

# WORKING P A P E R

---

## Age Differences in Daily Social Activities

CHRISTOPHER STEVEN MARCUM

WR-904

December 2011

This paper series made possible by the NIA funded RAND Center for the Study of Aging (P30AG012815) and the NICHD funded RAND Population Research Center (R24HD050906).

This product is part of the RAND Labor and Population working paper series. RAND working papers are intended to share researchers' latest findings and to solicit informal peer review. They have been approved for circulation by RAND Labor and Population but have not been formally edited or peer reviewed. Unless otherwise indicated, working papers can be quoted and cited without permission of the author, provided the source is clearly referred to as a working paper. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors.

RAND® is a registered trademark.



LABOR AND POPULATION

# Age Differences in Daily Social Activities

Christopher Steven Marcum\*

December 1, 2011

## Abstract

The extent to which older and younger people do different activities when they are with others and when they are alone is examined in this paper. I leverage interpersonal data in combination with information on activities from the American Time Use Survey to shed light the long held finding that older people have less social contact than younger people. The results show that, net of intervening factors, age is associated with declines in time spent with others for virtually all types of time use. However, the variety of activities that older and younger people do also differs. Using leisure activities to probe this finding uncovers that, when older people spend time with others it tends to be during activities that are *sui generis* social activities — such as attending parties—but that this is not necessarily the case for younger people. The literature on time use and aging is discussed in light of these findings and a new hypothesis on agency in the life course is proposed.

## 1 Introduction

One of the most vexing questions in social gerontology today is why social behavior among older adults differs from younger adults. More than three decades of research on this topic has led to three consistent findings: older people have smaller networks than younger people (Lang and Baltes, 1997); older people have less diverse, more family-centric networks than younger people (Antonucci and Akiyama, 1987); and older people spend less time

---

\*Department of Economics and Statistics, Rand Corporation; cmarcum@uci.edu

with others than younger people (Carstensen, 2001; Cornwell, 2011; Larson et al., 1985). Put simply, aging is associated with declines in social network size, diversity of relationships, and interaction. Because past studies focused on broad measures of interaction (e.g., weekly contact, number of close confidants, etc) the empirical literature lacks a full understanding of how people engage their personal networks on an everyday basis. In particular, little is known about how time spent doing activities intersects with time spent with other people. In this paper, I advance a new line of inquiry in this area by addressing questions about how various activities differentially shape social contact for younger and older people during daily life.

Feld (1981) argued that the time individuals spend on shared focal activities gives rise to social interaction. Based on this insight, one possible explanation for older people having less social interaction is that they do different activities than younger people. Understanding how older and younger people use their time may illuminate additional sources of structural variation in everyday social behavior over the life course. Older people may spend their time doing activities that are more conducive to being alone while younger people may spend their time doing activities that are conducive to being with others. Using data from the American Time Use Survey, I address the following research questions: 1) Do older and younger people spend their time differently? 2) How does the variety of activities that people do shape time use in the presence and absence of others? 3) Specifically, do older people spend more time on activities that are less social (such as more sleeping and more hygiene activities) and thus less conducive to copresence, or do they simply spend less time with others regardless of the types of activities they do? The answers to these questions provide important clues into why age differences in personal networks exist in general, and specifically why older people spend less time with others during daily living.

In the following sections, I describe the state of knowledge on age differences in copresence (the state of being in the presence of another person) and time use. This is followed with a brief discussion of how the classic psychosocial theories of aging address the problem. Next, I describe the data and methods and report the results. I conclude with a discussion of how the findings fit broadly into the theoretical literature on the social psychology of aging and time use.

## 2 Time Use, Copresence, and Aging

One of the major findings of social gerontology over the last few decades is that older people spend less time active in their personal networks than younger people (Cornwell, 2011; Horgas et al., 1998; Larson, 1990). In the context of time use during daily activities, age differences in what people do when they are together and when they are alone becomes important in understanding why older people spend less time with others than younger people. Because, as Feld (1981) notes, social interaction takes place while people do things together — work, play, go to the doctor, make meals, et cetera — age differences in time use may help to explain why older people spend less time copresent with others than younger people. Recent work by Cornwell (2011) has shown that, net of life course and social structural factors, older people spend more time alone during their daily lives than younger people. One possible explanation for this disparity in “social time” is that older and younger people may spend their time doing different types of activities. Older people may do activities that are more likely done alone (such as private personal care) and younger people may do activities that are more likely to be done with others (such as going out to dinner with friends), resulting in differential chances of being copresent with others during an average day. Here, I will review how older and younger may spend their time differently.

Time use may differ between young and old for a variety of reasons. Structural changes in how aging individuals engage in society, along with changes in biology and the onset of senescence, makes some difference in time use between young and old inevitable. Variation in the performance of tasks in the presence of others along the dimension of age may reflect differences in health, work status, and family structure between younger and older populations. For example, older people may spend less time with others because of the need to do more private personal care activities due to the unique physiology of aging bodies. Younger people tend to live in larger families—with children, and at least another adult present in the home—than older people, who are more likely to live alone or with only a spouse (at least in the US non-institutionalized population). This means older people will tend to have more time to themselves and younger people may find it more difficult to get a free minute alone.

With fewer obligations from work and family, coupled with increased frailty, the older population is simply in a different structural position than

the younger population. Older people are more likely to be widowed and live alone, be retired, and be living on a fixed income (though they also tend to be wealthier than younger people). These life stage differences translate into variance in how older, versus younger, people spend their time. Older people, on average, have more free (leisure) time during retirement (Cowgill and Baulch, 1962), spend greater amounts of time volunteering than most younger age groups (Kaskie et al., 2008; Wilson, 2000), spend less time doing housework (Rexroat and Shehan, 1987; Verbrugge et al., 1996), and have more frequent interruptions to night sleep (Ceolim and Menna-Berreto, 2000; Yoon et al., 2003) which likely leads to more time resting during the day, as Horgas et al. (1998) find. Working age people, on the other hand, tend to eat out more (Presser, 1999), spend more time at work and in school (Keller, 2001; Nyce, 2007), and take fewer daytime naps (Buysse et al., 1992), than their older compatriots. These differences in how older versus younger people spend their time, then, may explain why being copresent with others also differs by age.

Copresence is an important part of daily life. Being in the company of others facilitates exchange between individuals (Homans, 1950) and provides comfort and support. Companionship is known to be supportive of well-being, especially among the elderly (Rook, 1987). It is common knowledge that social relationships take time to develop and time to maintain and that older individuals are more likely to spend time with close kin and long-time friends (Kahn and Antonucci, 1980). However, recent studies on the role of peripheral relationships in older people's personal networks (Fingerman, 2009; Morgan et al., 1997; Shaw et al., 2007) have shown that contact with a variety of close and not-so-close others is important for maintaining well-being. Independent studies by Findlay (2003) and Cattan et al. (2005) have shown that even occasionally spending time in groups of otherwise peripheral ties improves well-being among isolated and lonely elders. In general, while the types of people that older versus younger people come into contact with may vary, older people spend less time copresent with others than younger people.

Studying copresence during daily life helps to shed light on the availability of others to provide immediate support if needed (as well as, potentially, to understand sources of interpersonal conflict). Further, by examining what activities people do together and do alone during their day-to-day lives, we obtain an intimate perspective on what Goffman (1959) might consider front and back stage activities, or what Zerubavel (1979) considers public and pri-

vate time use, which is the stuff of classical sociological inquiry. As people age, the contrast between the front and back stages may become less sharp because older people are at once a population that is more isolated—obscuring front stage activities—and a population that is more dependent—exposing back stage activities.

