Aging in the Right Place: Effects from Relocation and Homebound Status

by

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Abstract

Many older adults wish to stay in their dwellings or neighborhood to achieve aging in place. However, aging in place may not be a one size fits all solution for older adults (Golant, 2008). In fact, many older adults are not prepared to achieve aging in place and relocation occurs frequently in later life (Joint Center for Housing Studies of Harvard University, 2019). Furthermore, the number of homebound older adults, who are confined to their dwellings due to difficulties in leaving their homes without significant assistance from others, has been increasing (Ornstein et al., 2015).

Even though the numbers of both movers and homebound older adults have increased in the past decade (Li et al., 2021; Ornstein et al., 2015), there is very limited knowledge about these two subgroups. My three-paper format dissertation focused on these two understudied populations in the aging in place literature. Specifically, Paper 1 (Chapter 2) examined the relationship between intergenerational proximity and contact frequency with children in the context of relocation. Findings showed that relocation and proximity to a child is associated with changes in in-person contact frequency with children, and changes in telephone contact frequency with children, respectively. In contrast, relocation and proximity to a child is not associated with changes either in contact frequency with children via email or via social media. The findings suggest movers could utilize digital contact modes (email and social media) to maintain contact with their social relations in response to relocation.

Paper 2 (Chapter 3) explored the effects of relocation on psychological well-being across different settings (within-community relocation, relocation from community to non-nursing

facilities, and relocation from community to nursing homes). This study revealed that older adults who stay in their community and within-community movers show no difference in terms of psychological well-being, implying that within-community relocation can be a strategy to achieve aging in the right place with respect to psychological well-being. In contrast, compared to older adults who stay in the community, non-nursing facilities movers and nursing home movers report lower psychological well-being over time suggesting that more support is needed to help older adults achieve aging in the right place in long-term care facilities.

Paper 3 (Chapter 4) investigated the longitudinal association between homebound status and social isolation in later life. Findings showed that homebound older adults are more likely to report a higher level of social isolation compared to non-homebound counterparts. Homebound older adults are also more likely to report a higher level of social isolation compared to semi-homebound older adults. Social isolation is a reversible condition. The findings suggest the importance of providing more social interaction opportunities.

In sum, this dissertation examines the extent to which relocation and homebound status are associated with social and psychological well-being, important components of aging in place. The findings of the dissertation could help older adults to make informed decisions about where to live in later life.

Chapter 1
Introduction

Most older people prefer to stay in their current dwelling, and community and the importance of aging in place has been emphasized by researchers and policy makers (Wiles et al., 2012). However, not every older adult lives independently in their current dwelling and community. Instead, more older adults experience relocation or become homebound older adults (Li et al., 2021; Ornstein et al., 2015). Specifically, it is estimated that about 5% of older adults aged 65 and older moved every year between 2016 to 2019 (Joint Center for Housing Studies of Harvard University, 2023). It is also estimated that 7.3% of community-dwelling Medicare beneficiaries are considered homebound older adults (Ornstein et al., 2015). An increasing number of movers and homebound older adults suggests that staying in the current dwelling cannot be an answer for every older adult.

While both relocation and homebound status may bring about significant changes in various domains, including social and psychological well-being, these two groups have received limited attention in the aging in place literature. This dissertation aims to contribute to aging in place literature by investigating the implications of housing transition on contact frequency with children and psychological well-being. My dissertation also expands the current literature on aging in place by looking at the implications of homebound status on social isolation. Specifically, this three-paper format dissertation aims to answer the following questions.

Paper 1: To what extent are relocation and proximity to a child associated with changes in contact frequency across different contact modes (in-person, telephone, email, and social media)?

Paper 2: To what extent is housing transition across different settings (within-community, non-nursing residential facilities, and nursing home) associated with changes in psychological well-being?

Paper 3: To what extent is homebound status (homebound status, semi homebound status, and non-homebound status) associated with changes in the level of social isolation?

Each paper significantly contributes to the current literature on aging in place. Specifically, concerning Paper 1, whereas previous studies have examined the association between relocation and contact frequency with traditional contact modes (in-person and telephone), it has not been fully examined whether relocation is associated with changes in contact frequency via digital contact modes (email and social media). Furthermore, unlike most previous studies which did not subcategorize movers based on the proximity to a child (Cho & Smith et al., 2023), Paper 1 considers the role of proximity to a child in the context of relocation.

Concerning Paper 2, previous studies explored the effects of housing transition on psychological well-being over a relatively short period. However, the long-term effects of housing transition on psychological well-being have not been fully explored even though person-environment fit may either improve or decrease over time. To the best of my knowledge, Paper 2 is the first study that examines the longitudinal association between housing transition and psychological well-being over a period of 5 years, utilizing a sample of Medicare beneficiaries aged 65 or older from a national-level panel survey.

Concerning Paper 3, while social isolation has been suggested as a risk factor for homebound status (Ankuda et al., 2022; Cudjoe et al., 2022), the link between these two variables has been rarely examined in the opposite direction, where homebound status is a risk factor for social isolation. Regarding measurement, previous studies tended to dichotomize homebound status (homebound status and non-homebound status) even though homebound status could be regarded as a continuum based on the level of confinement (Ornstein et al., 2015; Xiang & Brooks, 2017). In Paper 3, homebound status was categorized as homebound status, semi-homebound, and non-homebound status. Furthermore, studies examining the association between homebound status and social isolation tended to focus on limited domains of social interaction, for example, focusing on interaction with family and friends (Ankuda et al., 2022). In Paper 3, social isolation is measured more holistically by using measures that include diverse dimensions of social connections such as social engagement at church and clubs, in addition to interaction with family and friends.

1.1 Conceptual Framework

In Paper 1, the association between relocation and proximity to a child and changes in contact frequency with children are examined through the lens of Socioemotional Selectivity Theory, Intergenerational Solidarity Theory, and the Convoy Model of Social Relations (Antonucci et al., 2014; Bengtson & Robert, 1991; Carstensen, 2021). First, Socioemotional Selectivity Theory argues that the approach of endings makes older adults prioritize emotionally satisfying relationships such as children instead of building new relationships (Carstensen, 2021). Second, according to Bengtson & Robert (1991), intergenerational solidarity is a multidimensional concept that encompasses various dimensions including structural, associational, functional, affectual, normative, and consensual solidarities. Paper 1 focuses on the

structural and associational dimensions as the two dimensions are concerned with proximity and contact frequency between older adults and their children. Lastly, according to the Convoy Model of Social Relations, social relations are a multifaceted concept including structural, functional, and perceived dimensions (Antonucci et al., 2014). The nature of the three dimensions of social relations is influenced by context such as relocation. Among various dimensions of social relations, this study focused on changes in contact frequency, an indicator of the structural dimension following relocation.

Second, housing transition may also influence older adults' psychological well-being. Paper 2 (Chapter 3) is guided by Ecological Theory of Aging which argues that the effects of relocation on psychological well-being may differ depending on a unique fit between environment and person (Lawton & Simon, 1968; Lawton & Nahemow, 1973). Two main hypotheses of Ecological Theory of Aging are the docility hypothesis and proactivity hypothesis. While docility hypothesis focuses on vulnerability of older adults who are influenced by the demands of their environment, proactivity hypothesis views older adults as adjusting to their environment by taking action, such as relocation. Drawing on the docility and proactivity hypotheses, Paper 2 investigates the extent to which housing transitions across different settings are associated with changes in person-environment fit which is conceptualized as psychological well-being.

Lastly, in Paper 3, the Social Convoy Model of Social Relations was used as a framework to examine the association between homebound status and social isolation. According to this model, situational characteristics such as homebound status can influence the nature of social relations (Antonucci et al., 2014; Sharifian et al., 2022). Specifically, as in Paper 1, Paper 3 focused on changes in the objective dimension of social relations.

1.2 Data

I used the Health and Retirement Study (HRS) and National Health and Aging Trends Study (NHATS), two nationally representative panel surveys of older adults in the U.S. The HRS has been administered to older adults aged 50 or over every two years since 1992, and the NHATS has been administered to Medicare beneficiaries ages 65 or older annually since 2011 (Freedman & Kasper, 2019; Sonnega et al., 2014).

Specifically, in Paper 1, two waves of data from the HRS (2014 and 2018) were used to examine the associations between relocation and changes in contact frequency with children. Many older adults utilize various communication technologies besides in-person contact to maintain contact with their children (Faverio, 2022), and in 2014 the HRS included a recent digital contact mode (communication using Skype, Facebook, and other social media) (Smith et al., 2017). By focusing on changes in contact frequency with children between 2014 and 2018, the effects of Covid 19 on contact frequency with children are ruled out.

In Paper 2, I used five rounds of data from the NHATS (2011-2015) to examine the effects of housing transition on psychological well-being. The NHATS is an appropriate dataset to answer the research question, since it includes various questions about residential status, (e.g., community, residential care not nursing home, and nursing home), changes in address (yes/no), and psychological well-being in later life (Freedman et al., 2022).

In Paper 3, five rounds of data from the NHATS (2011-2015) were used to examine the longitudinal association between homebound status and social isolation. To determine people's homebound status (non-homebound, semi-homebound, and non-homebound), the NHATS includes questions about existence of helpers when going outside, frequency of living in their housing in each month, and the level of difficulty when living in their homes. The NHATS also

included detailed questions on social isolation across different dimensions, including marriage, family and friends, church participation, and club participation (Freedman et al., 2022). Detailed information about data is available in each following chapter (Chapter 2, Chapter 3, and Chapter 4).

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Chapter 2

(Paper 1): Proximity to a Child and Contact Frequency with Children in the Context of Relocation: Do Contact Modes Matter?

2.1 Introduction

While social contact is important to the maintenance of social relationships for older adults, it can be disrupted when they move. Social networks, (e.g., family members), play a vital role in the lives of older adults since these networks provide various supports (Cornwell et al., 2008). Studies have documented the benefits of social networks for older adults, especially with their adult children (Van der Pers et al., 2015) who tend to be the most important and supportive social connections of older adults (Bengtson, 2001; Silverstein & Bengtson, 1997).

Contact frequency is an important dimension of social relations (Antonucci et al., 2019; Manalel & Antonucci, 2022) as regular contact facilitates supports such as emotional and instrumental support (Hank, 2007; Swartz, 2009). While frequent contact with their children is beneficial for older adults, intergenerational proximity, which influences the nature of social relations, including contact frequency (Hank, 2007), often changes in the process of relocation (Lin & Rogerson, 1995). Previous studies have documented the role of proximity to a child in relation to contact frequencies, but the two aspects (proximity to a child and contact frequencies) have rarely been examined in the context of relocation in later life.

With significant advances in communication technologies, many older adults adopt various communication technologies to facilitate their contact with family members, including

with their adult children. About 61% of older adults have their own smartphone, 44% of older adults have their own tablet, and 45% of older adults use social media (Faverio, 2022). However, it is not clear whether following relocation, older adults utilize communication technologies such as telephone, email, and social media to maintain contact with their children. To provide some answers to this gap in the current literature, Paper 1 examined the association between relocation and proximity to a child and contact frequency across different contact modes using panel data from the Health and Retirement Study.

2.1.1 Changes in Intergenerational Proximity in the Context of Relocation

While aging in place has been regarded as a desirable goal by many older adults (Ahn et al., 2020), relocation is a life event in later life affecting many older adults. In the U.S., about 4.3% of older adults over 55 relocated within a year in 2019 (the U.S. Census Bureau, 2020). In another demographic study, Li et al. (2022) reported that about 4.9 million older adults aged 60 and over moved between 2010 and 2019 in the U.S.

Relocation can alter the proximity between older adults and adult children. According to Litwak and Longino (1987), there are three stages of relocation in later life. The first stage is amenity moving, where older adults often move to find better amenities. When older adults do not need daily care from their children, intergenerational proximity is less important. The second stage is informal care moving, where older adults move near to their children to receive care from their families. The final stage is nursing home relocation, where older adults move into nursing homes when their care needs increase.

To understand changes in distance between parents and their children in the process of relocation, Lin and Rogerson's intergenerational proximity development model (1995) has been used in previous studies and will subsequently be referred to in my discussion section. The

model expands on one developed by Litwak and Longino by considering relocation patterns of both parents and their children. According to Lin and Rogerson, there are three stages of intergenerational proximity. The first stage is an increase in the intergenerational distance. This change is often triggered by adult children as they move for work, education, or relationships. The second stage is viewed as a stabilization or adjustment process, and both adult children and older adults often move during this stage. Specifically, while some adult children relocate for family or employment reasons, some older adults relocate to find better amenities after retirement. The intergenerational distance is usually large for many older adults and adult children as they tend to be less involved in each other's lives. The final stage is a decrease in the intergenerational distance. Relocation is often prompted by changes in health status or marital status of older adults. Older adults may move closer to their children to receive care. On the other hand, adult children might move near to parents to provide more assistance. Lin and Rogerson's third stage corresponds to the second and third stage of Litwak and Longino's Later Life Migration Model (Lin & Rogerson, 1995).

2.1.2 Intergenerational Proximity and Contact Frequency with Children Across Different Contact Modes

The relationship between older adults and their adult children is considered the most important and enduring relationship (Fingerman et al, 2020; Thomas & Dommermuth, 2020). However, intergenerational proximity often changes following life events, such as relocation, which in turn influences the nature of an intergenerational relationship. For example, studies by Bordone (2009), Hank (2007), and Holmlund et al. (2013) have documented the role of physical proximity on contact frequency with children.

While in-person contact has been a default contact mode, advances in communication technology can be viewed as one of the most significant changes in recent decades. In fact, older adults are the fastest growing segment of the population in terms of technology adoption (Faverio, 2022). Thus, advances in technologies may reshape the ways older adults maintain contact with their children (Antonucci et al., 2017; Hülür & Macdonald, 2020). For example, Antonucci et al. (2017) found that frequency of contact with children via telephone and electronic modes is comparable to the frequency of in-person contact frequency with children, respectively. Similarly, a daily diary study by Fingerman et al. (2015) found that intergenerational support occurs via multiple contact modes (in-person, telephone, and electronic media). Although these studies suggest that older adults utilize diverse contact modes to maintain contact with their children, these studies did not focus on the extent to which contact frequency with children is associated with proximity to a child in the context of relocation.

To date, the importance of proximity on in-person contact frequency with children has been well-documented; however, the role of proximity in contact frequency via various communication technologies (telephone, email, and social media) has received less attention. Since communication technologies do not require proximity, proximity may exert less influence on communication technologies. Nonetheless, most previous studies did not differentiate contact modes (Hank, 2007). While a recent study by Cho and Smith (2023) revealed differential impact of distance on contact frequency across in-person, telephone, and email modes, the study did not subcategorize older adults based on proximity to a child and did not include social media. The study by Cho and Smith (2023) also focused on the changes in contact frequency with friends. To the best of my knowledge, this study is the first to examine the extent to which

intergenerational proximity is associated with contact frequency with children across the four specific contact modes following relocation.

2.1.3 Conceptual Frameworks

Socioemotional Selectivity Theory (SST), Intergenerational Solidarity Theory, and the Convoy Model of Social Relations were used as guiding frameworks to understand older adults' changes in contact frequency with children in response to relocation in later life.

First, Carstensen's Socioemotional Selectivity Theory (SST) (Carstensen, 2006; Carstensen, 2021) posits that reduced time perspectives bring about changes in motivation from prioritizing novel experiences to preferring emotionally satisfying experiences. SST focuses on changes in time perspective to explain why individuals in later life prefer to spend time in emotionally meaningful relationships instead of in relationships which provide useful information. Reduced time perspective is not only influenced by chronological age but can also be influenced by other events such as relocation, which suggests the approach of social endings. For instance, in their experimental study Fredrickson & Carstensen (1990) examine preference for social partners (familiar social partners versus novel partners) under two conditions: (1) unspecified conditions and (2) anticipated social endings (before long-distance relocation by themselves). Participants were asked whether they wanted to spend 30 minutes of free time with either familiar social partners or novel partners in both conditions. The study found that older adults prefer to spend their time with a familiar social partner rather than with novel social partners in the first condition. Interestingly, most older adults who wanted to spend time with novel social partners in the first condition preferred to spend their time with a familiar social partner in the second condition. While SST does not elaborate on the role of communication technologies in social relations, a few studies have documented that older adults tend to use

technologies to maintain emotionally meaningful relationships, instead of to gain new information (Sims et al., 2016).

Second, the Convoy Model of Social Relations has been used to explain continuity and change in social relations across the lifespan (Antonucci et al., 2019). According to this model, social relations are a multidimensional concept, comprised of structural, functional, and quality dimensions. Proximity and contact frequency are indicators of the structural dimension. Since this model considers the influence of individual and environmental factors on social relations, the social convoy model can be applied to examine continuity and change in social relations following relocation (Antonucci et al., 2019; Fuller et al., 2020). The social convoy model also posits that context can influence the way people maintain contact with their social relations. Advances in communication technology in recent decades can be viewed as significant changes in macro-level context. Thus, the Social Convoy Model can be used as a framework to understand whether older adults utilize diverse communication technologies (e.g., email and social media) besides traditional contact modes (in-person and telephone) to maintain contact with children (Antonucci et al., 2017).

Lastly, Bengtson's Intergenerational Solidarity Theory has been used to explain the level of solidarity between older parents and adult children (Bengtson, 2001; Bengtson & Roberts, 1991). According to Bengtson, intergenerational solidarity is a multidimensional concept comprised of six dimensions: 1) structural, 2) associational, 3) functional, 4) normative, 5) consensual, and 6) affective dimensions (Bengtson & Roberts, 1991; Fuller et al., 2020). Among these six dimensions of solidarity, this study specifically focuses on the structural and associational dimensions. Structural solidarity is known as an opportunity structure for intergenerational relationships. Intergenerational proximity and number of family members have

often been used as empirical indicators of the structural dimension (Bengtson & Roberts, 1991). The associational dimension concerns frequencies and patterns of interaction between generations. Frequency of contact across different contact modes (e.g., in-person and telephone) and shared activities between generations have often been used as empirical indicators of this dimension (Bengtson & Roberts, 1991). Previous studies applying intergenerational solidarity theory tend to focus on in-person and telephone contact between generations. However, a study by Peng et al. (2018) introduces the term *digital solidarity* and suggests the importance of including digital contact modes, such as social media, in the associational solidarity dimension given the increasing adoption rate of technologies.

2.1.4 Present Study

Adult children are the most reliable social relations in later life since they provide various types of support to older adults; however, the way people interact with their children can be influenced by relocation and proximity to a child. While friends can complement adult children in the lives of older adults, friends cannot replace adult children, because adult children and friends provide different types of support (Sander et al., 2017). To the best of my knowledge, this is the first study which examines changes in communication frequencies across four different contact modes among older adults who either stayed or relocated in the last 4 years, and who potentially changed their proximity to a child.

First, in terms of in-person contact frequency with children, previous studies have documented the benefits of proximity on in-person contact (Hank, 2007), and in-person contact is very sensitive to the distance people moved (Cho & Smith, 2023). Based on these findings, it is hypothesized that both relocation and a lack of proximity to their child would be associated with lower in-person contact frequency with their children.

Second, in terms of telephone contact frequency with children, while distance is not a barrier to telephone contact, telephone contact frequency is influenced by long distance (Cho & Smith, 2023; Mok et al., 2010). Given the evidence from these two studies, it is hypothesized that relocation and lack of proximity to their child would be associated with lower-telephone contact frequency, albeit to a lesser extent than in-person contact mode.

Third, in terms of email contact frequency with children, previous studies have found that email is not sensitive to either short or long-distance that people have moved (Cho & Smith, 2023; Mok et al., 2010). Given this information, it is hypothesized that neither relocation nor a lack of proximity to their child would be associated with contact frequency with children via email.

Lastly, in terms of social media contact frequency with children, similar to email, previous studies have documented that older adults utilize digital media (e.g., Skype) for both proximate and long-distance relationships (Quan-Haase et al., 2017; Quan-Haase et al., 2019). Thus, it is hypothesized that neither relocation nor a lack of proximity to their child would be associated with contact frequency with children via social media.

In summary, based on previous evidence and different contact modes, it is hypothesized that while in-person and telephone contact modes are sensitive to relocation and proximity to a child, email and social media are not sensitive to relocation and proximity to a child.

2.2 Method

2.2.1 Data

Two waves of data from a subset of the longitudinal panel data of the Health and Retirement Study (HRS: 2014-2018) were utilized to examine the associations between relocation and proximity to a child and contact frequency with children across four contact

modes. The HRS is a national multistage area probability longitudinal panel study of adults over the age of 50 sampled from the contiguous states of the U.S. Participants who identify as African American or Hispanic are purposefully oversampled (Sonnega et al., 2014). The HRS is sponsored by the National Institute on Aging (grant number NIA U01AG009740) and is conducted by the University of Michigan. The HRS fully implemented the Leave-Behind Questionnaire (LBQ) in 2006. Psychosocial information such as contact frequency with children was obtained from the Psychosocial Leave-Behind Questionnaire (LBQ) (Smith et al., 2017). Data about household-level income, household-level wealth, and health status were obtained from the RAND HRS Longitudinal File 2020 (V1).

2.2.2 Study Sample

Participants in the final analytic sample for the current study were restricted to people (1) aged 50 years or older, (2) alive in 2018, (3) who completed the Leave Behind Questionnaire (LBQ) in 2014, (4) who completed the LBQ in 2018, and (5) who responded to at least one of the contact types with children (i.e., in-person, telephone, write or email, and social media) in 2018 (n = 3,015).

2.2.3 Measures

2.2.3.1 Relocation and Proximity to a Child Between 2014-2018

The following two interview questions were used to construct a variable that indicates individuals' moving history between 2014-2018 and proximity to a child between 2014-2018. First, the HRS asked respondents if they were still living in or around either their main or secondary residence from the prior wave (e.g., between 2014-2016 and between 2016-2018). If they said yes but also said they had moved, they would be characterized as moving within area.

If they said they were no longer living in or around the main or secondary residence, they would be considered as moving out of the area. This interview question was coded as 1) stayer, 2) moving within area, and 3) moving out of the area. Second, respondents were asked whether any of their children lived within 10 miles. This variable was coded as 1) yes and 2) no. Using this information, the variable called relocation and proximity to a child status was categorized into 7 groups: 1) *stayers with consistent proximity to a child*, 2) *stayers with proximity to a child at least at one time point* (e.g., either 2014, 2016, 2018, or two time points), 3) *stayers without proximity to a child*, 4) *within area movers with proximity to a child*, 5) *within area movers without proximity to a child*, 6) *out of area movers with proximity to a child*, and 7) *out of area movers without proximity to a child*. 157 participants (4.41%) who moved more than once were categorized based on the first move.

