^2$ ( $R^2$ change)	.288(.004)	

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Table 3.8. Regression Coefficients for OLS Hierarchical Regressions Predicting Wave 2 Chronic Health Conditions (N=605)

Covariates	Chronic Conditions W2	
	Unstandardized	Standardized
<b>Model 1</b>		
Age	-.002	-.009
Gender (1=male)	.113	.043
Education	-.014	-.038
Income	-.016	-.031
Chronic Conditions	.531***	.539
Received Support	.021**	.106
Anticipated Support	.006	.011
Social Contacts	-.004	-.012
Living Alone	-.092	-.033
$R^2$	.321***	
<b>Model 2</b>		
Age	-.001	-.004
Gender (1=male)	.124	.047
Education	-.017	-.047
Income	-.019	-.036
Chronic Conditions	.531***	.539
Received Support	.031***	.154
Anticipated Support	.014	.025
Social Contacts	.018	.051
Living Alone	1.569**	.567
Alone X Received	-.031	-.252
Alone X Anticipated	-.006	-.024
Alone X Social Contacts	-.062*	-.361
$R^2$ ( $R^2$ change)	.336(.016**)	
<b>Breakdown of interaction term by living arrangement</b>		
lives with others (0)	0.018	0.050***
lives alone (1)	-0.044	-0.123***

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

## **Chapter 4**

### **The Impact of Socioeconomic Status and Living Alone on Life Satisfaction Trajectories among the Elderly**

Subjective well-being has been studied by psychologists and sociologists for over five decades (Maddox & Wiley, 1976; Neugarten, Havighurst & Tobin, 1961). Subjective well-being comprises many domains, with much of the research focusing on the distinction between positive and negative affect and life satisfaction (Ryff, 1989).

Although the study of psychological well-being has not always been informed by theory, the structure of several measures has been widely examined among samples of older adults including the Life Satisfaction Index (Neugarten, Havighurst, & Tobin, 1961) and the Center for Epidemiological Studies – Depression Scale (; Krause & Liang, 1992; Liang, 1984; 1985; Radloff, 1977; Stock, Okun, & Benin, 1986).

Subjective well-being refers to an individual's overall assessment of their life and comprises life satisfaction, positive affect, and negative affect (Diener, 2000; Pinquart & Sörensen, 2000). In addition to being valuable as a construct with which to evaluate behavioral interventions, the study of subjective well-being provides an avenue to focus on the positive aspects of life as contrasted with the predominant focus on negative health outcomes such as chronic disease and disability (National Research Council, 2001).

Empirical results are equivocal concerning changes in subjective well-being over time and age. Diener and colleagues (Diener et al. 1999) reviewed three decades of



subjective well-being research and found the construct to be relatively stable across age (Butt & Beiser, 1987; Inglehart, 1990; Newmann, 1989). Other investigators have reported a positive (Campbell, Converse, & Rogers, 1976; Diener, 1984; Prenda & Lachman, 2001), curvilinear (Lang & Heckhausen, 2001), and a negative relationship (Chen, 2001; Freund & Baltes, 1998) between subjective well-being and age.

Longitudinal studies have shown short-term (up to two years) stability of life satisfaction (Bauer & Okun, 1983; Bowling, Farquar, & Grundy, 1996), whereas a recent analysis of data over a 22-year period has indicated that life satisfaction peaks at age 65 and then declines (Mroczek & Spiro, 2005). More recently, Young (2006) reported findings that the effect of support on life satisfaction varied by source. In particular, family support family did not lead to higher levels of life satisfaction. In a similar vein, Reinhardt, Boerner, and Horowitz (2006) that after controlling for the positive effect of perceived support, receiving instrumental support had a negative effect, while receiving affective support had a positive effect on well-being.

One reason for these equivocal results may be the social context in which these relationships are examined. Social roles, particularly as defined by marital status and living arrangement, have been posited to play a critical role in the subjective well-being of older adults. One such living arrangement is living alone. Living alone is strongly related to subjective well-being and merits additional attention in the research literature. According to the U.S. Census Bureau (Fields & Casper, 2001), the percentages of older adults aged 65 or older who lived alone in 2000 were 17.0% for men and 39.6% for women. How might living alone affect well-being? A key to this relationship may be found in interpersonal contacts and social support. Those who live with others have built

in daily contact; people who live alone must make a more concerted effort to initiate and maintain social contacts. Having a differential access to social interaction is important because a vast body of research suggests that maintaining regular contact with others is essential for a wide range of health-related outcomes, including well-being (Pinquart & Sörensen, 2000).

A majority of the research on living arrangements has focused on the strong and positive effect of marital status on health. However, Hughes and Waite (2002) found a significant relationship between living arrangement and health two years later, independent of the effects of marital status. The lack of research on unmarried older adults is further exacerbated by problems in specifying the components and structure of social support. Social support is a complex multidimensional construct and as such, it is not clear which dimensions or facets of support are associated with subjective well-being. Further, the underlying mechanism presumably involved in the salubrious effects of being married is related to having a co-resident who can be a constant and immediate source of support if needed.

This viewpoint overlooks the possibility that older people may be unmarried, but nevertheless live with other individuals. These other adults could be part of a committed relationship that are either unable to marry or choose to remain unmarried. So if the real underlying factor is some sort of residential isolation, then focusing on those who live alone may more accurately capture this factor. In addition, those who live alone are frequently the sole person responsible for overseeing their domicile expenses and upkeep. While some elderly living alone may be better off financially to handle their expenses and residence upkeep, the burden of arranging for present and future expenses and

upkeep still falls on them. This potential burden may inhibit providing support to others by limiting the amount of money, goods, or other assistance available to exchange.

How does social structure relate to living alone and subjective well-being? Social structure comprises age, gender, education, and race and influences virtually all facets of social life, including well-being. At the macro level, social structure influences subjective well-being via socioeconomic status and social stratification (House et al., 1994; Ross & Wu, 1996; Hagestad & Dannefer, 2001; O’Rand, 2001). This influence can be seen in the following arguments. In a large part, subjective well-being is derived from one’s accomplishments in life and acceptance of one’s past as worthwhile. Higher educational success may lead to a positive appraisal of one’s life, which in turn leads to greater subjective well-being. In addition, greater external as well as internal resources may improve one’s quality of life and reduce financial strain. Finally, people of higher socioeconomic status may guard against the negative consequences of life stressors by reducing their risk and devising effective coping strategies (Pinquart & Sörensen, 2000). In fact, there is extensive research to suggest that higher education, income, and social class lead to greater subjective well-being (George, 1992; Haring, Stock, & Okun, 1984).

Viewing the relationship in terms of the theory of cumulative advantage adds a more dynamic view to research in this field. Cumulative advantage suggests that the association between socioeconomic status and health increases over time. Accordingly, research has documented that socioeconomic status is positively associated with well-being, and this differential increases with age (Dannefer, 2003; O’Rand, 2001; Ross & Wu, 1996). Selective survival may cause inequalities in subjective well-being to diminish and possibly converge in later life (Palloni & Ewbank, 2004). In other words,

these same social structural indicators also influence whether a person lives alone, although limited attention has been afforded to how living alone may interact with these social structures in terms of trajectories of subjective well-being.

A positive view on life satisfaction over time in the elderly has been offered by Tornstam (1997) in the concept of gerotranscendence. Gerotranscendence, according to Tornstam, is "a shift in meta-perspective from a materialistic and pragmatic view of the world to a more cosmic and transcendent one, normally accompanied by an increase in life satisfaction" (Tornstam, 1997 p. 143; 2005). Instead of maintaining goals, expectations, and ideals associated with mid-life, gerotranscendence offers a developmental aging perspective emphasizing change.