Most people find themselves alone for at least short periods every day (Larson and Csikszentmihalyi, 1978; Larson et al., 2001). Alone time has important mental and social benefits to people as it can offer relief from social overload and a chance to retract from social pressures. Again in Goffman's terms, when other people are present, individuals are constrained to perform their on stage roles (Goffman, 1959; 1971; Larson, 1990). When alone, people are less influenced by social norms and can engage in back stage behavior. While being alone may be desirable in many circumstances, too much social isolation is regarded as a risk factor for many negative health, social, and financial outcomes as documented in the work of gerontologist James House and his colleagues (House, 2001; House et al., 1988a;b).

Much of the literature on aging and activities focuses on age differences in the amount of time budgeted to active leisure (e.g., exercise) and/or passive leisure (e.g., reading). Leisure activities are vital in the maintenance of both physical health and social well-being. The free time that older people gain through retirement is largely allocated to passive leisure (Gauthier and Smeeding, 2003; Verbrugge et al., 1996). Evidence from the longitudinal Americans' Changing Lives Study shows that exercising for leisure declines early during adulthood and continues declining through old-age (Shaw et al., 2010). Because leisure activities are often more fun and rewarding when they are done with others (Kleemeier, 1961; Lemon et al., 1972), it is important to understand whether the differences between young and old in their respective leisure activities results in less time spent with others. Horgas et al. (1998) found that older adults (ages 70 to 105 in both independent and assisted living arrangements) spend a significant amount of time doing leisure activities during their daily lives. However, they also found that there was no association between age and the amount of time spent in contact with other people—suggesting that after age 70 the negative association between spending time with others and age disappears.

Some aspects of time use do not change with age, especially those aspects that are related to interaction with, and dependence upon, other individuals and institutions. In a diurnal society, for example, people tend to follow a work-by-day sleep-by-night pattern of everyday life (Presser, 2003; Red-

mond, 1988). We wake in the morning, perform hygienic routines, eat, and go about our days until we go to sleep sometime after dusk. While there may be variability in the types of activities we do throughout the day, the social structure (and to some extent survival) implores us to do them regardless of whether we are young or old. At various points in life people may rely on others to help us perform some tasks, as described in the vast literature on obligatory activities of daily living (Moss and Lawton, 1982). It is unlikely that older people would abandon the social and cultural organization of time in everyday routines after a lifetime of exposure to them. In general, dependence on others and on institutions provides a reasonably equitable constraint on time use for the young and old alike.

In summary, with the recent widespread availability of large-scale data on time use, scholars of aging across disciplines have been able to shed light on how people’s daily activities differ and change over the life course (Baltes and Mayer, 2001; Gauthier and Smeeding, 2003; Kaskie et al., 2008; Mullahy and Robert, 2010; Robinson and Godbey, 1997; Shaw et al., 2010). These time use studies have been invaluable in uncovering psychological and sociological sources of variation in the amount of time people spend accessing their interpersonal networks. Congruently, how gerontologists think about interpersonal networks has shifted away from broad measurement in frequency of contact to real-time connections between people during everyday life (Cornwell, 2011; Oerlemans et al., 2011). Despite these advances, how time use intersects with daily social life remains an open question. This paper bridges two rich lines of research on aging—the study of time use and daily social contact—to shed light on how older versus younger people spend their time with others and alone.

## **2.1 What do classic theories of aging predict?**

The four classic psychosocial theories of aging (Disengagement, Activity, Continuity, and Selectivity) are, at a very basic level, about differences in how people spend their time over the life span. Despite each of these theories having a social structural component, the major works in this area have emphasized the psychological components. My contribution is to explore how the social structural aspects of these theories contributes to age differences in time use.

Disengagement theory emphasizes how the aged have exhausted their functional capacity in society (Cumming and Henry, 1961). Those lost func-

tions, of course, involved modifications to how the elderly spend their time as mainly from production promoting activities to leisure activities. Behavioral change under disengagement theory arises as individuals recognize their own limitations and as society prescribes cohort replacement in the workforce. Thus, disengagement theory reflects the long-held sociological view that the age-grading of society (particularly of the social institutions of school and work) shapes changes in social behavior as people age (Foner, 1975; Parsons, 1942).

Activity theory—which implies time use in its name—, as an alternative to disengagement, maintains that individuals find life satisfaction in the types of activities they do in the face of changes in roles over the life course (Lemon et al., 1972). Time use changes with age under activity theory, but the personal and social utility of doing various activities does not, suggesting that older people will choose to spend their time doing socially rewarding activities such as leisure with other people.

Continuity theory, as a foil to disengagement and an expansion of activity theory, makes a stronger statement about the role of time use in aging individuals lives than either disengagement or activity theories. Under continuity theory, individuals maintain the types of activities they do as they age (Atchley, 1989). This theory was motivated by the observation that many people demonstrate remarkable consistency in time use and interpersonal relationships over their life course. Continuity theory postulates that as social roles change with age, individuals seek to maintain continuity in their lives by doing the things they've always done and engaging in social interaction with the people they've known the longest (i.e., lifelong friends and family members). The ways in which people spend time with others, net of differences in life course factors associated with role differences between the young and old like marital and employment statuses, are expected to be similar across age-groups.

One of the main issues with disengagement, activity, and continuity theories is that they assume that aging is a relatively invariant experience. However, one of the most important sociological contributions to gerontology in the last 40 years has been Dannefer's (1987) observation that aging is not experienced uniformly, but, in fact, is characterized by increasing heterogeneity in the population. This is the perspective taken by a range of social psychologists whose recent ideas about aging are classified under selectivity theory (Baltes and Baltes, 1990; Frederickson and Carstensen, 1990; Heckhausen and Schulz, 1995). One of the key selectivity theories of aging acknowledging

that older people are a diverse population is presented by Baltes and Baltes (1990) as a “Model of Selective Optimization with Compensation.” Under this theory, aging is presumed to be a process of adaptation to changes in resources (the authors mainly describe cognitive resources, but the theory is general). Depending on individual circumstances, older people will choose to engage in activities that first of all optimize their ability, and secondly that compensate for activities they can no longer do. Older people may not run marathon due to the increased frailty of their bodies, but they might go for a brisk walk through the neighborhood, as a substitute for running.<sup>1</sup> Social behavior, under selectivity theory, changes by the same mechanism. Because of resource losses that give rise to sleeping more, and spending more time doing personal care activities, for example, older people may choose to budget the time they spend with others on specific activities: perhaps substituting time they would have spent going dancing earlier in life with just having company while (and perhaps getting help with) doing household chores.

The psychosocial theories of aging offer the following hypotheses about the relationship between age, copresence, and time use. From disengagement theory, we expect older people to spend more time doing leisure activities than younger people but less time with others overall. That is, we expect a negative relationship between age and time spent with others irrespective of the type of activity being done. Activity theory predicts that older people will do different activities than younger people, with more time budgeted for leisure. The relationship between age and time spent doing these leisure activities with others, under activity theory, is hypothesized to be positive. Continuity theory predicts that older and younger people will not spend their time differently with respect to either activities or copresence. Finally, selectivity theory predicts that the overall amount of social time may not necessarily decline with age, but that the activities that older people do when they are with others will be different from the activities that younger people do with others present. Importantly, these hypotheses are posited net of the social structural factors that differentially constrain the availability of others for younger and older people—such as age differences in marital status, employment status, household composition, et cetera—that are known to account for at least 40% of the variance in spending time with

---

<sup>1</sup>There are a few elderly marathon runners, like Centenarian Briton Fauja Singha (born April, 1, 1911), who became the world’s oldest person to complete a marathon on October 16, 2011 at the Toronto Waterfront Marathon. He is also the world record holder for fastest time running a marathon by a competitor over the age of 90.

others (Cornwell, 2011; Marcum, 2010).