2.2.3.2 Frequency of Four Different Modes of Social Contact with Children in 2018

The following four questions were used to measure the frequency of the four different modes of social contact with children in 2018 (i.e., in-person, telephone, write or email, and communicate by Skype, Facebook, or other social media): (1) how often do you meet up with your children? (2) how often do you speak on the phone with your children? (3) how often do you write or email your children? and (4) how often do you communicate with your children by Skype, Facebook, or other social media? There were six categorical responses for each contact type: (1) three or more times per week, (2) once or twice per week, (3) once or twice per month, (4) every few months, (5) once or twice per year, and (6) less than once per year or never (Smith et al., 2017). For easier interpretation, I collapsed these six categories into three: a) infrequent contact by combining (5) and (6), b) moderate contact by combining (3) and (4), and c) frequent contact by combining (1) and (2).

2.2.3.3 Covariates

Following previous literature (Cho & Smith, 2023), the following variables were included as covariates: age, gender, marital status, educational attainment, household-level income status, household-level wealth status, ethnicity, number of chronic diseases, any issue in activities of daily living (ADL), any other immediate family such as brothers or sisters, parents or grandchildren, any friends, any resident children, number of nonresident children, positive social support from children, negative social support from children, and frequency of four different modes of social contact (i.e., in-person, telephone, write or email, and social media) with children in 2014, respectively.

Specifically, age was coded as a continuous variable, gender was coded as 1= male and 2= female. Marital status was coded as 1= married or partnered, 2 = separated, or divorced, or widowed, and 3 = never married. Race/ethnicity was coded as 1 = White, non-Hispanic, 2 = Black, non-Hispanic, 3 = other, non-Hispanic, and 4 = Hispanic. Educational attainment was coded as 1= less than high school, 2 = GED/high-school graduate, 3 = some college, and 4 = college and above. The household level income (range: 0 – 4,514,000) and the household level wealth (range: -500,000 – 3,650,000) were log-transformed on the RAND HRS Longitudinal File. These two variables were coded into quartiles. Household level income: (1 = 0 – 26,402, 2 = 26,472 – 50,619, 3= 50,640 – 93,200, and 4 = 93,318 – 4,514,000). Household level assets: (1 = -500,000 – 14,551, 2 = 15,000 – 98,000, 3 = 100,000 – 199,000, and 4 = 200,000 – 3,650,000). The existence of any other family, existence of any friends and number of resident children were coded into binary variables (0 = no and 1 = yes). The number of non-resident children is coded into continuous variable. An index of positive social support from children was created by averaging the scores of the following three questions*: (1) "*How much do they really understand

the way you feel about things?" (2) "How much can you rely on them if you have a serious problem?," and (3) "How much can you open up to them if you need to talk about your worries?" *(*range 1-4). An index of negative social support from children was created by averaging the score of the following four items: (1) "How often do they make too many demands on you?" (2) *"*How much do they criticize you?," (3) "How much do they let you down when you are counting on them?", and (4) *"*How much do they get on your nerves?" (range 1-4). ADL was coded as binary 1 (people who have at least one ADL issue) and 0 (people who do not have any ADL issue) using the following five questions: due to health or memory problems do you have any difficulty with (1) "bathing or showering?" (2) "eating, such as cutting up your food?" (3) "dressing, including putting on shoes and socks?" (4) "with walking several blocks?," and (5) "getting in or out of bed?" The count of self-reported chronic disease was measured as a continuous variable based on the following 7 items: diseases (high blood pressure, diabetes, heart disease, stroke, lung disease, cancer, and arthritis) (range 0-7). Lastly, there were six categorical responses for the frequency of the four different modes of social contact with children in 2014: (1) three or more times per week, (2) once or twice per week, (3) once or twice per month, (4) every few months, (5) once or twice per year, and (6) less than once per year or never (Smith et al., 2017). For easier interpretation, I combined these six categories into three: a) infrequent contact by combining (5) and (6), b) moderate contact by combining (3) and (4), and c) frequent contact by combining (1) and (2).

2.2.4 Analysis Plan

The analysis was divided into two parts. First, bivariate analyses (i.e., chi-square and one-way ANOVA) were conducted to determine differences in covariates across the seven groups. Second, because the four different modes of social contact with children (i.e., in-person,

telephone, write or email, and social media) have different numbers of responses and participants could report using more than one mode (e.g., in person and telephone), I employed four separate ordinal logistic regression analyses to examine the associations between relocation and proximity to a child between 2014-2018 and the frequency of four different modes of social contact with children in 2018. Specifically, in Model 1, contact frequency with children in 2018 was regressed onto relocation and proximity between 2014-2018, controlling for contact frequency with children in 2014 across the four modes of social contact. In Model 2, contact frequency with children in 2018 was regressed onto relocation and proximity to a child between 2014-2018, controlling for contact frequency with children in 2014 and all remaining covariates across the four modes of social contact, respectively.

2.3 Results

2.3.1 Sample Characteristics by Relocation and Proximity to a Child

Table 2.1 illustrates the socio-demographic and health status across the 7 categories of relocation and proximity to a child. More than 80% of our study sample was categorized into the stayer groups. Specifically, 36.4% of individuals were categorized into *stayers* who *maintain close proximity to a child all the time*, 15.5% of individuals were categorized into *stayers who maintain close proximity at least at one time point*, and 29.4% of individuals were categorized into *stayers without close proximity to a child.* The remaining 19% of the study sample were categorized into mover groups. Specifically, 4.5% of individuals were categorized into *within area movers who main close proximity to a child,* 3.3% of individuals were categorized into *within area movers without proximity to a child,* 4.2% of individuals were categorized into *out of area movers with close proximity to a child,* and 6.5% of individuals were categorized into *out of area movers without proximity to a child.* The seven groups were different in most

socioeconomic and demographic variables except for gender, having any ADL, having any friends, and having any other immediate family members. The seven groups were also significantly different in contact frequency across the four contact modes in 2018 and 2014 (as shown in Table 2.2 and Table 2.3).

2.3.2 Ordinal Logistic Regression

Four separate multivariate ordinal logistic regressions were employed to examine the associations between the relocation and proximity to a child and changes in contact frequency with children across the four contact modes. *Stayers with consistent proximity to a child* served as the reference group in the four separate multivariate ordinal logistic regression models.

Step 1

In step 1, contact frequency with children in 2018 was regressed on the relocation and proximity to child status between 2014-2018, only controlling for contact frequency with children in 2014 across the four types of contact modes (See Table 2.4, Table 2.5, Table 2.6, and Table 2.7). First, in terms of in-person contact frequency with children, in general, the reference group has more in-person contact with children compared to other groups. Specifically, compared with the *stayers with consistent proximity to a child*, *stayers with proximity to a child at least at one time point* (OR = 0.74, [CI] = [0.59, 0.93], p = .012) and *stayers without proximity to a child* (OR = 0.39, 95% [CI] = [0.32, 0.48], p <. 001) were associated with change to a decrease in the odds of more in-person contact frequency category in 2018. Also, compared with the reference group, *within area mover without proximity to a child* (OR = 0.48, 95% [CI] = [0.32, 0.73], p <. 001) and *out of area mover without proximity to a child* (OR = 0.38, 95% [CI] = [0.28, 0.53], p <. 001) were associated with change to a decrease in the odds of more in-person contact frequency category. In contrast, compared with the reference group, *within area mover*

with proximity to a child (OR = 0.99, 95% [CI] = [0.68, 1.44], p = .981) and *out of area mover with proximity to a child* (OR = 1.37, 95% [CI] = [0.93, 2.04], p = .110) were no different in terms of change in in-person contact frequency in 2018.

Regarding telephone contact frequency with children in 2018, compared with the reference group (*stayers with consistent proximity to a child*), *staying without proximity to a child (*OR = 0.67, [CI] = [0.52, 0.85], p < .001), *within area move with proximity to a child* (OR = 0.58, 95% [CI] = [0.37, 0.91], p = .018), and *out of area move without proximity to a child* (OR = 0.50, 95% [CI] = [0.34, 0.72], p < .001) were associated with change to a decrease in the odds of more telephone contact frequency category. In contrast, compared with the reference group, *stayers with proximity to a child at least at one time point (*OR = 0.85, 95% [CI] = [0.63, 1.15], p = .308), *within area mover without proximity to a child* (OR = 0.90, 95% [CI] = [0.54, 1.51], p = .707), and *out of area mover with proximity to a child* (OR = 1.35, 95% [CI] = [0.78, 2.33], p = .278) were no different in terms of change in telephone contact frequency in 2018.

Unlike in-person contact frequency with children in 2018 and telephone contact frequency with children in 2018, this study found no significant association between relocation and proximity to a child and change in email contact frequency with children. There was no significant association between relocation and proximity to a child and change in social media contact frequency with children as well.

Step 2

In step 2, all covariates (age, gender, marital status, educational attainment, income status, wealth status, ethnicity, number of chronic diseases, any issue in ADL, any other immediate family, any resident children, number of nonresident children, positive social support from children, negative social support from children, and frequency of four different modes of

social contact with children in 2014) were included in the model (See Table 2.8,Table 2.9, Table 2.10, and Table 2.11).

In terms of changes in in-person contact frequency with children in 2018**,** the reference group tends to have more in-person contact with children compared to other groups. Specifically, compared with the reference group, *stayers with proximity to a child at least at one time point (*OR = 0.72, 95% [CI] = [0.56, 0.91], p = .006) and *stayers without proximity to a child* were more likely to change to lower in-person contact frequency category (OR = 0.33, 95% [CI] = [0.27, 0.41], p < .001). Also, compared with the reference group, *within area mover without proximity to a child* group (OR = 0.46, [CI] = [0.30, 0.70], p < .001) and *out of area mover without proximity to a child* group (OR = 0.36, [CI] = [0.26, 0.50], p < .001) were associated with changes to lower in-person contact frequency category. In contrast, this study found that compared with the reference group, *within area move with proximity to a child* (OR = 1.01, [CI] = [0.68, 1.48], p = .966) and *out of area move with proximity to a child* (OR = 1.33, [CI] = [0.89, 1.98], p =.161) were not associated with changes in the odds of in-person contact frequency. In terms of covariates, being non-Hispanic other, positive relationship with children in 2014, having a resident child, and in-person contact frequency with children in 2014 were associated with changes to increase in the odds of more in-person contact frequency (Table 2.8).

Regarding telephone contact frequency with children in 2018**,** compared with the reference group (*stayers with consistent proximity to a child*), *stayers without proximity to a child* (OR = 0.71, 95% [CI] = [0.55, 0.91], p = .009) was associated with a change to decrease in the odds of more telephone contact frequency. Also, compared with the reference group, w*ithin area movers with proximity to a child* (OR = 0.59, [CI] = [0.37, 0.93], p = .026) and *out of area movers without proximity to a child group* (OR = 0.54, [CI] = [0.37, 0.80], p = .002) were

associated with change to a decrease in the odds of more telephone contact frequency category. In contrast, this study found that compared with the reference group, *stayers with proximity to a child at least one time point* (OR = 0.86, [CI] = [0.63, 1.17], p = .350), *within area movers without proximity to a child* (OR = 1.06, [CI] = [0.62, 1.83], p = .805), and *out of the area movers with proximity to a child* (OR = 1.26, [CI] = [0.73, 2.20], p = .399) were not associated with changes in the odds of telephone contact frequency. In terms of covariates, being female, race, positive quality with children, negative quality with children, and telephone contact frequency in 2014 were associated with increase in the odds of more telephone contact frequency in 2018 (Table 2.9).

Unlike in-person and telephone contact frequency with children, I did not find significant association between relocation and proximity to a child and change in email contact frequency with children 2018. In terms of covariates, age, being female, separated or divorced, education, positive relationship with children, and previous email contact frequency with children were associated with the odds of email contact frequency (Table 2.10).

Lastly, this study did not find any significant relationship between relocation and proximity to a child and changes in social media contact frequency with children. In terms of covariates, age, being female, having chronic diseases, being in the 4th quartile of income group, positive relationship with children, having any friends, the number of nonresident children, and media contact frequency in 2014 were associated changes in the odds of media contact in 2018 (Table 2.11).

2.4 Discussion

While many older adults prefer to age in place, housing transitions do occur frequently in later life. Previous research has focused on aspects of location, such as whether people stay in

their current residence or not (Cho & Smith, 2023; Forsyth & Molinsky, 2021; Perry et al., 2018). However, these previous studies did not differentiate stayers and movers based on the proximity of networks, even though older adults are heterogeneous concerning proximity to their child, and this has implications for their contact frequency with their children.

This paper, Paper 1, examines how relocation and proximity to a child is associated with changes in contact frequency with children across four contact modes. Findings indicate that while in-person and telephone contact modes are sensitive to both relocation and proximity to a child, email and social media contact modes, on the other hand, are not sensitive to relocation and proximity to a child. I organize this section according to contact modes starting with in person contact, followed by telephone, email, and social media. I will then discuss the theoretical contributions of Paper 1.

In terms of changes in in-person contact frequency with children, as hypothesized, this study finds that in-person contact frequency with children is very sensitive to relocation and proximity to a child. For instance, these results show that compared to the reference group (*stayers with consistent proximity to a child)*, the other two stayer groups tend to shift to lower in-person contact frequency with their children. While the HRS does not provide information about why adult children in the other two stayer groups moved between 2014-2018, Lin and Rogerson (1995) posit that adult children often move or live far away from their parents for employment or education purposes. It is feasible that this increased distance may hinder older adults and adult children from maintaining previous levels of in-person contact frequency.

In contrast to the reference group (*stayers with consistent proximity to a child*), *within area movers who maintain their proximity to a child* were no different in terms of in-person contact frequency with children, suggesting the role of proximity to a child in facilitating in-

person contact. Table 2.1 shows that *within area movers with proximity to a child* are similar to the reference group in terms of the number of chronic diseases. It is feasible, then, that older adults in the *within area movers with proximity to a child* group may move near to their adult children to receive more daily assistance, especially when they are ill.

Compared to the reference group (*stayers with consistent proximity to a child*), *movers without proximity to a child* are more likely to change to lower in-person contact with their children regardless of the distance moved. Older adults who move far away from their children may not need support from their children (Lin & Rogerson, 1995). It is also possible that *movers without proximity to a child* may voluntarily exclude their children from their core networks. Instead, *movers without proximity to a child* may establish a local relationship after relocation as environmental factors (e.g., relocation and distance) can influence the nature of their social relations (Antonucci et al., 2019; Bengtson, 2001; Silverstein & Bengtson, 1997). Overall, the findings of the current study suggest the importance of considering proximity to a child when examining changes in in-person contact with children, whether people move or not.

Second, concerning changes in contact frequency via telephone, as hypothesized, telephone contact is less sensitive to relocation and proximity to a child, compared to in-person contact mode. In general, the findings of this study show that effects of relocation on telephone contact frequency can vary based on the proximity to a child. Compared to the reference group, both *stayers without proximity to a child* and *out of area movers without proximity to a child* are more likely to change to lower telephone contact frequency with their children. While proximity is not a barrier to telephone contact, older adults without proximity to a child may be less involved in the lives of their children compared to stayers who maintain consistent proximity to their children (Lin & Rogerson, 1995). In contrast, the other groups (*stayers with proximity to a*

child at least at one time point, *within area movers without proximity to a child*, and *out of area movers with proximity to child*) are similar to the reference group. Given the moderate sensitivity of telephone contact mode to distance (Cho & Smith, 2023; Mok et al., 2010), older adults in these groups may have experienced changes in telephone contact frequency in the short-term. However, older adults in these groups may rebound to their original level of contact frequency with children over time.

Interestingly, compared to the reference group, *within area movers with proximity to a child* tend to have lower telephone contact frequency. Even though the telephone offers convenience to older adults, older adults may enjoy less companionship via telephone interaction than with in-person interaction (Sun & Schafer, 2023; Mulder & Van Der Meer, 2009). Older adults in this group may move near to their children to enjoy more frequent in-person interaction, and facilitate support from their children, which requires physical presence (Spring et al., 2017). Previous studies found that compared to stayers, while short-distance movers and stayers do not differ in terms of telephone contact frequency, long-distance movers tend to have less frequent telephone contact (Cho & Smith, 2023; Mok et al., 2010). While the study by Cho & Smith (2023) and Mok et al. (2010) categorized relocation groups based on the distance people moved, (e.g., less than 5 miles and more than 50 miles), this study categorized older adults based on whether respondents still lived in their main or secondary residence and their proximity to a child.

Unlike the above traditional contact modes (in-person and telephone contact), email and social media as recent contact modes are not influenced by relocation and proximity to a child. Previous studies reveal that contact frequency with friends via email (Cho & Smith, 2023) and contact frequency with kin via email/instant message (Mok et al., 2007; Mok et al., 2010) are not

sensitive to relocation. The inherent nature of these two recent contact modes may help older adults utilize them to maintain contact with their children. For example, the asynchronous nature of email may help older adults to easily maintain contact with long-distance children. Previous studies found that older adults also tend to use email to meet their emotional needs or to arrange gatherings (Quan-Haase et al., 2019). Regarding social media, it provides both audio and visual features (Quan-Haase et al., 2019), and these features may help older adults enjoy more companionship when interacting with children via social media. However, it is worthwhile to note that about 40-50% of older adults were categorized as the infrequent contact group in the case of email and social media contact modes (Table 2.2). Even though email and social media contact modes are not influenced by relocation and proximity to a child, these modes may not be primary contact modes when maintaining contact with their children.

Concerning theoretical contributions, the Social Convoy Model and Intergenerational Solidarity Theory have been applied to understand changes in the structural nature of relationships, such as frequency of contact. However, while most previous studies focused on traditional contact modes (in-person and telephone), this study is one of the few studies using these frameworks to understand changes in contact frequency with children following relocation, specifically via digital contact modes (email and social media).

Furthermore, in other studies, Socioemotional Selectivity Theory (SST) has been applied to explain older adults' changes in preference of social relations, from novel/informative to emotionally satisfying relationships. However, few studies have examined whether older adults use digital media (e.g., email and social media) to facilitate emotionally satisfying relationships (Sims et al., 2016; Quan-Haase et al., 2019). One exception is a study by Sims et al. (2016), which found that older adults often use information and communication technology (ICT) to

contact family members, rather than for informational purposes (Sims et al., 2016). Consistent with previous studies, our findings confirm the potential of both asynchronous (email) and synchronous digital media (social media) in maintaining contact with both local and distant children (Quan-Haase et al., 2019).

2.4.1 Limitations and Future Directions

There are several limitations to this study. First, while this study considers both relocation and proximity to a child, the motivation for relocation is not considered. Even though we do not know older adults' exact motivations for relocation, we do know that proximity changes as older adults' needs change (Lin & Rogerson, 1995; Litwak & Longino, 1987). For example, while older adults who move near their children may want more interaction with them for various reasons, (e.g., enjoy more companionship and get more assistance), older adults who move far away from their children may not want to stress or burden them with caring for them.

Second, as mentioned in the methods section, relocation status is categorized based on whether people move or stay. If respondents moved, they were asked whether they still lived in either their main or secondary residence, or somewhere else, to distinguish respectively between a *within area move* and an *out of area move*. While *within area move* and *out of area move* were distinguished based on people's residence, the exact distance people moved was not considered.

Third, regarding contact frequency with children across four contact modes, since the HRS asks about the average contact frequency with their children who do not live with them, we do not know whether older adults have more frequent contact with their proximate children or long-distance children. Also, since information about contact frequency with children is available from the Leave Behind Questionnaire, administered to the same respondents every four years, the short-term effect of relocation on changes in contact frequency with children cannot be

captured. Regarding the email/write contact mode, since the HRS did not distinguish email and mail, we do not know whether older adults prefer to send an email or write a letter to their children.

Fourth, regarding proximity to a child, older adults were categorized based on whether they have any child within 10 miles. However, we do not know the geographic distribution of their other children. It is possible that while older adults could have many adult children within 10 miles, some older adults could have just one child nearby. Future studies could examine whether the effect of relocation and proximity to a child on contact frequency differs by geographic distribution of other children.

Fifth and finally, this study utilized data from the HRS 2014-2018, and the data was collected before Covid 19. Covid 19 has undoubtedly influenced the way older adults interact with their children. Some researchers reveal within-person increases in physical isolation and within-person decreases in digital isolation during the Covid 19 pandemic (Peng & Roth, 2021). A study by Freedman et al. (2022) documents a decrease in in-person contact but increases in video contact during the Covid 19 pandemic (Freedman et al., 2022). As Covid 19 may influence the way older adults interact with their adult children, future studies could investigate the effects of Covid 19 on the associations between relocation and proximity to a child and contact frequency with children across four contact modes.

2.4.2 Conclusion

About 40% of older adults experience social isolation (National Academies of Sciences, Engineering, and Medicine, 2020), and eradicating social isolation is one task of the Grand Challenges for Social Work. The current study suggests that relocation can be a risk for in-person and telephone contact modes. In contrast, digital contact modes (email and social media)

may be useful tools to maintain contact with children following relocation. Although digital contact modes are useful, social interaction via diverse contact modes (e.g., combination of in-person, telephone, and digital contact modes) are recommended compared to social interaction via limited types of contact modes (e.g., social media only) (Holt-Lunstad, 2023). One solution for older adults who experience reduced in-person contact with their children could be for social workers to arrange other types of social support, such as volunteering opportunities, religious participation, or intergenerational connection programs.