A great deal of the research on subjective well-being is based on cross-sectional studies. Cross-sectional studies, however, confound intrapersonal changes with interpersonal differences. The few longitudinal studies of subjective well-being in old age are largely based on either highly aggregated data of population trends and a series of repeated cross-sectional surveys (e.g., Diener & Suh, 1998), or consist of two observations over a relatively short period of time (Smith & Baltes, 1993). The problem lies in the fact that studies of population trends reveal little information on intrapersonal changes over time and two repeated observations estimate the amount of change but do not distinguish among alternative growth curves (Hertzog & Nesselroade, 2003; Rogosa, 1988). People do not exhibit uniform changes and outcomes as they move through the life course. Instead, as Dannefer (2003) points out, individual differences become more pronounced as people grow older. It is for this reason that the study of inter-individual and intra-individual change is so critical.

Although a wide array of measures of subjective well-being have been included in past research, the current analyses will focus on life satisfaction. Life satisfaction reflects a cognitive evaluation of one's life as satisfying or congruent with one's goals. Life satisfaction was chosen for several reasons. First, the reliability of life satisfaction scales for the elderly has been adequately addressed. Most importantly, while research has shown short term stability in life satisfaction over short periods of time (Bowling, Farquar, & Grundy, 1996), evidence has also supported different results over time including data over a 22-year period that indicated life satisfaction peaks at age 65 and then declines (Mroczek & Spiro, 2005).

In order to help clarify the equivocal findings regarding how life satisfaction changes over time among the elderly, analyzing life satisfaction using Hierarchical Linear is proposed. Modeling (HLM). In addition, we plan to further our knowledge by examining the influence of social structure (measured here as age, education, and gender) and its interaction with living alone before and after controlling for the effects of social resources on life satisfaction. The following hypotheses will be tested.

Hypothesis 1: On average, life satisfaction will decrease over time.

Hypothesis 2: Those living alone are especially likely to experience a decrease in life satisfaction over time. The decline will be manifest in both the intercept and the slope. Specifically, for those living alone as contrasted with those living with others, the intercept will be lower and the rate of change will decrease over time.

Hypothesis 3: Age, gender, and education are expected to interact with living

alone.

Hypothesis 4: The addition of social resources to the model will mediate the effect these hypothesized interactions exert on life satisfaction.

Those with more social support will be less vulnerable to the loss of life satisfaction.

## **Methods**

### Sample

The data for these analyses come from four waves of an NIA funded (Neal Krause, PI) probability sample of noninstitutionalized English-speaking elderly household residents, who were 65 years of age and older at Wave 1, retired, and living in the coterminous United States. Wave 1 interviews were conducted by Louis Harris and Associates (now Harris Interactive). With a response rate of 69%, a total of 1,103 interviews were completed at the baseline in 1993. Collection of Waves 2 through 4 data was completed in 1997 (n=605), 1999 (n=529), and 2003 (n=269) with response rates in the range of lower 60%. Descriptive statistics for selected items in the analyses are provided in Table 4.1.

### Measures

In HLM, the data are in two separate files, Level 1 and Level 2. The Level 1 file contains all time-varying covariates and the Level 2 file contains all time constant covariates. The goal of Level 1 is to assess the extent of variation in individual trajectories over time. The goal of Level 2 is to identify factors that can explain or predict these individual changes.

Level 1 dependent Variable. Life satisfaction is assessed by a composite comprising three items from the LSIA scale (Neugarten, Havighurst, and Tobin, 1961) and one global indicator of overall life satisfaction. The 3 LSIA items include: (a) best years of my life, (b) look back on my life, fairly well satisfied, and (c) would not change my past life even if I could (4-point scale [strongly disagree (1), somewhat disagree (2), somewhat agree (3), and strongly agree (4)]). In addition, a fourth item assessing satisfaction with life as a whole is included [not satisfied at all (1), not very satisfied (2), somewhat satisfied (3), very satisfied (4), and completely satisfied (5)]. This item was transformed to the same 4-point scale as the LSIA items before the composite was computed. Chronbach's alphas for the life satisfaction composite are: wave 1 = .71; wave 2 = .67; wave 3 = .72; and wave 4 = .64). Higher scores on all four items reflect greater reported life satisfaction.

Level 2 (baseline) covariates. Age is treated as a continuous variable. Male was coded as a dummy variable with the value "1" representing male. Education was also scored as a continuous variable reflecting the total numbers of years of completed schooling. A dummy variable was created to reflect current living arrangement with "1" reflecting those individuals who were living alone and "0" reflecting those who were living with others.

Functional status was included to control for differential physical health and possible disability. Functional status was scored as the sum of 14 variables assessing daily limitations in bathing yourself, climbing a few stairs, walking outside, dressing yourself, and feeding yourself, shopping, using the phone, light housework, taking a train or bus, standing, stooping, reaching, grasping, and lifting. Each item was scored on a

five-point scale in terms of difficulty as follows: none (0), a little (1), some (2), a lot (3), and unable to do it (4). Chronbach's alpha for the 14-item composite is .91).

Three dimensions of support will be assessed in this study: received social support, social contact, and negative interaction. Social support received from others during the past year is measured by a single composite comprising tangible support, informational support, and emotional support. The composite was created by summing the scores on 10 items: (a) help with transportation, (b) help with chores, (c) help with shopping, (d) being with a person during stressful times, (e) comforting via physical affection, (f) listening to a person, (g) expressing interest and concern, (h) suggesting some action, (i) providing information during a difficult situation, and (j) help with understanding situations. All items described above were coded very often (4), fairly often (3), once in a while (2), and never (1). The received support composite scale scores ranged from 10 to 40, with a higher score reflecting greater support received (Chronbach's alpha = .68).

Social contacts are measured at time 1 by a single composite scale comprising contacts with kin and contacts with friends. Specifically, the variable is created by summing the responses across six 4-point items for contact with kin is assessed by the frequency in a week the subject: (a) went out to visit family, (b) had the family visit them, (c) had contact by phone or letter with their family, (d) went out to visit friends, (e) had friends visit them, and (f) had contact by phone or letter with friends. Response categories for the six contact items are: never (1), once in awhile (2), fairly often (3), and very often (4). The scale ranged from 6 to 24, with a higher score reflecting a higher frequency of contacts (Chronbach's alpha = .68).



Interaction with others is not always pleasant. In order to provide a more balanced point of view of the social support process it is necessary to take these negative exchanges into account as well. Negative interaction comprises four items assessing unpleasant feelings associated with the contact with others during the past year. These items include: (a) too many demands, (b) critical of you, (c) prying into personal affairs, and (d) taking advantage of you. All four items are coded in the following manner: very often (4), fairly often (3), once in a while (2), and never (1). Higher scores reflect greater amounts of negative interaction reported by the respondent (Cronbach's alpha = .80).

#### Missing Data Imputation

Initial descriptive analysis of the data for the 1103 elderly participants indicated that with the exception of income with 10.77 % missing data, the proportion of cases with missing data on the remaining items ranged from 0% to 8.22%. Although the proportion of missing data for each item was quite small, the use of listwise deletion of cases would have resulted in drastic sample reduction. In an effort to avoid the potential bias associated with item nonresponse, multiple imputation was employed (Schafer, 1997).

Multiple imputation involves a regression-based approach and a data augmentation algorithm that incorporates random variation (Rubin, 1987). More specifically, three complete data sets were imputed and the analyses that follow were then run on each of these three data sets. Subsequently, estimates were averaged across the five imputations to generate a single point-estimate. Standard errors were then calculated using a formula that combined the average of the squared errors of the estimates and the variance of the parameter estimates across the five. (Schafer, 1997; Schafer & Olsen, 1998).

