Amount of Care Given and Caregiving Satisfaction: A Latent Growth Curve Analysis

Alexis J. Walker, Alan C. Acock, Sally R. Bowman, and Fuzhong Li

Department of Human Development and Family Sciences, Oregon State University.

We examined the wear-and-tear hypothesis using data from 4 annual interviews with 130 (128 White) middle-aged daughters caring for their physically impaired, elderly mothers. We formulated a latent growth curve model hypothesizing that increases in the amount of care given by daughters caused a decrease in caregiving satisfaction, independent of caregiving duration. We found considerable individual variability and change in both caregiving satisfaction and the amount of care given in univariate latent growth curve analyses. Contrary to the wear-and-tear hypothesis, a multivariate latent growth curve analysis revealed duration of caregiving had no effect on either initial caregiving satisfaction or change in satisfaction. An elaborated wear-and-tear model was supported, however. The mechanism for decline in satisfaction is an increase in the amount of care given.

According to the wear-and-tear hypothesis, caregiving burdens increase as duration of caregiving increases (Townsend, Noelker, Deimling, & Bass, 1989). Consistent with this hypothesis, the caregiving literature generally posits concurrent negativity for caregivers. Occasionally, the underlying mechanism posited to explain this pattern is a high level of or an increased need for care (Pearlin, Mullan, Semple, & Skaff, 1990). For example, Lang and Brody (1983) described parental caregiving as progressive, and Abel (1986) stressed the strain resulting from watching the unavoidable decline of a loved one.

Recently, however, researchers have suggested that levels of burden, depression, or strain from caregiving, assessed both concurrently and longitudinally, are lower than one would expect given the attention these variables have received (Matthews, 1988; Stull, Bowman, & Smerglia, 1994; U.S. Select Committee on Aging, 1987; Zarit, Reever, & Bach-Peterson, 1980), thus calling the wear-and-tear hypothesis into question. In fact, an alternative model has been suggested. Stephens and Zarit (1989) proposed an adaptation hypothesis (see also Townsend et al., 1989) in which caregivers are seen as acclimating to their circumstances, experiencing little change or possibly even improvement in outcomes over time. They suggested that adaptation is more likely if the care receiver’s health is stable, providing the opportunity for the caregiver to adjust to steady caregiving demands.

There have been a handful of longitudinal studies of caregiving outcomes, but these studies are characterized by a variety of measures and variability in samples. Not surprisingly, the results are inconsistent and are difficult to compare. Studies of caregivers to aging persons with dementia have reported declines in their functioning and greater need for care over time (Schulz & Williamson, 1991; Zarit, Todd, & Zarit, 1986). Zarit et al. followed caregivers of spouses with dementia for a 2-year period. Although wives initially were more burdened than husbands, there were no differences in burden at the 2-year follow-up. Their data supported the adaptation model: in taking care of a spouse with dementia, caregivers, particularly women, increasingly were able to deal with problems over time, even as the disease progressed. Schulz and Williamson (1991) found high levels of depression over a 2-year period in spouse and daughter caregivers to persons (70% were women) with Alzheimer’s disease. Women had high stable rates of depression throughout, but men had significantly higher rates over time. Yet 41% of the caregivers had variable depression scores. Women, particularly wives, evidenced variability in depression; husband and son caregivers were consistently asymptomatic. Overall, the authors saw their findings as supportive of the wear-and-tear model. Finally, Suitor and Pillemer (1994) found no significant change in the marital satisfaction of daughters and daughters-in-law caring for parents with dementia over a one-year period, yet they, too, reported high individual variability over time.

The results of longitudinal studies of caregivers to physically impaired elders also have produced inconsistent results. Townsend and her colleagues (1989) found little overall association between time and either subjective stress or depression, but substantial individual variability. They studied White daughters and sons caring for mothers and fathers with a range of cognitive and physical disabilities over a 14-month period. Over one third (36%) of the caregivers reported increased stress and 52% reported decreased stress over time. Depression declined for 58% but increased for 34%. Overall, changes were small. There was no assessment of the amount of care given, however, because, consistent with the wear-and-tear model, time was the hypothesized mechanism causing increased stress and depression.

Stoller and Pugliesi (1989) studied a community-based sample of aging parents in 1979 and again in 1986. Although functional status was positively correlated with burden for nonspouse caregivers, aid, health, and functional status were stable over time. Further, in an 8-month study of caregiving to elderly, post-hospitalization patients, Johnson and Catalano (1983) found the functional characteristics of care receivers to be relatively stable, while the relationship between the caregiver and the care recipient deteriorated.
It is difficult to draw precise conclusions from these panel studies. Outcomes over a range of constructs have been positive, neutral, and negative, and there is noteworthy evidence of individual variability. Analytic techniques that describe aggregate patterns mask this individual variability, which merits further attention. Indeed, variability is evident also in the extent to which the health of the care receiver changes: care recipients with dementia experienced declines in health and/or increases in symptoms over time; those with physical impairments had relative functional stability over time. The role of change in health and change in the amount of care given in caregiving outcomes has not been clarified. Further, most studies included coresidential caregivers. It is difficult in these cases to separate care on which the care receiver is dependent from ordinary household tasks (Sankar, 1993). Together, these characteristics mean it has been impossible to determine the connection between the need to give increasing amounts of care over time and caregiving outcomes.

Of particular note is the operationalization of time in longitudinal studies. Most assessments were made from 8 to 14 months apart, although one community-based study of aging persons, only some of whom required assistance, had two assessments separated by nearly 8 years. All examined change between two points in time and were unable to test any nonlinear change. Many of these studies operationalized duration of caregiving as the time between the first and second observations. This ignores the actual duration of caregiving that precedes the initial observation. It also assumes that time, rather than other variables that may change between the first and second observations, is the proximate cause of change.

In examining the results of studies of the wear-and-tear hypothesis, Townsend and her colleagues (1989) concluded that the striking amount of individual variability deserves greater attention. They argued that researchers should attempt to discover the mechanisms accounting for this variability. Explaining individual variability in caregiving satisfaction is the objective of our study. In it, we examine the wear-and-tear hypothesis longitudinally, focusing on the impact of duration of caregiving on caregiving satisfaction. Further, we elaborate this model by including amount of and change in care given as explanatory variables.

