Outcome Trajectories for Assisted Living and Nursing Facility Residents in Oregon

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Objective. To compare assisted living residents and nursing home residents on outcome trajectories for three outcomes: ability to perform activities of daily living (ADLs), psychological well-being, and pain and discomfort.

Data Sources/Study Setting. A representative sample of one-third of the census from 38 participating assisted living facilities ($N = 605$) and two-fifths of the census from 31 participating nursing facilities ($N = 610$).

Study Design. A longitudinal design using hierarchical linear models to examine how setting (being in an assisted living setting or in a nursing home) affected growth trajectories for each outcome studied when adjusting for other resident characteristics.

Data Collection. Residents or their proxies were interviewed and chart reviews done at baseline, six months, and one year. All baseline data were collected between August 1995 and May 1996.

Principal Findings. We found differences in case mix between assisted living and nursing facility residents but no differences in outcome trajectories for ADLs, psychological well-being, and pain and discomfort. For ADLs and pain and discomfort on average, residents in both settings experienced change over the study period. For psychological well-being, residents experienced no change on average.

Conclusions. The lack of difference in growth trajectories for ADLs, pain and discomfort, and psychological well-being between the two settings was noteworthy.

Key Words. Assisted living, nursing home, outcomes, activities of daily living, psychological well-being, pain

Discontent over the current long-term care system in the United States is widespread. Consumers have expressed strong preferences to avoid living in nursing homes (Mattimore, Wenger, Cesbiens, et al. 1997). In the 1990s, alternative residential care settings, often going under the umbrella term "assisted living," arose as a market phenomenon to meet the demand for new forms of long-term care. The first licensed and publicly subsidized model of assisted living was developed in Oregon, where state officials and organized consumer organizations collaborated to create a model that emphasized a full range of services in apartment-style accommodations that afforded privacy and opportunities for individualized care (Kane et al. 1990). After experience with a demonstration program in the 1980s, Oregon began licensing assisted living facilities in 1990. From the inception, Oregon has paid for services in assisted living for financially eligible, nursing home–certifiable people under its home- and community-based Medicaid waiver. The model developed in Oregon was envisioned not as a step in the continuum with lighter care than in nursing homes, but rather as a "nursing home replacement" model, designed to serve at least a subset of those who otherwise would be in nursing homes. Despite its privacy and apartment-style accommodations, Oregon aspired to produce a model that was inexpensive enough to be feasible for people with modest incomes and those subsidized by Medicaid.

In 1995, the authors of the present study began a multifaceted evaluation of assisted living, for which we collected original longitudinal data on a sample of assisted living and nursing home residents. This article compares the following key outcomes for these residents: functional status, pain and discomfort, and psychological well-being.

BACKGROUND

ASSISTED LIVING

Assisted living has proliferated rapidly in the country as a whole. In general, the term assisted living has come to be used for any residential setting not licensed as a nursing home that provides or arranges personal care and routine

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nursing in a homelike residential setting (Kane and Wilson 1993; Lewin-VHI 1996). In practice, states vary greatly in the way they regulate assisted living, which, in turn, reflects different philosophies about who should be served in these residential long-term care settings and the relationship envisaged between assisted living and nursing homes (Mollica 2000). The service capability may be enhanced or constrained by state service and admission and retention rules built into licensing regulations. The homelike nature of the settings also varies a great deal among and within states, with some assisted living settings providing single-occupancy apartments and others providing shared accommodations in board-and-care settings with two or more persons per room. In a national probability study of assisted living settings serving 11 or more people, Hawes et al. (1999) found that only 11 percent of the assisted living facilities in the nation met the study's definition of *both* high service (i.e., involvement of a licensed nurse in care) and high privacy (i.e., private accommodations). The Oregon models studied here, by definition, all have high privacy and high service. Apartment-style assisted living, by design, offers privacy and the opportunity for autonomy. It also exposes residents to the risks of everyday life associated with cooking and bathing and tends to afford staff less opportunity for protective surveillance. Also, whether the service is provided by internal staff, outside home care agencies, or a combination of these, assisted living tends to be more lightly staffed than are nursing homes. The federal standardization of assessment and quality standards does not apply to assisted living, and states have been free to develop their own regulations. As a result, concerns have arisen about the effects of this type of care on the well-being of vulnerable seniors.