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2.6 Tables

Table 2.1 Socio and Demographic Characteristics Across the 7 Categories of Relocation and Proximity to a Child (N=3,015)

	Stayers & consistent proximity to a child	Stayers & proximity to a child at least at one time point	Stayers without proximity to a child	Within area movers & proximity to a child	Within area movers without proximity to a child	Out of area movers & proximity to a child	Out of area movers without proximity to a child	Total	Test
N	1,098 (36.4%)	468 (15.5%)	886 (29.4%)	137 (4.5%)	101 (3.3%)	128 (4.2%)	197 (6.5%)	3,015 (100.0%)	
Age	69.93 (8.90)	65.92(8.93)	67.35 (8.51)	65.87 (8.82)	64.64 (9.67)	69.60 (10.1)	65.13 (8.36)	67.86 (9.018)	<0.001
Gender									0.503
Male	414 (37.7%)	178 (38.0%)	372 (42.0%)	48 (35.0%)	40 (39.6%)	52 (40.6%)	76 (38.6%)	1,180 (39.1%)	
Female	684 (62.3%)	290 (62.0%)	514 (58.0%)	89 (65.0%)	61 (60.4%)	76 (59.4%)	121(61.4%)	1,835 (60.9%)	
Marital Status									0.046
Married/Partnered	773 (70.4%)	334 (71.4%)	653 (73.7%)	80 (58.4%)	66 (65.3%)	96 (75.0%)	130 (66.0%)	2,132 (70.7%)	
Separated/Divorced/Widowed	308 (28.1%)	126 (26.9%)	219 (24.7%)	52 (38.0%)	32 (31.7%)	31(24.2%)	62 (31.5%)	830 (27.5%)	
Never married	17 (1.5%)	8 (1.7%)	14 (1.6%)	5 (3.6%)	3 (3.0%)	1 (0.8%)	5 (2.5%)	53 (1.8%)	
Count of 7 physical conditions	2.10 (1.31)	1.82 (1.34)	1.84(1.27)	2.13 (1.48)	1.76 (1.13)	2.07 (1.42)	1.89 (1.29)	1.95 (1.32)	<0.001
Educational attainment									
Less than high school	161 (14.7%)	72 (15.4%)	59 (6.7%)	23 (16.8%)	9 (8.9%)	12 (9.4%)	12 (6.1%)	348 (11.5%)	
GED/high school Graduate	463 (42.2%)	149 (31.8%)	269 (30.4%)	43 (31.4%)	33 (32.7%)	35 (27.3%)	62 (31.5%)	1,054 (35.0%)	
Some college	267 (24.3%)	130 (27.8%)	242 (27.3%)	43 (31.4%)	24 (23.8%)	40 (31.2%)	60 (30.5%)	806 (26.7%)	
College and above	207 (18.9%)	117 (25.0%)	316 (35.7%)	28 (20.4%)	35 (34.7%)	41 (32.0%)	63 (32.0%)	807 (26.8%)	
Asset 4 quartiles									<0.001
Lowest quartile (-500,000–14,551)	150 (13.7%)	93 (19.9%)	121 (13.7%)	54 (39.4%)	30 (29.7%)	30 (23.4%)	57 (28.9%)	535 (17.7%)	
2nd quartile (15,000–98,000)	257 (23.4%)	116 (24.8%)	170 (19.2%)	30 (21.9%)	24 (23.8%)	29 (22.7%)	29 (14.7%)	655 (21.7%)	
3rd quartile									

	Stayers & consistent proximity to a child	Stayers & proximity to a child at least at one time point	Stayers without proximity to a child	Within area movers & proximity to a child	Within area movers without proximity to a child	Out of area movers & proximity to a child	Out of area movers without proximity to a child	Total	Test
(100,000–199,000)	357 (32.5%)	134 (28.6%)	249 (28.1%)	18 (13.1%)	15 (14.9%)	35 (27.3%)	48 (24.4%)	856 (28.4%)	
4th quartile (200,000–3,650,000)	334 (30.4%)	125 (26.7%)	346 (39.1%)	35 (25.5%)	32 (31.7%)	34 (26.6%)	63 (32.0%)	969 (32.1%)	
Income 4 quartiles									<0.001
Lowest quartile (0 – 26,402)	169 (15.4%)	95 (20.3%)	98 (11.1%)	26 (19.0%)	24 (23.8%)	19 (14.8%)	39 (19.8%)	470 (15.6%)	
2nd quartile (26,472 – 50,619)	279 (25.4%)	105 (22.4%)	205 (23.1%)	33 (24.1%)	24 (23.8%)	31 (24.2%)	35 (17.8%)	712 (23.6%)	
3rd quartile (50,640 – 93,200)	379 (34.5%)	109 (23.3%)	258 (29.1%)	38 (27.7%)	24 (23.8%)	44 (34.4%)	53 (26.9%)	905 (30.0%)	
4th quartile (93,318 – 4,514,000)	271 (24.7%)	159 (34.0%)	325 (36.7%)	40 (29.2%)	29 (28.7%)	34 (26.6%)	70 (35.5%)	928 (30.8%)	
Ethnic/Race									<0.001
White, non-Hispanic	818 (74.5%)	285 (60.9%)	683 (77.1%)	83 (60.6%)	74 (73.3%)	102 (79.7%)	151 (76.6%)	2,196 (72.8%)	
Black, non-Hispanic	149 (13.6%)	94 (20.1%)	110 (12.4%)	35 (25.5%)	13 (12.9%)	10 (7.8%)	30 (15.2%)	441 (14.6%)	
Other, non-Hispanic	27 (2.5%)	14 (3.0%)	20 (2.3%)	4 (2.9%)	4 (4.0%)	7 (5.5%)	7 (3.6%)	83 (2.8%)	
Hispanic	104 (9.5%)	75 (16.0%)	73 (8.2%)	15 (10.9%)	10 (9.9%)	9 (7.0%)	9 (4.6%)	295 (9.8%)	
Any ADL (Yes)	49 (4.5%)	22 (4.7%)	35 (4.0%)	11 (8.0%)	4 (4.0%)	10 (7.8%)	9 (4.6%)	140 (4.6%)	0.269
Positive relationship with children	3.31 (0.67)	3.19 (0.76)	3.22 (0.73)	3.21 (0.74)	3.12 (0.83)	3.30 (0.62)	3.14 (0.78)	3.24 (0.72)	0.002
Negative relationship with children	1.70 (0.61)	1.72 (0.68)	1.60 (0.59)	1.70 (0.63)	1.61 (0.68)	1.64 (0.58)	1.67 (0.62)	1.67 (0.62)	
Any other family members (Yes)	1,049 (95.5%)	444 (94.9%)	842 (95.0%)	129 (94.2%)	95 (94.1%)	117 (91.4%)	188 (95.4%)	2,864 (95.0%)	0.592
Any friends (Yes)	997 (90.8%)	426 (91.0%)	832 (93.9%)	124 (90.5%)	89 (88.1%)	112 (87.5%)	178 (90.4%)	2,758 (91.5%)	0.062

	Stayers & consistent proximity to a child	Stayers & proximity to a child at least at one time point	Stayers without proximity to a child	Within area movers & proximity to a child	Within area movers without proximity to a child	Out of area movers & proximity to a child	Out of area movers without proximity to a child	Total	Test
Any resident children (Yes)	192 (17.5%)	157 (33.5%)	194 (21.9%)	39 (28.5%)	28 (27.7%)	25 (19.5%)	40 (20.3%)	675 (22.4%)	<0.001
Number of non-resident children	2.52 (0.66)	2.39 (0.72)	2.14 (0.77)	2.44 (0.67)	2.12 (0.77)	2.63 (0.57)	2.39 (0.75)	2.37 (0.73)	<0.001

Note: ADL (activities of daily living)

Table 2.2 Contact Frequency with Children in 2018 Across the 7 Categories of Relocation and Proximity to a Child

	Stayers & consistent proximity to a child	Stayers & proximity to a child at least at one time point	Stayers without proximity to a child	Within area movers & proximity to a child	Within area movers without proximity to a child	Out of area movers & proximity to a child	Out of area movers without proximity to a child	Total	Test
In-person in 2018								N = 2,978	0.001
Infrequent Contact	98 (9.1%)	82 (17.8%)	268 (30.5%)	20 (14.7%)	29 (28.7%)	16 (12.5%)	67 (34.2%)	580 (19.5%)	
Moderate Contact	383 (35.5%)	197 (42.8%)	480 (54.7%)	47 (34.6%)	44 (43.6%)	44 (34.4%)	89 (45.4%)	1,284 (43.1%)	
Frequent Contact	598 (55.4%)	181 (39.3%)	130 (14.8%)	69 (50.7%)	28 (27.7%)	68 (53.1%)	40 (20.4%)	1,114 (37.4%)	
Telephone in 2018								N = 2,997	0.001
Infrequent Contact	26 (2.4%)	19 (4.1%)	39 (4.4%)	9 (6.6%)	9 (8.9%)	5 (3.9%)	12 (6.2%)	119 (4.0%)	
Moderate Contact	168 (15.4%)	102 (21.9%)	265 (30.0%)	33 (24.3%)	24 (23.8%)	19 (15.0%)	68 (34.9%)	679 (22.7%)	
Frequent Contact	894 (82.2%)	345 (74.0%)	580 (65.6%)	94(69.1%)	68 (67.3%)	103 (81.1%)	115 (59.0%)	2,199 (73.4%)	
Email in 2018								N = 2 ,953	0.001
Infrequent Contact	499 (46.7%)	210 (45.7%)	316 (36.2%)	61 (45.9%)	45 (45.0%)	44 (35.2%)	56 (28.9%)	1,231 (41.7%)	
Moderate Contact	238 (22.3%)	108 (23.5%)	257 (29.5%)	27 (20.3%)	25 (25.0%)	30 (24.0%)	58 (29.9%)	743 (25.2%)	
Frequent Contact	332 (31.1%)	142 (30.9%)	299 (34.3%)	45 (33.8%)	30 (30.0%)	51 (40.8%)	80 (41.2%)	979 (33.2%)	
Social media in 2018								N = 2,957	0.001
Infrequent Contact	603 (56.5%)	246 (53.2%)	420 (48.0%)	62 (46.6%)	49 (49.5%)	59 (47.2%)	80 (41.0%)	1,519 (51.4%)	
Moderate Contact	159 (14.9%)	74 (16.0%)	183 (20.9%)	25 (18.8%)	18 (18.2%)	22 (17.6%)	47 (24.1%)	528 (17.9%)	
Frequent Contact	306 (28.7%)	142 (30.7%)	272 (31.1%)	46 (34.6%)	32 (32.3%)	44 (35.2%)	68 (34.9%)	910 (30.8%)	

Table 2.3 Contact Frequency with Children in 2014 Across the 7 Categories of Relocation and Proximity to a Child (N=3,015)

	Stayers & consistent proximity to a child	Stayers & proximity to a child at least at one time point	Stayers without proximity to a child	Within area movers & proximity to a child	Within area movers without proximity to a child	Out of area movers & proximity to a child	Out of area movers without proximity to a child	Total	Test
In-person in 2014									<0.001
Infrequent Contact	85 (7.7%)	82 (17.5%)	281 (31.7%)	23 (16.8%)	29 (28.7%)	26 (20.3%)	69 (35.0%)	595 (19.7%)	
Moderate Contact	395 (36.0%)	230 (49.1%)	502 (56.7%)	53 (38.7%)	49 (48.5%)	53 (41.4%)	89 (45.2%)	1,371 (45.5%)	
Frequent Contact	618 (56.3%)	156 (33.3%)	103 (11.6%)	61 (44.5%)	23 (22.8%)	49 (38.3%)	39 (19.8%)	1,049 (34.8%)	
Telephone in 2014									<0.001
Infrequent Contact	15 (1.4%)	15 (3.2%)	29 (3.3%)	4 (2.9%)	6 (5.9%)	4 (3.1%)	8 (4.1%)	81 (2.7%)	
Moderate Contact	146 (13.3%)	111 (23.7%)	270 (30.5%)	32 (23.4%)	36 (35.6%)	27 (21.1%)	64 (32.5%)	686 (22.8%)	
Frequent Contact	937 (85.3%)	342 (73.1%)	587 (66.3%)	101 (73.7%)	59 (58.4%)	97 (75.8%)	125 (63.5%)	2,248 (74.6%)	
Email in 2014									<0.001
Infrequent Contact	561 (51.1%)	203 (43.4%)	296 (33.4%)	65 (47.4%)	39 (38.6%)	53 (41.4%)	55 (27.9%)	1,272 (42.2%)	
Moderate Contact	239 (21.8%)	138 (29.5%)	283 (31.9%)	32 (23.4%)	30 (29.7%)	26 (20.3%)	67 (34.0%)	815 (27.0%)	
Frequent Contact	298 (27.1%)	127 (27.1%)	307 (34.7%)	40 (29.2%)	32 (31.7%)	49 (38.3%)	75 (38.1%)	928 (30.8%)	
Social Media in 2014									<0.001
Infrequent Contact	717 (65.3%)	264 (56.4%)	486 (54.9%)	79 (57.7%)	58 (57.4%)	74 (57.8%)	90 (45.7%)	1,768 (58.6%)	
Moderate Contact	142 (12.9%)	82 (17.5%)	184 (20.8%)	21 (15.3%)	19 (18.8%)	18 (14.1%)	50 (25.4%)	516 (17.1%)	
Frequent Contact	239 (21.8%)	122 (26.1%)	216 (24.4%)	37 (27.0%)	24 (23.8%)	36 (28.1%)	57 (28.9%)	731 (24.2%)	

Table 2.4 Ordinal Logistic Model on Changes in In-person Contact frequency with Children (N=2,978)

	Odd Ratio	95% CI	p-value
Relocation and proximity to a child			
Stayers with proximity to a child at least at one time point	0.74	[0.59,0.93]	0.012
Stayers without proximity to a child	0.39	[0.32,0.48]	0.000
Within area movers with proximity to a child	0.99	[0.68,1.44]	0.981
Within area movers without proximity to a child	0.48	[0.32,0.73]	0.001
Out of area movers with proximity to a child	1.37	[0.93,2.04]	0.110
Out of area movers without proximity to a child	0.38	[0.28,0.53]	0.000
In-person contact in 2014			
Infrequent contact	0.04	[0.03,0.05]	0.000
Moderate contact	0.21	[0.18,0.26]	0.000

Note: reference group: stayers & consistent proximity to a child

Table 2.5 Ordinal Logistic Model on Changes in Telephone Contact frequency with Children (N=2,997)

	Odd Ratio	95% CI	p-value
Relocation and proximity to a child			
Stayers with proximity to a child at least at one time point	0.85	[0.63,1.15]	0.308
Stayers without proximity to a child	0.67	[0.52,0.85]	0.001
Within area movers with proximity to a child	0.58	[0.37,0.91]	0.018
Within area movers without proximity to a child	0.90	[0.54,1.51]	0.707
Out of area movers with proximity to a child	1.35	[0.78,2.33]	0.278
Out of area movers without proximity to a child	0.50	[0.34,0.72]	0.000
Telephone contact in 2014			
Infrequent contact	0.01	[0.01,0.02]	0.000
Moderate contact	0.07	[0.06,0.09]	0.000

Note: reference group: stayers & consistent proximity to a child

Table 2.6 Ordinal Logistic Model on Changes in Email Contact Frequency with Children (N=2,953)

	Odd Ratio	95% CI	p-value
Relocation and proximity to a child			
Stayers with proximity to a child at least at one time point	0.95	[0.76,1.19]	0.671
Stayers without proximity to a child	1.01	[0.83,1.20]	0.971
Within area movers with proximity to a child	0.98	[0.67,1.43]	0.948
Within area movers without proximity to a child	0.85	[0.56,1.29]	0.454
Out of area movers with proximity to a child	1.38	[0.94,2.02]	0.098
Out of area movers without proximity to a child	1.23	[0.91,1.68]	0.172
Email contact in 2014			
Infrequent contact	0.05	[0.04,0.07]	0.000
Moderate contact	0.31	[0.26,0.37]	0.000

Note: reference group: stayers & consistent proximity to a child

Table 2.7 Ordinal Logistic Model on Changes in Social Media Contact Frequency with Children (N=2,957)

	Odd Ratio	95% CI	p-value
Relocation and proximity to a child			
Stayers with proximity to a child at least at one time point	1.01	[0.79,1.25]	0.995
Stayers without proximity to a child	1.13	[0.94,1.36]	0.189
Within area movers with proximity to a child	1.27	[0.88,1.84]	0.197
Within area movers without proximity to a child	1.17	[0.77,1.78]	0.453

Out of area movers with proximity to a child	1.23	[0.83,1.80]	0.291
Out of area movers without proximity to a child	1.28	[0.94,1.74]	0.110
Social Media contact in 2014			
Infrequent contact	0.09	[0.07,0.10]	0.000
Moderate contact	0.36	[0.29,0.44]	0.000

Note: reference group: stayers & consistent proximity to a child

Table 2.8 Ordinal Logistic Model on Changes in In-person Contact frequency with Children (n=2,978)

	Odd Ratio	95% CI	p-value
Relocation and proximity to a child			
Stayers with proximity to a child at least at one time point	0.72	[0.56,0.91]	0.006
Stayers without proximity to a child	0.33	[0.27,0.41]	0.000
Within area movers with proximity to a child	1.01	[0.68,1.48]	0.966
Within area movers without proximity to a child	0.46	[0.30,0.70]	0.000
Out of area movers with proximity to a child	1.34	[0.89,1.98]	0.161
Out of area movers without proximity to a child	0.36	[0.26,0.50]	0.000
In-person contact in 2014			
Infrequent contact	0.05	[0.04,0.66]	0.000
Moderate contact	0.23	[0.19,0.28]	0.000
Age in 2014	1.01	[0.99,1.01]	0.454
Gender			
Female	1.09	[0.93,1.28]	0.281
Marital status			
Separated, or divorced	0.81	[0.62,1.05]	0.119
Widowed	1.12	[0.88,1.42]	0.353
Never married	0.89	[0.48,1.64]	0.715
Count of 7 physical conditions	0.98	[0.92,1.04]	0.530
Education			
GED/high-school graduate	0.89	[0.67,1.18]	0.429
Some college	0.90	[0.67,1.22]	0.528
College and above	1.06	[0.77,1.45]	0.715
Asset quartiles (ref. 1st quartile: -500,000 – 14,551)			
2nd quartile (15,000 – 98,000)	0.92	[0.71,1.19]	0.54
3rd quartile (100,000 – 199,000)	1.02	[0.78,1.33]	0.85
4th quartile (200,000 – 3,650,000)	1.15	[0.86,1.54]	0.31
Income quartiles (ref: 1st quartile: 0 – 26,402)			
2nd quartile (26,472 – 50,619)	1.01	[0.76,1.31]	0.954
3rd quartile (50,640 – 93,200)	1.10	[0.83,1.46]	0.500
4th quartile (93,318 – 4,514,000)	1.28	[0.93,1.76]	0.116
Race/Ethnicity			
Black, non-Hispanic	0.92	[0.72,1.18]	0.556
Other, non-Hispanic	0.56	[0.35,0.89]	0.015
Hispanic	1.18	[0.88,1.57]	0.259
Any ADL	1.29	[0.88,1.89]	0.185
Positive relationship with children	1.65	[1.49,1.91]	0.000
Negative relationship with children	1.11	[0.97,1.28]	0.117
Any other family members	0.98	[0.69,1.38]	0.910
Any friends	1.10	[0.84,1.45]	0.469
Any resident children	1.275	[1.03,1.52]	0.020
Number of non-resident children	0.94	[0.84,1.05]	0.311

Note: ADL (activities of daily living)

Table 2.9 Ordinal Logistic Model on Changes in Telephone Contact Frequency with Children (n=2,997)

	Odd Ratio	95% CI	p-value
Relocation and proximity to a child			
Stayers with proximity to a child at least at one time point	0.86	[0.63,1.17]	0.350
Stayers without proximity to a child	0.71	[0.55,0.91]	0.009
Within area movers with proximity to a child	0.59	[0.37,0.93]	0.026
Within area movers without proximity to a child	1.06	[0.62,1.83]	0.805
Out of area movers with proximity to a child	1.26	[0.73,2.20]	0.399
Out of area movers without proximity to a child	0.54	[0.37,0.80]	0.002
Telephone contact in 2014			
Infrequent contact	0.02	[0.02,0.05]	0.000
Moderate contact	0.10	[0.10,0.12]	0.000
Age in 2014	1.01	[0.99,1.02]	0.079
Gender			
Female	1.52	[1.24,1.87]	0.000
Marital status			
Separated, or divorced	1.07	[0.76,1.51]	0.665
Widowed	0.78	[0.56,1.08]	0.142
Never married	0.81	[0.35,1.82]	0.615
Count of 7 physical conditions	1.05	[0.96,1.13]	0.223
Education			
GED/high-school graduate	0.98	[0.67,1.44]	0.955
Some college	0.87	[0.58,1.30]	0.515
College and above	0.88	[0.58,1.35]	0.585
Asset quartiles (ref. 1st quartile: -500,000 – 14,551)			
2nd quartile (15,000 – 98,000)	0.98	[0.70,1.37]	0.933
3rd quartile (100,000 – 199,000)	1.25	[0.89,1.76]	0.187
4th quartile (200,000 – 3,650,000)	1.12	[0.78,1.61]	0.521
Income quartiles (ref: 1st quartile: 0 – 26,402)			
2nd quartile (26,472 – 50,619)	1.02	[0.71,1.47]	0.880
3rd quartile (50,640 – 93,200)	0.96	[0.65,1.40]	0.846
4th quartile (93,318 – 4,514,000)	1.13	[0.74,1.73]	0.554
Race/Ethnicity			
Black, non-Hispanic	1.54	[1.11,2.14]	0.009
Other, non-Hispanic	1.98	[1.05,3.72]	0.033
Hispanic	1.95	[1.29,2.92]	0.001
Any ADL	0.91	[0.55,1.49]	0.668
Positive relationship with children	1.97	[1.69,2.29]	0.000
Negative relationship with children	1.25	[1.05,1.49]	0.009
Any other family members	0.79	[0.50,1.26]	0.334
Any friends	1.30	[0.93,1.82]	0.119
Any resident children	1.12	[0.87,1.43]	0.361
Number of non-resident children	1.11	[0.97,1.27]	0.110

Note: ADL (activities of daily living)

Table 2.10 Ordinal Logistic Model on Changes in Email Contact Frequency with Children (n=2,953)

	Odd Ratio	95% CI	p-value
Relocation and proximity to a child			
Stayers with proximity to a child at least at one time point	0.91	[0.72,1.15]	0.446
Stayers without proximity to a child	0.92	[0.76,1.11]	0.409
Within area movers with proximity to a child	0.96	[0.65,1.42]	0.870
Within area movers without proximity to a child	0.80	[0.51,1.23]	0.319
Out of area movers with proximity to a child	1.29	[0.87,1.92]	0.198
Out of area movers without proximity to a child	1.14	[0.83,1.57]	0.392
Email contact in 2014			
Infrequent contact	0.08	[0.06,0.10]	0.000
Moderate contact	0.35	[0.29,0.42]	0.000
Age in 2014	0.98	[0.97,0.99]	0.000
Gender			
Female	1.24	[1.05,1.45]	0.008
Marital status			
Separated, or divorced	1.39	[1.07,1.81]	0.013
Widowed	0.84	[0.66,1.07]	0.165
Never married	0.75	[0.39,1.45]	0.405
Count of 7 physical conditions	1.03	[0.96,1.09]	0.334
Education			
GED/high-school graduate	1.74	[1.27,2.38]	0.001
Some college	2.14	[1.54,2.98]	0.000
College and above	2.65	[1.87,3.76]	0.000
Asset quartiles (ref. 1st quartile: -500,000 – 14,551)			
2nd quartile (15,000 – 98,000)	0.90	[0.69,1.18]	0.475
3rd quartile (100,000 – 199,000)	1.09	[0.83,1.43]	0.527
4th quartile (200,000 – 3,650,000)	1.26	[0.94,1.68]	0.120
Income quartiles (ref: 1st quartile: 0 – 26,402)			
2nd quartile (26,472 – 50,619)	0.95	[0.72,1.26]	0.758
3rd quartile (50,640 – 93,200)	0.96	[0.72,1.28]	0.809
4th quartile (93,318 – 4,514,000)	1.10	[0.79,1.51]	0.555
Race/Ethnicity			
Black, non-Hispanic	1.01	[0.78,1.28]	0.951
Other, non-Hispanic	0.87	[0.54,1.41]	0.592
Hispanic	0.94	[0.70,1.27]	0.709
Any ADL	0.68	[0.45,1.02]	0.067
Positive relationship with children	1.30	[1.15,1.47]	0.000
Negative relationship with children	0.98	[0.86,1.13]	0.881
Any other family members	0.90	[0.64,1.27]	0.575
Any friends	1.28	[0.95,1.71]	0.093
Any resident children	0.91	[0.75,1.11]	0.380
Number of non-resident children	1.11	[0.99,1.23]	0.058

Note: ADL (activities of daily living).