We control for the relationship of the caregiver to the care receiver and for gender by including only daughters giving care to their aging, unmarried mothers. We believe that it is especially advantageous to examine the wear-and-tear hypothesis in a sample of women. Women are strongly attached to family members, and the mother-daughter relationship has been described as particularly forceful (Boyd, 1989; Horowitz, 1985; Stafford, 1988). Indeed, daughters have said that caregiving to their mothers improved the quality of their mothers’ lives, thus contributing to their own sense of satisfaction (Abel, 1989, 1990).

Because of the potential for different outcomes when care recipients have cognitive versus physical impairments (Birkel & Jones, 1989; Scharlach, 1989), we only sample pairs in which mothers have physical disabilities. We include three important predictors: (1) coresidence of caregivers and care receivers, because of the association of coresidence with higher rates of assistance (Chappell, 1991; Lang & Brody, 1983); (2) duration of caregiving, the primary independent variable in the wear-and-tear hypothesis (e.g., Townsend et al., 1989); and (3) amount of care given, because of its implicit role in the wear-and-tear model.

A Conceptual Model of Change in Caregiving Satisfaction

Drawing specifically on the wear-and-tear model and findings from the research testing it, we derive nine hypotheses. First, there will be individual variability in change in caregiving satisfaction over time. Second, the amount of care given, on average, will increase over time, as care recipients grow older. That is, the slope of care given will be positive. Some daughters may give a stable or decreasing level of care, but the overall pattern will be an increase in care given. Third, caregiving satisfaction levels, on average, will decrease over time. That is, the slope of caregiving satisfaction will be negative. Although some individuals may have a constant or even increasing level of satisfaction, the overall pattern will be a decline in satisfaction.

Hypothesis 4 predicts the initial level of care given: coresidence will be related to higher initial amounts of care. Independent of impairment, caregivers give more care when they reside with their care receivers (Chappell, 1991; Lang & Brody, 1983). Hypotheses 5 and 6 predict the initial level of caregiving satisfaction. The fifth hypothesis, in combination with the seventh hypothesis described below, is the heart of the wear-and-tear model. The fifth hypothesis is that the longer one has been giving care, the lower one’s initial level of caregiving satisfaction. The sixth hypothesis is that the initial amount of care given in Wave 1 will be related negatively to the initial level of caregiving satisfaction, net of duration. That is, respondents who initially give higher levels of care will have lower initial levels of caregiving satisfaction. Hypothesis 6 tests cross-sectionally the effect of care given on caregiving satisfaction.

Hypotheses 7 through 9 predict change in caregiving satisfaction. The seventh hypothesis, together with the fifth, directly assesses the wear-and-tear model. It suggests that the longer one has been giving care, the more negative the slope of or the greater the decline in caregiving satisfaction. Hypothesis 8 states that there may be a connection between the initial level of care given in Wave 1 and change in caregiving satisfaction. Although there is insufficient empirical evidence to assert this position, it may be that daughters providing high levels of care in Wave 1 would experience the steepest declines in satisfaction.

Hypothesis 9 is that the greater the rate of increase in care given, the sharper the decline in the rate of caregiving satisfaction. This hypothesis recognizes that the rate of change varies across individuals. What is conventionally referred to as the slope is actually the mean rate of change. Thus, the rate of change has both a mean (slope) and interindividual variability (variance). Hypothesis 9 asserts that individual variability in the rate of change in the amount of care given has an important consequence. Specifically, individuals who give increasingly more care over time than average will have a greater than average decrease in caregiving satisfaction. In hypothesis 9, we are asserting
that the rate of change in care given directly affects the rate of change in caregiving satisfaction.

METHODS

Participants

Recruitment. — Participants were 128 White and 2 non-White caregiving daughters who volunteered with their mothers between 1986 and 1988 for a longitudinal study on mother-daughter relationships in middle and later life. They were recruited primarily through articles in local newspapers in Northwestern Oregon, the population center of the state. In an attempt to maximize diversity, approximately 25% of the sample was recruited from each of the four urban/rural centers in the area that vary in size, occupational base, income, and so on. The sample corresponds favorably on demographic characteristics to a national probability sample, the National Survey of Families and Households (NSFH; Sweet, Bumpass, & Call, 1988; see Note 1, Appendix 2). Across four samples, only age and education were substantially different. The age difference is not surprising given the association of advanced age with poor health. The education difference is consistent with census data (Duncan, 1987) showing Oregon has high levels of education for women across the age groups used in this study. As is true for most volunteer samples, we underrepresented minorities: only 1.5% of pairs are non-White. Nevertheless, this figure is only somewhat below 1990 census data for areas within Oregon from which the sample was recruited.

Mother-daughter pairs were included in the original sample only if specific criteria were met: (a) mothers were aged 65 or older; (b) mothers were unmarried (i.e., widowed, divorced, or deserted); (c) neither mothers nor daughters were cognitively impaired as reported by daughters or by project interviewers; (d) daughters lived with or within 45 miles of their mothers; (e) mothers received assistance with meal preparation, laundry, housekeeping, personal care, and/or financial needs; and (f) daughters were primary caregivers in that they provided more than half of the assistance needed by their mothers. We recruited 173 pairs in this way.

Most daughters in our sample helped their mothers with shopping and errands, indoor maintenance, and bureaucratic mediation. Nearly one-quarter (23%) gave help with activities of daily living (ADLs), such as dressing and bathing. Most mothers had chronic health conditions, such as arthritis (74%), impaired vision (66%), difficulty in hearing (55%), and high blood pressure (49%), of the sort associated with instrumental activities of daily living (IADLs; Branch, Horowitz, & Carr, 1989). Although the mothers in this sample were healthier than is typically the case in caregiving studies, and we specifically excluded mothers with cognitive impairment, a focus on such a relatively healthy sample is warranted. The vast majority of aging persons in the United States experience chronic health conditions that, although somewhat limiting to their self-sufficiency, do not create ADL needs (Matthews, 1988). Care-receiving mothers in this study had needs for assistance that were slightly greater than those indicated for the population of aging women from the 1979–1980 National Health Interview Survey (Bould, Sanborn, & Reif, 1989; Kovar, Hendershot, & Mathis, 1989), as would be expected for care receivers, but similar rates of ADL needs for aging women from the Supplement on Aging to the 1984 National Health Interview Survey, the 1982 National Long Term Care Survey, and the 1987–1988 National Survey of Families and Households (Freedman, Wolf, Soldo, & Stephen, 1991; Kunkel & Applebaum, 1992).