Because no studies have been reported to date that compare outcomes of assisted living residents who receive care under a high-service, nursing home replacement model with residents in more protected settings, little can be said to allay questions about the effectiveness and safety of these settings. The two main (and somewhat opposite) concerns can be summarized as follows: (1) that assisted living will offer a promise of "aging in place"—that is, permitting residents to remain in the same living setting despite increased disability—but in practice shift residents to nursing homes or other settings as soon as substantial care needs arise; and (2) that assisted living staff will be unable to discern and respond to changes in health status while residents age in place, therefore leading to bad outcomes for residents. Indeed, a recent study by the General Accounting Office (GAO 1999) raised just these kind of concerns about the adequacy of consumer information and the quality of care in assisted living.

ASSISTED LIVING IN OREGON

Oregon's assisted living model offered an opportunity to test the reality of some of these concerns. To be licensed as a provider of assisted living in Oregon, a facility must offer single-occupancy apartments with full bathrooms (usually with showers, not bathtubs), a way to refrigerate and heat food, and a locking apartment door. The assisted living settings are also required to serve three meals a day in a dining room as part of their basic service provision and to offer individual care plans that promote aging in place. Because Oregon's nurse practice act permits nurses to teach and delegate nursing tasks to unlicensed personnel, care is largely provided by unlicensed staff of the assisted living program. Indeed, licensing standards are almost silent on the actual types and numbers of staff needed; they require only that someone be awake and on duty at all times and that staffing be sufficient to provide adequate care. Oregon, therefore, afforded an ideal place to test the extent to which aging in place really occurs and how well residents fare under a nursing home replacement program with minimal staffing requirements and a stated philosophy of upholding values of dignity, independence, and privacy.

CHALLENGES OF COMPARING OUTCOMES ACROSS SERVICE SECTORS

Evaluating emerging health care programs requires examining a moving target. In 1990, when Oregon began licensing assisted living, there were three licensed programs, all in the Portland area. When we began our evaluation in the summer of 1995, 39 licensed assisted living facilities were serving about 2,000 people and were located throughout the state (by 1998 there were more than 100 facilities serving about 4,000 people).

Comparisons across modalities of care should rely on outcome measures of quality because particular processes are linked to particular modalities or sites of care (Kane 1998). However, substantial differences in the distribution of clients according to setting may impede comparing modalities of care. Statistically, lack of overlap in the disability distribution across modalities of care often makes the comparison of outcomes difficult. Even in Oregon, where the model is designed to serve people with nursing-home levels of need, we expected, and indeed found that our nursing home sample was, on average, more functionally disabled, in worse health, and more cognitively impaired than our assisted living sample (Kane, Huck, Frytak, et al. 1999). Therefore, to address whether differences in relative effectiveness exist across the two types of settings, we framed the question as follows: How do individual residents' outcome trajectories vary according to setting (i.e., residing in an assisted living facility or a nursing home)? We speculated that trajectories for functional status and pain and discomfort would favor the nursing home because of its greater focus on health care and rehabilitation, and that psychological well-being would favor the assisted living setting because of its more normal and pleasant environment. On the other hand, the opposite case can also be argued. Some commentators expect greater maintenance of functional abilities in assisted living because of the demands and possibilities of the environment, and poorer maintenance of psychological well-being because of less focus on formal activity and socialization programs. Thus, we use two-tailed tests of significance, given the lack of clear hypotheses and our interest in determining whether there were any differences in outcome attributable to setting.

METHODS

DESIGN

We used hierarchical linear models (HLM) to model growth trajectories for selected outcomes. This approach permits the determination of whether the type of setting is associated with mean initial differences in each outcome, as well as whether the type of setting affects the slope of each outcome. Analysis of growth curves has become more commonplace in past years in the health care literature (Blatt, Davenport, and Olshan 1999; Brekke et al. 1997; Wickrama, Lorenz, and Conger 1997; Zee 1998) because the problems inherent in measuring individual change have been well documented (Harris 1963; Chronbach and Furby 1970; Rogosa and Willet 1985). We used a HLM approach to avoid the problems associated with first difference (or *n* difference) models (Rogosa and Willet 1985). HLM provides a way to estimate changes within an individual without introducing the bias associated with traditional repeated measures designs (Bryk and Raudenbush 1992). Another advantage of these models is ease of interpretation. Coefficients in these models have the same meaning as coefficients in a standard regression.