### 3 Data & Methods

The data come from the pooled annual 2003 to 2008 American Time Use Survey (ATUS).<sup>2</sup> The ATUS records the types of activities respondents do on a single day in their lives. It collects information on the time spent doing these various activities, who is present during the activity, and whether the activity is done at home or abroad. This dataset is ideally suited for studying the intersection between time use and copresence during the daily lives of the US population because it captures both the types of activities people do and when individuals are alone and with other people.

The ATUS sample is a national probability subsample of the monthly longitudinal U.S. Census Current Population Study (CPS) conducted annually since 2003. The target population of the ATUS is the housed non-institutionalized U.S. population aged 15 and older. Much of the richness of this data is derived from the fact that respondents are linked to many sociodemographic variables on the CPS. A random person is selected from a household completing its eighth and final CPS interview. Respondents receive a \$40 incentive for participation and are twice mailed an advance notice informing them of their diary day and subsequent telephone interview; instructions for the diary day are included in the advance mailer. People living in households without telephones or cellphones are asked to call the survey administrators (toll-free) on their interview day. Non-contact follow-ups are conducted up to eight consecutive days from a respondent's diary day. The sample size of the pooled ATUS is 85,645 (57% female) who do a collective 1.70 million activity spells.

ATUS data are collected by computer-assisted telephone interviews the day following the time use diary day. The ATUS diary days are distributed across the days of the week with 10% of respondents allocated to each day from Monday through Friday and 25% of respondents allocated evenly to each weekend day. Weeks of the year are equally represented on the ATUS.<sup>3</sup> While there were efforts to capture respondents on Federal holidays it was not always possible due to variability of survey administration policy. In

---

<sup>2</sup>The technical details of the sample design and the survey methodology can be found in *American Time Use Survey User's Guide : Understanding ATUS 2003-2008 (U.S. Census Bureau, 2009)*.

2003, data were not collected about Thanksgiving Day or Christmas Day; in 2004 and 2005, data were not collected about Thanksgiving Day; in 2007, data were not collected about New Year’s Day; and in 2008, data were not collected about Christmas Day. To account for uneven sampling probabilities across days, all multivariate analyses are done using sampling weights.

### **3.1 Data Limitations**

The ATUS survey design limited collecting information about the presence of others to all activities except sleeping, certain personal activities (such as ‘using the bathroom’ and ‘massage’), and working activities. Obviously, the amount of time spent with others doing these “exempt” activities is suppressed in my analysis. This will tend to bias estimates of social time downward because, in reality, there is at least a minor chance of others being present during the exempt activities. However, unlike prior work on this topic, these activities are accounted for in the multivariate analysis through sufficient statistics, as explained below in the analysis section. Finally, since the ATUS survey design defines “copresence” as physical copresence, certain communication activities where others are virtually present (such as communication over a phone or an online chat) will lack information on the virtually present others. This limitation will result in lower estimates of social time for these activities, though the effects will be small as less than 5% of such activities suffer from these reporting errors.

One of the other limitations is that this data reflects age differences from a fixed point in time, rather than from following a cohort of individuals throughout their adult lives. There is evidence from the Baltimore Longitudinal Study of Aging, however, that suggests age differences in time use are not as susceptible to cohort processes as other research topics. Verbrugge et al.’s (1996) conclusion that the age structure of activities has persisted from at least 1958 to 1992 discounts the limitations of cross-sectional research in this area. This lends credibility to the generalizability of the current study to the process of aging itself and not simply to momentary age differences in the population.

### **3.2 Analyses**

The dependent variable in this study is amount of time measured in minutes. The analysis begins with a simple test of the hypothesis that age differen-

tiates time budgets with respect to the amount of time individuals spend doing the following activities: caregiving, communication, eating, education, household labor, leisure, personal care, private personal care, sleeping, travel, volunteering, waiting, and work production. I aggregate the data by ten-year age groups (top-coded at 75+) and compute the mean proportion of time spent doing each of the thirteen types of activity. I also employ a simple Tobit regression model of the proportion of time spent doing each activity on age as a statistical test of the relationship between age and time use. Given that there is significant variation in time budgets along age, I then move onto a multivariate analysis of how the presence of other people during time use factors into the problem.

For the multivariate analysis, I use a Bayesian multinomial probit (MNP) regression model to test the hypothesis that the share of individual time budgets doing particular activities in the presence of others declines with age, net of other factors. This approach is similar to that taken by Mullahy and Robert (2010) in their analysis of the ATUS data. The MNP model facilitates fractional regression of the amount of time done in each type of activity given all other time use on a set of explanatory variables. Alternative analytic approaches, such as the multivariate Tobit, multivariate normal, and some Dirichlet-based regression methods are not ideal for this data because they produce estimates that are not robust against the  $y_{ij} = 0$  (no minutes  $[y]$  doing a particular activity  $[j]$  by individuals  $[i]$ ) phenomenon that is very common in the ATUS activity data. To account for the variation in activities and copresence stemming from social and demographic characteristics, I control for these factors in addition to age: marital status (ref=married, spouse present), employment status (ref=employed full time), gender (ref=male), race (ref=white only), ethnicity (ref=non-Hispanic), income, education, number of children, household size, housing tenure, day of the week (ref=Sunday), and holiday (ref=non-holiday).

The total amount of time spent doing each non-work, non-sleeping, non-private personal care activity is divided into two types of time use: activities done in the presence of others and activities done alone. These are combined with a third type, “all other time use,” which is simply the balance of time use and serves as the reference activity. For example, an individual has 1440 minutes to spare on her diary day. If she spent 30 minutes of leisure time in the presence of others and 60 minutes of leisure alone, her reference time use would be 1350 ( $1440 - [30 + 60]$ ). Thus, each regression consists of a 3 column matrix of dependent variables on age and other explanatory variables. The

two quantities of interest (the logit of time spent with others and alone, and the proportion of time spent with others) are drawn from the posterior predictive distribution of the model for each age-group and represent the average age-specific time-budget for a particular type of activity with and without others present given all other time use and net of explanatory factors. The model is outlined in detail in Imai and Van Dyk (2005), but takes the following form:

For each of the ten valid activities where copresence is observed, let there be three dependent variable categories ( $j$ ). The regressions for  $k = 1, \dots, j$  are,

$$\begin{aligned} Pr(y_i = k) &= \frac{\exp(X_i\beta_k)}{1 + \sum_{j=1}^j \exp(X_i\beta_k)}, \\ Pr(y_i = 0) &= \frac{1}{1 + \sum_{j=1}^j \exp(X_i\beta_k)}, \end{aligned} \tag{1}$$

which ensures the adding-up assumption of the model,

where  $y_i$  is the observed proportion of time use in the dependent variable for the  $i^{th}$  respondent,  $X_i$  is a vector of the  $i^{th}$  respondents independent variables, and  $\beta_j$  is a vector of the regression coefficients from  $j^{th}$  regression. Estimation is done via Bayesian maximum a posteriori methods with a standard normal prior using the `MCMCpack` and `VGAM` packages for R.

## 4 Results

Table 1 reports the mean proportion of time spent doing each type of activity during the diary day by age group in the American Time Use Survey data. Standardized regression age coefficients from Tobit regressions of the number of minutes spent doing each activity on age (numeric) are also reported. This tests for a linear relationship between age and time spent doing each activity, adjusted for the range of the data (i.e., between 0 and 2880). The table shows evidence of significant variation in how older and younger people spend their time. Older people spend less time than their younger counterparts doing the following activities: communication, education, personal care, sleeping, and travel. These are traded for more time spent: eating, doing housework, leisure activities, private personal care activities, and waiting. The small, non-significant, linear effect of age on time spent in work production is the

result of an apparent curvilinear ( $\cap$ -shaped) relationship between age and work time.