Participants’ characteristics. — At Wave 1, daughters’ median age was 53. The majority (62%) were married, although 22% were divorced. Daughters’ median education level was 14 years, and their median annual family income was $27,250. One-quarter (26%) had children under the age of 18. Most (61%) were employed. Daughters estimated that they had been taking care of their mothers for a median of 5 years; one-fifth (20%) lived with their mothers. Mothers’ median age was 82.5. Most (89%) were widowed. Their median education level was 12 years, and their median annual income was $7,862. Daughters reported that, on average, their mothers had 4.05 (SD = 1.90) of 14 health problems common among the elderly.

Procedures. — Only daughters’ data are reported here. Each respondent was interviewed by the first author or trained graduate student interviewers, in person and at her convenience, usually in her home or in the home of her mother. Daughters (and mothers) received birthday cards each year to help maintain their interest in the study and were paid $20 in Wave 1 and $15 at the beginning of each subsequent wave. They also received a general report about study participants during the second wave of data collection. At the conclusion of each interview, participants were asked about their willingness to be contacted again in the next year. No fewer than 97% agreed in any one year. Before the anniversary of the previous interview, daughters received a postcard indicating that they would be contacted by the project office to set up a time for an additional interview. Whenever possible, participants had the same interviewer from year to year. Over the course of data collection, all but one of the interviewers were women. These procedures were followed through all four waves of the study. At each interview, daughters were asked questions about their mothers’ health and the assistance they gave. They also completed several paper-and-pencil measures, such as the one described below measuring caregiving satisfaction.

Measures

Four variables are of central interest in this study: care given, caregiving satisfaction, caregiving duration, and coresidence.

Care given. — Daughters were asked about the specific tasks with which they helped their mothers in 8 aid categories, the first 7 of which are IADL and the eighth of which is ADL help: (1) shopping/errands, (2) indoor maintenance, (3) financial tasks, (4) food preparation/clean up, (5) outdoor maintenance, (6) financial aid, (7) bureaucratic mediation, and (8) personal care. For every activity in each category, daughters were asked: “Does your mother do
Caregiving satisfaction. — Several caregiving studies have assessed caregiving satisfaction, but conceptualization and measurement have not been consistent. Satisfaction has been categorized as perceived gains from caregiving, positive affect in response to caregiving, or as caregiving uplifts that accumulate over time (Lawton, Moss, Kleban, Glicksman, & Rovine, 1991). For example, in the 1983 Informal Caregivers Survey (Miller, 1989), the following single-item measure was used to assess satisfaction: “How many points would you give to show how good it makes you feel to help __________?” The range was 0 to 3,000,000, with a median of 500. Kramer (1993, p. 370), using a convenience sample of White wives caring for their cognitively impaired husbands, included a 15-item measure designed to “capture long-term caregiving satisfaction.” It included items such as, “By providing care I am living up to my religious or moral principles,” and “Caring for my husband has taught me some important things about myself.” Lawton, Kleban, Moss, Rovine, and Glicksman (1989) argued that satisfaction is one of the important domains of the caregiving experience. There is perhaps the most methodologically rigorous measure, given its validation by confirmatory factor analysis. The five items (α = .71), however, reflect various aspects of caregiving, such as the care recipient showing appreciation and the frequency with which the caregiver feels angry with the care recipient. These studies suggest that there is, as yet, no consensus on the meaning and content of caregiving satisfaction.

In this study, rather than employing a single-item measure of satisfaction or one that reflects several different dimensions, we utilized a 10-item semantic differential measure developed and validated by Campbell, Converse, and Rodgers (1976), who conceptualized domains of or roles in life as areas in which one may experience a sense of personal satisfaction. The focus of the domain measure is on life as areas in which one may experience a sense of personal satisfaction. The focus of the domain measure is on life as areas in which one may experience a sense of personal satisfaction. The scope of the domain measure is on life experience rather than life conditions; that is, the degree to which the domain of caregiving is experienced as satisfying or rewarding. Thus, our outcome measure is one explicitly tied to the caregiving role rather than to global psychological well-being. Conceptualizing caregiving as a role rather than as an essential or natural activity is consistent with feminist perspectives that describe caregiving as something women do rather than something they are (Erickson, 1993; Hochschild, 1983; West & Zimmerman, 1987).

The scale consists of 10 semantic differential pairs: enjoyable, miserable; hopeful, discouraging; full, empty; friendly, lonely; interesting, boring; worthwhile, useless; rewarding, disappointing; brings out the best in me, doesn’t give me much chance; easy, hard; and free, tied down. Items were counterbalanced to avoid biased response sets. Daughters were told: “Here are some words and phrases that we would like you to use to describe how you feel about assisting your mother.” This was followed by instructions for completing a semantic differential scale. Response choices for each pair of items ranged from 1 (negative) to 7 (positive). Principal components analysis confirmed that all 10 items loaded on one factor. Reliabilities for the scale ranged from .91 to .94 over the four waves of data collection.

Caregiving duration. — The wear-and-tear hypothesis as operationalized by a number of researchers (Abel, 1986; Lang & Brody, 1983; Pearlin et al., 1990; Townsend et al., 1989; Walker, Shin, & Bird, 1990) asserts that negative caregiving outcomes result from longer durations of caregiving. Therefore, we included daughters’ reported length of time caring for their mothers as a central predictor in our model. Caregiving duration was measured in years (see Note 2, Appendix 2).

Coresidence. — As noted above, 20% of the caregiving daughters lived with their mothers. Regardless of impairment level, caregivers give more care when they reside with their care receivers (Chappell, 1991; Lang & Brody, 1983; Walker & Pratt, 1991). Because the proportion of daughters who coresided with their mothers did not change significantly over time, our measure of coresidence reflects shared living arrangements at Wave 1.

Analysis

Conventional analyses assume a common slope or rate of change in the outcome variable — here, caregiving satisfaction. The slope represents an overall or mean rate of change for a sample, however, and masks the considerable individual variation seen in longitudinal investigations. Although the overall rate of change may be negative, some caregivers may have a sharper rate of decline than others; a few may actually increase their level of satisfaction. Even if the overall rate shows no change, some women may become increasingly satisfied, while other women’s satisfaction may decline. The adaptation hypothesis implies that the slope for both the amount of care given and the level of caregiving satisfaction will approach zero. That is, neither the amount of care given, nor the level of caregiving satisfaction, will change systematically over time. Adaptation sometimes implies, however, that caregiving satisfaction may increase over time. In this case, the slope for satisfaction would be positive.