In this article, we address the following questions: For residents who remain in nursing homes or assisted living, how do their functional outcomes compare over time? How does their pain and discomfort compare over time? How does their psychological well-being compare over time? Essentially, we are asking whether patterns of change in these outcomes over the year of the study differ as a function of being in assisted living versus being in the more protective setting of the nursing home. The data for assisted living and nursing facility residents are pooled in the analyses and, although type of setting is the main variable of interest, we have included in the models a variety of other social and health-related factors with the potential to contribute to each particular outcome trajectory.

SAMPLE

The sample was drawn from assisted living facilities (ALF) and nursing facilities (NF) in the state of Oregon. All 39 licensed ALFs in the state of Oregon in the summer of 1995 were invited, and 38 agreed to participate. Nursing homes were randomly sampled and invited to participate on a rolling basis from the list of 156 Medicaid-certified nursing homes in the state. Ten out of the 41 eligible nursing homes we approached refused to participate, resulting in a 78 percent response rate for the final sample of 31 nursing homes. We also deemed ineligible five nursing homes randomly picked from the list because they were transitioning to a different form of care (three) or had sustained heavy damage due to flooding (two). We randomly sampled one-third of the residents from each ALF and two-fifths of the residents from each NF. To eliminate potential subacute cases, residents with lengths of stay less than 21 days were excluded from the study. We also excluded residents who were under 65 years of age or comatose. Family members and staff were used as proxy respondents for the resident interview when interviewers considered residents too cognitively impaired to be interviewed directly. This resulted in an initial sample of 610 NF residents and 605 ALF residents.

Table 1 shows the sample size for each wave of data collection by facility type and proxy status. The distribution of proxy interviews is essentially inverted in the two types of facilities. From the ALF sample, 517 respondents (or their proxies) still residing in a study facility were interviewed at six months. Between wave 1 and wave 2, attrition from the ALF sample was due to relocation to the community ($n = 8$), relocation out of state ($n = 4$), unable to locate or do interview ($n = 4$), refusal to do interview ($n = 15$), and death ($n = 57$). From the NF sample, 483 respondents still residing in a long-term care facility were interviewed at six months. Between wave 1 and wave 2, attrition from the NF sample was due to relocation to the community ($n = 6$), relocation out of state ($n = 3$), unable to locate or do interview ($n = 1$), refusal to do interview ($n = 9$), and death ($n = 108$). From the ALF sample, 441 respondents still residing in a long-term care facility were interviewed at

Table 1: Sample Sizes for Study Period by Facility Type and Proxy Status

	Baseline	*Six Months*	*One Year*
ALF	605	517	441
Nonproxy	478 (79%)	367 (71%)	285 (65%)
Proxy	127 (21%)	150 (29%)	156 (35%)
NF	610	483	372
Nonproxy	171 (28%)	119 (25%)	88 (24%)
Proxy	439 (72%)	364 (75%)	284 (76%)
Total	1215	1000	813
Nonproxy	649 (53%)	486 (49%)	373 (46%)
Proxy	566 (47%)	514 (51%)	440 (54%)

12 months. Between wave 2 and wave 3, attrition from the ALF sample was due to moving to the community ($n = 14$), relocation out of state ($n = 9$), unable to locate or do interview ($n = 4$), interview not done ($n = 2$), refusal to do interview ($n = 20$), and death ($n = 56$). From the NF sample, 372 respondents still residing in a long-term care facility were interviewed at 12 months. Between wave 2 and wave 3, attrition from the NF sample was due to residence in the community ($n = 5$), relocation out of state ($n = 2$), refusal to do interview ($n = 6$), and death ($n = 114$). Over the entire study period, roughly one-fifth of the ALF and one-third of the NF baseline samples died.