Table 2.11 Ordinal Logistic Model on Changes in Media Contact Frequency with Children (n=2,957)

	Odd Ratio	95% CI	p-value
Relocation and proximity to a child			
Stayers with proximity to a child at least at one time point	0.89	[0.70,1.14]	0.387
Stayers without proximity to a child	1.15	[0.94,1.40]	0.166
Within area movers with proximity to a child	1.10	[0.75,1.61]	0.621
Within area movers without proximity to a child	1.12	[0.72,1.74]	0.597
Out of area movers with proximity to a child	1.22	[0.82,1.81]	0.316
Out of area movers without proximity to a child	1.14	[0.82,1.57]	0.417
Social media contact in 2014			
Infrequent contact	0.11	[0.10,0.14]	0.000
Moderate contact	0.41	[0.32,0.51]	0.000
Age in 2014	0.95	[0.94,0.95]	0.000
Gender			
Female	1.55	[1.31,1.83]	0.000
Marital status			
Separated, or divorced	1.07	[0.82,1.39]	0.607
Widowed	0.98	[0.76,1.26]	0.885
Never married	1.30	[0.69,2.43]	0.402
Count of 7 physical conditions	1.08	[1.01,1.15]	0.013
Education			
GED/high-school graduate	1.28	[0.95,1.73]	0.100
Some college	1.20	[0.88,1.65]	0.236
College and above	1.33	[0.95,1.87]	0.091
Asset quartiles (ref. 1st quartile: -500,000 – 14,551)			
2nd quartile (15,000 – 98,000)	0.87	[0.67,1.13]	0.319
3rd quartile (100,000 – 199,000)	1.01	[0.77,1.33]	0.914
4th quartile (200,000 – 3,650,000)	0.90	[0.67,1.20]	0.486
Income quartiles (ref: 1st quartile: 0 – 26,402)			
2nd quartile (26,472 – 50,619)	1.27	[0.96,1.69]	0.087
3rd quartile (50,640 – 93,200)	1.25	[0.93,1.68]	0.130
4th quartile (93,318 – 4,514,000)	1.49	[1.07,2.07]	0.016
Race/Ethnicity			
Black, non-Hispanic	1.10	[0.86,1.41]	0.422
Other, non-Hispanic	1.10	[0.68,1.78]	0.674
Hispanic	1.07	[0.80,1.44]	0.634
Any ADL	1.03	[0.69,1.52]	0.871
Positive relationship with children	1.34	[1.19,1.52]	0.000
Negative relationship with children	1.05	[0.91,1.21]	0.445
Any other family members	0.85	[0.59,1.23]	0.399
Any friends	1.34	[1.00,1.80]	0.047
Any resident children	1.08	[0.88,1.31]	0.437
Number of non-resident children	1.25	[1.12,1.40]	0.000

Note: ADL (activities of daily living)

Chapter 3 (Paper 2): Effects of Housing Transition on Psychological Well-being: Is Aging in Their Current Dwelling the Best Option for Older Adults?

3.1 Introduction

Housing transition is a major event in later life and is triggered by various reasons such as change in health or family situations (Litwak & Longnio, 1987). While the majority of older adults in the United States stay in their current residence, there has been an increase in the number of housing transitions among older adults over the past decade. For example, about 4.9 million older adults moved in 2019 while about 1.4 million older adults moved in 2010 (Li et al., 2021). Older adults may relocate to different settings including within-community, non-nursing residential facilities, and nursing homes (Chyr et al., 2020; Granbom et al., 2019). Utilizing data from the National Health and Aging Trend Study (NHATS), previous studies found that about 8.2% of older adults moved within-community over 4 years (Granbom et al., 2019). About 9.0% of older adults moved to non-residential facilities and about 4.9% of older adults moved to nursing homes over 8 years (Chyr et al., 2020).

Previous studies documented various factors associated with relocation and the impact of housing on health in later life (Franco et al., 2021; Roy et al., 2018; Shaw, 2004). However, the association between housing transition and psychological well-being has not been fully explored (Smider et al., 1996; Villeneuve et al., 2022), and the effects of housing transition on psychological well-being may vary across different settings considering different characteristics of older adults and unique characteristics across different settings.

Concerning individual characteristics, compared to non-movers, within-community movers tend to live alone, experience a hospital stay, and receive Medicaid (Granbom et al., 2019). However, the two groups are similar in terms of their sociodemographic characteristics and health status such as age, gender, and education (Stephens & Allen, 2022). Compared to non-movers, the third and fourth groups, residential facility movers and nursing-home movers respectively both tend to be older, live alone, and report more limitations in terms of self-care, mobility, more chronic diseases, and probable dementia.

Different conclusions can be drawn regarding the nature of the three different destinations. First, within-community is often associated with better amenities or environment (Bjelde & Sanders, 2012; Stephens & Allen, 2022). Second, non-nursing residential facilities offer health, social, and supportive services by providing a home-like environment (Dobbs et al., 2023). Lastly, nursing homes offer advanced and comprehensive care to residents, but their privacy or autonomy is limited (Dobbs et al., 2023).

Given the increasing number of older Americans who experience housing transition in later life, we need to understand the consequences of both staying in the community and moving to long-term care facilities. While a few previous studies have investigated the effects of relocation on mental health over a relatively short period of time (Davison et al., 2022), investigation over a longer period of time is needed as older adults constantly interact with their new residence over time. Understanding the effects of housing transition on well-being may also help older adults and policy makers make more informed decisions regarding this matter (Chyr et al., 2020) because psychological well-being is associated with various health outcomes and mortality (Kim et al., 2021). To fill a gap in the current literature, utilizing nationally representative panel survey data of older adults, this study examines the effects of housing

transition on psychological well-being across three different settings (within community, residential facilities, and nursing homes) over 5 years.

3.1.1 Psychological Well-being

While researchers have used slightly different definitions of psychological well-being (George, 2010), two main components are the hedonic and eudemonic approaches (Kim et al., 2021) and have been used in research on aging given the high correlation between the two components (Kim et al., 2016; Smith et al., 2022; Suntai et al., 2023). According to the hedonic approach, psychological well-being is determined by the frequency of positive affect and negative affect and the level of satisfaction with one's own life (Diener et al., 1999; Diener, 2007; Kim et al., 2016). On the other hand, according to the eudemonic approach, psychological well-being is determined by evaluation of self-realization, self-efficacy, and resilience (Ryff, 2014). Because higher psychological well-being is associated with better health outcomes in later life, psychological well-being has received much attention from researchers (Kim et al., 2021). However, the long-term association between housing transition and psychological well-being remains unclear.

3.1.2 Factors Associated with Psychological Well-being in Later Life

Both individual level and environmental level factors are associated with psychological well-being (Gerstorf et al., 2010a; Gerstorf et al., 2010b; Wahl & Gerstorf, 2020). Regarding age, while psychological well-being is mostly stable in later life, psychological well-being tends to decrease as death approaches (Gerstorf et al., 2010b). Concerning race and ethnic differences, previous studies found that non-Hispanic Black older adults tend to report being happier compared to non-Hispanic older adults (Tang et al., 2019). The relationship between marital

status and psychological well-being is not clear. A study by Wright & Brown (2017) found that partnership status is associated with psychological well-being among men, but partnership status is not associated with psychological well-being among women (Wright & Brown, 2017). Some studies suggest the protective effects of marriage only exist among people who report satisfying relationships (Hank & Wagner, 2013). Regarding health conditions, previous studies documented the link between better physical functioning such as activities of daily living (ADL) and instrumental activities of daily living (IADL) and better well-being in later life (Windsor et al., 2013). Concerning dementia, people with dementia tend to report lower well-being compared to people without dementia (Ferreira et al., 2020). Regarding socioeconomic status, studies consistently document a positive link between higher socioeconomic status such as higher education and higher income and better psychological well-being (Tan et al., 2020; Read et al., 2016).

Neighborhood characteristics (e.g., county-level wealth) are also associated with people's psychological well-being. Using growth curve models, Gerstorf et al. (2010a) found that while objective neighborhood characteristics are associated with lower psychological well-being, objective neighborhood factors were not associated with changes in psychological well-being over time. Besides objective neighborhood characteristics, subjective neighborhood evaluation (e.g., perceived neighborhood qualities) are associated with psychological well-being in later life (Stephens et al., 2019; Stephens & Allen, 2022; Wahl & Gerstorf, 2020).

3.1.3 Conceptual Frameworks

Lawton and Simon's Ecological Theory of Aging (Lawton & Simon, 1968; Lawton & Nahemow, 1973; Whal et al., 2012) was used as a guiding framework to examine the effects of housing transitions on psychological well-being across different settings including community

and long-term care facilities (Kahana et al., 2003). The core concept of the Ecological Theory of Aging is environmental docility. According to the environmental docility hypothesis, vulnerable older adults are for instance very sensitive to environmental press or demands (Lawton & Simon, 1968; Wahl & Gerstorf, 2020). While Lawton and Simon's Ecological Theory of Aging has been used widely, the theory has been criticized because the theory views older adults as merely passive individuals who are influenced by their environments (environmental press) (Wahl & Gerstorf, 2020).

Later, to complement the docility concept, Lawton (1989) introduced the proactivity concept which views older adults as active individuals who can adjust their environments. For example, relocation is one way to interact with/adjust their environment, and this may influence their developmental outcomes such as psychological well-being (Oswald et al., 2002; Wahl et al., 2012). According to the Ecological Theory of Aging, the effects of relocation on psychological well-being differ depending on the unique combination of person and environment (Lawton & Simon, 1968; Lawton & Nahemow, 1973) and the interaction of docility, proactivity and changing context over time (Iwarsson, 2005; Wahl & Gerstorf, 2020).

Supporting the Ecological Theory of Aging, previous studies have shown stability and changes in psychological well-being. For instance, non-movers tend to report stable well-being over time (Werngren-Elgström et al., 2009). Unlike non-movers, within-community movers could experience both an increase or decrease in psychological well-being (Costlow et al., 2020; Kahana et al., 2003). Older adults who move to non-nursing residential facilities tend to report reduced well-being (Mueller et al., 2023; Tracy & DeYoung, 2004), but the effects of housing transition differ by the interaction between person and their environment (Smider et al., 1996). Lastly, while nursing home relocation is a challenging life event, older adults who move to

nursing homes go through various psychological reactions *such as struggle, compromise,* and *acceptance* (Lan et al., 2020). These various reactions imply that psychological well-being could change after housing transition (Wu & Rong, 2020).

3.1.4 Present Study

To date, most studies have examined the effects of housing transition over a relatively short period (Lan et al., 2020; Wu & Rong, 2020), and the long-term effect of housing transition on psychological well-being is unclear. Based on Lawton and Simon's environmental docility/proactivity hypotheses and dynamics of docility, proactivity and context over time, the following hypotheses are proposed:

Hypothesis 1: Compared to non-movers (stayers), within-community movers would report a similar level of psychological well-being over time since the two groups are similar in terms of individual characteristics and environment.

Hypothesis 2: Compared to non-movers (stayers), the rate of positive changes in psychological well-being is greater among non-nursing residential facility movers, as various tailored supports are available at residential facilities, and older adults adjust to their new environment (proactivity outweighs docility over time).

Hypothesis 3: Compared to non-movers (stayers), the rate of positive changes in psychological well-being is greater among nursing home movers, as tailored supports are available at nursing homes, and older adults adjust to their new environment (proactivity outweighs docility over time).

To the best of my knowledge, this is the first study to examine the effects of housing transition on psychological well-being over five years, drawing on a nationally representative sample of older adults in the U.S. between 2011 and 2015.

3.2 Method

3.2.1 Data

Data from the National Health and Aging Trends Study (NHATS Round 1-5, 2011-15) was used to examine the association between housing transition and psychological well-being. The National Institute on Aging (NIA) initiated the NHATS to investigate various issues among older adults in the United States (Freedman & Kasper, 2019). The NHATS started in 2011 and included a nationally representative sample of Medicare beneficiaries aged 65 and older in the U.S. (Montaquila et al., 2012).

3.2.2. Study Sample

The study participants were restricted to participants who completed the survey from wave 1 to wave 5 (2011-2015) and who provided data on psychological well-being in at least two waves. Since the psychological well-being section is not administered to proxy respondents, proxy respondents were excluded. The final analytic sample size was 3,549. On average, study participants completed 3.6 annual surveys, and there were 12,673 person-years observations between 2011-2015.

3.2.3. Measures

3.2.1.1 Housing Transition

NHATS includes several residential status indicators and they were used to create a housing transition variable (Freedman et al., 2022). In round 1, respondents were asked to indicate residential status: (1) community, (2) residential care not nursing home, and (3) nursing home. From round 2, respondents were asked whether their address changed since the previous interview: (1) same address since last interview and (2) new address since last interview. If

respondents reported the same address, they were categorized as non-movers. On the other hand, if respondents report a new address, their residence status (community, non-nursing residential care, and nursing home) was examined. Using this information, a housing transition variable was created as (1) non-movers, (2) within-community relocation, (3) non-nursing residential facility move, and (4) nursing home relocation **(**as depicted in figure 3.1**)**. While older adults could experience multiple relocation in later life, this study focuses on the first housing transition from community to different settings (within-community, non-nursing residential facilities, and nursing home). Thus, if a person moves multiple times, that person was examined up until their second housing transition. For example, if a respondent moves from community to a residential facility at wave 2 and moves again from residential facility to a nursing home at wave 4, the study includes data for this person only up to wave 3. Table 3.1 shows housing transition status by each wave.

3.2.1.2 Psychological Well-being

The NHATS includes 11 well-being items concerning hedonic and eudaimonic components (Freedman et al., 2022). Four items were related to positive and negative affect (the hedonic component): "during the last month, how often did you feel (1) cheerful, (2) bored, (3) full of life and (4) upset." These four items were measured using a five-point Likert scale (range from 1 = every day to 5 = never). The remaining seven items were related to the evaluation of their lives (the eudaimonic component): (5) "my life has meaning and purpose, (6) I feel confident and good about myself, (7) I gave up trying to improve my life a long time ago, (8) I like my living situation very much, (9) other people determine most of what I can and cannot do, (10) when I really want to do something, I usually find a way to do it, and (11) I have an easy

time adjusting to change." These seven items are measured using a three-point Likert scale (range from 1 = agree a lot to 3 = agree not at all).

While hedonic and eudaimonic components are conceptually distinct components, previous research conducted confirmatory factor analysis and suggested measuring psychological well-being as a single construct given the high correlation of these two components in the NHATS (Kim et al., 2016). Negative questions were reversed, so higher scores indicate better subjective well-being. Then, the 11 (four hedonic and seven eudaimonic) items were summed together with a range from 11 to 41 (Kim et al., 2016; Simning et al., 2021), (Cronbach's $\alpha = 0.746$). There were a few missing values in psychological well-being across 5 waves: 84 (2.37%) in around 1, 80 (2.25%) missing values in round 2, 133 (3.79%) missing in round 3, 184 (5.37%) missing values in round 4, and 108 (3.34%) missing values in round 5.

3.2.1.3 Covariates

According to the Ecological Theory of Aging, a person's psychological well-being is determined by a unique interaction between individual competence and their environmental characteristics. Based on previous studies (Chyr et al., 2020; Stephens & Allen, 2022 Latham-Mintus et al., 2022), several individual characteristics (e.g., sociodemographic, health) and environmental-related variables (e.g., neighborhood characteristics) that are associated with psychological well-being were included. Baseline age was coded as a categorical variable (1 = 70-74, 2 = 75-79, 3 = 80-84, 4 = 85-90, 5 = 90+). Concerning sociodemographic variables, gender was coded as a binary variable (1 = male and 2. female). Race/Ethnicity was coded as: (1 = White, non-Hispanic, 2 = Black, non-Hispanic, 3 = Hispanic, and 4 = Other). Educational attainment was coded as: (1 = less than high school, 2 = high school, 3 = some college, no degree, 4 = college graduate). Marital status was coded as: (1 = married/living with a partner, 2 =

separated/divorced, 3 = widowed, 4 = never married**).** Imputed income data in the NHATS was used, and the income variable was categorized into quartiles (1st quartile: 0-16,216, 2nd quartile: 16,236-30,883, 3rd quartile: 30,883-59,769, and 4th quartile: 60,000-5,000,000). All sociodemographic variables are time-invariant variables except for the income variable.

All health-related variables are coded as time-varying variables. Specifically, the number of Activities of Daily Living (ADLs) was coded as a continuous variable based on the information of whether people experience difficulties in eating, bathing, toileting, and dressing (range: 0-4). The number of Instrumental Activities of Daily Living (IADLs) was coded as a continuous variable based on the information of whether people experience difficulties in doing laundry, grocery shopping, preparing meals, banking, and taking medications (range: 0-5). The number of mobility issues was coded as a continuous variable based on the information of whether respondents needed assistance: 1) getting outside of the house, 2) moving inside the house, and 3) need assistance getting out of bed (range 0-3). The number of chronic diseases is based on the information on whether respondents experienced the following diseases: hypertension, heart disease, arthritis, osteoporosis, diabetes, lung disease, stroke, and cancer (range 0-8). Following the user-guide of the NHATS, dementia status was categorized into three groups (1 = no dementia, 2 = possible dementia, 3 = probable dementia) (Kasper et al., 2013). Hospital stay was coded as a binary variable (0 = did not experience overnight hospital stays within the last 12 months and 1 = experienced overnight hospital stays within the last 12 months).

Two time-varying neighborhood level variables (neighborhood disorder and social cohesion) were included as covariates. Regarding neighborhood disorder, interviewers answered the following questions: “how much of the following did you see: (1) litter, broken glass, or

trash? (2) graffiti on buildings and walls? and (3) vacant or deserted houses or storefronts?" Originally, these questions were based on a 4-point Likert scale (1 = none to 4 = a lot). Following previous studies (Latham & Clarke, 2018), neighborhood disorder was coded as a binary variable (0 = no neighborhood disorder, 1 = presence of neighborhood disorder) (Cronbach's α = .722). Unlike neighborhood disorder, which was reported by an interviewer, the level of social cohesion was measured based on respondents' response to the following three questions: "1) people know each other well, (2) people are willing to help each other, and (3) people can be trusted." These questions were measured on a 3-point Likert scale (1 = do not agree, 2 = agree a little, 3 = agree a lot). The distribution of this variable is skewed. Following previous studies (Latham & Clarke, 2018; Latham-Mintus et al., 2022), a binary variable of social cohesion was created using low 10% as a cut-off point (1.66 out of 3) (1 = low social cohesion and 0 = not low social cohesion) (Cronbach's α = 0.729).

3.2.4 Analysis Plan

First, descriptive analyses were conducted to identify sociodemographic, health, and neighborhood characteristics of the sample in the baseline. Second, chi-square and ANOVA were conducted to examine sociodemographic, health, and neighborhood differences across four housing transition groups (no move, within-community move, non-nursing residential facility moves, and nursing home moves). Third, longitudinal mixed-effect modeling was used to examine the association between housing transition and psychological well-being. As the NHATS is administered every year, the unit of time is defined as a year. Specifically, Model 1 (unconditional growth model) estimated the association between time (year) and psychological well-being over 5 years. Intra-class coefficients (ICC) were calculated to examine the level of variance in psychological well-being that can be explained by inter individual differences. Model

2 examined (1) the time trajectory (years) of psychological well-being and (2) the effect of housing transition on the intercept of the time trajectory without covariates. In Model 3, all time-invariant covariates (age, gender, race, and education) and time-variant covariates (marital status, dementia, hospital stay, income, neighborhood disorder, social cohesion, ADL count, IADL count, and mobility count) were added**.** In Model 4, interaction between housing transition and time were added. The marginal predicted means of psychological well-being were estimated from the mixed-effect modeling as well.

3.3 Results

3.3.1 Sample Characteristics by Housing Transition

Table 3.2 illustrates the sociodemographic, health and environmental characteristics of the unweighted sample at round 1. Approximately, 20% of participants were included in the 65-69, 70-74, 75-79, and 80-84 age groups, respectively. The remaining 15% were in the 85-89 or 90+ age group. About 58% of the study participants were women and 72% of the participants were White, non-Hispanic. About 22% of people completed less than high school education, and 53% of people were married or live with their partner. The mean income of the sample is $54,656. Regarding health-related variables, about 83% of the sample did not have dementia, and 80% of the sample did not experience hospitalization in the past 12 months. On average, people reported more than two chronic diseases. Regarding neighborhood characteristics, about 86% of people lived in a neighborhood without physical neighborhood disorder. About 85% of people perceived their neighborhood as having high social cohesion.

Table 3.3 illustrates the sociodemographic, health, and environmental characteristics of the unweighted sample at round 1 by housing transition. 2,973 people did not move between round1 to round 5. 388 people moved within-community, 129 people moved to non-nursing

residential facilities, and 59 people moved to nursing homes between round 1 and round 5. The four groups (no movers, within-community movers, non-nursing residential movers, and nursing-home movers) were different in most sociodemographic features. Specifically, the four groups were different in terms of age, gender, race, education, marital status, income, dementia status, hospitalization, the number of ADL issues, the number of IADL issues, the number of mobility issues, and the number of chronic diseases. In contrast, the four groups were not different in terms of neighborhood characteristics such as presence of neighborhood disorder and the level of social cohesion.