The method used to analyze change over time in caregiving satisfaction is based on structural equation modeling of latent growth curves. Structural equation modeling is widely used in aging research, but the combination of this technique with latent growth curve methodology makes it an especially useful procedure for achieving the objectives of developmental research (McArdle & Anderson, 1990; Willett & Sayer, 1994). Structural equation modeling by itself has been critiqued for failing to address individual differences in change (Muthén, 1991); latent growth models are designed to measure both intraindividual and interindividual variabl-
ity in change. Analysis using latent growth curve methodology involves estimating individual growth curves from repeated-measures data to explain both change and the covariates of change in the developmental process. The advantages of latent growth curve analysis are that we can (a) draw some conclusions about change at the aggregate level; (b) examine individual differences in change in caregiving satisfaction over time; (c) study predictors of caregiving satisfaction, such as duration of caregiving and amount of care given; (d) represent individual change by either a linear or nonlinear trajectory; (e) model occasion-by-occasion measurement errors; (f) model time-varying predictors of growth and use growth parameters as predictors of later outcomes; and (g) study predictors of change in caregiving satisfaction based on both the initial level of care given and change in the amount of care given over time (Willett & Sayer, 1994). We want to stress the special advantage of our approach in that we can use change in one variable (amount of care given) as a predictor of change in another variable (caregiving satisfaction). The method is appropriate in this study because the data set contained measures from the same individuals at four points in time, at intervals of approximately one year.

The model parameter estimates were derived via the EQS structural modeling program (Bentler, 1993) using maximum-likelihood estimation procedures. For decisions about missing data, we utilized EQS multisample procedures to test the assumption that the mechanism of missingness is completely at random (Little & Rubin, 1987).

Attrition and missing data. — Over the 4 years of the study, 41 mothers and 2 daughters died. Data from daughters in these pairs were excluded. Using Wave 1 data, we compared the 130 women from whom we report data herein with the 41 bereaved daughters. They did not differ significantly in marital status, education, income, employment status, number of children under age 18, coresidence with mother, and mothers’ age, but their mothers were in poorer health, as would be expected (Koyano et al., 1989). Although we acknowledge this difference between those lost to the study through death and those who remained, we note that the perceived perils of attrition in panel studies may not be as problematic as is assumed (Norris, 1987).

Missing data are a potential problem in longitudinal research because of the loss of information for reasons other than death. Respondents with some missing data may be different from respondents for whom all data are present. Traditional methods of handling missing values such as pairwise deletion, substitution of means, imputation by regression, and even expectation maximization (Little & Rubin, 1987) are unable to test whether the pattern of missing data is missing completely at random. Structural equation modeling can test explicitly whether the nature of the missing data is problematic. Little and Rubin (1987) described a condition of missing data as missing completely at random. By definition, missing completely at random refers to the condition in which the probability of a person’s response on a variable is independent of the person’s score on that variable or on any related variable in the model. They also described less restrictive conditions (see also Rubin, 1976).

We tested whether it was valid to use the total sample of 130 cases with some missing data or whether we should report results on the sample with complete data (n = 92). Muthén, Kaplan, and Hollis (1987), Allison (1987), and Duncan and Duncan (1995) described structural equation modeling procedures to conduct the test for data missing completely at random. As they have not been used in the gerontological literature, the procedures for testing the hypothesis appear in Appendix 1. We found the missing completely at random hypothesis to be tenable. Because this is the most stringent missing data condition, the missingness data mechanism in this longitudinal data set is considered ignorable (Little & Rubin, 1987; Rubin, 1976). For this reason, all 130 observations are included in the analysis. We also ran the model using only the 92 cases with no missing data. As would be expected given the findings of the missing completely at random test, the results are comparable (see Note 3, Appendix 2).

RESULTS

Consistent with hypothesis one, there is substantial individual variability in caregiving satisfaction over time (see Note 4, Appendix 2). This variability is demonstrated in the subsample of daughters presented in Figure 1. This figure presents 10 randomly selected individual growth curves of change in caregiving satisfaction. “Mary” (Figure 1, Case 66), began the study at age 66, having cared for her mother for 6 years, with a level of caregiving satisfaction that was slightly below average. Her satisfaction declined somewhat in each subsequent wave of the study. Mary’s mother, “Joan,” was legally blind at Wave 1. She also suffered from arthritis and emphysema. Mary described Joan’s health in Wave 1 as “fair,” and Joan’s arthritis and emphysema as worsening over the 4 years. From the very first wave, Mary ran all of Joan’s errands, took care of her household chores,
managed her money, prepared her food, and served as a mediator between her mother and social and health institutions. Joan also needed considerable help with ADLs, which Mary provided. Recall that few mothers in the study (23%) required ADL help, indicating that Mary gave more care than was typical. By Wave 4, Mary was meeting all of Joan’s ADL needs, and her caregiving satisfaction had declined to its lowest level.

Case 9 presents a more positive picture than average. “Ivy,” the daughter, was 72 years old at the onset of the study, when she had been caring for her mother, “Virginia,” for 11 years. She and her mother lived together. Virginia had high blood pressure, heart problems, and arthritis, each of which restricted her activities. At Wave 1, Ivy ran all of her mother’s errands, completed less than half of her indoor tasks, prepared most of her meals, and did all of the outdoor maintenance. Ivy also acted as a mediator for Virginia with health care professionals and others. Her caregiving satisfaction was above average. Through both Wave 2 and Wave 3, Ivy’s satisfaction declined slightly when Virginia suffered hearing and vision losses. By Wave 2, Ivy had taken on some financial management tasks for the first time, and she began to provide a little ADL help. In Wave 3, Ivy kept these responsibilities and began giving financial aid to her mother as well. By Wave 4, Ivy, who had her own health problems, found a secondary caregiver to take on some of her responsibilities. Virginia’s general health improved somewhat so that she no longer needed ADL help and could function more effectively in the kitchen. Furthermore, Ivy no longer did any outdoor work.

As revealed by the figure, her caregiving satisfaction in this last wave showed a marked improvement relative to the three earlier time periods.

The heavy line in Figure 1 represents the overall change (mean) for the entire set of participants. Consistent with our model, the rate of change can be described as a linear decline. The figure illustrates that individual daughters began and ended the study at varying levels of satisfaction. Interindividual variability is interesting in and of itself, but it also is meaningful to identify its causes. Recall that our model allows for inferences about individual variability as well as the cause of an overall pattern.