Table 1: Proportion of Time Spent Doing Select Activities By Age Group

	Age Group							<i>Z</i>	<i>Sig.</i> <sup>†</sup>
	(15–24)	(25–34)	(35–44)	(45–54)	(55–64)	(65–74)	(75+)		
Caregiving	0.0103	0.0262	0.0178	0.0077	0.0066	0.0050	0.0037	-1.4112	
Communication	0.0428	0.0370	0.0364	0.0348	0.0360	0.0394	0.0388	-8.3607	***
Eating	0.0335	0.0410	0.0419	0.0421	0.0456	0.0495	0.0515	34.3652	***
Education	0.0532	0.0076	0.0039	0.0028	0.0015	0.0011	0.0010	-26.4640	***
Household Labor	0.0514	0.0919	0.1032	0.1029	0.1069	0.1084	0.0980	27.6381	***
Leisure	0.1730	0.1526	0.1538	0.1703	0.2058	0.2524	0.2788	66.4713	***
Personal Care	0.0019	0.0030	0.0041	0.0068	0.0077	0.0095	0.0108	-3.0425	**
Private personal care	0.0272	0.0243	0.0250	0.0260	0.0264	0.0250	0.0260	6.7894	***
Sleeping	0.4757	0.4323	0.4176	0.4133	0.4193	0.4359	0.4494	-30.3395	***
Travel	0.0488	0.0516	0.0533	0.0502	0.0456	0.0386	0.0284	-11.8796	***
Volunteering	0.0031	0.0028	0.0047	0.0042	0.0037	0.0038	0.0042	-0.1794	
Waiting	0.0015	0.0017	0.0020	0.0019	0.0020	0.0022	0.0018	6.9577	***
Work Production	0.0775	0.1279	0.1363	0.1369	0.0929	0.0292	0.0076	0.6337	

Data come from the pooled 2003–2008 American Time Use Survey. *Z*-scores and significance stars based on Tobit regressions of each dependent variable on linear age variable. † Significance codes:  $Pr(> |Z|) = \dots$  0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05. Gray bar used for emphasis of Leisure Time row.

The leisure row is highlighted on this table to bring attention to the effects for that activity. The most substantial difference in time use between young and old is in leisure activities, both relatively as a proportion of time use and absolutely in minutes (in terms of the size of the standardized coefficient [66.47]). Older people spend more time doing leisure activities than younger people. The difference between youngest and oldest groups is equivalent to 2.6 hours, or roughly 15% of hours awake, during the diary day. These results are consistent with the hypothesis that older people spend their time differently than younger people, albeit in *specialized* ways. That is, older people generally tend to substitute doing certain activities for more time to do leisure in their daily time budgets—or that they spend less time doing other activities and, thus, increase the share of time spent doing leisure.

Given this, I now turn to the question of whether or not the age difference in time use accounts for the age difference in time spent with others. That is, do older people spend less time with others, irrespective of the types of activities done, or do they tend to decrease the amount of time they spend with others during particular activities? To address this question, I follow Mullahy and Robert’s (2010) analytic approach to modeling similar time use data with the continuous generalization of multinomial regression. This analysis compares the amount of time spent doing each activity in the presence and absence of others, relative to all other time use. I specifically focus on the effect of age, net of other factors.

Table 2 reports the predicted logits comparing the amount of time spent doing select activities in the presence of others to doing those activities alone from the multinomial probit regression model. For brevity, the results have been grouped by ten year age intervals, *post hoc*. The standardized difference between the linear age coefficients ( $Z$ ) are also reported ( $\frac{dF_{others}}{dx_{others}} - \frac{dF_{alone}}{dx_{alone}}$ ). Positive values indicate a greater share of time doing a particular activity in the presence of others by individuals falling in each age-group. In the same way, negative values indicate a greater share of time doing a particular activity alone. The Z-scores show the relative magnitude of the age effects. All controls are accounted for in this model. Figure 1 expresses the results reported in Table 2 as the predicted proportion of time spent with others while doing each activity and expands them across the entire age spectrum in the data. For clarity, this is not the percent of time spent doing each activity, rather it is the percent of time spent with others during each activity. With few exceptions, younger people spend a greater share of their time doing non-sleeping, non-working, non-private care activities in the presence of others

than older people. This is true for activities that, on average, are more social across the age spectrum (such as caregiving and communication) as well as for activities that are more likely to be done alone (such as personal care activities). Activities that demonstrate the strongest negative association between age and share of time spent with others are Leisure activities ( $Z = -26.464^{***}$ ), suggesting that, despite a positive association between age and the percent of total time spent doing leisure, less of that share is spent with others and more is spent alone by the aged. The results for educational activities have to be taken lightly because there are very few older people who spend *any* time doing them (see Table 1). Given that, we might expect educational activities to become more social with age as older people are more likely to be investing in self-actualization and doing educational activities to become more socially involved and less likely to be doing educational activities for career development and human capital development (as younger people) (Lang and Carstensen, 2002; Wilson and Simson, 2003).

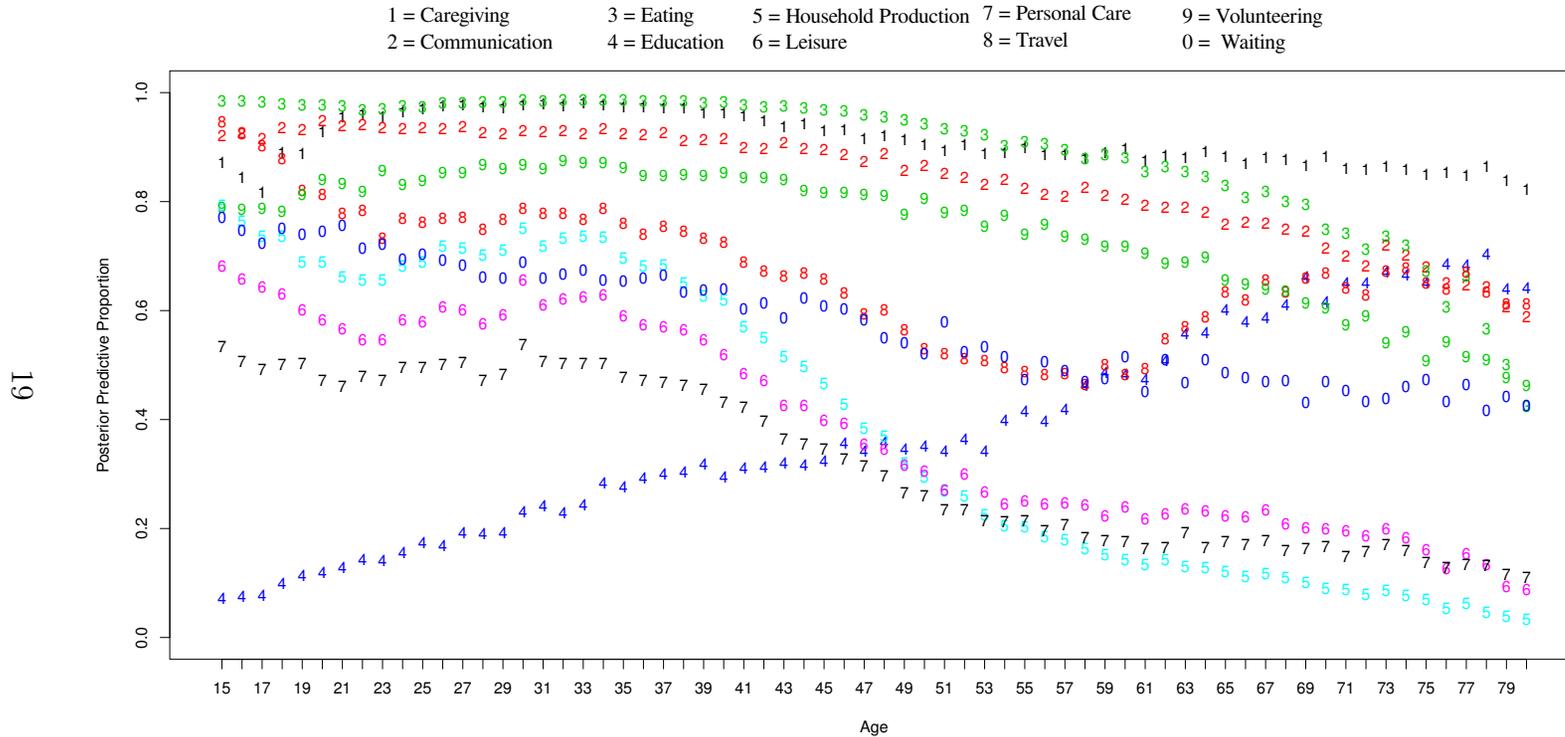
Table 2: Mean Posterior Predicted Logits of Time Spent Doing Select Activities With Others Compared with Doing Select Activities Alone by Age Group