## Data Analysis

To evaluate the hypotheses outlined above, hierarchical linear models will be employed. In particular, changes in life satisfaction within an older person will be represented by a growth curve as follows (level 1 or repeated-observation model):

$$Y_{iT} = b_{0i} + b_{1i}T + \varepsilon_{iT} \quad (1)$$

In Equation 1,  $Y_{iA}$  is life satisfaction for individual  $i$  at time  $T$ ;  $b_{0i}$  is the intercept of life satisfaction for individual  $i$ ;  $b_{1i}$  is the rate of change (slope) in life satisfaction for individual  $i$  across the different times; and  $\varepsilon_{iA}$  represents random error in life satisfaction for individual  $i$  at time  $T$ .

In the proposed analysis, both linear and non-linear changes in life satisfaction will be considered. Linear change with time will be evaluated by estimating Equation 1 as it appears above, whereas non-linear change will be evaluated in a separate pass through the data by adding additional nonlinear terms (e.g., quadratic and/or cubic time terms). By comparing several progressively more complex models in which life satisfaction is modeled as linear, quadratic, and/or cubic functions of time, the most appropriate functional form for the norm will be selected.

An important feature of Equation 1 is the assumption that the growth curve parameters vary across individuals. Thus, individual growth curve parameters (i.e., intercept and slopes of time-related changes) become dependent variables in the level 2 (or person-level) models. Within a level-2 equation without any covariates (or an unconditional model), the intercept is equivalent to the mean of a particular parameter (e.g., intercept or rate of change). In addition, some individual or group attributes can be included as predictors. This can be represented in the following for each of the

individual growth parameters:

$$b_{pi} = \beta_{p0} + \sum \beta_{pq} X_{qi} + r_{pi} \quad (2)$$

In Equation 2,  $X_{qi}$  is a covariate (e.g., age, male, education, functional status, etc.) associated with individual  $i$  and,  $\beta_{pq}$  represents the effect of  $X_q$  on the  $p$ th growth parameter ( $b_{pi}$ ).  $r_{pi}$  is a random effect with mean of 0.

## Results

Linear and quadratic functions (see Table 4.2) were evaluated with the quadratic specification fitting the unconditional model best [intercept = 12.297 ( $p = .000$ ); linear slope =  $-.032$  ( $p = .015$ ); quadratic slope =  $.007$  ( $p = .035$ )]. In terms of satisfaction, the intercept falls slightly above "neither satisfied nor unsatisfied". With a negative linear slope of  $-.041$  ( $p < .01$ ) and a positive quadratic slope  $.013$  ( $p < .01$ ), life satisfaction decreases over time until year 5, when satisfaction begins to increase (dotted black line in Figure 4.1).

Figure 1 shows the roughly parallel lines for those living with others and those living alone (Model 1, Table 4.3). At baseline, those living alone reported slightly lower levels of satisfaction at the intercept than did those living with others. Even though the linear and quadratic slopes were statistically significant, the differences over time do not seem very different regardless of one's living arrangement at baseline. The actual estimates for Figure 4.1 are presented in Table 4.4.

Model 1 (Table 4.3) coefficients indicate that both living alone ( $-.656$ ;  $p=.000$ ) and poorer functional status ( $-.109$ ;  $p=.000$ ) exert negative effects on the intercept of satisfaction. This suggests that those who live alone and those in poor health tend to have

lower life satisfaction at the onset of the study. Neither age, gender, nor education directly affected the intercept. There were no significant effects associated with the linear and quadratic rate of change although age is very close to exerting a positive effect on the quadratic slope (.001;  $p=.053$ ).

Turning to the hypothesized interactions, the effect of living alone on life satisfaction varied across education and age (see Table 4.3, Model 2). Education by living alone was significant at the intercept only (-0.089,  $p = .050$ ). At baseline, those living with others reported higher levels of satisfaction regardless of education (Figure 4.2). However within each living arrangement, higher education was related to less reported satisfaction. No significant education by alone interactions were noted on the linear and quadratic slopes. Table 4.5 contains the estimates for Figure 2.

The interaction of baseline age by living alone exhibited significant effects on the intercept of satisfaction (0.054,  $p=.046$ ) as well as the linear slope (-0.013,  $p=.016$ ). Older age at baseline was related to greater satisfaction at baseline within living arrangement. This changed immediately over time with the youngest ages reporting greater satisfaction while older ages reported decreased satisfaction until approximate convergence at year 7. At year 8, within each living arrangement, older age was related to greater satisfaction, with a greater difference among those living alone. See Table 4.6 for the estimates associated with Figure 4.3.

In Model 3 (Table 4.3) social relation variables were added to the model to see if they mediated any of effects of living alone, including the interactions Negative interaction and support received were not significantly associated with the intercept and slopes. As expected, reported more social contact is associated with higher satisfaction at

baseline (.131;  $p=.000$ ). Even when controlling for support (Model 3, Table 4.3), living alone remained associated with less satisfaction (-.861;  $p = .000$ ). While the negative interaction of living alone by education at baseline reduced slightly, the significance increased (-.070;  $p = .000$ ). The interaction of age by living alone was no longer significant at baseline but the interaction remained significant at the linear slope (-.012;  $p = .023$ ).

## **Discussion**

The overall goal of this research was to examine the interaction of living alone and social structure on well-being, defined in these analyses as life satisfaction. A series of incremental models were examined to: (a) define the shape of the overall trajectory of life satisfaction; (b) to see how the trajectory varies by living status; (c) examine the interaction of living alone and social structure, more specifically (age, male, and education); and (d) explore how social relations may affect these hypothesized interactions.

First, what is the overall shape of the trajectory of life satisfaction? Overall, the sample appeared “somewhat satisfied” with a decrease in life satisfaction over time until year 5 when satisfaction begins to increase. The good news is that there are no great decreases in level of satisfaction. And in fact, over the time of this study, i.e. 10 years, the level of satisfaction returned to the same level it was at baseline.

Are those living alone less satisfied than those residing with others? The answer is yes, but the negative direct effects of living alone on life satisfaction are evidenced in the intercept (baseline) only. Even when controlling for functional limitations, living

alone still exerted a significant negative effect on baseline life satisfaction. With the exception of the negative impact of functional status on baseline satisfaction, no other variable significantly impacts the intercept (Model 1). This surprising finding might be a result of controlling for functional status and its relationships with age, gender, and education.

How does the rate of change in satisfaction vary over the years for these two living arrangements? Simply stated in terms of direct effects, they do not change. They are fairly similar and consistent over time for those living alone and those living with others. There are no significant effects on the linear and quadratic rates of change in satisfaction. Although age, gender, and education were found to have no direct significant effects on the baseline level or their rate of change, it may be case that the model tested did not adequately portray the relationship. What if age, gender, and education were important predictors only when interacting with living arrangement? This, in fact, proved to be the case regarding education and age. Less education was related to greater satisfaction within each living arrangement at baseline, with those living alone the least satisfied of all. One explanation for this may lie in the fact that while those with higher education may be more aware of changes in their lives and be better able to apply cognitive assessments of their lives, but they may be more likely to seek a higher level of accomplishments to compare with their own (Figure 4.2). Another explanation may be the inability of the more highly educated to find a suitable alternative to the rewarding jobs they had in earlier life

The interaction of age within each living arrangement is more complex. Not only are older individuals within in living arrangement significantly more satisfied at baseline,

they also experience a difference in their rate of change over time. At each year those living alone at baseline reported slightly less satisfaction than did those living with others with the exception of those 85 years of age living alone at baseline. Their ratings of satisfaction slightly surpassed those age 65 living with others.

Within each living arrangement, those who were older at baseline showed greater increases in satisfaction over time. For both living arrangements, those age 65 at baseline showed a steady decrease over time. The rate of change of those 75 years of age at baseline fell somewhat in the middle. This changed immediately over time with the youngest ages reporting greater satisfaction than those 85 years of age. Older ages reported decreased satisfaction until approximate convergence at year 7. At year 8, within each living arrangement, older age was related to greater satisfaction, with a greater difference among those living alone.