The remaining hypotheses, based on the conceptual model presented above, are graphically illustrated in Figure 2. This model was estimated using a multigroup approach that allowed us to include all 130 cases. As shown in Appendix 1, three groups were involved. The largest group (n = 92) includes those respondents who have no missing data for any of the 4 waves. The second group (n = 25) includes respondents who have missing data for Waves 3, 4, or both. The final group (n = 13) has data only for the first wave. The means and standard deviations, by group, for each observed variable appear in Table 1. Consistent with our finding that missing data are missing completely at random, there is a single solution. Model fitting indices produced a $\chi^2 (79, N = 130) = 130.348, p < .001$ (see Note 5, Appendix 2). Comparative fit indices, however, indicate that the results provided a good fit. The Bentler-Bonett Non-Normed Fit Index (BBNFI) = .923 and the Comparative Fit Index (CFI) = .908 are acceptable. The ratio of $\chi^2$ to degrees of freedom of 1.650, although very sensitive to sample size, is also satisfactory (see Carmines & McIver, 1981). Tests of nonlinearity revealed that the quadratic terms for amount of care given and for caregiving satisfaction were not significant. To test assumptions of homoscedasticity, we assumed errors were equal across the 4 waves. For both amount of care given and caregiving satisfaction, there was no significant improvement in fit, signifying that the errors do not vary systematically.

The measurement and structural parameter estimates are presented in Table 2. Here, we focus on the estimated initial levels of and the rates of change in the latent variables (i.e., care given and caregiving satisfaction), as well as the structural parameters linking them. The initial level (mean) for the amount of care given is 2.009 ($p < .001$). This is the predicted initial level (predicted mean) of care given on the 1- to 4-point scale described above. As the note to Figure 2 explains, the value of 2.009 reflects the estimated initial level of amount of care given after partialling out the effect of coresidence (hypothesis 4). The model shows that coresidence is positively associated with initial level of care given, as predicted.

The rate of change for care given (slope) represents the estimated linear change in the latent construct over the 4 years, or the mean rate of change for all 130 daughters in the study. In numerical terms, the rate of change is .144 ($p < .001$), indicating a linear change such that the predicted amount of care given increases .144 units per year. This is a modest but statistically significant increase consistent with our second hypothesis.

There are significant individual differences ($SD = .170$) in this linear trend, $t(130) = 3.858, p < .001$, indicating variability across individuals in the amount of care given over the 4 years. Some daughters report larger than average increases in the amount of care given, some report smaller or no increases, and some change in conflicting ways, increasing and then decreasing the amount of care they give. Whereas the variance of the slope represents individual differences in the level of care given, the mean of the slope reflects the average rate of change from the initial level (Wave 1) to the end of data collection (Wave 4).

For caregiving satisfaction, the initial (mean) level is 6.498. This represents the predicted initial level (predicted mean) of caregiving satisfaction on the 7-point scale described above. It differs from the mean for caregiving
Table 1. Means (SD) by Group of Variables in the Hypothesized Latent Growth Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1a (n = 92)</th>
<th>Group 2b (n = 25)</th>
<th>Group 3c (n = 13)</th>
<th>Combined (n = 130)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coresidence</td>
<td>.20 (.40)</td>
<td>.20 (.40)</td>
<td>.23 (.44)</td>
<td>.20 (.40)</td>
</tr>
<tr>
<td>Years caregiving</td>
<td>6.99 (6.59)</td>
<td>6.79 (8.14)</td>
<td>6.58 (4.86)</td>
<td>6.91 (6.72)</td>
</tr>
<tr>
<td>Care given</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wave 1</td>
<td>1.94 (0.58)</td>
<td>2.13 (0.80)</td>
<td>2.21 (0.59)</td>
<td>2.00 (0.62)</td>
</tr>
<tr>
<td>Wave 2</td>
<td>2.27 (0.71)</td>
<td>2.39 (0.85)</td>
<td>2.36 (0.78)</td>
<td>2.30 (0.74)</td>
</tr>
<tr>
<td>Wave 3</td>
<td>2.36 (0.78)</td>
<td>2.21 (0.84)</td>
<td>2.36 (0.78)</td>
<td>2.30 (0.74)</td>
</tr>
<tr>
<td>Wave 4</td>
<td>2.43 (0.78)</td>
<td></td>
<td></td>
<td>2.43 (0.78)</td>
</tr>
<tr>
<td>Satisfaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wave 1</td>
<td>5.46 (0.96)</td>
<td>5.40 (1.35)</td>
<td>5.22 (1.02)</td>
<td>5.42 (1.04)</td>
</tr>
<tr>
<td>Wave 2</td>
<td>5.37 (1.04)</td>
<td>5.34 (1.48)</td>
<td>5.36 (1.13)</td>
<td>5.36 (1.13)</td>
</tr>
<tr>
<td>Wave 3</td>
<td>5.12 (1.09)</td>
<td></td>
<td></td>
<td>5.12 (1.09)</td>
</tr>
<tr>
<td>Wave 4</td>
<td>5.09 (1.09)</td>
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*aDaughters with no missing data across the four waves.

*bDaughters with missing data on Waves 3 and/or 4.

*cDaughters with missing data on Waves 2, 3, and 4.

*d0 = no coresidence, 1 = coresidence.

*eMean amount of care given on a scale from 1 no help at all to 4 help with all activities in errands, indoor maintenance, financial tasks, food preparation, outdoor maintenance, financial aid, bureaucratic mediation, and personal care.

*fMean of 10 items ranging from 1 negative to 7 positive.
satisfaction in the observed variables for Wave 1 (Table 1) because the initial level of the latent variable representing caregiving satisfaction partials out the effects of duration (hypothesis 5, .007, n.s.) and the initial level of care given (hypothesis 6, -.541, \( p < .01 \)). Note that, contrary to the wear-and-tear hypothesis (number 5), duration of caregiving is unrelated to initial caregiving satisfaction. The effect of the initial level of care given on the initial level of satisfaction, however, -.541 (\( p < .01 \)), shows that the higher the initial level of care given, the lower the initial level of caregiving satisfaction. The standardized coefficient for this effect is \( \beta = -.345 \). This is clear support for our sixth hypothesis that the initial level of care given has a significant negative effect on the initial level of caregiving satisfaction.

The rate of change for caregiving satisfaction, -.230 (\( p < .10 \)), indicates a negative trend. Caregiving satisfaction decreases linearly over time by .230 units each year. This decline in satisfaction is modest, but not significant as we expected in hypothesis 3. As is the case for the rate of change for care given, the rate of change for caregiving satisfaction is a mean value. The rate of change shows that daughters, on average, decline in their level of satisfaction. That the variance is not significant suggests that the model explains most of the individual variability in the rate of change. In contrast, a univariate latent growth curve model of satisfaction has a significant variance.