3.3.2 Multilevel Models for Association Between Housing Transition and Psychological Well-being

Table 3.4 shows results of the effects of housing transition and trajectories of psychological well-being from mixed-effects models. Model 1 **(**basic model: Random intercept and random slope model only**)** shows that the average psychological well-being at wave 1 was 35.06 and it reduced by 0.13 every year ($\beta = -0.13$, $p < 0.001$). Intra-class correlation (ICC) was 73% meaning that 73% of the variance in psychological well-being is explained by between-person variance (Not in Table 3.4). A high ICC indicates that mixed-effects model was a particularly appropriate method to examine the longitudinal association between housing transition and psychological well-being. Housing transition was added in Model 2 (unadjusted model), and it showed that time (year) was associated with decreased psychological well-being ($\beta = -0.14$, $p < 0.001$). Compared to stayers, within-community movers tend to report lower psychological well-being ($\beta = -0.56$, $p < 0.001$). Residential facility movers tended to report lower psychological well-being ($\beta = -1.92$, $p < 0.001$) than stayers. Also, nursing home movers tended to report lower psychological well-being ($\beta = -3.52$, < 0.001) than stayers.

Covariates were added in Model 3 (adjusted model), showing that non-movers and within-community movers were no different in terms of psychological well-being ($\beta = -0.22$, $p = 0.215$). Compared to non-movers, residential facility movers are associated with lower psychological well-being ($\beta = -1.12$, $p < 0.001$). Compared to non-movers, nursing-home movers are associated with lower psychological well-being ($\beta = -1.09$, $p = 0.011$) (Model 3 in Table 3.4 and Figure 3.2).

Regarding sociodemographic variables, age and gender were not associated with psychological well-being. Black, non-Hispanic older adults tended to report higher psychological well-being compared to White, non-Hispanic older adults ($\beta = 0.57$, $p<0.001$). More education (some college and college degree) was associated with higher well-being compared to having less than a high school education ($\beta = 0.77$, $p<0.001$; $\beta = 1.20$, $p<0.001$). Higher income (2^{nd} income quartile, 3^{rd} income quartile, and 4^{th} income quartile) was associated with higher psychological well-being compared to 1^{st} quartile income status, respectively ($\beta = 0.21$, $p = 0.018$; $\beta = 0.36$, $p<0.001$; $\beta = 0.54$ $p<0.001$). Concerning marital status, being widowed was associated with lower well-being compared to married/patterned status ($\beta = -0.27$, $p = 0.017$). All health-related variables were associated with reduced psychological well-being. Specifically, possible dementia ($\beta = -0.33$, $p = 0.015$), hospital stay within the last 12 months ($\beta = -0.19$, $p = 0.002$), the number of chronic diseases ($\beta = -0.06$, $p = 0.049$), the number of ADL issues ($\beta = -0.38$, $p <0.001$), the number of IADL issues ($\beta = -0.39$, $p<0.001$), and the number of mobility issues ($\beta = -0.41$, $p<0.001$) were associated with lower psychological well-being. Neighborhood level variables, presence of neighborhood disorder ($\beta = -0.23$, $p = 0.009$) and low social cohesion ($\beta = -0.34$, $p < 0.001$) were negatively associated with psychological well-being, respectively.

Model 4 (interaction model) shows that the associations between housing transitions and psychological well-being did not vary by time (Model 4 in Table 3.4). Specifically, the effects of being within-area movers on psychological well-being did not significantly vary over time ($\beta = 0.10$, $p = 0.120$). Also, the effect of being residential facility movers on psychological well-being did not significantly vary over time ($\beta = 0.01$, $p = 0.958$). Lastly, the effects of being nursing home movers on psychological well-being did not significantly vary over time ($\beta = 0.29$, $p = 0.157$). None of the interactions between housing transition and time interaction were significant, indicating that Model 4 might be overcomplicated. Thus, I used Model 3 as the final model to discuss my results, instead of Model 4. The negative covariance between slopes and random intercepts suggested that older adults who reported higher psychological well-being at the baseline tended to report a steeper decline in psychological well-being over time (Model 1 to Model 4).

3.4 Discussion

Aging in place is a preference for many older adults, and it is a common policy ideal, but it is not a universal (*one-size-fits-all*) solution for every older adult (Hillcoat-Nallétamby & Ogg, 2014; Kasper et al., 2018). Even though older adults often choose relocation as a strategy to adapt to their environment (Golant, 2011; Golant, 2014), the impact of relocation in later life on psychological well-being has been overlooked. Guided by the Ecological Theory of Aging (Lawton & Simon, 1968; Lawton & Nahemow, 1973), this study examines the extent to which housing transition across different contexts is associated with changes in psychological well-being over 5 years drawing on a nationally representative sample of older adults in the U.S.

First, confirming the first hypothesis, this study found that stayers and within-community movers are no different in terms of psychological well-being over time. Our finding aligns with a

study by Stephens and Allen (2022) which found that community movers and non-movers are no different in terms of quality of life (QOL). In the study by Stephens and Allen (2022), psychological well-being is conceptualized as QoL and measured by utilizing the Control, Autonomy, Satisfaction, Pleasure (CASP) scale which includes both hedonic and eudaimonic components (Hyde et al., 2003; Toma et al., 2015). Similarly, our measurement of psychological well-being includes both the hedonic and eudaimonic components.

According to the Person-Environment fit perspective, people's psychological well-being is determined by a unique combination of characteristics of the person and the environment (French et al., 1976; Lawton & Simon, 1968; Lawton & Nahemow, 1973). Previous studies found that non-movers and within-community movers are similar in terms of most sociodemographic characteristics (Granbom et al., 2019). While within-community movers report a lower level of housing satisfaction compared to non-movers before moving, within-community movers report a similar level of housing satisfaction after moving (Stephens & Allen, 2022). Given the shared competencies (e.g., health and socioeconomic positions) as well as similar environmental conditions (similar level of housing satisfaction) (Granbom et al., 2019; Stephens & Allen 2022), the two groups may show similar trajectories in psychological well-being over time.

Second, contrary to expectation, non-nursing residential facility movers report lower psychological well-being at baseline, and their lower psychological well-being persists over time. Relocation to non-nursing residential facilities is a stressful life event (Regier & Parmelee, 2021), and residential facility movers tend to experience more health and functional limitations compared to non-movers. Even if residential facilities offer person-centered care that might not easily be accessible in the community (Dobbs et al., 2023), relocation to non-nursing residential

facility is still a challenging life event for older adults as they need to find new roles, a sense of home, and *a new normalcy* over time (Regier & Parmelee, 2021; Prentice et al., 2023). Decreased psychological well-being suggests that older adults who reside in non-nursing facilities may not easily figure out a new person-environment fit. While previous studies have examined the effects of relocation to non-nursing residential facilities on psychological well-being in a relatively short period, a person-environment fit has not been examined for a longer period. By examining the effects of transition to non-nursing facilities over a five-year period, this study contributes to the current literature on the housing transition and well-being.

Lastly, contrary to expectation, nursing residential facility movers report lower psychological well-being at baseline, and their lower psychological well-being persists over time. Previous research on the effects of the transition to nursing homes found that older adults tend to report anxiety and experience various emotions such as feeling overwhelmed in the short-term (e.g., within one year after their relocation) (Costlow & Parmelee, 2020; Wu & Rong, 2020). Even though nursing homes provide comprehensive care for nursing residents, they may not necessarily satisfy the autonomy of nursing home movers, which influences well-being in later life (McCabe et al., 2021). As documented by Melrose (2004 & 2013) and Smith & Brand (1975), this study finds a negative association between nursing home relocation and psychological well-being.

To date, most studies examining the relationship between nursing home transition and psychological well-being were conducted over a relatively short period of time (Davison et al., 2022; Brandburg, 2007; Walker et al., 2007). One exception is a recent study by Villeneuve et al. (2022) which examined quality of life between non-movers and nursing home movers over 20 years in France. The study by Villeneuve et al. (2022) found that nursing home movers and non-

movers do not significantly differ in terms of trajectories in quality of life. In contrast, the current study found that compared to non-movers, nursing home movers report lower psychological well-being over time. The discrepancy may be associated with differences in the time frame between the current study and the study by Villeneuve et al. (2022). Specifically, while the current study examined the effects of nursing home relocation over a 5-year period, the study by Villeneuve et al. (2022) examined the association between nursing home relocation and quality of life over a 20-year period. It is probable that longer periods may allow nursing home movers time to adjust and find a new person-environment fit in the nursing home setting.

Model 4 shows that none of the housing transition and time interactions were significant. As a follow-up analysis, I conducted multilevel models after creating a categorical variable which indicates the timing of housing transition (no move, move between wave 1 to 2, move between wave 2 to 3, move between wave 3 to 4, move between wave 4 to 5). However, due to a high correlation with the housing transition variable (correlation = 0.81), the timing of housing transition variable could not be included in the model. Instead, a two-way ANOVA was conducted to examine the main effects of housing transition, the main effects of the timing of housing transition, and the interaction effect on psychological well-being. Findings show that the main effects of housing transition were significant ($F = 3.70$, $p = 0.013$). In contrast, the main effect of timing of move, and interaction between housing transition, and timing of moving were insignificant ($F = 2.06$, $p = 0.103$; $F = 0.73$, $p = 0.624$). The result suggests that while housing transition is associated with psychological well-being, the timing of housing transition is not associated with psychological well-being. This also shows that the effects of housing transition do not differ by the timing of housing transition. Several studies suggest that the first 12 months after housing transition is a critical period for adjustment following relocation (Melrose 2004;

Melrose 2013). It is probable that the NHATS, administered annually, may not be sensitive enough to capture changes in psychological well-being in response to relocation.

3.4.1 Limitations and Future Directions

To the best of my knowledge, this is the first study which examines the link between housing transition and psychological well-being over 5 years utilizing nationally representative panel survey data. However, there are several limitations to this study.

First, since information about motivation for relocating is not available in the NHATS, this study could not consider whether housing transition in later life is voluntary or involuntary. The effects of housing transition on psychological well-being may significantly differ depending on the nature of relocation. The Health and Retirement Study, another longitudinal panel study of older adults, unlike NHATS, provides information about reasons for moving (e.g., family reasons or health issues). Thus, future studies could examine whether the effects of housing transition on psychological well-being differ by whether the housing transition was voluntary or not.

Second, this study utilized data from the NHATS from 2011 and 2015 which is before the emergence of Covid 19 pandemic. The impact of Covid 19 may differ across different settings, and the association between housing transition and psychological well-being could have changed after Covid 19. Future study is warranted to investigate whether the association between housing transition and psychological well-being has changed compared to pre-Covid 19.

Third, while this study focuses on psychological well-being, movers might face other mental health issues such as depression, anxiety, and loneliness following the housing transition. Future studies could examine the effects of housing transition on these mental health concerns,

and this may help older adults make informed decisions regarding housing transition across different settings.

Fourth, this study focuses on the effects of relocation from community to other settings (within-community, non-nursing residential facilities, and nursing homes), but not on adults who relocate in other ways. For example, older adults who reside in non-nursing residential facilities could move back to the community, or those who reside in a nursing homes could experience a within-facility relocation (moving from one nursing home to another). Future studies could examine whether the association between housing transition and psychological well-being differs based on their initial location and final destination.

Lastly, previous qualitative studies that examine the effects of housing transition within short time frames such as monthly have suggested that older adults are especially vulnerable following their transition (Davison et al., 2022; Wu & Rong, 2022). However, this study did not find significant time interaction effects. The lack of significant time interaction on changes in psychological well-being may be attributable to the fact that data were collected every year and the transition may have occurred many months prior to data collection. Therefore, the older adults had time to acclimate to their new environment. For a more nuanced understanding of the effects of housing transition on psychological well-being over time, future studies could examine dynamics in psychological well-being over a shorter time frame (e.g., monthly or weekly).

3.4.2 Conclusion

While many older adults prefer to age in place in their current dwellings, housing transition in later life can be a proactive measure to find a better person-environment fit for some older adults (Golant, 2011). Older adults aged 55 and over are the only demographic that has shown an increasing number of relocations in the past decade (Li et al., 2021). Whereas 83% of

the study sample stayed in their dwellings over a 5-year period, the remaining 17% experienced relocation during this period. The environment plays a vital role in their lives. Given more diversified relocation patterns across different settings, policy makers should consider both community-dwelling older adults, non-nursing residential facility movers, and nursing home movers (Chyr et al., 2020). This study found that within-community movers are not associated with psychological well-being. In contrast, this study found that non-residential facility relocation and nursing home relocation are associated with lower psychological well-being. The lower level of well-being among older adults who moved to long-term care facilities may be explained by lack of autonomy, familiarity, comfort, and meaningful roles in long-term care facilities (Wu & Rong, 2020). For relocation to long-term care facilities to be considered *aging in the right place*, more person-centered assistance needs to be arranged. This could help older adults to adjust to a new person-environmental fit, and eventually result in better psychological well-being in later life.

3.5 References

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3.6 Figures and Tables

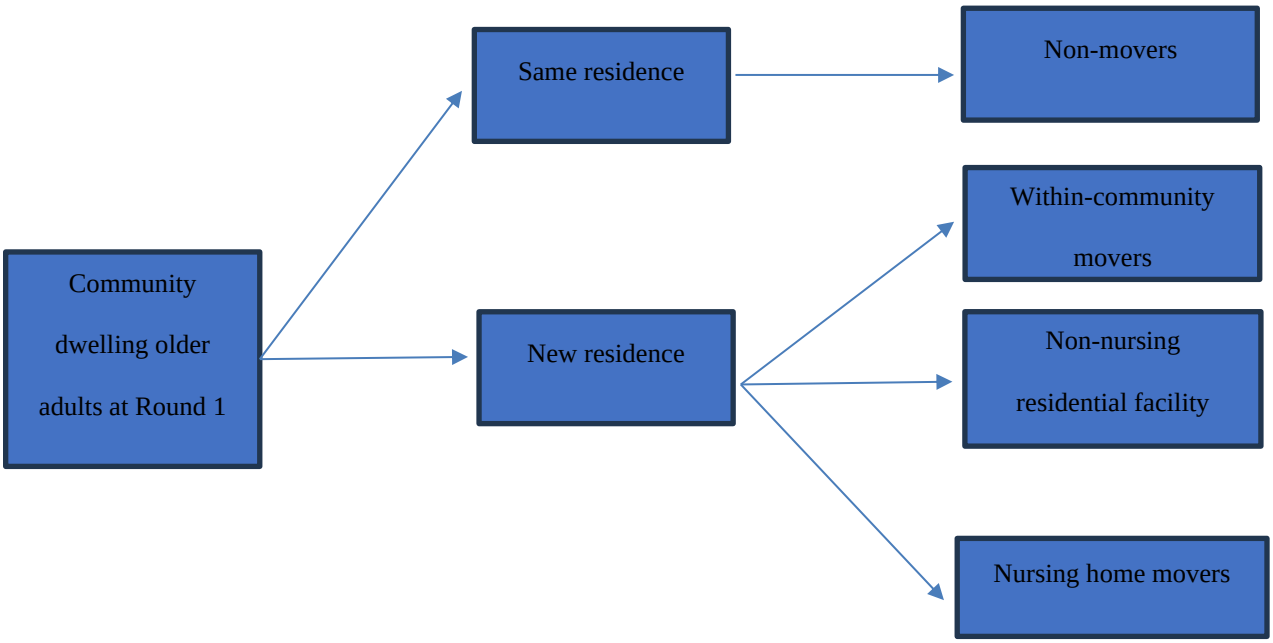


Figure 3.1 Housing Transition Status

Table 3.1 Housing Transition Status by Each Wave

	No move	Within-community	Non-nursing residential facility	Nursing home
Round 1	3,549			
Round 2	3,367	132	40	9
Round 3	3,344	119	33	17
Round 4	3,352	132	37	8
Round 5	3,096	94	30	11

Note: housing transition starts from round 2
Everyone resides in the community at round 1

Table 3.2 Characteristics of Sample at Baseline at Round 1

	N = 3,549
Variables	
Age	
65-69	781 (22.01%)
70-74	805 (22.68%)
75-79	762 (21.47%)
80-84	696 (19.61%)
85-90	342 (9.64%)
90+	163 (4.59%)
Gender	
Man	1,468 (41.36%)
Woman	2,081 (58.64%)
Race	
White, non-Hispanic	2,572 (72.47%)
Black, non-Hispanic	715 (20.15%)
Hispanic	168 (4.73%)
Others	94 (2.65%)
Education	
Less than high school	784 (22.20%)
High School	946 (26.79%)
Some college, no degree	718 (20.33%)
College graduate	1,083 (30.67%)
Marital Status	
Married/Living with partner	1,898 (53.54%)
Separated/divorced	426 (12.02%)
Widowed	1,102 (31.09%)
Never married	119 (3.36%)
Dementia status	
No dementia	2,977 (83.88%)
Probable dementia	407 (11.47%)
Possible dementia	165 (4.65%)
Hospital stays within the last 12 months	
No	2,842 (80.17%)
Yes	756 (19.83%)
Income M, (SD)	54565.21 (143039.4)
Presence of neighborhood disorder	
No	3,064 (86.43%)
Yes	509 (13.57%)
Social cohesion	
High social cohesion	2,990 (84.73%)
Low social cohesion	539 (15.27%)
ADL count M, (SD)	0.34 (0.81)
IADL count M, (SD)	0.57 (1.05)
Mobility issue count M, (SD)	0.48 (0.88)
Number of chronic diseases M, (SD)	2.41 (1.43)

Note: ADL= Activities of Daily Living, IADL = Instrumental Activities of Daily Living, Unweighted

Table 3.3 Characteristics of Sample at Baseline by Housing Transition Status (n = 3,549)

	Non-movers (n = 2,973)	Within-community movers (n = 388)	Non-nursing residential movers (n = 129)	Nursing-home movers (n = 59)	Test Statistics
Age					$\chi2$ (15) = 182.26 ***
65-69	682	91	4	4	
70-74	685	109	7	4	
75-79	643	80	28	11	
80-84	581	60	41	14	
85-90	263	37	29	13	
90+	119	11	20	13	
Gender					$\chi2$ (3) = 10.27 *
Male	1,261	147	42	18	
Female	1,712	241	87	41	
Race					$\chi2$ (9) = 27.05 **
White, non-Hispanic	2,138	273	107	44	
Black, non-Hispanic	613	81	9	12	
Hispanic	143	24	0	1	
Others	79	10	3	2	
Education					$\chi2$ (9) = 30.55 **
Less than high school	643	101	16	24	
High School	787	109	34	16	
Some college, no degree	603	68	35	12	
College graduate	924	109	43	7	
Marital status					$\chi2$ (9) = 49.17 ***
Married/Living with partner	1,644	188	51	15	
Separated/divorced	345	61	10	10	
Widowed	885	126	61	30	
Never married	96	12	7	4	
Income Quartiles					$\chi2$ (9) = 60.43 ***
1st quartile (0-16,216)	728	124	31	36	
2nd quartile (16,236-30,883)	734	108	36	13	
3rd quartile (30,883- 59,769)	733	68	29	7	
4th quartile (60,000-5,000,000)	788	88	33	3	
Dementia status					$\chi2$ (6) = 90.56 ***
No dementia	2,540	316	90	31	
Probable dementia	312	56	25	14	

Possible dementia	121	16	14	14	
Hospital stays within the last 12 months					$\chi 2$ (3) = 21.34 ***
No	2,416	296	93	37	
Yes	554	92	36	21	
Presence of neighborhood disorder					$\chi 2$ (3) = 7.70
No	2,559	333	122	50	
Yes	410	55	7	9	
Social cohesion					$\chi 2$ (3) = 2.86
High social cohesion	2,515	313	112	50	
Low social cohesion	448	67	15	9	
ADL count M, (SD)	0.31 (0.76)	0.44 (0.89)	0.42 (0.93)	1.11 (1.41)	F (3,545) = 21.57 ***
IADL count M, (SD)	0.52 (1.01)	0.73 (1.17)	0.86 (1.24)	1.59 (1.50)	F (3,3545) = 26.87 ***
Mobility issue count M, (SD)	0.46 (0.87)	0.55 (0.94)	0.53 (0.91)	1.08 (1.22)	F (3,3545) = 10.80 ***
Number of chronic diseases M,(SD)	2.38 (1.43)	2.52 (1.47)	2.59 (1.52)	2.77 (1.52)	F (3,3584) = 3.01 *

Note: ADL = Activities of Daily Living, IADL = Instrumental Activities of Daily Living, *$p < .05$. **$p < .01$. ***$p < .001$.

Table 3.4 Housing Transition and Trajectories of Psychological Well-being from Mixed-Effects Models

	Model 1	Model 2	Model 3	Model 4
Intercept	35.06 ***	35.26 ***	34.94 ***	34.99 ***
Study Wave	-0.13 ***	-0.14 ***	-0.06***	-0.07 **
Housing Transition (ref. stay)				
Within-community relocation		-0.56 ***	-0.22	-0.54 *
Transition to residential facilities		-1.92 ***	-1.12 ***	-1.14 *
Transition to nursing homes		-3.52 ***	-1.09 *	-1.90 **
Housing Transition * Time				
Within-community relocation				0.10
Transition to residential facilities				0.01
Transition to nursing homes				0.29
Age (ref 65-69)				
70-74			-0.01	-0.01
75-79			0.21	0.21
80-84			-0.05	-0.05
85-90			-0.14	-0.14
90+			0.43	0.43
Female			-0.07	-0.07
Race (ref. White Non-Hispanic)				
Black, non-Hispanic			0.57 ***	0.57 ***
Hispanic			0.21	0.19
Others			-0.25	-0.24
Educational attainment (ref. <= high school)				
High School			0.14	0.13
Some college, no degree			0.77 ***	0.77 ***
College graduate			1.20 ***	1.20 ***
Marital Status (ref. Married/Partner)				
Separated/Divorced			-0.23	-0.24
Widowed			-0.27 **	-0.27 *
Never Married			-0.45	-0.46
Dementia (ref. no dementia)				
Probable dementia			-0.12	-0.12
Possible dementia			-0.33 *	-0.34 *
Overnight hospital stays within the last 12 months (no)			-0.19 **	-0.19 **
Income Quartiles (ref.1st quartile: 0-16,216)				
2nd quartile (16,236-30,883)			0.21 *	0.21*
3rd quartile (30,883- 59,769)			0.36 ***	0.36 ***
4th quartile (60,000-5,000,000)			0.54 ***	0.53 ***
ADL count (range 0-4)			-0.38 ***	-0.38 ***
IADL count (range 0-5)			-0.39 ***	-0.39 ***
Mobility count (range 0-3)			-0.41 ***	-0.41 ***
Chronic diseases (0-8)			-0.06 *	-0.06 *
Presence of neighborhood disorder (yes)			-0.23**	-0.23 **
Low social cohesion (yes)			-0.34***	-0.34 ***
Random Effects				
Var(wave)	0.24	0.24	0.18	0.18
Var(_con)	12.81	12.48	9.62	9.61
Var(wave,_cons)	-0.55	-0.55	-0.42	-0.42
Var(residual)	4.68	4.67	4.59	4.59
Log likelihood	-33010.107	-32964.278	-31515.423	-31513.282
Chi Square (df)	7260.10 ***	7153.65 ***	5518.44 ***	5521.10 ***

Note: ADL = Activities of Daily Living, IADL = Instrumental Activities of Daily Living, *$p < .05$. **$p < .01$. ***$p < .001$.