While life satisfaction did decline modestly over the period of the study, the finding of higher satisfaction at 85 years of age is line with the theory of gerotranscendence (Tornstam, 1997). As discussed earlier, gerotranscendence is "a shift in meta-perspective from a materialistic and pragmatic view of the world to a more cosmic and transcendent one, normally accompanied by an increase in life satisfaction" (Tornstam, 1997 p. 143.). Instead of maintaining goals, expectations, and ideals associated with mid-life, gerotranscendence offers a developmental aging perspective emphasizing change. This changes the evaluative perspective the oldest-old take when assessing their satisfaction.

Another explanation to the age interaction with time might reflect older people's greater initial optimism at having lived to an advanced age, followed by increased

awareness of their vulnerability to stressors such as financial strain over time. Finally, as the years pass, they may develop new coping skills to become more capable of dealing with life's ups and downs without it affecting their overall sense of well being. Those who are 65 at baseline may not develop as many new strategies for coping over time, thus exhibiting a fairly steady moderate decrease in satisfaction.

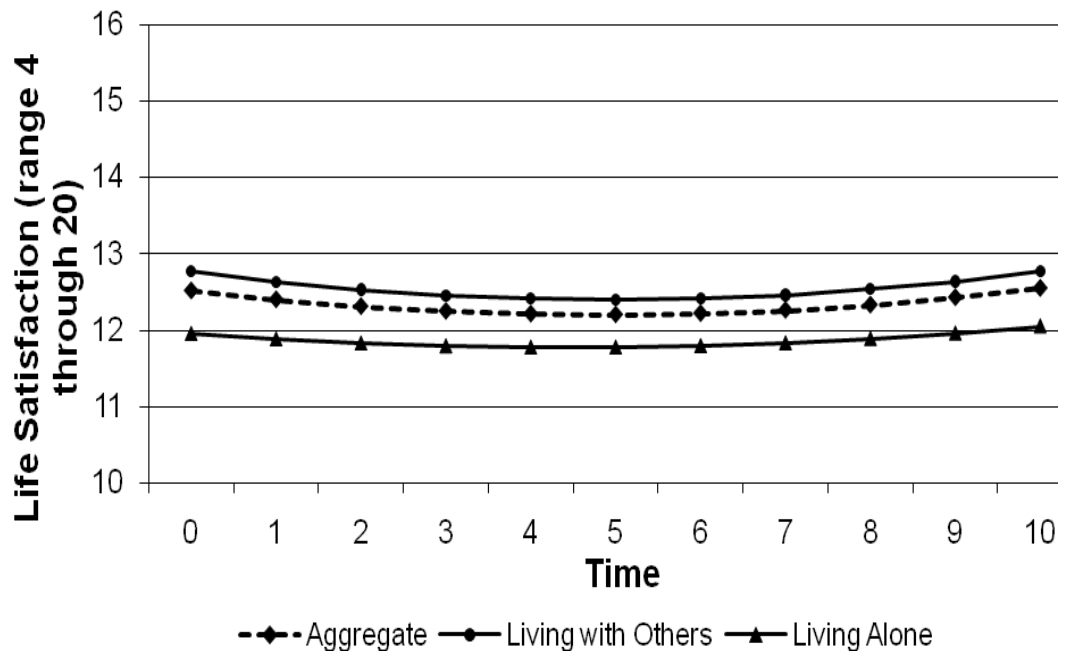
Did social resources mitigate the findings presented above? Only a higher level of social contact was associated with greater satisfaction at baseline. There was no change regarding the interaction of living alone by education at baseline. Finally the interaction of age by living alone was no longer significant at baseline but remained significant on the rate of change. The key finding associated with living alone, social structure, and life satisfaction is that the effect of social structure is evidenced almost exclusively in its interaction of age and education with living alone.

There are two major limitations of this study. First this research is based on only 4 waves of data over 10 years. More observations might help clarify the shape of the trajectories over time. Second, although fairly stable over time, living arrangement is not a time constant variable. Living arrangement is a dynamic time varying measure. For example some individuals may change from living with others to living alone and then back to living with others. With the current four waves of data, there would be a great reduction in sample size if living arrangement was treated as a time varying covariate.

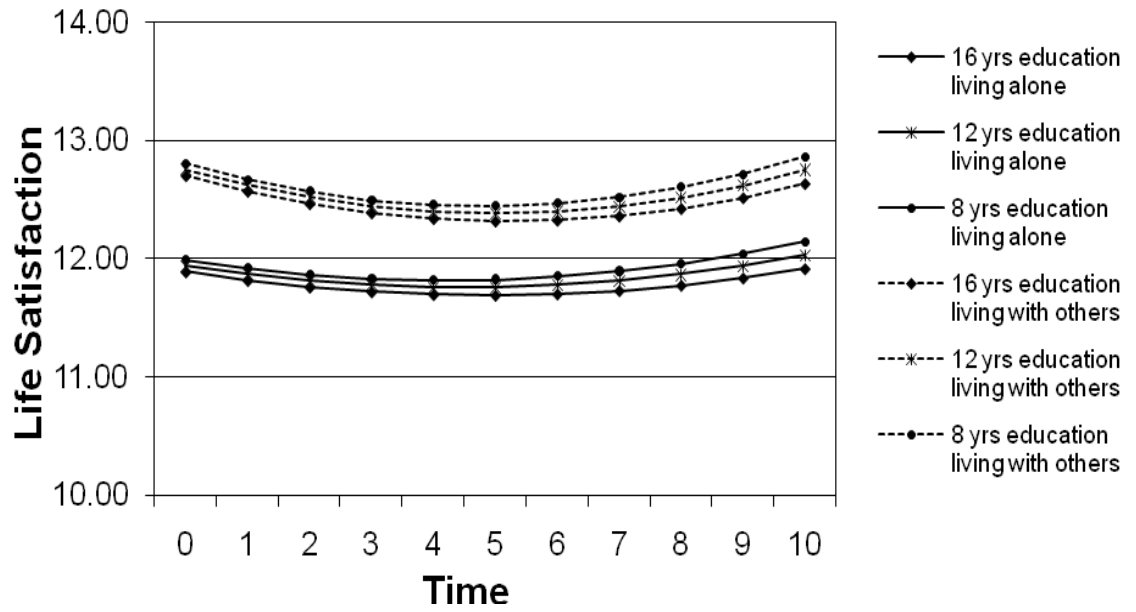
In spite of these limitations, our knowledge regarding trajectories of life satisfaction in the elderly was greatly enhanced. Our findings support Tornstam's theory of gerotranscendence. In addition, the extremely persistent effect of living alone on life satisfaction was revealed.