Contrary to the wear-and-tear hypothesis, caregiving duration was unrelated to change in caregiving satisfaction over time (hypothesis 7, .001, n.s.). The eighth hypothesis specified that the rate of change in caregiving satisfaction — its slope — depends on the initial level of the amount of care given (see Figure 2). Our hypothesis that the higher the initial level of care given, the greater the decline in caregiving satisfaction, was not supported (see Table 2). The slope is .90 (n.s.). Thus, interindividual variability in the rate of change in caregiving satisfaction cannot be explained by the initial level of care given.

The ninth hypothesis is an important component of our conceptual model. It proposes that we can explain interindividual variability in the rate of change in satisfaction (i.e.,
decline) based on interindividual variability in the rate of change in the amount of care given (i.e., increase). This hypothesis is strongly supported (slope = \(-.638; \ p < .01\)). The standardized estimate for this parameter is \(\beta = -.531\). Specifically, relative to daughters with little or no change in the amount of care given, daughters who report a greater increase in the amount of care given have a significantly greater decline in caregiving satisfaction. The results for the ninth hypothesis demonstrate that a substantial portion of the individual variation in caregiving satisfaction can be explained by the rate of change in the amount of care given.

Note that initial amount of care given was not correlated with change in care given over time, nor was initial satisfaction correlated with change in satisfaction. Therefore, these relationships were not included in the model.

Post-Hoc Analyses

Other factors also may affect change in caregiving satisfaction. Townsend and her colleagues (1989), who found little connection between caregiving duration and caregiving outcomes but substantial individual variability, suggested that researchers attempt to explain individual variability in adaptation to caregiving over time, as we have done here. They suggested as well that researchers examine the effects of change in the care receiver's health on caregiving outcomes. Furthermore, recent research on the impact of multiple roles on caregiving outcomes (Franks & Stephens, 1992) suggests that we examine the potential impact of these competing commitments.

Investigating the effects of multiple independent variables over time is extremely difficult, particularly with small samples. Even the variables included in our basic model presented obstacles. Take coresidence, for example. Our model had one path from coresidence at Wave 1 to the initial amount of care given. We were fortunate that the proportion of coresiding daughters did not change significantly over time. Had it done so, we would have had to add three additional paths to the model, one each from coresidence to change in the amount of care given in Wave 2, Wave 3, and Wave 4. Additional paths require additional subjects, and additional tests of the missing-completely-at-random hypothesis. Furthermore, the multisample analysis to handle missing data makes the addition of new variables particularly complex (Graham, Hofer, & Piccinin, 1994). Nevertheless, we agreed with Townsend et al. (1989) and Franks and Stephens (1992) that exploration of additional variables was warranted. We carried out a structural equation analysis using EQS with listwise deletion (\(n = 92\)) in which we added 4 variables to the basic model. Because our earlier multisample approach demonstrated that the missing data were missing completely at random, the listwise solution should not be biased (see Note 6, Appendix 2).

The 4 variables we added to the model (see Figure 3) included (a) mothers' age (in years), (b) mothers' health (1 poor to 4 excellent), (c) daughters' marital status (0 = unmarried, 1 = married), and (d) daughters' employment status (0 = not employed; 1 = employed). We added a path from each of these variables to all four endogenous variables in the model. We used Wave 1 measures because age is correlated perfectly with time and because daughters' per-

ceptions of mothers' health, daughters' marital status, and daughters' employment status were invariant — on average — across the four waves. We expected mothers' age (positively) and mothers' health (negatively) to be associated with the initial amount of and change in the amount of care given. We expected daughters' competing commitments (being married and being employed) to reduce the initial amount of care, and to be related negatively to the slope of care given.

We would have liked also to add daughters' number of dependent children to the model, but its skewed distribution rendered its inclusion problematic. We expected no direct effect of the additional variables on caregiving satisfaction or on change in satisfaction because we hypothesized that these effects would be mediated by the amount of care given, consistent with our elaborated version of the wear-and-tear hypothesis.

None of the additional variables had a direct effect on the two satisfaction measures. The only variable in our analyses influencing change in caregiving satisfaction is the rate of change in the amount of care given (see Note 7, Appendix 2). The additional variables, however, did appear to have an impact on the amount of care given. There were trends for mothers' ages to be related positively (\(.023, t = 1.787, p < .10\)) and mothers' health to be related negatively (\(-.158, t = 1.825, p < .10\)) to the initial level of care given, as we expected. That is, daughters with older mothers and daughters whose mothers were in poorer health tended to give more care at Wave 1. Furthermore, there was a trend for daughters' marital status to be positively related (\(.215, t = 1.671, p = .10\)) to initial care. Married daughters tended to give more care at Wave 1 than unmarried daughters. This was contrary to our post-hoc hypothesis that daughters' competing commitments reduce the level of care given.

As we hypothesized, mothers' ages were strongly related, positively (\(.009, t = 3.441, p < .001\)), to change in care given: Daughters with older mothers gave increasingly greater amounts of care over the 4-year period. The other

![Figure 3. Influence of mothers' age, mothers' health, and daughters' competing commitments on caregiving satisfaction. Correlation of exogenous variables and the measurement model are excluded to simplify presentation.](image-url)
three additional variables, mothers’ health and daughters’ employment and marital statuses, were not significantly related to change in the amount of care given.

These post-hoc analyses were not definitive tests of the impact of these variables on care given and on caregiving outcomes. Nevertheless, the overall pattern of the findings is suggestive. Several variables influence the initial amount of care given: coresidence (positively), and possibly the care receiver’s age (positively), the care receiver’s health (negatively), and the caregiver’s being married (positively). Care receiver’s age also predicts increasing amounts of care given over time. Only care given affects caregiving satisfaction, however. Amount of initial care given and rate of change in amount of care given are important predictors, respectively, of initial caregiving satisfaction and of changes in caregiving satisfaction. Giving more care means being less satisfied with caregiving. The duration of caregiving is remarkable for its lack of direct influence on caregiving satisfaction.