	Age Group							<i>Z</i>	<i>Sig.</i> <sup>†</sup>
	(15–24)	(25–34)	(35–44)	(45–54)	(55–64)	(65–74)	(75+)		
Caregiving	2.6225	3.7484	3.1510	2.2815	2.0481	1.8816	1.6222	-5.9413	***
Communication	2.6305	2.5784	2.2972	1.7920	1.3779	0.9582	0.4329	-7.1277	***
Eating	3.8256	4.1678	3.8357	2.7766	1.9235	1.1509	-0.0102	-6.9978	***
Education	-2.2058	-1.2659	-0.8028	-0.5765	-0.0710	0.5380	0.6546	3.2532	**
Household Labor	0.8840	0.9565	0.3557	-0.8609	-1.7433	-2.2707	-3.1773	-15.6964	***
Leisure	0.4675	0.4531	-0.0557	-0.8478	-1.2015	-1.4142	-2.1983	-26.8279	***
Personal Care	-0.0186	-0.0048	-0.3600	-1.0717	-1.5173	-1.6507	-2.0215	-3.2744	**
Travel	1.6066	1.2205	0.8734	0.1929	0.0634	0.6169	0.5144	-11.1182	***
Volunteering	1.4822	1.8601	1.6700	1.3104	0.9118	0.3827	-0.0632	-3.3507	**
Waiting	1.0259	0.7052	0.5212	0.1805	-0.0455	-0.1671	-0.2757	-5.0934	***

Data come from the pooled 2003–2008 American Time Use Survey. Logits represent the mean of the posterior predictive distribution of the multinomial probit regression model comparing the amount of time doing select activities with others and doing select activities alone to all other time use. The estimates are net of marital status, employment status, gender, race, ethnicity, income, education, number of children, household size, housing tenure, day of the week, and holiday. Age-groups are aggregated post-hoc. Z-scores represent the standardized difference in the linear age coefficients. † Significance codes:  $Pr(> |Z|) = \dots$  0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05.

Why, even after controlling for intervening factors, is there a negative relationship between age and spending time with others? To shed light on this question, I return to the data, using leisure activities as an example. Since older people spend more time doing leisure activities than younger people but spend less time copresent with others, they may be doing fewer leisure tasks that are conducive to copresence. This would be consistent with social withdrawal and disengagement theories of aging. Alternatively, older people may do the same types of leisure activities that younger people do but have fewer people around to do them with, which would be consistent with continuity and activity theories of aging. Or, a combination of differences in leisure activities and simply spending more time alone may be at play. Table 3 reports the detailed description from the ATUS documentation for the top ten leisure activities for each age group, representing 92% of the total amount of time spent doing leisure by the sample.

Figure 1: Posterior Predicted Proportion of Time Spent Doing Select Activities in the Presence of Others By Age



Data come from the pooled 2003–2008 American Time Use Survey. Values represent the mean proportions from the posterior predictive distribution of the multinomial regression model comparing the amount of time doing select activities with others and doing select activities alone to all other time use. The estimates are net of marital status, employment status, gender, race, ethnicity, income, education, number of children, household size, housing tenure, day of the week, and holiday.

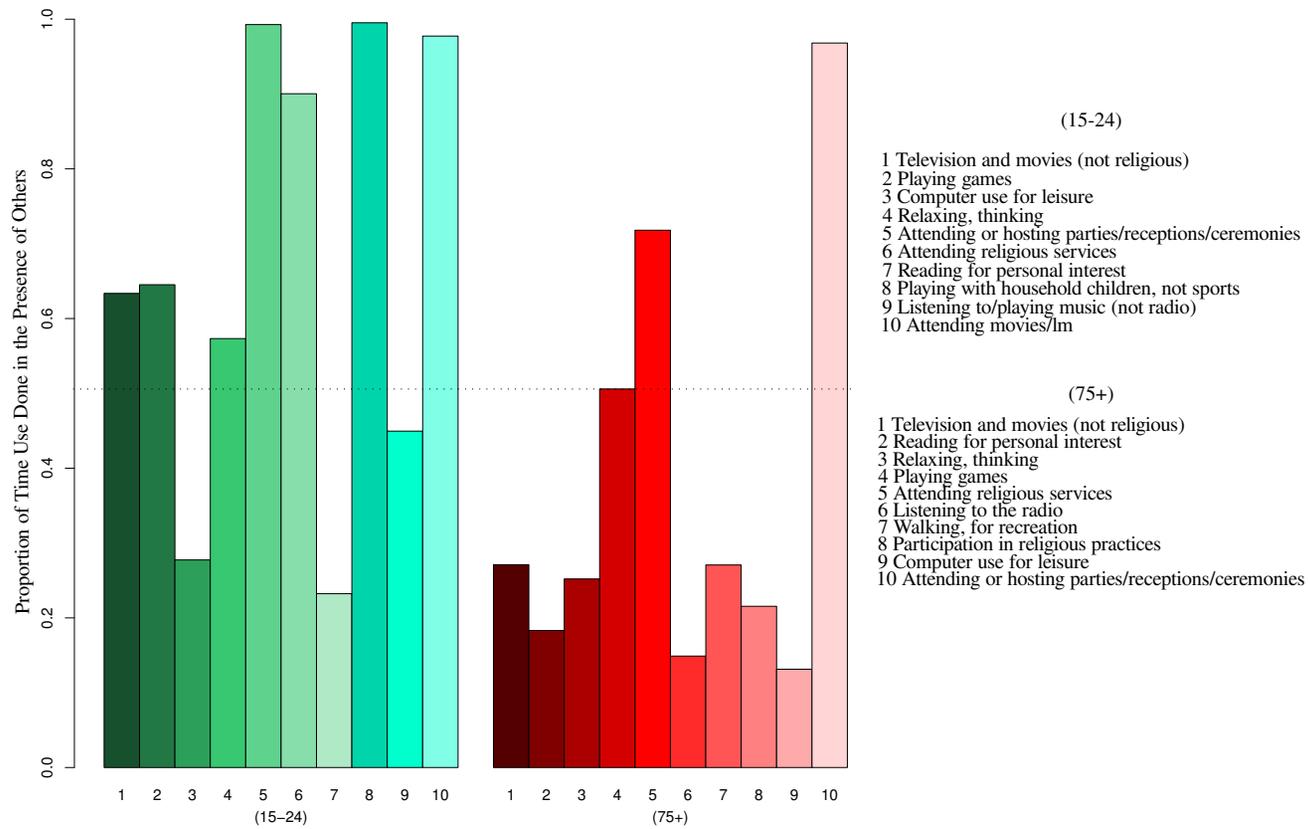
While the top activity (television watching) is the same for each age-group, less common leisure activities vary by age-group. Figure 2 contrasts the two most extreme age-groups (aged 15-25 and aged 75+). This figure expresses the proportion of time spent doing each age-specific leisure activity with others versus alone from the raw data, rank ordered by person-hours. The dotted line at  $y = 0.50$  reflects unity in leisure time spent with others and alone. For the older group, only three of the top-ten activities are done in the presence of others more than 50% of the time. These include activities that are inherently social, playing games, going to church, and attending parties. The younger group, on the other hand, spends nearly all of their leisure time in the presence of others. The exceptions for the younger group include activities that are not necessarily conducive to being around other people, such as playing on a computer, reading, and listening to music. In summary, older people tend to be with others more often than not during leisure activities that are *sui generis* social activities and tend to spend the balance of their leisure time alone, while younger people are more likely to be around others without regard to activity type.