Figure 4.1 Life Satisfaction by Living Arrangement



### Figure 4.2 Living Alone by Education



### Figure 4.3 Living Alone by Age

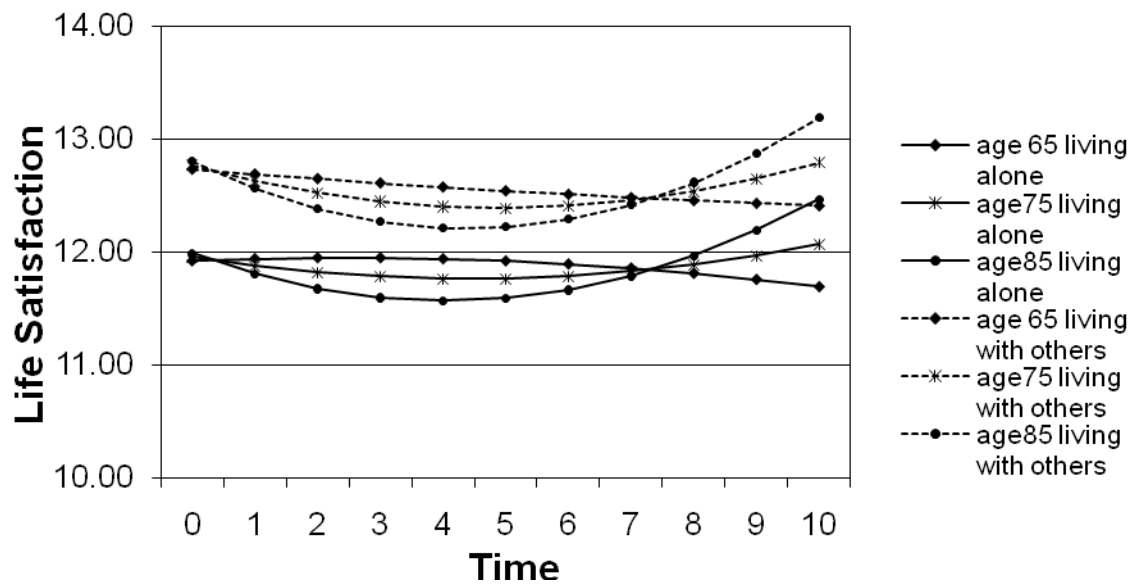


Table 4.1. Descriptive Statistics for Study Variables

Variable	Mean (or Percent)	SD
<b>Level 1 (N = 2506)</b>		
Life satisfaction (range 4-20)	13.10	2.53
Time since baseline in years (range 0 – 10)	3.30	3.36
<b>Level 2 (N=1103)</b>		
Age (years)	74.47	6.73
Male (1=male)	38.57 %	
Education (years)	11.40	3.58
Living Alone (1= living alone)	31.31 %	
Functional Status (range 0 to 56)	8.28	10.84
Negative Interaction (range 4 to 16)	5.72	2.30
Support Received (range 10 to 40)	21.11	6.39
Social Contacts (range 6 to 24)	14.57	3.68

Table 4.2. Linear and Quadratic Unconditional Models

	Linear Model 0		Quadratic Model 0	
	Coefficient	p-value	Coefficient	p-value
<b>Fixed Effect</b>				
For Intercept 1, P0	12.339	0.000	12.297	0.000
Intercept 2, B00				
For Centered Time slope, P1	-0.019	0.094	-0.032	0.015
Intercept 2, B10				
For Centered Time <sup>2</sup> slope, P2			0.007	0.035
Intercept 2, B20				
	Variance	p-value	Variance	p-value
<b>Random Effects</b>				
Intercept 1, R0	3.043	0.000	3.147	0.000
Centered Time slope, R1	0.001	0.334	0.003	>.500
Centered Time <sup>2</sup> slope, R2			0.000	0.414
level-1, E	2.990		2.955	
<b>Sample sizes</b>				
	Level 1 N = 2506		Level 1 N = 2506	
	Level 2 N = 1103		Level 2 N = 1103	
	Level 2 N ( $\chi^2$ ) = 673		Level 2 N ( $\chi^2$ ) = 497	

Table 4.3. Coefficient Estimates Hierarchical Models 1, 2 and 3

Fixed Effects	Model 1		Model 2		Model 3	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Intercept						
Intercept	12.232	0.000	12.226	0.000	12.217	0.000
Age	-0.018	0.186	-0.021	0.121	-0.023	0.115
Male	-0.198	0.206	-0.242	0.141	-0.180	0.258
Education	-0.014	0.494	-0.021	0.311	-0.032	0.103
Living Alone	-0.656	0.000	-0.849	0.000	-0.861	0.000
Functional	-0.109	0.000	-0.107	0.000	-0.094	0.000
Status						
Alone x Age			0.054	0.046	0.035	0.178
Alone x Sex			-0.480	0.233	-0.348	0.353
Alone x			-0.089	0.050	-0.070	0.000
Education						
Negative					-0.206	0.111
Interaction						
Support					0.003	0.789
Received						
Social Contacts					0.131	0.000
For Time Slope						
Intercept	-0.041	0.006	-0.041	0.005	-0.042	0.005
Age	-0.001	0.565	-0.001	0.730	-0.001	0.701
Sex	0.000	0.992	0.009	0.781	-0.008	0.803
Education	-0.001	0.807	-0.001	0.897	-0.000	0.939
Living Alone	0.029	0.380	0.052	0.146	0.054	0.131
Functional	-0.001	0.725	-0.002	0.672	-0.001	0.881
Status						
Alone x Age			-0.013	0.016	-0.012	0.023
Alone x Sex			0.073	0.352	0.083	0.299
Alone x			-0.002	0.854	-0.003	0.690
Education						
Negative					0.003	0.627
Interaction						
Support					-0.004	0.113
Received						
Social Contacts					-0.008	0.060
For Time Slope2						
Intercept	0.013	0.002	0.014	0.001	0.015	0.001
Age	0.001	0.053	0.001	0.080	0.001	0.074
Sex	0.012	0.105	0.015	0.073	0.018	0.045
Education	-0.000	0.871	-0.000	0.817	-0.000	0.866
Living Alone	-0.006	0.490	-0.001	0.902	-0.001	0.900
Functional	0.001	0.465	0.001	0.473	0.001	0.655
Status						

Alone x Age			0.003	0.093	0.003	0.085
Alone x Sex			0.015	0.467	0.011	0.614
Alone x Education			0.001	0.752	0.001	0.687
Negative Interaction					-0.001	0.683
Support Received					0.001	0.107
Social Contacts					-0.000	0.940
Random Effects	Variance	p-value	Variance	p-value	Variance	p-value
Intercept	2.818	0.000	2.756	0.000	2.309	0.000
Slope	0.002	>.500	0.002	>.500	0.002	>.500
Slope2	0.000	0.363	0.000	0.322	0.000	0.315
level-1, R	2.948		2.942		2.940	

Note: Fixed effects and variance components are based on all the data. The chi-square statistics are based on only 497 of 1103 units that had sufficient data for computation.

Table 4.4. Estimates of Life Satisfaction Associated with Figure 4.1.

Time	Aggregate	Living with Others	Living Alone
0	12.51	12.76	11.95
1	12.40	12.76	11.88
2	12.31	12.76	11.82
3	12.25	12.76	11.79
4	12.21	12.76	11.77
5	12.20	12.76	11.77
6	12.22	12.76	11.79
7	12.26	12.76	11.83
8	12.33	12.76	11.88
9	12.42	12.76	11.96
10	12.55	12.76	12.05



Table 4.5. Estimates of Life Satisfaction Associated with Figure 4.2.

Time (years)	Living Alone			Living with Others		
	8 years of education	12 years of education	16 years of education	8 years of education	12 years of education	16 years of education
0	11.99	11.94	11.89	12.81	12.76	12.71
1	11.92	11.87	11.82	12.67	12.62	12.57
2	11.87	11.82	11.76	12.57	12.52	12.47
3	11.83	11.78	11.72	12.50	12.44	12.39
4	11.82	11.76	11.70	12.46	12.40	12.34
5	11.83	11.76	11.69	12.45	12.38	12.32
6	11.85	11.78	11.71	12.47	12.40	12.33
7	11.90	11.81	11.73	12.52	12.44	12.36
8	11.96	11.87	11.78	12.61	12.52	12.43
9	12.04	11.94	11.84	12.72	12.62	12.52
10	12.15	12.03	11.92	12.87	12.75	12.64

Table 4.6. Estimates of Life Satisfaction Associated with Figure 4.3.