All outcome analyses used complete cases composed of individuals participating in all three waves of data collection. Differences between sample sizes presented in Table 1 and those used in our analyses below result from the requirement of complete cases, mainly due to missing data on the dependent variables. The functional status outcome is modeled on all residents in the study with three waves of usable data, whereas the psychological well-being and pain and discomfort are examined only for those residents who were personally interviewed (because we did not ask proxy respondents to rate these subjective phenomena).

DATA COLLECTION

Data were collected through personal interviews with residents or their proxies at baseline, six months, and one year. Chart reviews were also performed at each time wave. Variables elicited from the interviews (which averaged an hour in length) included resident functional status, cognitive status, psychological well-being, and social functioning; these variables were supplemented with diagnoses from the chart reviews.

MEASURES OF OUTCOMES (DEPENDENT VARIABLES)

Three outcomes are examined in our analyses: functional abilities (i.e., performance of activities of daily living, or ADLs), psychological well-being (PWB), and pain and discomfort.

Functional Abilities

ADLs were measured as the need for assistance using a magnitude estimation scale developed by Finch, Kane, and Philp (1995). This adaptation of the scale includes weighted items of continence, feeding, toileting, transferring, and dressing. Bathing was excluded from the scale because all nursing facility residents receive assistance with bathing. The resultant ratio scale provides a single summary measure. The scale was transformed to a range of 0 to 100, where 0 represents no functional limitations and 100 represents complete dependence or death.

The final sample at wave 3 for the ADL analyses was 776 residents (428 ALF and 348 NF).

Psychological Well-Being

PWB was measured by the mental health subscale from the SF-36 Short-Form Health Survey (Ware and Sherbourne 1992). The subscale contains five items tapping the mental health components of anxiety, depression, loss of behavioral or emotional control, and PWB. Following scoring recommendations for the SF-36, the subscale's range is 0 to 100, with a high score indicating high PWB (Ware et al. 1993). Reliability and validity of the subscale have been well documented (McHorney, Ware, and Raczek 1993; Ware and Sherbourne 1992). The baseline ALF and NF sample had an alpha of .78 on the subscale.

The final sample at wave 3 for the PWB analyses included 352 nonproxy residents (272 ALF and 80 NF).

Pain and Discomfort

The pain and discomfort measure was an adaptation of the pain and discomfort scale developed at RAND by Kane, Riegler, Bell, et al. (1982) for use with nursing home patients. The pain and discomfort items measure the frequency of (1) aches and pains in joints or muscles, (2) chest pain, (3) shortness of breath, (4) dizziness, (5) itching and burning, (6) headaches, and (7) coughing. The baseline ALF and NF sample had an alpha of .67 on the scale.

The final sample at wave 3 for the pain and discomfort analyses included 336 nonproxy residents (257 ALF and 79 NF).

MEASURES (INDEPENDENT VARIABLES)

All of the variables included as control variables in the growth models were measured at baseline.

Health Status Variables

The independent variables on health and cognitive status incorporated into one or more models are described below. These included self-assessed health, eyesight, cognition, interference of pain with daily activities, and several medical diagnoses—congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), hip fracture, stroke, and cancer. All of the outcome analyses controlled for resident health and cognitive status. However, some variables were dropped or added depending on the outcome based on our theory about what might affect the outcome. A diagnosis of cancer was included in only the pain and discomfort analysis. Interference of pain with daily activities was included in only the PWB analysis.

Self-assessed general health was measured by a four-category classification: (1) poor, (2) fair, (3) good, and (4) excellent. Eyesight was coded as (1) excellent, (2) good, (3) fair, and (4) poor. A mental status score was based on the numbers of errors on the Mental Status Questionnaire (MSQ) (Kahn et al. 1960). The MSQ score range was 0–10 errors. Frequency of pain interfering with daily activities was coded as (1) none of the time, (2) a little of the time, (3) some of the time, and (4) most of the time. CHF, COPD, hip fracture, stroke, and cancer were coded as the presence or absence of each diagnosis based on data from reviews of the residents' charts.

Demographic Variables

Age and length of stay (LOS) were included in all models. Age was measured as a continuous variable and LOS as a dichotomous variable capturing whether an individual had been in the facility longer than six months. Admission to the hospital from the ALF or NF in the last six months is a dichotomous variable and included in the ADL and pain and discomfort analyses. Gender was included in the pain and discomfort analysis.