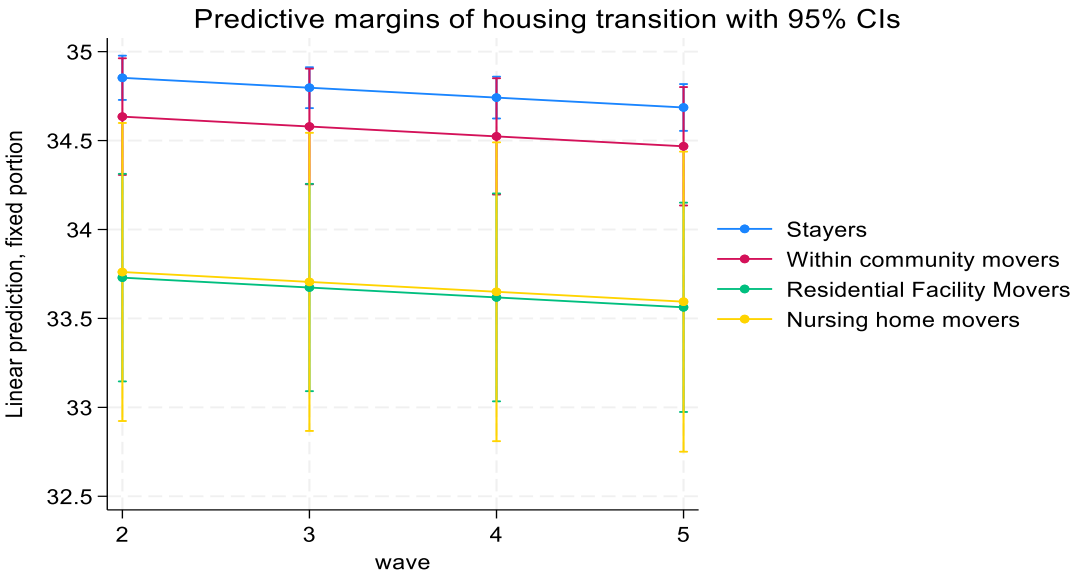


Figure 3.2 Estimated Means and Variance in Psychological Well-being as a Function of Housing Transition

Chapter 4 (Paper 3): The Longitudinal Association Between Homebound Status and Social Isolation

4.1 Introduction

Many community-dwelling older adults in the U.S. are confined to their dwellings. Specifically, about 5.6% of community-dwelling older adults are homebound, who report never or rarely having gone outside their home in a given month (Ornstein et al., 2015). Given the increasing number of older adults in the U.S., the number of homebound older adults is expected to increase (Ornstein et al., 2020). Specifically, about 2-3% of community-dwelling older adults became homebound every year, and about 12.7% of non-homebound older adults became homebound over 7 years of follow-up (Ornstein et al., 2020).

Social isolation, a lack of social contact influenced by lack of in-person interaction and limited social relationships, is often associated with homebound status (Holt-Lunstad, 2021; Kawai et al., 2023). Interestingly, even though social isolation is related to homebound status, it does not mean that social isolation and homebound necessarily coexist (Holt-Lunstad, 2021; Sakurai et al., 2019; Mitsutake et al., 2021). For example, Xiang et al. (2020b) explored trajectories of homebound status among older adults in the U.S. This study found that about 65% of people never experienced being homebound, and only 17.8% of this group reported social isolation. On the other hand, about 8.3% of older adults were persistently homebound, and about 58.6% of individuals in this group experienced social isolation. Similarly, a study by Sakurai et al. (2019) of older adults in Tokyo examined the prevalence of social isolation and homebound status, finding that 18.4% of older adults were homebound, but they did not experience social

isolation. Furthermore, 13.8% of older adults reported experiencing social isolation, but they were not homebound. According to this study, only 7.6% of older adults experienced both homebound status and social isolation, and the remaining 60.2% of older adults neither experienced social isolation nor homebound status.

Several studies using data from the National Health and Aging Trends Study (NHATS) reported associations between social isolation and being homebound (Ankuda et al., 2022; Cudjoe et al., 2022; Szanton et al., 2016; Xiang et al., 2020b). On the one hand, social isolation can increase the likelihood of becoming homebound. For example, Cudjoe et al. (2022) found that over a 9-year period, socially isolated older adults were more likely to become homebound compared to socially connected older adults. On the other hand, homebound status can pose a risk of social isolation (Ankuda et al., 2022; Szanton et al., 2016). For example, the cross-sectional study by Szanton et al. (2016) found that both homebound and semi-homebound older adults participated less in various in-person social activities such as religious participation, club participation, and going out for joy compared to non-homebound older adults (Szanton et al., 2016). Similarly, a cross-sectional study by Ankuda et al. (2022) documented that homebound older adults tended to have less contact with their family members and friends across various communication modalities-in-person, telephone, and video-compared to non-homebound older adults. While previous cross-sectional studies identified homebound status as a risk factor for social isolation in later life (Ankuda et al., 2022; Szanton et al., 2016), the extent to which homebound status is associated with trajectory of social isolation remains unexplored. In addition, while objective social isolation is a multidimensional concept, previous studies did not examine social isolation holistically (Ankuda et al., 2022; Szanton et al., 2016).

Building on previous studies (Ankuda et al., 2022; Szanton et al., 2016), the present study examines the longitudinal association between homebound status and social isolation over time using data from the NHATS, a nationally representative panel survey.

4.1.1 Factors Associated with Social Isolation in Later Life

Various sociodemographic, health-related, housing features, and neighborhood features are associated with social isolation in later life (Cudjoe et al., 2020). Regarding sociodemographic and health-related variables, a systematic review by Wen et al. (2023) identified being aged 80 or over, having less than a high school education, not having a spouse, having functional limitations (e.g., activities of daily living), having chronic diseases, and cognitive decline as risk factors of social isolation in later life. Usage of mobility assistive devices was negatively associated with social engagement (Latham-Mintus et al., 2022). Regarding income, low-household income level was associated with social isolation both from family members and friends (Chatters et al., 2018). Another study found that low income was a risk factor for social isolation in terms of living arrangement, identification of social relations who can talk about important things, religious attendance, and other social engagement (Cudjoe et al., 2020). The link between race/ethnicity and social isolation was mixed. For example, compared to African American, non-Hispanic white older adults were more likely to live without a partner and had limited social interaction with their congregational members. However, African American and non-Hispanic white older adults were no different in other aspects of social contact, such as maintaining contact with family members, maintaining contact with friends, and attending group activities in a neighborhood. (Taylor et al., 2019). The subjective value placed on social engagement including visiting friends or family members, attending

religious events, attending club events, and going out for enjoyment was also positively associated with social interaction among older adults (Latham & Clarke, 2018).

Environmental factors encompass physical aspects of housing, residential types, and neighborhood environment that affect social isolation. Regarding physical aspects of housing such as stairs and lack of ramps were risk factors for social isolation in later life (Clarke, 2014; Sixsmith & Sixsmith, 2008). Concerning residential types, about 25% of community-dwelling older adults experience social isolation (National Academies of Sciences, Engineering, and Medicine, 2020), and residing in long-term care facilities have been identified as a risk factor for social isolation in later life (Boamah et al., 2021; Simard & Volicer, 2020).

Lastly, previous studies have shown that both objective and subjective neighborhood characteristics are linked with the level of social connections in later life (Finlay et al., 2023; Latham, & Clarke, 2018; Moore et al., 2011; Yang & Moorman, 2021). For example, Latham & Clarke (2018) found that objective neighborhood characteristics such as the presence of physical disorder and subjective neighborhood characteristics such as a low-level of neighborhood cohesion were associated with fewer meetings with families or friends and less participation in clubs or organizations. However, only the presence of physical disorder was associated with less going out for enjoyment. Interestingly, neither the presence of physical disorder nor a low-level of neighborhood cohesion characteristics was associated with religious attendance (Latham & Clarke, 2018).

4.1.2 Conceptual Framework

The Social Convoy Model of Social Relations was used as a framework to examine the extent to which homebound status is associated with the level of social connection in later life. Kahn & Antonucci (1980) regard social relations as a multifaceted concept which includes

structural, support, and quality domains, and the characteristics of social relations can change over time due to situational characteristics. For example, in this framework, the degree of confinement to one's housing, a situational context, could influence the nature of the structural dimension of social relations such as contact frequency with family and friends and participation in church and club activities (Antonucci et al., 2019; Sharifian et al., 2022). People's social relations are comprised of very close inner circle, fairly close middle circle, and role-based outer circle relations. While the inner circle social networks, such as immediate family members, tend to be maintained over time, the fairly close middle circle, such as extended relatives, and the role-based outer circle, such as friends in clubs or in religious organizations, can be relatively easily changed by situational characteristics or change over time (Antonucci, 1986; Antonucci et al., 2019).

4.1.3 Present Study

Even though the number of homebound and semi-homebound older adults is expected to increase, they remain overlooked populations (Ornstein et al., 2015; Qiu et al., 2010). Homebound older adults are particularly vulnerable to social isolation, a serious public health issue. Existing longitudinal studies identified social isolation as a risk factor for being homebound (Cudjoe et al., 2022; Xiang et al., 2020b). However, while homebound status can pose a risk of social isolation, this relationship has rarely been examined. Furthermore, given a low level of frequency of going out and functional issues among semi-homebound older adults, though to a lesser degree than homebound older adults, they may be susceptible to social isolation like homebound older adults. However, to date, many previous studies did not differentiate between semi-homebound and homebound status (Cudjoe et al., 2022). Previous studies, drawing on a small sample size, examined social connections among homebound older

adults (Medvene et al., 2016; Nilsen et al., 2018). However, the longitudinal association between homebound status at baseline and social isolation has not been explored using a nationally representative sample of older adults.

To fill a gap in the current literature, this study examines whether homebound status (non-homebound, semi-homebound, and homebound) is associated with changes in social isolation over 5 years utilizing data from a nationally representative panel survey of older adults in the U.S. Utilizing the Convoy Model of Social Relations and the previous studies on homebound status and social isolation (Cudjoe et al., 2022b; Szanton et al., 2016; Kahn & Antonucci, 1980; Xiang et al., 2020b), this study proposes the following hypotheses.

Hypothesis 1-1: Compared to non-homebound older adults, semi-homebound older adults would report a higher social isolation at baseline.

Hypothesis 1-2: Compared to non-homebound older adults, semi-homebound older adults would report a steeper increase in social isolation over time since semi-homebound older adults tend to have poor health and experience more functional limitations compared to non-homebound older adults.

Hypothesis 2-1: Compared to non-homebound older adults, homebound older adults would report a higher social isolation at baseline.

Hypothesis 2-2: Compared to non-homebound older adults, homebound older adults would report a steeper increase in social isolation over time since homebound older adults tend to have poor health and experience more functional limitations compared to non-homebound older adults.

Hypothesis 3-1: Compared to semi-homebound older adults, homebound older adults would report higher social isolation at baseline.

Hypothesis 3-2: Compared to semi-homebound older adults, homebound older adults would report a steeper increase in social isolation over time since homebound older adults tend to have poor health and experience more functional limitations compared to semi-homebound older adults.

4.2 Method

4.2.1 Data

Data from the National Health and Aging Trends Study (NHATS Round 1-5, 2011-2015) were used to examine the association between homebound status and social isolation. The National Institute of Aging (NIA) initiated the NHATS to investigate various issues among older adults in the U.S. (Freedman & Kasper, 2019). The NHATS started in 2011 and includes a nationally representative sample of Medicare beneficiaries aged 65 and older in the U.S. (Montaquila et al., 2012).

4.2.2 Sample

The study participants were restricted to participants who completed the survey from round 1 to round 5 and who provided data on social isolation for at least two rounds. Since questions related to social isolation were administered to both sample person and proxy respondents, proxy respondents were included. 3.92% of respondents were proxy at round 1. The range of proxy respondents ranged from 4.39% to 13.11% between round 2 and round 5. The final analytic sample size was 3,917. On average, study participants completed 4.7 annual surveys, and there were 18,264 person-years observation between 2011-2015.

4.2.3 Measures

4.2.1.1 Homebound Status

To determine participants' homebound status, the following questions were utilized: "How often did you go out last month," "did anyone ever help you (yes/no)," "how often did you go outside by yourself," and "how much difficulty did you have when leaving your home by yourself?" Using this information, homebound status was categorized into three groups: homebound, semi-homebound, and non-homebound (Ornstein et al., 2015). Specifically, being homebound includes people who never or rarely left their home in the last month. Semi-homebound includes people who left their homes more than two times per week (1) only with someone who helps them or (2) has helper but left home by themselves, or (3) without helper but experience difficulty when go out. Lastly, non-homebound status includes people who left their home at least twice per week without any difficulty or helper. Homebound status was defined based on participants' round 1 status (baseline).

4.2.1.2 Social Isolation

Based on Berkman and Syme Social Network Index (SNI), the level of social isolation is measured across four aspects: (1) marriage, (2) family and friends, (3) religious participation, and (4) club participation (Berkman & Syme, 1979; Pohl, 2017). As shown in Table 4.1, six questions were used to measure the level of social isolation across the four domains. While one question was used to measure social isolation in the marriage, religious participation, and club participation domain, three questions were used to measure social isolation in the family and friends domain. If respondents' response was no, they receive one point for each question. Specifically, no marriage/no partner (1 point), no family member who can talk about important things in the past year (1 point), no friends who can talk about important things in the past year (1 point), no in-person visit with friends or family in the past month (1 point), no religious

participation (1 point), and no club participation (1 point). The six items were added, and a higher score indicates a higher level of social isolation (range 0-6).

4.2.1.3 Covariates

Individual level sociodemographic variables included a six-level categorical age (65-69, 70-74, 75-79, 80-84, 85-89, and 90 or older), a binary gender (male and female), a four-category race (White/non-Hispanic, Black/non-Hispanic, Hispanic, and Other), a four-level categorical educational attainment (less than high school, high school, some college but no degree, and college graduate), household income quartiles (1^{st} = 0 to 15,223, 2^{nd} = 15,234-29,949, 3^{rd} = 30,000-57,600, and 4^{th} = 57,800-5,000,000), and a binary proxy respondent status (yes and no) variables. Following previous studies, the importance of four social engagement activities, (1) visiting friends or family members, (2) attending religious events, (3) attending club events, and (4) going out for enjoyment were treated as continuous variables (range: 1 = not so important, 2 = somewhat important, and 3 = very important) (Latham & Clarke, 2018).

Second, individual-level health and functioning-related variables included a binary measure of hospitalization in the last 12 months (yes or no). Mobility assistive device measure included canes, walkers, wheelchairs, or scooters (yes/no). Using this information, a variable measuring usage of any mobility assistive device was created (0 = no use, 1 = use). Activities of Daily Living (ADLs) included eating, bathing, toileting, and dressing. Respondents were asked whether they had difficulty performing the four activities (eating, bathing, toileting, and dressing) by themselves or had assistance in carrying it out (0 = no difficulty, 1 = experienced difficulty). Using this information, the number of difficulties in ADLs was created and treated as a continuous variable (range: 0-4). Similarly, a measure of Instrumental Activities of Daily Living (IADLs) included laundry, grocery shopping, meal preparation, banking, and taking

medication. Respondents were asked whether they had difficulty performing these five activities (include laundry, grocery shopping, meal preparation, banking, and taking medication) alone or required assistance from others (0 = assistance is not required, 1 = assistance is required). Using this information, the number of limitations in IADLs was created and treated as a continuous variable (range: 0-5). The number of chronic diseases coded as continuous variables based on information on hypertension, heart disease, arthritis, osteoporosis, diabetes, lung disease, stroke, and cancer (range: 0-8). Following NHATS's dementia classification (Kasper et al., 2013), dementia status was coded as three-categorical variables (no dementia, possible dementia, and probable dementia). Third, home environment level variables include a presence of stairs (yes/no), a presence of ramp (yes/no), a usage of any mobility device (yes/no), and three-category residential status (1. community 2. non-nursing residential facility, and 3. nursing homes) variables.

Concerning neighborhood level variables, first, objective neighborhood disorder was measured by NHATS interviewers using the following questions: how much (1) litter, broken glass, or trash on sidewalks and streets? (2) graffiti on buildings and walls? and (3) vacant or deserted houses or storefronts? (1 = none, 2 = a little, 3 = some, and 4 = a lot). Given the skewed distribution of this variable, following previous studies (Latham & Clarke, 2018), a dichotomous neighborhood disorder variable was created using the lowest 10% as a cutoff point (score = 1.33 out of 3) (0 = no physical neighborhood disorder at all and 1 = presence of any physical neighborhood disorder) (Cronbach's $\alpha = .731$).

Unlike neighborhood disorder, subjective neighborhood social cohesion was measured based on survey participants' response to the following questions: 1) *people know each other well*, (2) *people are willing to help each other*, and (3) *people can be trusted.* These questions

were measured on a three-Likert scale (1 = do not agree, 2 = agree a little, and 3 = agree) (Latham-Mintus et al., 2022). Following previous studies (Latham & Clarke, 2018), a dichotomous neighborhood social cohesion variable was created given the high skewed distribution of the social cohesion variable using the lowest 10% as a cutoff point (score = 1.67 out of 3) (0 = high level of neighborhood social cohesion and 1 = low to moderate level of neighborhood social cohesion) (Cronbach's $\alpha = .722$).

4.2.4 Analysis Plan

First, descriptive analyses were conducted to examine differences in sociodemographic, health, and neighborhood features by homebound status (non-homebound status, semi-homebound status, and homebound status). Second, mixed-effects regression models were used to examine the association between homebound status and social isolation over 5 years. Specifically, Model 1 (unconditional growth model) estimated the association between time (year) and social isolation over 5 years. Intra-class coefficients (ICC) were calculated to examine the level of variance in social isolation that can be explained by inter-individual differences. Model 2 examined (1) the time trajectory (year) of social isolation and (2) the effect of homebound status on the intercept of the time trajectory without covariates. In Model 3, all time-invariant covariates (baseline age, gender, race, and education) and time-variant covariates (marital status, dementia, hospital stay, income, ADL count, IADL count, chronic diseases, usage of mobility assistance device, neighborhood disorder, social cohesion, residence type, subjective importance of social engagement, and proxy status) were added. In Model 4, the interaction between homebound status and time was added. The marginal predicted means of social isolation were estimated from the mixed-effect modeling for visualization. All mixed-

effects models incorporate random intercept, random slope for time, and unstructured variance-covariance structure to account for random effects.

4.3 Results

4.3.1 Sample Characteristics by Homebound Status

Characteristics of the total sample and study participants across the three homebound status groups are presented in Table 4.2. There were significant differences in sociodemographic, health-related, housing features, and neighborhood features across the three homebound status groups. First, about 80.1% of older adults were categorized as non-homebound group. They tended to be younger, non-Hispanic White, more educated, and higher income. Specifically, about 45% of people were in the age groups between 65-74, about 74% were White, 33% were college graduates, and 27% were categorized into 4^{th} income quartile. The values for the four social engagement activities ranged from 1.93 to 2.56 on a Likert scale from 1 (not so important) to 3 (very important). Concerning health-related characteristics, people in the non-homebound status group were less likely to report dementia (4.5%), hospital stays within the last 12 months (16.6%), and use mobility assistance devices (14.8%). People in this group reported minimal ADL or IADL issues, but they tended to live with more than two chronic diseases. They were more likely to live in a community without physical disorder (88.0%), a community with high social cohesion (86.0%), a house with stairs (76.4%), or a house without ramps (92.4%). The proportion of proxy respondents was very low in the non-homebound status group (1.48%).

Second, about 4.8% of the study sample was categorized into the homebound status group. Older adults in the homebound group tended to show the opposite characteristics of those of non-homebound older adults. Specifically, about 44.2% of people were in the age group 85 and over, about 49.4% were White, 12.7% were college graduates, and 6.3% were categorized

into 4th income quartile. The values of the four social engagement activities ranged from 1.46 to 2.25 on the same Likert scale from 1 (not so important) to 3 (very important). Regarding health, they tended to experience more health issues such as dementia (36.8%), hospitalization (41.5%), and use mobility assistance devices (73.1%). People in the homebound group had an average of 1.72 ADL issues out of 4, 2.72 IADL issues out of 5, and 3.05 chronic diseases out of 8. They were more likely to live in a community with physical disorder (24.5%), in a community with low social cohesion (23.1%), in non-nursing residential facilities (17.3%), in a house with a ramp (40.5%), and in a house with stairs (59.4%). The proportion of proxy respondents was high in the non-homebound status group (23.1%).

Lastly, about 15% of people were categorized as semi-homebound. Most individual and neighborhood characteristics of the semi-homebound group fell in between characteristics of the non-homebound and the homebound group. Specifically, about 41.9% of people were in the age groups between 75-84, about 73.1% were female, 61% were White, 37% had less than high school education, and 44% were categorized into the 1st income quartile. The values for the four social engagement activities ranged from 1.71 to 2.42 on the same Likert scale from 1 (not so important) to 3 (very important). Regarding health-related characteristics, 62% experienced dementia, about 62.8% experienced hospitalization, and about 65% of people in this group used mobility assistance devices. People in the homebound group had an average of 1.39 ADL issues out of 4, 2.12 IADL issues out of 5, and 3.13 chronic diseases out of 8. Regarding neighborhood characteristics, about 19% of people lived in a neighborhood with physical disorders and in a neighborhood with low levels of social cohesion. About 7.4% of people resided in non-nursing residential facilities. While about 75% of lived in a house with stairs, only 25 % of them lived in a house with ramps. About 10.7% of people were proxy respondents.

4.3.2 Multilevel Models for Association Between Homebound Status and Social Isolation

Table 4.3 shows the results of the association between homebound status and social connectedness from mixed-effects models. Model 1 **(**basic model: random intercept and random slope model only**)** showed that the average social isolation level is 2.38, and it increased by 0.02 every year ($\beta = 0.02$, $p < 0.001$). Intra-class correlation (ICC) is 70% meaning that 70% of the variance in social isolation was explained by between-person variances (Not in Table 4.3). A high ICC indicated that the mixed-effects model was an appropriate method to examine the longitudinally association between homebound status and social isolation.