Time (years )	Living Alone			Living with Others		
	age 65	age75	age85	age 65	age75	age85
0	11.92	11.95	11.99	12.73	12.77	12.80
1	11.94	11.87	11.81	12.69	12.63	12.56
2	11.95	11.82	11.68	12.65	12.52	12.38
3	11.95	11.78	11.60	12.61	12.44	12.27
4	11.94	11.76	11.57	12.58	12.40	12.21
5	11.92	11.76	11.60	12.54	12.39	12.22
6	11.89	11.78	11.67	12.51	12.40	12.29
7	11.86	11.83	11.79	12.48	12.45	12.42
8	11.81	11.89	11.97	12.46	12.53	12.61
9	11.76	11.97	12.19	12.43	12.65	12.87
10	11.69	12.07	12.47	12.41	12.79	13.19

## **Chapter 5**

### **Conclusion**

Researchers have viewed social resources as critical to well-being (Antonucci, 1990; George, 1996; Pinguart & Sörensen, 2000) and their linkages to well-being among older adults have been examined in numerous studies. Despite a great deal of research, empirical findings regarding their influences remain inconclusive. In particular, Krause (1986) as well as others (Larson, 1974; Wood and Robertson, 1978) reported enhanced psychological functioning with increased support from others. Fagerström and her colleagues found a relationship of unsatisfactory social contacts with less reported satisfaction (Fagerström, et. al., 2007). Conversely, little or no effect on psychosocial outcomes has been noted by other researchers (Cohen & Sokolovsky, 1980; Lee & Ellithorpe, 1982). More recently, Young (2006) reported findings that the effect of support on life satisfaction varied by source. In particular, support from family did not lead to a better overall life.

This dissertation addresses three issues that might help explain these conflicting results. First, previous work has failed to adequately address the complex multidimensional domains of both social resources and psychological well-being. Second, various micro social contexts (i.e., living arrangement) have not been explored in the context of prior research. Finally, wider macro elements of the social context (i.e.

age, gender, education) have not been considered. Results of this study, which includes each of these factors missing in past research, will be presented.

### Modeling Issues

The first unique contribution of this research lies in the inclusion of multiple measures of social relations to assess various domains of well-being, including psychological measures as well as self-rated ill health (chapter 2 and chapter 3). This allowed the simultaneous modeling of multiple domains of both social resources and well-being within the context of living arrangement. Further, each domain itself is measured by multiple indicators. This allowed a more flexible and thorough modeling of the relationships among the key concepts under study. Although prior research has explored the multiple domains of social support and well-being, this is the first study that has combined multiple domains of both support and well-being and the role of living alone among the elderly.

### Measurement Level Issues

A second contribution to the literature was the unexpected finding that factorial invariance between the living arrangement subgroups (living alone and living with others) was not achieved. In other words, the items used to assess social relations may be interpreted differently by those living alone versus living with others. Qualitative research might be useful to clarify these constructs and interpret these measurement differences.

Another potential explanation for this inequivalence lies in the notion of invisible support (Bolger, Zuckerman, & Kessler, 2000). As noted earlier, invisible support is given to an individual without that individual's full awareness that it has occurred or with

the recipient's knowledge of the acts, but without the recipient interpreting the exchange as support. This could explain why those living with others define social support differently. Regression Level Issues

Next, the differences between the regression coefficients were tested for more substantive results. The findings indicated that those who live alone report a slightly higher frequency of contacts than those who reside with others. However, those who live alone report receiving significantly less actual and anticipated support. Therefore, it was not surprising that when the impact of living arrangement on well-being and self-rated ill health is examined, the key pathways within social relations where significant interactions with living alone were discovered consist of: (1) social contacts on received support and (2) received support on anticipated support.

Social Contacts. Looking at the relationship between the first of these two key pathways, social contacts on received support, social contacts have a much larger positive impact on support received for those who live alone than for those residing with other. Why might this occur and why is it important? Successfully maintaining an active social network might provide a starting point from which support can be drawn if needed. While this is true for all the older persons in this analysis, it is potentially more crucial for those who live alone.

Those elderly who reside with others have a readily available source of contacts and social exchange within the household. For example, a husband's social network is expanded by coming into contact with his wife's support network and they can more readily take advantage of the wider social networks of these household members. For those who live alone, the day-to-day availability of individuals with whom they can share

confidences, concerns, as well as other support is limited to social contacts outside their residence. In other words, those who live alone must exert a greater effort by actively pursuing contacts with their family and friends in order to maintain their social networks.

This may become more difficult in later life than in midlife or young adulthood due to functional limitations or reductions in mobility or changing social roles.

Another way to look at this social contacts by living alone interaction is through the theory of social capital (Deutsch, 1975). Social capital specifies that a person receives benefits by virtue of membership alone in social networks or other social structures. Therefore, maintaining an active social network is key to the availability of support both received and anticipated. For those who live alone, all social contacts with family and friends come from those residing outside their homes. Therefore, those elderly who live alone need to be more proactive in maintaining social ties than do those who have a readily available source within their households. Expending the effort to maintain their social ties is important because research reveals that doing so increases feelings of personal control and positive self-esteem (Rook & Ituarte, 1999); Rook & Pietromonaco, 1987).

In summary, maintaining an active social network may be more important for those who live alone than those who live with others. In addition, an active and engaged social network may buffer the negative effects of stress on well-being (Unger, Johnson, & Marks, 1997) and exert a positive influence by modeling positive health behaviors (Lewis & Rook, 1999).

Support Received. Looking at the second key pathway, support received has a much greater positive impact on anticipated support for those elderly who live alone as

compared to those who reside with others (over twice as large), although the relationship is significant for both groups. This finding suggests that those who live alone base their assessments of availability of future support in times of need on actual support that they have received in the past and/or are currently receiving. In other words, those who live alone may rely more heavily on concrete examples of support received when making evaluations of future support. Having an outside source of companionship may prove extremely important in these evaluations. Those who live with others may in part base their assessments of anticipated support on the mere presence of others within their households.

Anticipated Support. When looking at social relationships and depression, a third significant interaction emerges. Compared to those living with others, higher levels of anticipated support for those who live alone are related to a more pronounced decrease in feelings of depression (over twice as large). Keeping in mind that the relationship between greater anticipated support and reduced feelings of depression is significant regardless of living arrangement, why might this effect be so much more pronounced for those who live alone? Knowing that greater effort must be expended to attain support makes the reassurance that it is available more salient. When those who live alone get to the point where they can feel this way, the resulting gratitude they experience may be a potent mood enhancer (Emmons & McCullough, 2003). Anticipated support promotes confidence in one's own abilities, increasing positive feelings of control and esteem. When people live alone, they must rely on themselves more than those who live with others. Therefore, the reassurance afforded by anticipated support carries greater weight.

### Micro-social Factors, Support, and Well-Being

A third contribution of this research is the finding that living lone and its interaction with social contacts is consistent over time and across numerous domains of well-being (chapter 3). These findings complement the cross-sectional results and emphasize the importance of maintaining social contacts as a way to foster well being over time, in other words, successful aging (Rowe & Kahn, 1998). This is especially true for those who live alone either by choice or circumstance.

Chapter 3 focused on the interaction of living alone by social contacts, living alone by support received, and living alone by anticipated support on well-being over time. Not surprisingly, the largest predictor of well-being (however measured) at Time 2 is well-being at Time 1. Although physical and psychological well-being are not static over time, a certain level of stability should be expected in the physical and psychological well-being of the elderly (Bauer & Okun, 1983; Bowling, Farquar, & Grundy, 1996).

A fourth contribution of this dissertation was the finding that even when controlling for baseline covariates and well-being, several significant interactions between living alone and social relations emerged. By far, the most prevalent of these significant interactions was living alone by social contacts. The interaction effect of living alone by social contacts indicated that greater social contacts for those living alone at Wave 1 are related to increased life satisfaction at Wave 2. Further examination of the interaction term (Aiken and West, 1991) revealed that while the estimates were both in the hypothesized positive direction, only the estimate for those living alone is significant.