Table 3: Top Ten Leisure Activities By Age Group

(15-24)		(25-34)	
1	Television and movies (not religious)	1	Television and movies (not religious)
2	Playing games	2	Playing with household children, not sports
3	Computer use for leisure	3	Relaxing, thinking
4	Relaxing, thinking	4	Reading for personal interest
5	Attending or hosting parties/receptions/ceremonies	5	Attending or hosting parties/receptions/ceremonies
6	Attending religious services	6	Playing games
7	Reading for personal interest	7	Attending religious services
8	Playing with household children, not sports	8	Computer use for leisure
9	Listening to/playing music (not radio)	9	Other relaxing and leisure.
10	Attending movies/film	10	Attending household children's events
(35-44)		(45-54)	
1	Television and movies (not religious)	1	Television and movies (not religious)
2	Reading for personal interest	2	Reading for personal interest
3	Relaxing, thinking	3	Relaxing, thinking
4	Playing with household children, not sports	4	Attending religious services
5	Attending religious services	5	Computer use for leisure
6	Computer use for leisure	6	Attending or hosting parties/receptions/ceremonies
7	Attending or hosting parties/receptions/ceremonies	7	Playing games
8	Playing games	8	Walking, for recreation
9	Attending household children's events	9	Playing with household children, not sports
10	Attending movies/film	10	Other relaxing and leisure.
(55-64)		(65-74)	
1	Television and movies (not religious)	1	Television and movies (not religious)
2	Reading for personal interest	2	Reading for personal interest
3	Relaxing, thinking	3	Relaxing, thinking
4	Attending religious services	4	Attending religious services
5	Playing games	5	Playing games
6	Computer use for leisure	6	Computer use for leisure
7	Attending or hosting parties/receptions/ceremonies	7	Walking, for recreation
8	Walking, for recreation	8	Attending or hosting parties/receptions/ceremonies
9	Playing with non-household children, not sports	9	Participation in religious practices
10	Participation in religious practices	10	Listening to the radio
(75+)			
1	Television and movies (not religious)		
2	Reading for personal interest		
3	Relaxing, thinking		
4	Playing games		
5	Attending religious services		
6	Listening to the radio		
7	Walking, for recreation		
8	Participation in religious practices		
9	Computer use for leisure		
10	Attending or hosting parties/receptions/ceremonies		

Descriptions come from the American Time Use Survey 2003–2008 activity lexicon documentation. Order is determined by the rank of the person-minutes spent doing each activity (1=most time).

Figure 2: Proportion of Top Ten Age Specific Leisure Activities Done in the Presence of Others, Comparing the Youngest and Oldest Age Groups



Data come from the pooled 2003–2008 American Time Use Survey. Each set of bars is rank ordered by the total amount of time (in person-hours) spent doing each type of activity. Activity labels correspond to Table 1.

## 5 Discussion & Conclusion

In this paper, I analyzed the intersection between time use and copresence in the daily lives of older and younger Americans. This work has advanced our understanding of a principal problem in contemporary social gerontology: why older people spend less time in contact with others than younger people. In this discussion, I review the primary findings and reflect upon how they fit into the broader literature on age and social life. I conclude by proposing a new “life course respite” hypothesis that states that the negative relationship between age and time spent with others reflects greater flexibility in how older versus younger people can spend their time.

The results suggest that older people tend to spend less time with others than younger people, irrespective of what type of activities they are doing. At first glance, these results are tentatively consistent with theories of aging that emphasize withdrawal from, rather than continuity or expansion of, social activities. At the same time, the results support the idea that older people and younger people do different activities—which would support theories of aging as a process of activity substitution such as Baltes and Baltes’s (1990) selective optimization with compensation model.

However, the results also show a clear negative association between age and spending time with others, virtually irrespective of the type of activity (educational activities excepted). That is, despite older people having more freely disposal time—especially leisure time—they are more likely to spend that time alone. These results are net of the social structural factors that mediate age differences in copresence through availability of alters. The negative effect of age on spending time alone in most activities persists even after controlling for marital status, employment status, and household composition (among other things). *Ceteris paribus*, then, activity type is not protective against declines in social interaction among the aged. Age differences in time use appear to be independent of age differences in copresence. Interestingly, the focal analysis on leisure activities shows that older people tend to spend time with others doing leisure when the type of activity is inherently social (such as going to church or attending a party) while younger people tend to do leisure activities with other people present whether or not the activities are necessarily social. One interpretation of this result is that older people are more free than younger people to spend time alone—another interpretation is that older people are left out of the fun because they have fewer people around due to their living situation. Further research is needed

to discriminate between these possibilities.

The findings presented here are relevant for the broader literature on aging and spending time alone. Time spent alone plays an important role in shaping social life for older and younger people. Typically, scholarship has treated being alone as a risk factor for health problems because it reduces the chances having a companion during an emergency or to monitor well-being—especially for the elderly. Larson’s (1990) research suggests that the amount of time individuals spend alone during an average day increases from infancy through old age. His findings from time-diary studies indicate that solitude is associated with depression in adolescence more than it is in middle-adulthood and old age. That is, from adulthood through old age, spending time alone becomes a larger part of people’s days but is less associated with depressive symptoms. This suggests that being alone has different implications at different life stages. Larson and his colleagues argue that teenagers are faced with the challenge of spending enough time alone to improve self-image and seek respite from enormous social pressure (not less finish their homework), but not spend more time alone than they desire, which may reinforce negative self-images and lower self-esteem. By contrast, middle-age adults typically face many time pressures from family and work responsibilities, meaning that they may not have as much time alone as they would like (and indeed value) (Bryant and Zick, 1996; Presser, 2003). Perhaps, then, being more free from those pressures allows older people to do non-social leisure. On the flip side, younger people’s greater social leisure time may more aptly reflect their greater obligations to others and the omnipresence of other people in their daily lives than their higher propensity to, say, throw a dinner party. This is echoed by Thompson and Streib (1961), in their early study of how differences in older versus younger people’s family structures shape time use. They write:

In the earlier years [of adulthood] the use of much leisure time clearly is structured and constrained by family roles. Generally speaking, parents are obliged to spend a certain portion of their leisure time with their children; also there is always a certain amount of pressure on the parent to engage in those activities which express linkages between family and community—activities associated with scouting, PTA, and the like...[these] familial obligations decline in number in the later stages of the family cycle. Accordingly, it may be that family setting in this sense becomes

a less strong or less useful explanatory variable in the later years.

(Kleemeier, 1961, pg. 204).

This possibility has some empirical backing outside the family too, and the underlying causes may have to do with older people regaining a sense of independence in the face of biological and structural changes that make it more difficult to control when they are with people during other aspects of their lives. Lang and Baltes (1997) found that less social contact was associated with perceptions of greater autonomy (independence) for the very old (ages 85 and over). This was not the case for the young-old (i.e., ages 65-84), whose perceptions of autonomy are not associated with social contact. They conclude that being alone for very old people is a compensatory mechanism that allows them to maintain autonomy, while spending some time with others helps them to fulfill daily activities. Comparably, Herzog et al. (1998) show that doing leisure activities is associated with personality traits that promote individualism but not associated with a sense of social belonging among the elderly. This is contrasted against the young, whose leisure time is associated with greater social belonging in personality traits. Based on this research it is plausible that, net of other factors, older people do more television watching, reading, and reflecting alone (the top three leisure activities for people 75 and older), as a respite from a time in the life course when doing leisure alone was not as viable.