DISCUSSION

Our results cast doubt on the wear-and-tear hypothesis when it is reduced to its most simplistic formulation: the longer care is provided, the more negative the outcomes. Controlling for the initial amount and change in the amount of care given, duration of caregiving is related neither to the initial level of caregiving satisfaction, nor to change in caregiving satisfaction. Instead, our findings have identified a cause of wear-and-tear. Daughters give more care over time, and their caregiving satisfaction declines over time directly in response to this increase in the amount of care given. The increase in care given and the decrease in caregiving satisfaction are small but important. For every increase of one standard deviation in the amount of care given, there is a corresponding decrease in caregiving satisfaction of approximately one-half standard deviation. This finding is consistent with an elaborated view of the wear-and-tear model (Lang & Brody, 1983; Pearlin et al., 1990; Townsend et al., 1989): It is not duration of caregiving, but giving increasing amounts of care that wears on caregivers. This elaborated model is reinforced by the cross-sectional results showing that the initial level of care given is negatively related to the initial level of caregiving satisfaction. Giving more care erodes the positive outcomes of caregiving, and it does so concurrently as well as over time.

Mean satisfaction scores were high across all waves of data collection, however, indicating that it would be a mistake to give undue emphasis to the wear-and-tear aspects of caregiving. Even in the fourth wave, daughters reported fairly high satisfaction levels. Furthermore, there is no relationship between the initial level of care given and change in caregiving satisfaction over time. Our basic model and our post-hoc analyses suggest important predictors of the amount of care given. Coresidential daughters give more care initially and daughters with older mothers report greater increases in the amount of care given over time. Because giving more care is associated with declines in satisfaction, coresidential daughters and daughters with older mothers are probable targets for intervention.

Over a 4-year period, the amount of care given to physically impaired aging mothers primarily with IADL needs increases slightly. This was anticipated, given that the mothers receiving care from the daughters studied here had chronic conditions, such as arthritis and sensory impairments, that deteriorate slowly as opposed to diseases such as Alzheimer’s, that result inevitably in decline (Johnson & Catalano, 1983; Stoller & Pugliesi, 1989). As suggested by the post-hoc analyses, these chronic conditions seem to result in more rapid deterioration for older mothers.

It is not surprising that caregiving satisfaction was maintained at relatively high levels over the 4-year period. People derive both rewards and costs from their roles, and, even though they may decline over time, rewards from the caregiving role are considerable. It may be that rewards are especially relevant to women, in part because of high levels of attachment to their mothers (Abel, 1986, 1989, 1990; Boyd, 1989; Horowitz, 1985; Stafford, 1988). It also is possible that the disproportionate emphasis in the literature on burden and depression has deflected our attention from significant positive outcomes (Matthews, 1988; Stull et al., 1994; Zarit et al., 1980; but see Kramer, 1993; Lawton et al., 1989; Miller, 1989). High levels of satisfaction were evident in daughters even after a median of over 9 years of caregiving, beginning on average 5 years before the study began and continuing for an additional 4 years during the study.

Relatively positive outcomes over time also are not surprising because, in our sample, only a small proportion of caregivers provided ADL help. Burden has been found to be greater when more ADL help is given (Hooyman, Gonyea, & Montgomery, 1985), as is suggested by the elaborated wear-and-tear hypothesis. Our case study data are consistent with this view as well. In addition, the absence of high levels of dementia in our care receivers resulted in low levels of behavioral problems. Such problems are associated with greater caregiving costs and also may be associated with diminished rewards (Birkel, 1987; Kinney & Stephens, 1989; Scharlach, 1989).

Caregiving studies that include control groups and that focus on caregiving activities have determined that daughters of self-sufficient mothers provide the same type of assistance to their aging parents as do daughters of impaired mothers, although caregiving daughters spend more time giving aid and they give aid more often (Walker & Pratt, 1991). Thus, caregiving may reflect a lifelong pattern of aid giving, a pattern that is somewhat intensified with dependence. In other words, consistent with a life-course perspective (Kahn & Antonucci, 1980), caregiving daughters, as is true of most adult daughters, give aid in accordance with their parents’ needs (see also Gerstel & Gallagher, 1993; Stoller, 1983). The finding that daughters’ employment is unrelated to the amount of care given is consistent with this view, and with other literature (e.g., Stoller, 1983). These needs, even for physically impaired mothers, may increase only gradually from year to year. Such modest changes, considered in conjunction with a life-span view of intergenerational ties, imply that reliance of the wear-and-tear hypothesis on duration to explain caregiving outcomes is misguided. Furthermore, caregiving under stable conditions (i.e., when the care receiver’s health and the amount of care given remain the same over time) or when the care receiver’s
health improves (i.e., when caregiving responsibilities lessen) may represent the circumstances under which the adaptation hypothesis (Stephens & Zarit, 1989) would be confirmed. These stable or improving contexts may make it possible for caregivers to acclimate to their circumstances or to be less pressured and overwhelmed, thus experiencing little change in outcomes over time or reduced burden and increased positive outcomes. Both the adaptation hypothesis and the wear-and-tear hypothesis seem to depend on the amount of care given.

The overall pattern we found of increased care given and consequent decreased satisfaction exists in the context of substantial individual variability. For some daughters, the amount of care given and caregiving satisfaction were stable or decreased over time. An important contribution of this research is the use of linear growth models with data that demonstrate notable intra-individual variability. Such variability has characterized the findings of other longitudinal studies (Schulz & Williamson, 1991; Townsend et al., 1989). Our use of linear growth models enabled us to preserve these unique patterns for further investigation.

Our findings must be qualified by a number of factors. First, the study was not based on a representative sample. Because we recruited participants from diverse areas and they are similar to representative samples, however, we are satisfied that a wide range of caregiving daughters was included, and that the sample is typical of mostly White daughters who care for their physically impaired, unmarried mothers. Second, we excluded care receivers with cognitive impairments from the initial wave of data collection. A number of dementias are associated with significant declines in functioning over time. Giving care to a person undergoing substantial or precipitous cognitive decline may cause more wear-and-tear than the type of caregiving we studied here. Third, over the four waves, 23.7% of our care-receiving mothers died. Although their caregiving daughters were not very different from their counterparts when the study began, these mothers were in poorer health. Thus, caregiving may have intensified for these daughters over time. By excluding them, we may have underestimated average change both in the amount of care given and in the amount of caregiving satisfaction.