Similarly, the interaction effect of living alone by social contacts at Wave 1 is



also associated with decreased reports of depression. As was the case with life satisfaction, the interaction term showed that while both effects were in the hypothesized direction, only the estimate associated with living alone was significant. This suggests that the interaction effect emerges only at high levels of social contacts. This may indicate that at low levels of contact, the needs of those who live alone are not satisfied and that larger amounts of contact are needed once this occurs. Payout in terms of life satisfaction is perhaps greater because those who live alone are more grateful.

In addition, the significant interaction of living alone by social contacts at Wave 1 indicated that greater social contacts for those living alone at Wave 1 are related to more favorable ratings of physical health at Wave 2. Closer examination of the interaction term indicated that while the estimates for those living with others and those living alone were both significant, the effect of living with others was positive while the effect of living alone was larger in magnitude and in the hypothesized negative direction. Similar findings were found when the interaction was tested on chronic conditions. Both estimates were significant, with those living with others in a positive direction and those living alone in a negative direction.

#### Social Contacts versus Received and Anticipated Support

It is important to reflect on why significant findings emerged with the social contact measures, but not the measures of received support or anticipated support. Perhaps it is because social contact measures merely assess whether an interpersonal connection was made with significant others, whereas received support measures what was actually provided once contact was made, and anticipated support deals with beliefs about supportive exchanges in the future. Almost by definition, those who live alone

spend more time away from other people. Perhaps the sheer contentment, joy, and relief of coming into contact with others best speak to the needs of those who live by themselves. Simply put, what those who live alone may need most is the mere presence of others - not assistance of any kind or promises of help in the future.

Another reason for these findings emerging with social contacts and not the others may be that the social support measures used in this study do not capture all interpersonal exchanges that happen once contact is made. For example, companions and friends may share mutual interests that may lead to heightened exchanges (Rook, 1990c; Rook & Ituarte, 1999). Alternatively, the results could reflect a measurement issue. The social contact items in the survey are written in such a way that they reflect on and lean more toward contact outside of the home. As a result, those who live with others are not likely to count contacts with others in their own home. For example, one question from the survey is: "In the past two weeks, how often have you gone out to visit family?" It does not make sense to ask this question of people who live with others because it is a constant.

So, in effect, the most salient contacts are not likely to be included in the responses of those who live with others. To the extent that this is true, the social contact measures are likely to capture more salient ties for those who live alone. And because they do, social contact is likely to reap greater benefits. So the social contact measure is probably more appropriately thought of as a measure of contact outside the home. There is no real way to correct this. Asking about contacts in the home for those who live with others can't be used in conjunction with those who live alone because it is confounded with living arrangement. So the effect is captured in the direct effect of living

arrangement on well-being.

While there was a significant effect of living arrangement on the relationship between anticipated support and depression, the same was not true for life satisfaction and self-rated ill health. This reflects a difference in impact of support on well-being. Why might this make sense? Depression as assessed by the CESD scale reflects a state, assessing reported feelings of depression with the last week. Life satisfaction, as measured by the LSIA scale, reflects assessments across the life-course. For the elderly, living alone may be a recent development predicated by changes in marital status or health, and therefore more likely to affect more current assessments of well-being (i.e., depression), than more retrospective assessments (i.e., life satisfaction). Or maybe living alone arose in late life, so looking at social support over the life course requires a life long view that embraces both current and past support. Some misspecification may arise because the survey assesses only current support.

The lack of a significant living arrangement interaction for anticipated support on self-rated ill health is not so easily explained. The three self-rated ill health items used in this study reflect the respondent's evaluation of their current physical health status. Perhaps older adults, regardless of living arrangements, rate their health using external comparisons derived from their social networks or from some perceived societal standard for their age. In fact, one of the three items asks the respondent to rate their health compared to others their own age. This more external evaluation is not as affected by internal evaluations of anticipated support based on concrete examples of support received in the past as was the case with depression. Those who live with others may have a larger pool on which to base a comparison.

A potential explanation for these effects on health outcomes may simply be that the reasons individuals live with others may vary greatly. While some elderly continue to live within the context of an extended family, others may be forced into their living situation by financial problems and health issues. Although functional status was included to control for heterogeneity due to physical condition, further studies will need to include the reason behind living arrangement in order to more clearly assess the impact of living alone.

Regarding different patterns of results by outcome measures, i.e., psychological versus physical well-being, it should be noted that in addition to functional status at Time 1, older age, female gender, lower reported education, and less income were related to change in physical health over time. Also, greater reported amounts of received support were associated with greater reported serious and chronic conditions, and this relationship remained significant after the interaction terms were added to the equations. Neither anticipated support nor social contacts were linked to physical well-being at Time 2 and only one significant relationship between a covariate (other than well-being) was supported by the data. Specifically, lower reported education was associated with higher reported depression at Time 2.

#### Macro Social Structure, Living Alone, and Well-Being

A great deal of the research in subjective well-being is based on cross-sectional studies. Cross-sectional studies confound intrapersonal changes with interpersonal differences. There are few longitudinal studies of subjective well-being in old age and they: (a) are largely based on highly aggregated data of population trends; (b) consist of a series of repeated cross-sectional surveys (e.g., Diener & Suh, 1998); or consist of two

observations over a relatively short period of time (Smith & Baltes, 1993). The problem lies in the fact that studies of population trends reveal little information on intrapersonal changes over time and two repeated observations estimate the amount of change but do not distinguish among alternative growth curves (Hertzog & Nesselroade, 2003; Rogosa, 1988). People do not all exhibit the same changes and outcomes as they move through the life course and as Dannefer (2003) points out, individual differences become more pronounced as people grow older. It is for this reason that the study of intra-individual change is so critical. The study of intra-individual changes requires special data analytical procedures such as Hierarchical Linear Modeling (HLM) (Raudenbush & Bryk, 2002).

Chapter 4 diverges from the static estimates that I have provided so far in chapters 2 and 3 and addresses this lack in the literature by employing hierarchical linear modeling to assess the interaction of living alone and social structure on the trajectory of life satisfaction across ten years. A fifth contribution of these analyses was the findings that the effect of social structure is evidenced almost exclusively in its interaction of age and education with living alone. Age, gender, and education had no main significant effects on the baseline level of satisfaction or the rate of change. Age and education were important predictors only when interacting with living arrangement. Gender by living arrangement was not significant.

Less education was related to greater satisfaction within each living arrangement at baseline, with those living alone the least satisfied of all. One explanation for this may lie in the fact that while those with higher education may be more aware of changes in their lives and be better able to apply cognitive assessments of their lives, but they may

unfortunately be more likely to seek a higher level of accomplishments to compare with their own. Another explanation may be the inability of the more highly educated to find a suitable alternative to the rewarding jobs they had in earlier life that afforded them greater satisfaction. Those with less education have less rewarding jobs, so they look to life outside the workplace for meaning. This search may be found more easily for those living with others.

The interaction of age with living arrangement is more complex. Not only are older individuals within in living arrangement significantly more satisfied at baseline, they also experience a difference in their rate of change over time, driven predominantly by the quadratic slope. At each year those living alone at baseline reported slightly less satisfaction than did those living with others with the exception of those 85 years of age living alone at baseline. Their ratings of satisfaction slightly surpassed those age 65 living with others.

Within each living arrangement, those who were older at baseline showed greater increases in satisfaction over time. For both living arrangements, those age 65 at baseline showed a steady decrease over time. The rate of change of those 75 years of age at baseline fell somewhat in the middle. This changed immediately over time with the youngest ages reporting greater satisfaction than those 85 years of age. Older ages reported decreased satisfaction until approximate convergence at year 7. At year 8, within each living arrangement, older age was related to greater satisfaction. However the magnitude of the differences between the ages was larger for those living alone.