In conclusion, this paper has problematized variation in time-budgets as a possible factor in the process by which age differences in personal networks arise. Older people spend their time differently than their younger counterparts. In the focal case of leisure activities, this results in less propensity to be with others, as older people spend less time doing social leisure activities and younger people are more likely overall to be copresent. Older people have less access to their personal networks than younger people and thus fewer opportunities to involve others, particularly in their leisure time. Fewer structured opportunities to meet up for dinner and drinks after work or school, for example, means that older people either have to arrange meet-ups on their own or wait for visitors to come to them. However, getting together with their, most likely same-aged (Fischer, 1982; McPherson et al., 2001), friends to do leisure with may be more difficult for older people who have peers that are less ambulatory than their younger counterparts. The problem is magnified by the fact that older people are more likely to live alone. Even if elders do not live alone they may be less likely than younger age

groups to have similar-aged housemates (sibling, friend, spouse) who would be interested in the same leisure activities. In sum, older people have social structural positions that cause them to be alone more often. In the results presented here, I have attempted to control for many sources variation arising from differences in these social structural factors. The residual effect of age on time use highlights that some underlying process related to aging gives rise to spending less time with others during most daily activities net of the effect of the social structure. While plausible explanations stemming from the gerontological literature on time use claim that changes in personality, a sense of autonomy, and personal preferences account for the difference, future research should also explore age differences in health as a potential source of variation in time use.

## 6 References

- Antonucci, Toni C and Hiroko H Akiyama. 1987. "Social Networks in adult life and a preliminary examination of the convoy model." *The Journal of Gerontology: Psychological Sciences* 42:519–527.
- Atchley, Robert C. 1989. "A Continuity Theory of Normal Aging." *The Gerontologist* 29:183–190.
- Baltes, Paul B and Margret M Baltes. 1990. "Psychological Perspectives on Successful Aging: The Model of Selective Optimization with Compensation." In *Successful Aging: A Psychological Model*, edited by Paul B Baltes and Margret M Baltes, chapter 1. New York: Cambridge.
- Baltes, Paul B and Karl Ulrich Mayer. 2001. *The Berlin Aging Study: Aging from 70 to 100*. Cambridge University Press.
- Bryant, W Keith and Cathleen D Zick. 1996. "An Examination of Parent-Child Shared Time." *Journal of Marriage and the Family* 58:227–237.
- Buysse, DJ, KE Browman, TH Monk, CF Reynolds, AL Fasiczka, and DJ Kupfer. 1992. "Napping and 24-hour sleep/wake patterns in healthy elderly and young adults." *Journal of the American Geriatrics Society* 40:779–786.
- Carstensen, Laura L. 2001. "Selectivity Theory: Social Activity in Life-Space Context." In *Families in Later Life: Connections and Transitions*, edited by Alexis J Walker, Margaret M O'dell, Lori A McGraw, and Diana L G White. Pine Forge Press.
- Cattan, Mima, Martin White, John Bond, and Alison Learmouth. 2005. "Preventing social isolation and loneliness among older people: a systematic review of health promotion interventions." *Ageing & Society* 25:41–67.
- Ceolim, M F and L Menna-Berreto. 2000. "Sleep/wake cycle and physical activity in healthy elderly people." *Sleep Research Online* 3:87–95.
- Cornwell, Benjamin. 2011. "Age Trends in Daily Social Contact Patterns." *Research on Aging* 33:598–631.
- Cowgill, D and N Baulch. 1962. "The use of leisure time by older people." *Gerontologist* 2:47–50.

- Cumming, Elaine and William E Henry. 1961. *Growing Older: The Process of Disengagement*. New York: Basic Books.
- Dannefer, Dale. 1987. "Aging as intracohort differentiation: Accentuation, the Matthew effect, and the life course." *Sociological Forum* 2:211–236.
- Feld, Scott L. 1981. "The Focused Organization of Social Ties." *American Journal of Sociology* 86:1015–1035.
- Findlay, Robyn. 2003. "Interventions to reduce social isolation amongst older people: where is the evidence?" *Ageing & Society* 23:647–658.
- Fingerman, Karen L. 2009. "Consequential Strangers and peripheral ties: the importance of unimportant relationships." *Journal of Family Theory and Review* 1:69–82.
- Fischer, Claude. 1982. *To Dwell Among Friends*. Chicago: Chicago University Press.
- Foner, Anne. 1975. "Age in Society: Structure and Change." *American Behaviorist* 19:144–165.
- Frederickson, B L and Laura L Carstensen. 1990. "Choosing social partners: how old age and anticipated endings make us more selective." *PsyAgi* 5:335–347.
- Gauthier, Anne H and Timothy M Smeeding. 2003. "Time Use at Older Ages: Cross-National Differences." *Research on Aging* 25:247–74.
- Goffman, Erving. 1959. *The Presentation of self in everyday life*. Garden City, NY: Double Day.
- Goffman, Erving. 1971. *Relations in Public: Microstudies of the public order*. New York: Harper & Row.
- Heckhausen, Jutta and Richard Schulz. 1995. "A life-span theory of control." *Psychological Review* 102:284–304.
- Herzog, A Regula, Melissa M Franks, Hazel R Markus, and Diane Holmberg. 1998. "Activities and well-being in older age: Effects of self-concept and educational attainment." *Psychology and Aging* 13:179–185.

- Homans, George C. 1950. *The Human Group*. New York: Harcourt, Brace and Company.
- Horgas, Ann L, Hans-Ulrich Wilms, and Margret M Baltes. 1998. "Daily Life in Very Old Age: Everyday Activities as Expression of Successful Aging." *The Gerontologist* 38:556–558.
- House, James S. 2001. "Social Isolation Kills, But How and Why?" *Psychosomatic Medicine* 63:273–274.
- House, James S, Karl R Landis, and Debra Umberson. 1988a. "Social Relationships and Health." *Science* 241:540–546.
- House, James S, Debra Umberson, and Karl R Landis. 1988b. "Structures and Processes of Social Support." *Annual Review of Sociology* 14:293–318.
- Imai, Kosuke and David A Van Dyk. 2005. "A Bayesian Analysis of the Multinomial Probit Model Using Marginal Data Augmentation." *Journal of Econometrics* 124:311–334.
- Kahn, Robert L and Toni C Antonucci. 1980. "Convoys over the life course: Attachment, roles, and social support." In *Life-span development and behavior*, edited by Paul Baltes and O G Brim, volume 3, pp. 253–286. Academic Press.
- Kaskie, Brian, Sara Imhof, Joseph Cavanaugh, and Kenneth Culp. 2008. "Civic Engagement as a Retirement Role for Aging Americans." *The Gerontologist* 48:368–377.
- Keller, George. 2001. "The New Demographics of Higher Education." *The Review of Higher Education* 24:219–235.
- Kleemeier, Robert Watson (ed.). 1961. *Aging and Leisure: A research perspective into the meaningful use of time*. Oxford University Press.
- Lang, Frieder R and Margret M Baltes. 1997. "Being with People and Being Alone in late Life: Costs and Benefits for Everyday Functioning." *International Journal of Behavioral Development* 21:729–746.
- Lang, Frieder R and Laura L Carstensen. 2002. "Time Counts: Future Time Perspective, Goals, and Social Relationships." *Psychology and Aging* 17:125–139.