Nevertheless, our study has significant advantages over others in the literature. First, we attended to the unique individual patterns evident in the data, patterns that have been reported by others but have been missed through the use of techniques that analyze data in the aggregate. Second, we operationalized caregiving duration using daughters’ reports rather than the time interval of our longitudinal study. Third, rather than combining caregiving spouses with caregiving children and/or others, we included only one relationship type in our study, mother-daughter, controlling for the gender of the caregiver and of the care receiver as well as excluding daughters with married mothers from the sample. Given that family relationships differ by gender and by generation (Boyd, 1989; Horowitz, 1985; Stafford, 1988), failure to control for these factors potentially produces significant confounds in the data. Fourth, we controlled for the impairment of the care receiver, excluding caregivers to persons with dementia from our sample. Finally, we addressed directly the troublesome problem of missing data that plagues panel studies. According to Zarit (1989) and others (MaloneBeach & Zarit, 1991; Young & Kahana, 1989), not attending to the concerns we addressed here is a major pitfall in family caregiving research.

Caregiving for physically impaired, aging, unmarried mothers is a role for daughters that increases in demands over time, resulting in parallel declines in caregiving satisfaction. Not all women can be characterized by this pattern, however. There are those for whom the amount of care given is stable, and those for whom satisfaction increases over time. The mounting evidence of variability, to which our study has contributed, renders techniques such as linear growth models increasingly compelling in the study of family caregiving.

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Address correspondence to Dr. Alexis Walker, Human Development and Family Sciences, Milam 322, Oregon State University, Corvallis, OR 97331-5102 or to walkera@ccmail.orst.edu

REFERENCES


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Appendix 1

We had complete information from 92 daughters and incomplete information from 38 daughters for an N of 130 (bereaved and deceased daughters were excluded). We tested whether the missing data for the 38 daughters were missing randomly, enabling us to incorporate all 130 cases in the analysis. To examine the most stringent assumption of the test for data missing completely at random, individual models were fit simultaneously to three subsamples representing the patterns of missing observations, with the corresponding parameters constrained to be equal across subsamples. Subsample 1 includes the 92 cases with no missing data. Subsample 2 includes 25 cases missing data from Waves 3 and/or 4 (9 were missing data from Wave 3, 4 from Wave 4, and 12 from both Waves 3 and 4). Although it would have been possible to treat these as 3 separate subgroups, they were combined due to their small n’s (Muthén et al., 1987; Marini, Olsen, & Rubin, 1980). Subsample 3 includes 13 women with missing data on Waves 2, 3, and 4. Although the second and third subsamples have small n’s, the sample sizes are comparable to those used by McArdle and Hamagami (1991). With small sample sizes, there may not be sufficient power to detect important violations of the missing completely at random assumption. The procedure tests the invariance of the moment matrices for the 3 groups. This includes means, intercepts, variances, and covariances of the observed variables. The common parameters are held invariant across groups (Duncan & Duncan, 1995). If common parameters may be treated as invariant, then the missing completely at random condition is met. The model-fitting procedures yielded a χ²(N, N = 130) = 47.05, p < .24, and fit indices of NNFI = .982, and CFI = .989. The results indicate that the missing completely at random condition is substantiated, and, therefore, the missing data mechanism is considered ignorable (Little & Rubin, 1987). Consequently, maximum-likelihood estimation would exhibit no sample bias.

Appendix 2

Notes

1. Comparisons were made on marital status, income, age, mothers’ health, percentage needing help with household tasks, percentage needing help with personal care, and number of health problems. Comparisons were between coresidential and between non-coresidential daughter-mother and mother-daughter pairs (some surveys directed their questions to daughters, and some were directed to mothers). The results are available from the senior author.

2. Prior to performing the analyses, we regressed, separately, initial amount of care given and initial level of caregiving satisfaction onto a number of sociodemographic variables identified in the literature as potentially important. These included daughters’ age, education, household income, number of children, number of children under age 18, and number of siblings. None was significant. Therefore, none was controlled in estimating initial levels of care given and caregiving satisfaction.

3. Contact the senior author for the results of the analyses with an n of 92 cases. The structural equation modeling procedure does not produce imputed values for missing cases. Instead, it puts constraints on parameters that could not otherwise be estimated because data are missing to be equal to corresponding parameters where data are present. A more complete explanation of this process is in Appendix 1 and in Duncan and Duncan (1995).

4. We tested a univariate latent growth curve model specifying the initial level and change in satisfaction. For this univariate model the χ²(13, N = 130) = 15.158, p < .30. Comparative fit indices, however, indicate that the results provided a good fit. The Bentler-Bonett Non-Normed Fit Index (BBNFI) = .993 and the Comparative Fit Index (CFI) = .990 are acceptable. The ratio of chi-square to degrees of freedom of 1.167, although very sensitive to sample size, is also satisfactory (see Carmines & McIver, 1981). For this model the variance in the rate of change in satisfaction is .032 (p < .05).

5. The identification of the latent growth model is straightforward in the case of a linear slope. For the group with no missing data (N = 92) there are 55 known values in the variance/covariance matrix of the observed variables, and 10 known values in the vector of means of the observed variables. This greatly exceeds the number of parameters by fixing the loadings of the four waves of observed variables at 1.0. The linear rate of change is identified by fixing each of the coefficients from the rate of change to each of the four measures (see Figure 2). For Wave 1, the coefficient is fixed at 0, for Wave 2 it is fixed at 1.0, for Wave 3 it is fixed at 2.0, and for Wave 4 it is fixed at 3.0. With these multiwave data, the statistical equation for each growth curve is formulated as follows (the effects of duration and coresidence are omitted to simplify presentation):

\[ Y = \beta_1 + T \beta_2 + E, \]

where \( \beta_1 \) is the intercept (initial level), \( \beta_2 \) is the slope (rate of change), \( T \) is the \( t \)th value of time (i.e., 0, 1, 2, and 3), and \( E \) represents the time-specific errors of prediction. The set of equations for one daughter’s growth curve in caregiving satisfaction for four waves (Sat1, Sat2, Sat3, and Sat4) is:

\[ \begin{align*}
\text{Sat1} &= \beta_1 + \beta_2 + E_1 \\
\text{Sat2} &= \beta_1 + 2\beta_2 + E_2 \\
\text{Sat3} &= \beta_1 + 3\beta_2 + E_3 \\
\text{Sat4} &= \beta_1 + 4\beta_2 + E_4
\end{align*} \]

Using the constant of 1 for \( \beta_1 \) makes it the intercept. The 0,1,2,3 coding for the four time periods, \( T \), imposes a linear restriction on change in satisfaction (other restrictions would permit nonlinear growth or allow for unequal time periods). This is true whenever the measurement units are equally spaced as is the case for yearly observations.

6. The model with the four additional variables failed to converge in the multisample analysis.

7. Parameter estimates, coefficients, and t-values for this model are available from the authors.