Greater satisfaction at 85 years of age is line with the theory of gerotranscendence (Tornstam, 1997). According to Tornstam, gerotranscendence is "a shift in meta-

perspective from a materialistic and pragmatic view of the world to a more cosmic and transcendent one, normally accompanied by an increase in life satisfaction" (Tornstam, 1997 p. 143.). Instead of maintaining goals, expectations, and ideals associated with mid-life, gerotranscendence offers a developmental aging perspective emphasizing change. In his recent book, Tornstam (2005) shows both qualitative and quantitative studies that support his perspective.

Another explanation to this age effect might reflect the older people's greater initial optimism at having lived to an advanced age, followed by increased awareness of their vulnerability to stressors such as financial strain over time. Finally, as the years pass, they may develop new coping skills to become more capable of dealing with life's ups and downs without it affecting their overall sense of well being. Those who are 65 at baseline may not develop as many new strategies for coping over time, thus exhibiting a fairly steady moderate decrease in satisfaction. It may also be survivors who are more hardy both psychologically and physically.

Finally I addressed whether or not the addition of negative interactions, support received, and social contacts to the models might explain or mitigate the findings presented above? Only a higher level of social contact was associated with greater satisfaction at baseline. While the magnitude of the interaction of living alone by education at baseline reduced slightly, the significance level actually increased. Finally the interaction of age by living alone was no longer significant at baseline but remained significant at the linear slope. No significant effect was observed on the rate of change. The key finding associated with living alone, social structure, and life satisfaction is that the effect of social structure is evidenced almost exclusively in its interaction of age and

education with living alone.

### **Next Steps**

While the findings of this dissertation gave us a clearer look at social relations and well-being in the context of living alone, they also point out the need to continue research. The question then becomes, where do we go from here? There are several areas of study that may further clarify the relationships examined in this study. Three such areas are described next.

First, a growing area of research involves the use of biological information in conjunction with survey data. These biomarkers may include physical performance measures (e.g., one-leg stand, gait speed), blood samples (e.g., WBC count, glucose, cholesterol), and saliva samples (e.g., genetic markers). For example, well-being has been shown to be linked with depression in a national sample of older Taiwanese (Seplaki, Goldman, Weinstein, & Lin, 2004). In addition, in a sample of aging women, Ryff and others found that certain measures of psychological well-being and ill-being were significantly linked with several biomarkers including cortisol, DHEAS, norepinephrine, HDL cholesterol, total/HDL cholesterol, systolic blood pressure, and waist-hip ratio (Ryff, et. al, 2006). The addition of biomarkers may provide a novel approach to studying living arrangement and its effect on social support and well-being.

Second, additional measures need to be studied in order to extend this work. Some potential areas may include attachment, relatedness, loneliness (Ryan & Deci, 2001), gratitude, hope/optimism (Emmons & McCullough 2003), and companionship (Rook, 1990c; Rook & Ituarte, 1999). Evidence supporting the linkages between



relatedness and subjective well-being is manifold. Studies suggest that relatedness has a strong influence on happiness and subjective well-being (Argyle 1987; DeNeve, 1999). In a similar vein, loneliness is negatively related to positive affect and life satisfaction (Lee & Ishii-Kuntz 1987). Emmons & McCullough (2003) studied the effect of a grateful outlook, which they defined as "prototypically gratitude stems from the perception of a positive personal outcome, not necessarily deserved or earned, that is due to the actions of another person"(p. 377), on psychological and physical well-being in a series of experimental studies. They found that the gratitude-outlook groups had heightened well-being across several measures of well-being when evaluated against the comparison groups. The scope of inquiry may be expanded from social support to social relationships, more specifically, companionship (Rook, 1990c). The addition of these types of measure may help flesh out the mechanisms by which living alone operates.

Arguably, the penultimate measure of well-being measures is mortality.

Extending the models presented in this dissertation to include mortality is a logical next step for future research. In a study of post-myocardial infarction, Frasure-Smith and colleagues (2000) found that depression was a predictor of one-year cardiac mortality, but social support was not. However, higher levels of support were related to less depression over the first post-myocardial infarction year. The authors posit that support may buffer patients from the negative effects of depression on mortality because support leads to fewer depressive symptoms. While this type of "buffering" research is common in social science, this study is unique in its selection of mortality as an outcome.

Applying the findings presented here regarding the importance of social contacts to practice and/or policy decisions regarding living arrangements may provide help to

better inform practitioners regarding optimal housing options for older adults. Many living arrangement options are available (retirement communities, assisted living, planned communities, intergenerational, and shared housing) that offer naturally occurring support and contact (Cummings, 2002). However, the issue may lie in the older adult's past experience, expectations, and needs regarding social contacts and not just the availability of programs of housing options.

There are several additional research questions that may be examined in future work. Why is living alone related to well-being? What specific coping measures do those who live alone typically adopt? Does participation in voluntary associations (e.g., church) help? What role might solitary activities like reading or hobbies play in adjusting to living alone? Was the decision to live alone voluntary or unwelcome? We need to further explore the context surrounding the current living arrangement as well as individual preferences. The present study has opened up a number of questions for future research.

### **Limitations**

This dissertation examined the effect of living alone on the relationship between social relations and well being using a comprehensive set of measures and multiple analyses techniques. While each paper had its unique shortcomings, four limitations are shared across all papers. Even though portions of this research included longitudinal data, the determinant of causality is still not conclusive. Additional waves of data that include time lagged covariates are needed to see if these trends remain the same with lagged covariates and if reciprocal linkages exist.

Global measures of support were used in these analyses. The inclusion of relationship-specific measures of support might help to more closely identify important interactions between the elderly and their social network. Further, relation-specific measures may allow the evaluation of each social network member total contribution to support. Using global measures may actually average the effects of support on well-being resulting in an insignificant relationship. However, the fact may be that while a spouse may provide positive support to the respondent, an equally negative support relationship with a child may exist.

In addition, the data did not include a variable that could be used to assess the period of time that survey participants had been living alone or with others. It is possible that the course of social interaction and support vary with time spent living alone. Perhaps after an initial difficult period of adjustment that gradually gives way to a more settled life.

Finally, race, ethnicity, and culture were not examined due to the small numbers of minorities present in the data set i.e., 98% white and 2% all other groups. Kaniasty (2000) examined help-seeking comfort and receiving social support among Latinos, African Americans, and European Americans during a communitywide emergency as well in a nonemergency situation two years later. He found that the effects of ethnicity differed according to the context, with differential support in the nonemergency situation only. More recently Russell and Taylor (2009) investigated living alone in Hispanic and non-Hispanic populations. They reported that living alone was related to more depressive symptoms among Hispanics but not among non-Hispanics and that variations in social support did not change this. However, social support did reduce the relationship

between living alone and depression among both Hispanics and non-Hispanics. These findings highlight the need to evaluate a variety of ethnicities and cultures to get a more accurate picture of how social relations effect well-being.

### **Summary**

In spite of these shortcomings, the findings highlight the benefits of maintaining a strong social network and of receiving support, especially for the elderly who live alone. With increasing numbers of older adults projected in the future along with increasing estimated costs of their health care, understanding health status and developing interventions to halt or reduce the progression of disease and disability should be a major public health priority. Research on living alone matters not only due to large number of elderly who live alone or are at risk of living alone, but also because it may help providers develop better planning aids for future living arrangements and their needs. Such planning could help ease adjustments to living alone. Results of this study suggest that interventions that focus on bolstering the social support systems available to older adults can result in increased well being, especially for those who live alone.

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