- Larson, Reed W. 1990. "The solitary side of life: an examination of the time people spend alone from childhood to old age." *Developmental Review* 10:155–183.
- Larson, Reed W and M Csikszentmihalyi. 1978. "Experiential Correlates of Time Alone in Adolescence." *Journal of Personality* 46:677–693.
- Larson, Reed W, Maryse H Richards, Belinda Sims, and Jodi Dworkin. 2001. "How Urban African American Young Adolescents Spend Their Time: Time Budgets for Locations, Activities, and Companionship." *American Journal of Community Psychology* 29:1573–2770.
- Larson, Reed W, Jiri Zuzanek, and Roger Mannell. 1985. "Being Alone Versus Being with Others: Disengagement in the Daily Experience of Older Adults." *Journal of Gerontology: Social Sciences* 40:S375–S381.
- Lemon, Bruce, Vern L Bengtson, and James A Peterson. 1972. "An Exploration of the Activity Theory of Aging: Activity Types and Life Satisfaction among In-Movers to a Retirement Community." *Journal of Gerontology* 27:511–523.
- Marcum, Christopher Steven. 2010. "Life Course Explanations of Social Time Age-Curves." In *Annual Meeting of the American Sociological Association, Atlanta*.
- McPherson, Miller, Lynn Smith-Lovin, and James M Cook. 2001. "Birds of a Feather: Homophily in Social Networks." *Annual Review of Sociology* 27:415–444.
- Morgan, David L, Margaret B Neal, and Paula Carder. 1997. "The Stability of Core and Peripheral Networks Over Time." *Social Networks* 19:9–25.
- Moss, Miriam S and M Powell Lawton. 1982. "Time Budgets of Older People: A Window on Four Lifestyles." *Journal of Gerontology* 37:S115–S123.
- Mullahy, John and Stephanie A Robert. 2010. "No time to lose: time constraints and physical activity in the production of health." *Review of Economics of the Household* 8:409–432.
- Nyce, Steven A. 2007. "The Aging Workforce: Is Demography Destiny?" *Generations* 31:9–15.

- Oerlemans, Wido G M, Arnold B Bakker, and Ruut Veenhoven. 2011. "Finding the Key to Happy Aging: A Day Reconstruction Study of Happiness." *Journals of Gerontology* 66B.
- Parsons, Talcott. 1942. "Age and Sex in the Social Structure of the United States." *American Sociological Review* 7:604–161.
- Presser, Harriet B. 1999. "Toward a 24-Hour Economy." *Science* 284:1778–1779.
- Presser, Harriet B. 2003. *Working in a 24/7 economy: challenges for American families*. Russel Sage.
- Redmond, Cleve R. 1988. "The effects of working nontraditional hours on life satisfaction." *Mid-American Review of Sociology* 23:21–40.
- Rexroat, Cynthia and Constance Shehan. 1987. "The Family Life Cycle and Spouses' Time in Housework." *Journal of Marriage and Family* 49:737–750.
- Robinson, John P and Geoffrey Godbey. 1997. *Time for Life: The surprising ways that Americans Use their time*. University Park, PA: Pennsylvania State University Press.
- Rook, Karen S. 1987. "Social Support Versus Companionship: Effects on Life Stress, Loneliness, and Evaluations by Others." *Journal of Personality and Social Psychology* 52:1132–1147.
- Shaw, Benjamin A, Neal Krause, Liang Jersey, and Joan Bennett. 2007. "Tracking Changes in Social Relations Throughout Late Life." *Journal of Gerontology: Social Sciences* 62:S90–S99.
- Shaw, Benjamin A, Jersey Liang, Neal Krause, Mary Gallant, and Kelly McGeever. 2010. "Age Differences and Social Stratification in the Long-Term Trajectories of Leisure-Time Physical Activities." *Journals of Gerontology* 65B:756–766.
- Thompson, Wayne E and Gordon F Streib. 1961. "Meaningful Activity in a Family Context." In *Aging and Leisure: A research perspective on the meaningful use of time*, edited by Robert W Kleemeier, chapter 7, pp. 177–211. New York: Oxford University Press.

- Verbrugge, Lois M, Ann L Gruber-Baldini, and James L Fozard. 1996. "Age Differences and Age Changes in Activities: Baltimore Longitudinal Study of Aging." *Journals of Gerontology* 51B:S30–S41.
- Wilson, James. 2000. "Volunteering." *Annual Reviews in Sociology* 26:215–240.
- Wilson, Laura B and Sharon Simson. 2003. "Combining Lifelong Learning with Civic Engagement." *Gerontology & Geriatrics Education* 24:47–61.
- Yoon, In-Young, Daniel F Kripke, Jeffrey A Elliott, Shawn D Youngstedt, Katharine M Rex, and Richard L Hauger. 2003. "Age-related changes of Circadian Rhythms and Sleep-Wake cycles." *Journal of the American Geriatrics Society* 51:1085–1091.
- Zerubavel, Eviatar. 1979. "Private Time and Public Time: The Temporal Structure of Social Accessibility and Professional Commitments." *Social Forces* 58:38–58.

Table 4: Goodness-of-Fit Summaries from the Bayesian Multinomial Probit Models

	Mean	Q2.5	Q97.5
<b>Model Covariances</b>			
Caregiving.0:Caregiving.0	1.2331	1.1175	1.3062
Caregiving.0:Caregiving.1	0.4320	0.3587	0.5151
Caregiving.1:Caregiving.1	0.7669	0.6938	0.8825
Communication.0:Communication.0	1.0420	0.9773	1.1685
Communication.0:Communication.1	-0.1885	-0.6821	0.1753
Communication.1:Communication.1	0.9580	0.8315	1.0227
Eating.0:Eating.0	1.4471	1.1925	1.6707
Eating.0:Eating.1	-0.1489	-0.6950	0.2021
Eating.1:Eating.1	0.5529	0.3293	0.8075
Education.0:Education.0	1.0986	0.9982	1.1905
Education.0:Education.1	-0.0115	-0.2685	0.2241
Education.1:Education.1	0.9014	0.8095	1.0018
Household Production.0:Household Production.0	0.9850	0.9446	1.0225
Household Production.0:Household Production.1	0.3810	0.1391	0.4857
Household Production.1:Household Production.1	1.0150	0.9775	1.0554
Leisure.0:Leisure.0	1.1108	1.0896	1.1345
Leisure.0:Leisure.1	0.4013	0.3379	0.4502
Leisure.1:Leisure.1	0.8892	0.8655	0.9104
Personal Care.0:Personal Care.0	0.9611	0.9132	1.0103
Personal Care.0:Personal Care.1	0.4115	0.0695	0.6291
Personal Care.1:Personal Care.1	1.0389	0.9897	1.0868
Travel.0:Travel.0	0.8329	0.7894	0.9089
Travel.0:Travel.1	0.4235	0.2290	0.5585
Travel.1:Travel.1	1.1671	1.0911	1.2106
Volunteering.0:Volunteering.0	1.1756	1.0101	1.2973
Volunteering.0:Volunteering.1	-0.4536	-0.9228	0.0676
Volunteering.1:Volunteering.1	0.8244	0.7027	0.9899
Waiting.0:Waiting.0	0.7347	0.3809	1.1777
Waiting.0:Waiting.1	-0.4013	-0.6494	0.0244
Waiting.1:Waiting.1	1.2653	0.8223	1.6191
<b>Model Pseudo – R<sup>2</sup></b>			
Caregiving	0.2028	0.1368	0.2868
Communication	0.1277	0.0014	0.4791
Eating	0.1213	0.0001	0.9911
Educational	0.0270	0.0026	0.0746
Household Production	0.1624	0.1076	0.2384
Leisure	0.1656	0.1226	0.2064
Personal Care	0.2150	0.0179	0.3969
Travel	0.2077	0.1035	0.3208
Volunteering	0.3923	0.0001	0.9262
Waiting	0.2887	0.0203	0.5886

Posterior distributions based on 5000 MCMC draws with a 500 iteration burn-in. A “.1” suffix on the variable names indicates time use in the presence of others and a “.0” indicates alone time.