Homebound status was added in Model 2 (unadjusted model), and it showed that time (year) is associated with an increase in social isolation ($\beta = 0.02$, $p < 0.001$). Compared to those with a non-homebound status, semi-homebound older adults tended to report a higher level of social isolation ($\beta = 0.52$, $p < 0.001$). Compared to those with a non-homebound status, homebound older adults tended to report a higher level of social isolation ($\beta = 1.06$, $p < 0.001$).

All covariates were added in Model 3 (adjusted model). While the significance of the relationship between being semi-homebound and higher levels of social isolation was not maintained, the significance of the relationship of being homebound and higher levels of social isolation was maintained. Specifically, compared to non-homebound status, being semi-homebound status was not associated with a higher level of social isolation ($\beta = 0.05$, $p = 0.180$). Compared to being non-homebound, having a homebound status was associated with a higher level of social isolation ($\beta = 0.21$, $p < 0.001$) (Model 3 in Table 4.3 and Figure 4.1).

Regarding individual characteristics, older age was associated with more social isolation. Being female was associated with a lower level of social isolation ($\beta = -0.11$, $p < 0.001$). People with higher educational attainment (high school, some college, and college graduate) were

associated with a lower level of social isolation (β = -0.17, p <0.001; β = -0.21, p <0.001; β = -0.36, p <0.001). Similarly, people with higher income (2nd income quartile, 3rd income quartile, and 4th income quartile) were associated with a lower level of social isolation (β = -0.11, p <0.001; β = -0.27, p <0.001; β = -0.37, p <0.001). The importance of activities (visiting families, attending religious services, and participating in clubs) was associated with a lower level of social isolation (β = -0.12, p <0.001; β = -0.28, p <0.001; β = -0.29, p <0.001) except for going out for enjoyment (β = -0.02, p = 0.058).

Most health-related characteristics were associated with a higher level of social isolation. Specifically, probable dementia (β = 0.10, p <0.001), possible dementia (β = 0.09, p <0.001), chronic diseases (β = 0.01, p <0.001), IADL issues (β = 0.03, p <0.001), and hospital stay (β = 0.03, p <0.05) were associated with a higher level of social isolation. In contrast, ADL issues and chronic diseases were not associated with social isolation (β = 0.01, p = 0.410; β = 0.01, p = 0.581). Older adults who used a cane, walker, wheelchair, or scooter tended to report a higher level of social isolation (β = 0.10, p <0.001).

Concerning home environment and residential status variables, stairs were associated with a higher level of social isolation (β = 0.04, p <0.05), while ramps were associated with a lower level of social isolation (β = -0.07, p <0.01). Living in a non-nursing residential facility was associated with an increase in social isolation (β = 0.19, p <0.001) and living in nursing home was associated with an increase social isolation (β = 0.19, p <0.01). Concerning neighborhood-level variables, the presence of physical disorder (β = 0.05, p <0.05) and lack of social cohesion (β = 0.12, p <0.001) were associated with a higher social isolation. Lastly, proxy response status was positively associated with a higher level of social isolation (β = 0.83, p <0.001).

Model 4 (homebound status and time interaction model) showed that non-homebound older adults and semi-homebound older adults were no different in terms of changes in social isolation over time ($\beta = 0.01$, $p = 0.284$). Also, compared to non-homebound older adults, homebound older adults were no different concerning changes in social isolation over time ($\beta = -0.02$, $p = 0.271$) (Model 4 in Table 4.3).

The same analysis was conducted using semi-homebound older adults as a reference group (Table 4.4). Model 2 shows (unadjusted model) that compared to those with a semi-homebound status, non-homebound older adults tended to report a lower level of social isolation ($\beta = -0.52$, $p < 0.001$). Compared to those with a semi-homebound status, homebound older adults tended to report a higher level of social isolation ($\beta = 0.53$, $p < 0.001$). Model 3 shows (adjusted model) that semi-homebound and non-homebound older adults did not differ in terms of in terms of social isolation ($\beta = -0.05$, $p = 0.180$). Compared to those with a semi-homebound status, homebound older adults tended to report a higher level of social isolation ($\beta = 0.16$, $p < 0.01$). Model 4 (homebound status and time interaction model) shows that the association between homebound status and social isolation did not vary by time. Specifically, semi-homebound older adults and non-homebound older adults were no different in terms of changes in social isolation over time ($\beta = -0.01$, $p = 0.284$). Also, compared to semi-homebound older adults, homebound older adults were no different concerning changes in social isolation over time ($\beta = -0.03$, $p = 0.122$) (Table 4.4).

4.4 Discussion

Homebound status can pose a risk of social isolation, but prior to this study, this relationship had not been longitudinally examined. Guided by the Social Convoy Model of Social Relations, the current study found that being confined to one's housing is a risk factor for

social isolation. In this section, I start with a comparison of non-homebound and semi-homebound older adults, followed by a comparison of non-homebound and homebound older adults, and finally, semi-homebound and homebound older adults. Lastly, I discuss whether the findings of this study are consistent with the predictions of the Social Convoy Model of Social Relations.

First, contrary to hypothesis 1-1, semi-homebound older adults are not significantly different from non-homebound older persons in terms of baseline social isolation ($\beta = 0.05$, $p = 0.180$). The findings of this study are inconsistent with the cross-sectional study by Szanton et al. (2016) which found different participation rates between non-homebound and semi-homebound older adults across different social activities. Specifically, Szanton et al. (2016) found that a percentage of semi-homebound older adults did not have in-person meetings with family members and friends, attend religious events, participate in club activities, or go out for enjoyment, at rates of 15.8%, 36.7%, 54.0%, and 19.3%, respectively. In contrast, the percentages reported by non-homebound older adults were lower, 6.5%, 20.0%, 30.9%, and 8.4%, respectively. In summary, Szanton et al. (2016) found that semi-homebound older adults participated much less in social activities than non-homebound older adults. It is worthwhile to note that Szanton et al. (2016) focused solely on in-person social interaction. In contrast, this current study examines the level of social isolation by utilizing a holistic social isolation measurement which, in addition to in-person social engagement, includes marital/partner status and identification of family members and friends who can talk about important things from the past year (Berkman & Symen, 1979; Pohl et al., 2017). Differences in how social isolation is measured may explain the inconsistent findings across these two studies.

In hypothesis 1-2, it was anticipated that over time, social isolation of semi-homebound adults would grow more steeply than that of non-homebound older persons. Contrary to hypothesis 1-2, semi-homebound older adults are not significantly different in terms of changes in social isolation over time compared to non-homebound older adults ($\beta = 0.01$, $p = 0.284$) even though there are differences between these two populations. Compared to non-homebound older adults, semi-homebound older adults have poorer health conditions such as more functional limitations, more health issues, and have fewer resources (as shown in Table 4-1). These two groups, though, place similar levels of importance across different social interaction domains including visiting families/friends, attending religious services, participating in clubs, and going out for enjoyment, which are positively associated with people's actual social engagement (Latham & Clarke, 2018). These shared perspectives may explain why the two groups exhibit similar trajectories over time.

Hypothesis 2-1 compares the baseline social isolation between homebound and non-homebound older persons. Supporting hypothesis 2-1, this study found that homebound older adults tend to report a higher level of social isolation at baseline compared to non-homebound older adults ($\beta = 0.21$, $p < 0.001$). Given the unique characteristic of homebound older adults, that of being confined to their housing, this population is particularly susceptible to social isolation. This finding aligns with previous studies (Cheng et al., 2022; Marti & Choi, 2022; Szanton et al., 2016). For instance, according to the study by Marti and Choi (2022), only 20% of homebound older adults go out to meet their families, only 11.2% meet their friends, and only 11.2% attend religious events. Similarly, a qualitative study by Cheng et al. (2022) reveals that the majority of homebound older adults report difficulties in maintaining interaction with their family members and friends.

Regarding trajectories of social isolation over time (hypothesis 2-2), contrary to expectation, the two groups (homebound and non-homebound) exhibit similar trajectories in social isolation over 5 years ($\beta = -0.02$, $p = 0.271$). Since homebound older adults have more difficulty in maintaining in-person interactions, they might place a significant value on maintaining their current social relations with individuals who can talk about important things as it is not necessary to leave home to talk to a close family member or friend. According to Latham & Clarke (2018) who used the same data, the importance of social engagement activities is positively associated with social participation rate. Thus, it is likely that the importance of talking about important things to their family members or friends may be positively associated with maintaining social relations with these people. However, while the NHATS provides information on the perceived importance of social engagement activities which is positively associated with actual participation rate (Latham & Clarke., 2018), it does not provide information on the value placed on sharing important things with social relations.

Consistent with hypothesis 3-1, homebound older adults tend to report a higher level of social isolation at baseline compared to semi-homebound older adults ($\beta = 0.16$, $p = 0.008$). This finding implies that homebound older adults are also more vulnerable to social isolation than semi-homebound older adults due to their greater level of confinement. However, inconsistent with hypothesis 3-2, the two groups do not show significant differences in terms of the slope of social isolation change over time ($\beta = -0.03$, $p = 0.122$). Again, this unexpected finding may be related to how social isolation is measured in this study. Specifically, indicators of social isolation such as marital/partner status and identification of family members and friends who can talk about important things might not change significantly based on homebound status. Furthermore, this lack of difference may be associated with the time frame used to measure

social isolation. For example, in measuring the level of social isolation, previous studies used one week as a time period (Ankuda et al., 2022). However, in this study, a one-month time period was used to measure in-person social interaction with family members and friends, religious attendance, and club participation. Additionally, a one-year time period was used for the two questions related to identification of family members and friends who can talk about important things. Future studies could address the inconsistency between the current study and Ankuda et al. (2022) by re-examining whether the two groups exhibit different trajectories of social isolation over time using a shorter time period.

While the current study demonstrates that homebound status can be a risk factor for experiencing social isolation in later life, most previous studies considered the association in the opposite direction: social isolation as a risk factor for becoming homebound. For instance, utilizing data from the National Health and Aging Trends Study (NHATS), Cudjoe et al. (2022) found that socially isolated older adults were more likely to become homebound over time. Another study by Xiang et al. (2020b) examined trajectories of homebound status utilizing data from the NHATS and found that 65.5% of older adults maintain their non-homebound status, about 8.3% maintain their homebound status, and the remaining 26.2% experience a change from non-homebound status to homebound status over 7 years. These studies suggest that social isolation may be a risk factor for older adults becoming homebound.

In fact, a reciprocal relationship between homebound status and social isolation may exist. For example, a study by Xiang et al. (2020a) examined the bidirectional relationship between homebound status and depression. Interestingly, the study by Xiang et al. (2020a) found a relatively stronger lagged effect from homebound status to depressive symptoms compared to the lagged effect from depressive symptoms to homebound status. The current study did not

examine the bidirectional association between homebound status and social isolation. However, given the strong lagged effect from being homebound to depressive symptoms (Xiang et al., 2020a), it is probable that similar bidirectional association may exist between homebound status and social isolation.

The Convoy Model of Social Relations posits that while some social relations, such as non-kin relations, are easily changed by situational characteristics, some social relations, such as, kin ties, are stable (Antonucci, 1986; Kahn, & Antonucci, 1980). Utilizing this framework, Nilsen et al. (2018) examined social relations of home and community-based service (HCBS) users who are mostly confined to their dwellings. Nilsen et al. (2018) found that while kin networks (family and relatives) account for 80% of the inner circle, the most essential networks, non-kin networks account for only 20% of the inner circle. Similar to the study by Nilsen et al. (2018), the low level of social connections among homebound older adults implies that some of their non-kin social relations at clubs or churches may not exist for homebound older adults since they are confined to their housing. Nonetheless, similar trajectories of social isolation between homebound older adults and non-homebound older adults imply that some essential social relations are maintained despite their confinement, and this finding aligns with the postulation of the Convoy Model that older adults gravitate towards those people in their inner circle.

4.4.1 Limitations and Future Directions

The present study has several limitations. First, the way information about homebound status is collected and defined needs to be considered. Specifically, in the NHATS, participants' self-report questions were used to obtain information about homebound status. While the self-report approach is often used in large surveys, this approach is vulnerable to recall bias (Qiu et al., 2010).

Second, while homebound status is defined in a given month in the NHATS, different studies have used different time periods (e.g., one year) to define homebound status (Ko & Noh, 2021). Future studies could examine whether the association between homebound status and social isolation varies depending on how homebound status is defined.

Third, this study uses baseline homebound status to examine the association between homebound status and changes in social isolation over 5 years. However, homebound status is dynamic (Ankuda et al., 2021; Xiang et al., 2020b). When homebound status is compared at round 1 and round 5, 74.42% of people were categorized into the same homebound status, the remaining 25.58% of study sample were categorized into different homebound status. Future studies could examine how changes in homebound status are associated with changes in the levels of social isolation.

Fourth, while this study utilizes data that were collected before Covid 19, Covid 19 may influence the association between homebound status and social isolation. For example, the study by Ankuda et al. (2022) found a disproportionate impact of Covid 19 on contact frequency with friends and family among homebound older adults compared to non-homebound older adults. Future studies could examine whether Covid 19 has differential impact on other interpersonal interactions such as club participation and religious attendance based on the homebound status.

Fifth, in this study, social isolation was measured based on Berkman and Syme's Social Network Index (SNI). SNI was developed before the advances in various communication technologies, so it primarily focuses on in-person social contact. Thus, the way social isolation is measured in this study does not consider the level of social interaction using communication technology (Nicholson et al., 2020). Future studies should incorporate social interaction via

communication technology as older adults are the fastest growing population concerning technology adoption (Faverio, 2021).

4.4.2 Conclusion

Aging in place refers to people continuing to live in their current dwellings. Given the lack of social connections among homebound older adults, even though they are able to stay in their current dwellings, they cannot be considered as achieving *aging in the right place*. This study shows that homebound status is a risk factor for social isolation. However, homebound status is a modifiable factor. For older adults who report severe difficulties in leaving their dwellings, informal support or transportation support could be arranged to improve social connections. If frequent in-person interaction is not possible, and in-person social engagement is preferred by many older adults, social connections could be increased using technologies (Holt-Lunstad, 2023).

4.5 References

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4.6 Tables and Figures

Table 4.1 Indicators of the Social Isolation Measure

Domain	Indicator Questions	Indicator Responses
Marriage/partner	Are you currently married, living with a partner, separated, widowed, or never married?	No marriage or partner
Family and friends	Looking back over the past year, who are the people you talked with most often about important things?	No family identified No friend identified
	In the last month, did you ever visit in-person with friends or family not living with you either at home or theirs?	No
Church participation	In the past month, did you ever attend religious services?	No
Club participation	In the past month, did you ever participate in clubs, classes, or other organized activities?	No

Note. Indicator scores were summed to create the social isolation score (no = 1 point, yes = 0 points; range = 0 to 6), with higher score indicating greater isolation.

From: "Measuring Social Isolation in the National Health and Aging Trends Study," 2017, by J. S. Pohl, B. B. Cochrane, K. G. Schepp, & N. F. Woods, *Research in Gerontological Nursing*, *10*(6), p. 280. Copyright 2017 by SLACK Incorporated

Table 4.2 Sociodemographic, Health, and Environmental Characteristics of the Total Sample by Homebound Status

	Total N = 3,952	No homebound N = 3,169 (80.19%)	Semi homebound N = 593 (15.01%)	Homebound N = 190 (4.81%)	Chi-square or ANOVA
Variables					
Age					$\chi2$ (10) = 211.70 ***
65-69	805 (20.36)	707 (22.31)	83 (14.00)	15 (7.89)	
70-74	851 (21.53)	727 (22.94)	91 (15.85)	30 (15.79)	
75-79	827 (20.92)	683 (21.55)	119 (20.07)	25 (13.16)	
80-84	777 (19.66)	611 (19.28)	130 (21.92)	36 (18.95)	
85-90	444 (11.23)	300 (9.47)	99 (16.69)	44 (23.16)	
90+	249 (6.30)	141 (4.45)	68 (11.47)	40 (21.05)	
Gender					$\chi2$ (6) = 110.29 ***
Man	1,602 (40.53)	1,405 (44.34)	159 (26.81)	37 (19.47)	
Woman	2,351 (59.47)	1,764 (55.66)	434 (73.19)	153 (80.53)	
Race					$\chi2$ (6) = 111.19 ***
White, non-Hispanic	2,831 (71.62)	2,374 (74.91)	362 (61.05)	94 (49.47)	
Black, non-Hispanic	802 (20.29)	582 (18.37)	160 (26.98)	60 (31.58)	
Others	122 (3.09)	88 (2.78)	25 (4.22)	9 (4.74)	
Hispanic	198 (5.01)	125 (3.94)	46 (7.76)	27 (14.21)	
Education					$\chi2$ (6) = 167.52 ***
Less than high school	921 (23.49)	617 (19.58)	219 (37.74)	85 (46.96)	
High School	1,036 (26.42)	839 (26.63)	151 (25.68)	45 (24.86)	
Some college, no degree	791 (20.17)	654 (20.76)	109 (18.54)	28 (15.47)	
College graduate	1,193 (29.92)	1,041 (33.04)	109 (18.54)	23 (12.71)	
Income quartile					$\chi2$ (6) = 249.29 ***
1st quartile (0 to 15,223)	1,112 (28.13)	739 (23.32)	261 (44.01)	111 (58.42)	
2nd quartile (15,234 to 29,949)	986 (24.94)	777 (24.52)	156 (26.31)	53 (27.89)	
3rd quartile (30,000 to 57,600)	895 (22.64)	778 (24.55)	103 (17.37)	14 (7.37)	
4th quartile (57,800 to 5,000,000)	960 (24.29)	875 (27.61)	73 (12.31)	12 (6.32)	
Dementia status					$\chi2$ (4) = 425.66 ***
No dementia	3,156 (79.84)	2,699 (85.17)	368 (62.06)	89 (46.84)	
Probable dementia	457 (11.56)	325 (10.26)	101 (17.03)	31 (16.32)	
Possible dementia	340 (8.60)	145 (4.58)	124 (20.91)	70 (36.84)	
Hospital stays within the last 12 months					$\chi2$ (2) = 417.36 ***
No	3,123 (79.10)	2,659 (83.33)	371 (62.88)	112 (58.95)	
Yes	825 (20.90)	528 (16.67)	219 (37.12)	78 (41.05)	
Presence of neighborhood disorder					$\chi2$ (2) = 24.41 ***
No	3,423 (86.75)	2,788 (88.06)	482 (81.69)	152 (75.53)	
Yes	523 (13.25)	378 (11.94)	108 (18.31)	37 (24.47)	
Social cohesion					$\chi2$ (2) = 23.72 ***
High social cohesion	3,326 (84.74)	2,710 (86.03)	473 (80.72)	142 (76.84)	
Low and moderate social cohesion	599 (15.26)	40 (13.97)	113 (19.28)	46 (23.16)	
Stair					$\chi2$ (2) = 27.80 ***
Yes	2,978 (75.37)	2,421 (76.42)	444 (75.00)	113 (59.47)	
Ramp					$\chi2$ (2) = 92.45 ***
Yes	388 (9.82)	240 (7.58)	148 (25.00)	77 (40.53)	
Used any device					$\chi2$ (2) = 996.80 ***
Yes	1,019 (25.78)	472 (14.89)	405 (68.30)	142 (73.13)	
Residence (community ref.)	3,743 (94.49)	3,036 (95,8)	549 (92.58)	157 (82.63)	$\chi2$ (2) = 67.95 ***
Non-nursing residential facility	210 (5.31)	133 (4.20)	44 (7.42)	33 (17.37)	
ADL count (SD)	0.44 (0.94)	0.18 (0.51)	1.39 (1.39)	1.76 (1.52)	F (2,949) = 902.35***
IADL count (SD)	0.74 (1.22)	0.37 (0.80)	2.12 (2.12)	2.72 (1.37)	F (2,949) = 1261.81***
					F (2,949) = 115.37 ***
Number of chronic diseases (SD)	2.43 (1.44)	2.26 (1.38)	3.13 (1.50)	3.05 (1.50)	
Proxy (Yes) (%)	155 (3.92)	47 (1.48)	64 (10.79)	44 (23.16)	$\chi2$ (2) = 310.87 ***
Importance of visiting families & friends (SD)	2.52 (0.68)	2.56 (0.65)	2.42 (0.74)	2.10 (0.82)	F (2,3941) = 46.75 ***

Importance of religious services (SD)	2.33 (0.84)	2.33 (0.84)	2.35 (0.83)	2.25 (0.87)	F (2,3942) = 38.64 ***
Importance of participating clubs (SD)	1.87 (0.85)	1.93 (0.85)	1.71 (0.82)	1.46 (0.75)	F (2,3944) = 40.52 ***
Importance of going out (SD)	2.24 (0.76)	2.30 (0.74)	2.10 (0.79)	1.74 (0.81)	F (2,3943) = 61.17 ***

Note: ADL = Activities of Daily Living, IADL = Instrumental Activities of Daily Living, Any device = a cane, walker, wheelchair or scooter, Unweighted *$p < .05$. **$p < .01$. ***$p < .001$.

Table 4.3 Homebound Status and Social Isolation from Mixed-Effects Models

	Model 1	Model 2	Model 3	Model 4
Intercept	2.38 ***	2.25 ***	3.30 ***	3.30 ***
Study Wave	0.02 ***	0.02 ***	0.01 ***	0.01***
Homebound status (ref. non-homebound)				
Semi homebound		0.52 ***	0.05	0.01
Homebound		1.06 ***	0.21 ***	0.27 **
Housing Transition * Time				
Semi-homebound * Time				0.01
Homebound * Time				-0.02
Age (ref 65-69)				
70-74			0.10 **	0.10 **
75-79			0.07 *	0.07 *
80-84			0.20 ***	0.20 ***
85-90			0.24 ***	0.24 ***
90+			0.33 ***	0.33 ***
Female			-0.11 ***	-0.11 ***
Race (ref. White Non-Hispanic)				
Black, non-Hispanic			0.06 *	0.06 *
Hispanic			0.05	0.05
Others			-0.04	-0.04
Educational attainment (ref. <= high school)				
High school			-0.17 ***	-0.17 ***
Some college, no degree			-0.21 ***	-0.21 ***
college graduate			-0.36 ***	-0.36 ***
Dementia (ref. no dementia)				
Probable dementia			0.10 ***	0.10 ***
Possible dementia			0.09 ***	0.09 ***
Overnight hospital stays within the last 12 months (no)			0.03 *	0.03 *
Number of chronic diseases			0.01	0.01
Income quartiles (ref.1st quartile: 0 to 15,223)				
2nd quartile: (15,234 to 29,949)			-0.11 ***	-0.11 ***
3rd quartile: (30,000 to 57,600)			-0.27 ***	-0.27 ***
4th quartile: (57,800 to 5,000,000)			-0.37 ***	-0.37 ***
ADL count			0.01	0.01
IADL count			0.03 ***	0.04 ***
Stairs			0.04 *	0.04 *
Ramp			-0.07 **	-0.07 **
Used any device (Yes)			0.10 ***	0.10 ***
Residential status (ref. community)				
Non-nursing residential facilities			0.19 ***	0.19 ***
Nursing facilities			0.19 **	0.19 **
Presence of neighborhood disorder (Yes)			0.05 *	0.05 *
Low Social Cohesion (Yes)			0.12 ***	0.12 ***
Importance of visiting families & friends (SD)			-0.12 ***	-0.12 ***
Importance of attending religious services (SD)			-0.28 ***	-0.28 ***
Importance of participating clubs (SD)			-0.29 ***	-0.29 ***
Importance of going out for enjoyment (SD)			-0.02	-0.02
Proxy			0.83 ***	0.83 ***
Random Effects				
Var(wave)	0.02	0.02	0.02	0.02
Var(_con)	1.10	1.00	0.52	0.52
Var(wave,_cons)	-0.06	-0.06	-0.05	-0.05
Var(residual)	0.45	0.45	0.38	0.38
Log likelihood	-25820.478	-25656.942	-21503.224	-21501.925
Chi Square (df)	11639.67 ***	10868.51 ***	4854.88 ***	4856.11 ***

Note: Reference group non-homebound, ADL = Activities of Daily Living, IADL = Instrumental Activities of Daily Living, Any device = a cane, walker, wheelchair or scooter, Unweighted.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4.4 Homebound Status and Social Isolation from Mixed-Effects Models

	Model 1	Model 2	Model 3	Model 4
Intercept	2.38 ***	2.25 ***	3.35 ***	3.32 ***
Study Wave	0.02 ***	0.02 ***	0.01 ***	0.02***
Homebound status (ref. semi-homebound)				
Non-homebound		-0.52 ***	-0.05	-0.01
Homebound		0.53 ***	0.16 *	0.26 **
Housing Transition * Time				
Non-homebound * Time				-0.01
Homebound * Time				-0.03
Age (ref 65-69)				
70-74			0.10 **	0.10 **
75-79			0.07 *	0.07 *
80-84			0.20 ***	0.20 ***
85-90			0.24 ***	0.24 ***
90+			0.33 ***	0.33 ***
Female			-0.11 ***	-0.11 ***
Race (ref. White Non-Hispanic)				
Black, non-Hispanic			0.06 *	0.06 *
Hispanic			0.05	0.05
Others			-0.04	-0.04
Educational attainment (ref. <= high school)				
High school			-0.17 ***	-0.17 ***
Some college, no degree			-0.21 ***	-0.21 ***
College graduate			-0.36 ***	-0.36 ***
Dementia (ref. no dementia)				
Probable dementia			0.10 ***	0.10 ***
Possible dementia			0.09 ***	0.09 ***
Overnight hospital stays within the last 12 months (no)			0.03 *	0.03 *
Number of chronic diseases			0.01	0.01
Income quartiles (ref.1st quartile: 0 to 15,223)				
2nd quartile: 15,234 to 29,949			-0.11 ***	-0.11 ***
3rd quartile: 30,000 to 57,600			-0.27 ***	-0.27 ***
4th quartile: 57,800 to 5,000,000			-0.37 ***	-0.37 ***
ADL count			0.01	0.01
IADL count			0.03 ***	0.04 ***
Stairs			0.04 *	0.04 *
Ramp			-0.07 **	-0.07 **
Used any device (Yes)			0.10 ***	0.10 ***
Residential status (ref. community)				
Non-nursing residential facilities			0.19 ***	0.19 ***
Nursing facilities			0.19 **	0.19 **
Presence of neighborhood disorder (Yes)			0.05 *	0.05 *
Low social cohesion (Yes)			0.12 ***	0.12 ***
Importance of visiting families & friends (SD)			-0.12 ***	-0.12 ***
Importance of attending religious services (SD)			-0.28 ***	-0.28 ***
Importance of participating clubs (SD)			-0.29 ***	-0.29 ***
Importance of going out for enjoyment (SD)			-0.02	-0.02
Proxy			0.83 ***	0.83 ***
Random Effects				
Var(wave)	0.02	0.02	0.02	0.02
Var(_con)	1.10	1.00	0.52	0.52
Var(wave,_cons)	-0.06	-0.06	-0.05	-0.05
Var(residual)	0.45	0.45	0.38	0.38
Log likelihood	-25820.478	-25656.942	-21503.224	-21501.925
Chi Square (df)	11639.67 ***	10868.51 ***	4854.88 ***	4856.11 ***

Note: Reference group semi-homebound ADL = Activities of Daily Living, IADL = Instrumental Activities of Daily Living, Any device = a cane, walker, wheelchair or scooter, Unweighted

*p < .05. **p < .01. ***p < .001.

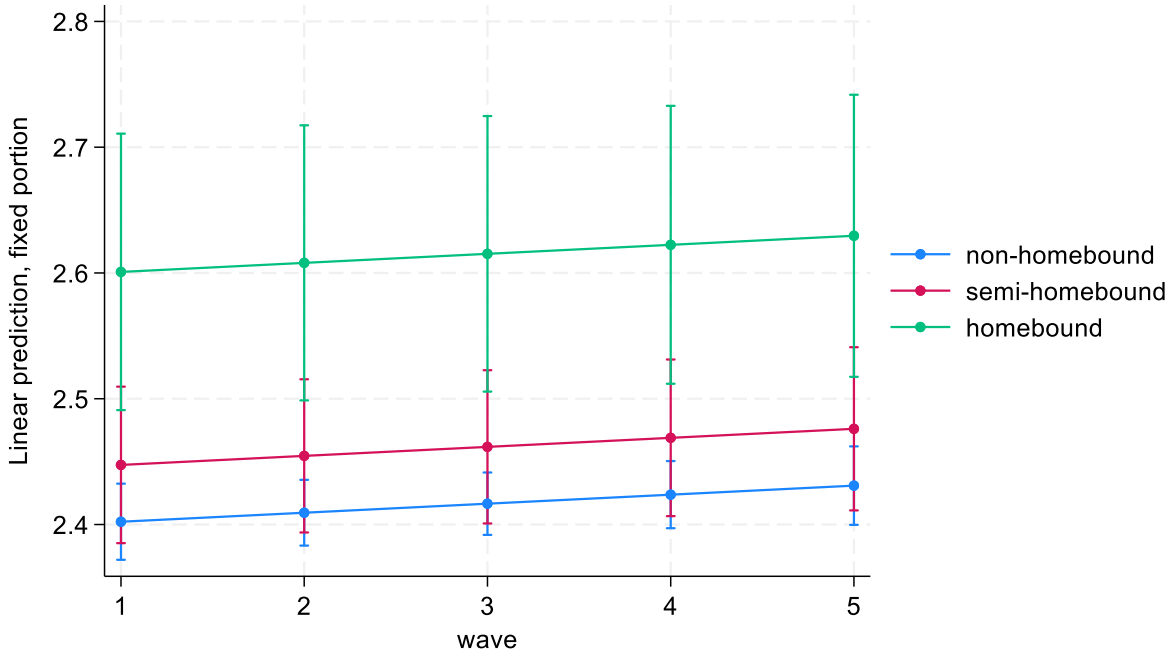


Figure 4.1 Estimated Means and Variance in Social Isolation as a Function of Homebound Status

Chapter 5 Conclusion

5.1 Summary of Findings

Aging in one's current dwelling cannot be considered the optimal solution for everyone given the heterogeneity among older adults. Many people either move or are confined to their dwellings for a variety of reasons, and the number of movers and homebound older adults has increased in recent years. However, to date, the effects of housing transition and homebound status have rarely been explored. The dissertation aims to provide empirical evidence on the social and psychological effects of housing transition and homebound status in later life. Specifically, the first two papers (Chapter 2 and Chapter 3) in the dissertation examine the extent to which housing transition is associated with changes in contact frequency with children and changes in psychological well-being, respectively. The last paper (Chapter 4) in the dissertation examines the extent to which homebound status is associated with social isolation in later life. The findings of the dissertation can help older adults make informed decisions on where to live in later life, especially regarding social connections and psychological well-being. In the final chapter, the key findings of each paper are reviewed. Theoretical contribution and social work practice implication are discussed as well. Lastly, this chapter concludes by addressing the limitations of the dissertation and suggesting future directions.

Paper 1 (Chapter 2) examined the extent to which relocation and proximity to a child are associated with changes in contact frequency with children across different contact modes. This study found that while about 80% of the study sample did not move between 2014-2018, about

20% of the study sample experienced either within-community relocation or out-of-community relocation during the same period. This study found that the effects of relocation and proximity to a child on contact frequency with children differ by contact modes. First, traditional contact modes, in-person and telephone contact frequency with children, are influenced by relocation and proximity to a child. Unlike traditional contact modes, neither email contact frequency nor social media contact frequency are influenced by relocation and proximity to a child. Non-significant effects of relocation and proximity to a child on contact frequency with children across digital contact modes (email and social media) suggest the potential of utilizing digital contact modes to maintain contact with children following relocation.

Relocation not only influences social relations but also may influence older adults' psychological well-being. Paper 2 (Chapter 3) examines to what extent different types of housing transition are associated with psychological well-being among community-dwelling older adults over 5 years. Housing transition was categorized as: non-moving, within-community relocation, non-nursing residential facility relocation, and nursing home relocation. During the 5-year period (2011-2015), about 83% of the study sample did not move, and of the 17% of movers, about two-thirds moved within the community, about a fifth of the sample moved to non-nursing residential facilities, and only about a tenth of those remaining movers moved to nursing homes.

First, how the four groups are different in terms of socio and demographic characteristics is explored. Non-movers and within-community movers show comparable sociodemographic characteristics and health conditions. In contrast, long-term care facility movers (non-nursing residential facility movers and nursing facility movers) exhibit less favorable sociodemographic characteristics and health conditions compared to non-movers. Results of Paper 2 found different effects of relocation on psychological well-being across different types of housing transition.

First, within-community movers and non-movers do not vary in terms of psychological well-being. This finding implies that within-community relocation can be an option for older adults to achieve aging in the right place concerning psychological well-being in later life rather than not moving. In contrast, non-nursing residential facility movers and nursing home movers report lower psychological well-being compared to non-movers. This finding suggests that moving from community to non-nursing residential care facility and nursing home moving is a significant change for most older adults, and that more individualized support is needed for long-term care facility movers to experience aging in the right place.

Paper 3 of the dissertation focuses on homebound older adults, another overlooked population in the aging-in-place literature. Specifically, the extent to which homebound status is associated with social connectedness was examined. Homebound status was categorized as the following: non-homebound, semi-homebound, and homebound status. About 80% of the study sample was categorized into non-homebound older adults, 15% were categorized as semi-homebound, and the remaining 5% of people were categorized as homebound older adults. Compared to non-homebound older adults, being homebound is associated with a higher level of social isolation while semi-homebound older adults report a similar level of social isolation compared to non-homebound older adults. Furthermore, compared to semi-homebound older adults, homebound older adults report a higher level of social isolation. Social Isolation is a preventable condition, and the findings of this study suggest the importance of providing support to homebound older adults to go out and to increase social connections.

5.2 Implications for Theory and Research

Paper 1 utilized Socioemotional Selectivity Theory (SST), Intergenerational Solidarity Theory, and the Convoy Model of Social Relations to examine changes in contact frequency

with children following relocation in later life (Antonucci et al., 2014; Bengtson & Robert, 1991; Carstensen, 2021). First, SST argues that older adults' limited time perspective influences their focus on emotionally meaningful engagement such as interaction with children. However, SST does not elaborate on the heterogeneity in social relations in later life caused by situational characteristics such as geographical proximity (Fuller et al., 2020). Unlike SST, which solely focuses on time perspective among older adults, both Intergenerational Solidarity Theory and the Social Convoy Model consider the role of geographical proximity in influencing contact frequency with children (Antonucci et al., 2014; Bengtson & Robert, 1991).

As both Intergenerational Solidarity Theory and the Social Convoy Model were developed before the rapid advances in digital technology such as smartphones, initially, these frameworks did not consider contact frequency via digital contact modes. However, given the increasing number of older adults utilizing communication technology, recent studies have highlighted the importance of incorporating communication technology in measuring intergenerational relations (Antonucci et al., 2017; Peng et al., 2018). Specifically, in the case of Intergenerational Solidarity Theory, to incorporate intergenerational contact via digital technology in the associational dimension of solidarity, Peng et al. (2018) coined the term *digital solidarity*. In the case of the Social Convoy Model of Social Relations, advancements in communication technology and adoption of digital technology among older adults can be considered as a macro level context, and it may influence the nature of social relations such as contact frequency (Antonucci et al., 2017). One of the theoretical contributions of this study is the application of the Intergenerational Solidarity Theory and the Social Convoy Model to examine changes in the level of contact with children via digital contact modes. By

differentiating different types of contact modes, this study provides a nuanced understanding of relocation and contact frequency with children.

It is worth noting that maintaining contact frequency via digital contact modes does not necessarily guarantee that two generations maintain a high-quality relationship or receive support that they need (Antonucci et al., 2017). Findings from recent studies suggest the importance of prioritizing in-person interaction over digital interactions, while evidence on the effects of digital interaction on health outcomes such as mental health and psychological well-being has been mixed (Holt-Lunstad, 2023; Hwang et al., 2023).

Paper 2 examined person-environment fit utilizing the Ecological Theory of Aging as a conceptual framework (Lawton & Simon, 1968; Lawton & Nahemow, 1973). Docility and proactivity are two primary concepts in the Ecological Theory of Aging (Lawton & Simon, 1968; Wahl & Gerstorf, 2020). The docility concept argues that older adults with less competence are easily influenced by their environment. In contrast, the proactivity concept views older adults as individuals who can adjust their environment to improve their person-environment fit. Relying on the docility concept, most previous studies primarily portray older adults as passive individuals who are influenced by their environment (Park et al., 2021). However, older adults can change their environment, for instance, through housing transition. A unique theoretical contribution of this study is the utilization of both docility and proactivity concepts to understand the association between housing transition and psychological well-being in later life.

However, it is worthwhile to note that, according to the Ecological Theory of Aging, both objective and subjective factors need to be considered to measure a person's environment fit (Granbom et al., 2014). While Paper 2 included a subjective factor at the macro level, perceived

neighborhood cohesion, subjective indicators at the micro level such as place attachment and perception of their current housing were not included. Future studies may benefit by incorporating these subjective indicators, in addition to objective indicators, as they may significantly influence older adults' person-environment fit (Granbom et al., 2014; Yong et al., 2011).

In Paper 3, the Social Convoy Model was used to examine the association between homebound status and social isolation. The Social Convoy Model argues that the nature of social relations is influenced by the situational context. As homebound older adults are confined to their housing, they are more likely to have insufficient social connections. To the best of my knowledge, Paper 3 is the first study to examine the association between homebound status and social connectedness utilizing the Social Convoy Model. However, it should be noted that the level of social isolation was assessed based on Berkman and Syme's Social Network Index (SNI) which only measures the objective and quantitative dimensions of social relations (Nicholson et al., 2020; Pohl et al, 2017). As social relations are a multifaceted concept (Antonucci et al., 2014), future studies could examine the extent to which homebound status is also associated with changes in the qualitative and subjective dimensions of social relations. Furthermore, SNI focuses on in-person social interaction, but digital interaction was not considered in the SNI (Nicholson et al., 2020). Future studies could also examine the association between homebound status and social isolation using an index which encompasses both in-person and digital interaction.

5.3 Implication for Social Work Practice

Aging in place is not a feasible option for every older adult. Quite a few older adults experience relocation. On the other hand, even when older adults do not move, they may be

confined to their dwellings in later life. Both relocation and homebound status may have social and psychological well-being implications. Papers 1 and 2 respectively found stability and changes in contact frequency with children and in psychological well-being, following relocation. Lastly, Paper 3 found that homebound older adults are susceptible to experiencing social isolation. Social workers and policymakers may use these findings to promote social connections and psychological well-being in later life to help older adults. In the following section, I will discuss how social workers and policymakers could utilize the findings of this study to help older adults to achieve aging in the right place.

First, one of the key findings of Paper 1 was the different roles played by relocation and proximity on contact frequency with children across various contact modes. On the one hand, the results of Paper 1 show that digital contact modes could assist two generations to maintain their level of contact frequency, overcoming spatial proximity. On the other hand, traditional contact modes (in-person and telephone contact modes) are easily influenced by relocation and proximity to a child. Social workers should be aware of continuity in digital contact frequency and decrease in traditional contact frequency following relocation, because certain support may not be easily available via digital contact modes. For example, if an older adult needs help to clean snow in their yard, children could help older adults to clean their yard when they have in-person meetings. However, such practical support is not available via digital contact modes. Thus, for older adults who report decreases in in-person contact interaction with children, social workers could arrange other in-person social interactions to complement decreased in-person interaction with children. For example, building a new relationship in a neighborhood may compensate for the lack of in-person contact with children.

One of the key findings of Paper 2 is the negative association between non-nursing residential care facility moving and psychological well-being. Previous studies have documented that transition to non-nursing residential care facilities can be a very stressful event concerning well-being, especially, in the short term (Mueller et al., 2023). Building on previous studies (Mueller et al., 2023), the findings of this study suggest that the negative effects of transition to a long-term care facility could last longer. Reduced psychological well-being implies the need for tailored support for long-term care facility movers, and social workers are well-trained to assist older adults through this transition process (Fields et al., 2012; Koenig et al., 2011). For instance, before transition, older adults often experience a decline in health, yet they may be reluctant to move to long-term care facilities (Mueller et al., 2023). Previous studies have shown that providing detailed information about facilities before transitioning to long-term care facilities could help older adults find a good person-environment fit in long-term care facilities (Fields et al., 2012). Thus, social workers could coordinate with older adults to determine if there is a way to address concerns and share detailed information about facilities. Decreased psychological well-being over time suggests the need for ongoing support after transitioning to residential facilities. For example, older adults may experience conflicts with other staff members due to differences in values, such as safety versus freedom (Koenig et al., 2011). If any issue arises, social workers could advocate for older residents' well-being, while ensuring their safety. However, it should be noted that even though social workers could assist transition to long-term care facilities, many long-term care facilities do not employ social workers (Zimmerman et al., 2024).

One of the key findings of Paper 3 is the negative association between homebound status and social isolation over time. While social isolation is a modifiable factor, as homebound older

adults are confined to their dwellings, they may not be aware of resources that could increase their social interaction (Cheng et al., 2022). Social workers could refer homebound older adults to relevant local resources to mitigate social isolation. For example, the Village model is a community-based aging-in-place intervention helping older adults to live independently in their communities (Hou & Cao, 2021). Specifically, the Village model could help homebound older adults to have more social interaction, because this model provides various services, such as friendly visits and transportation services (Szanton et al., 2016). Social workers could also refer homebound older adults to the Meals on Wheels program as the meal delivery service provides an opportunity for homebound older adults to have a short interaction with volunteers (Timonen & O'Dwyer, 2010). Furthermore, recent studies have shown the promise of utilizing technology to promote social interaction among homebound older adults (Choi et al., 2020; Gadbois et al., 2022). However, social workers should be aware that even though technologies provide a new way to promote social interactions, not all older adults have access to a computer or the internet and may lack the knowledge to use such technology (Fields et al., 2021; Perrin, 2021).

5.4 Limitation

Paper 1 focuses on contact frequency with children. However, the structure of the family has diversified, and it is estimated that about 16.5% of older adults aged 50 and over in the U.S. are childless older adults (Valerio et al., 2021). While children tend to be reliable social support for older adults, childless older adults may have other important social relations such as friends, other relatives, or neighbors. Given the increase in childless older adults, future studies are warranted to examine the extent to which relocation is associated with changes in contact frequency with other social relations such as friends, neighbors, and relatives.

In Paper 2**,** guided by the Ecological Theory of Aging as a conceptual framework, relocation is conceptualized as an active strategy to find a better person-environment fit. However, if more detailed information were available, such as older adults' involvement in their move, housing transition status could be examined in subcategories. For example, while older adults who mainly move due to family members' preferences can be categorized as passive movers, older adults who are mainly in charge of their own housing transition can be categorized as active movers. Furthermore, while Paper 2 focuses on the extent to which housing transition is associated with psychological well-being, whether people achieved aging in the right place should be assessed in multiple dimensions. For example, it is possible that while transition to a residential care facility is associated with lower psychological well-being, transition to a residential care facility is associated with better physical health and mental health. Thus, future studies could examine how housing transition is associated with other outcomes.

Findings from Paper 3 show a positive association between homebound status and social isolation. While homebound older adults may be vulnerable to loneliness as well as social isolation, Paper 3 focused on objective social isolation. Thus, future studies could investigate the extent to which homebound older adults are vulnerable to loneliness. Additionally, although homebound status and social isolation are closely related, they are independent risk factors for various negative health outcomes including mortality. Older adults who simultaneously experience homebound status and social isolation could be one of the most vulnerable populations (Fujiwara et al., 2017; Sakurai et al., 2019). Future studies should investigate the joint effect of social isolation and homebound status on health outcomes.

Lastly, there are common limitations that are relevant across the three studies. Specifically, all the papers utilized data collected before Covid 19, and the social and

psychological effects of housing transition and homebound status in later life may have changed after Covid 19. Future studies could examine whether the implications of housing transition and homebound status for social connections and psychological well-being hold after Covid 19.

Despite these limitations, the three papers in this dissertation add knowledge to the existing literature. In summary, the findings of two studies suggest that relocation does not necessarily have negative implications for older adults. Instead, the effects of relocation differ based on contact modes and the unique person-environment fit. As in-person contact mode is the most sensitive to relocation and proximity to a child, complementing reduced in-person contact frequency with children through other types of in-person interaction may help older adults without proximity to a child to achieve aging in the right place. Furthermore, many older adults are not prepared to stay in their current dwellings, and moving to a residential care is inevitable for many older adults. To help non-nursing residential care facilities movers and nursing home movers achieve aging in the right place, housing counseling or relocation intervention can be provided (Bekhet & Zauszniewski, 2016; Nordeström et al., 2023). Lastly, even though homebound older adults stay in their current dwelling, just confining themselves to their dwelling cannot be regarded as aging in place because maintaining social connections is a crucial component of aging in place (Wiles et al., 2012). The barriers to going out should be addressed to promote social connections, and it will help homebound older adults achieve aging in the right place.

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