Social Measures

Six social variables were incorporated into the study for the modeling of PWB: resident perception of interaction with staff; frequency of contact with relatives and contact with friends, having a confidant, and participation in group and in solo activities.

Perception of interaction with staff was a summed scale created from four items regarding the frequency of the residents' belief that the staff (1) treated them with dignity and respect, (2) listened to their comments and opinions, (3) encouraged them to do things for themselves, and (4) answered their questions. (Chronbach's $\alpha = .67$). Items in the scale are unweighted, and a factor analysis was performed to confirm that the variables were related to one underlying factor. Frequency of contact with children or other relatives in the past few months and frequency of contact with outside friends in the past few months were both coded as (1) not at all, (2) about once a month, (3) two to three times a month, (4) once a week, (5) several times a week, and (6) every day. Having a confidant was measured by asking the resident his or her level of agreement (four categories) with the statement that there is someone whom I trust and can confide in when I have a problem. Participating in solo and group activities as much as one wants are both dichotomous variables.

ANALYSIS

We used a two-level HLM to analyze the data over time for each outcome (Bryk and Raudenbush 1992). Heuristically, we can break down the estimation strategy into two levels, although in practice, estimates are derived simultaneously through full information maximum likelihood estimation. At level 1, each individual's growth trajectory for a given outcome variable (Y) is modeled as a function of repeated measures of each outcome at baseline, six months, and one year and includes a random error component (e).

Level 1: $$Y_{ti} = a_{0i} + a_{1i}T_i + e_{ti}.$$

T_i is the data collection wave ($i = 0, 1, 2$) for each individual, with t_0 = baseline, t_1 = six months, and t_2 = one year. The term a_{1i} (the slope) is the growth parameter for individual i and represents the expected change over a six-month interval; a_{0i} (the intercept) represents the baseline level of functioning of the individual. All parameters are allowed to vary across individuals. For example, the subscript i on the growth parameter denotes that the growth rate is allowed to vary across individuals.

At level 2, we model the resident-level predictors (J = number of independent variables) of baseline status (intercept) and the resident-level predictors of growth over the study period (slope), allowing a random component (u) to capture individual variation.

Level 2:

$$a_{0i} = b_{00} + \sum_{j=1 \text{ to } J} b_{0j} X_{0ji} + u_{0i}$$

$$a_{1i} = b_{10} + \sum_{j=1 \text{ to } J} b_{1j} X_{1ji} + u_{1i}.$$

Here, b_{00} represents the mean baseline status for residents and b_{10} represents the mean growth rate for residents over the study period. The terms u_{0i} and u_{1i} are the estimated variances of the growth parameters a_{0i} and a_{1i} and denote whether there is individual variation in the slope and the intercept of the sample.

First, a base model was run for each outcome variable to determine whether there was individual variation in the slope and intercept. The base model consisted of the mean intercept (b_{00}) and slope (b_{10}) effects and the variance components (u_{0i} and u_{1i}), respectively. Next, we fitted a quadratic form of the base model to determine the shape of the growth trajectories for each outcome (i.e., T_i^2 was added to the level 1 equation). We assessed whether the coefficient for mean acceleration was significant and whether the mean acceleration variance component was significant. If the tests were not significant, the squared term was not included in the model. A linear growth model fit the data best for ADLs and PWB. A quadratic growth model was better suited to the pain and discomfort data.[1]

Next, we fitted a full model for each outcome, where we estimated lagged predictors (baseline) of the intercept and slope for each outcome. The primary predictor of interest was type of setting (ALF vs. NF) and whether type of setting was a predictor of baseline status, a predictor of the growth rate (slope) for each outcome, or both. The significance of a fixed effect for each beta coefficient was tested using a standard t-test. The significance of a random effect for the variance component of the slope and the intercept was tested using a chi-square statistic.

We imputed small amounts of missing data in several independent variables using regression techniques (Little and Rubin 1987). Less than 3 percent of the data was imputed for age, LOS, general health, and hospital admission. Less than 5 percent of the data was imputed for any social item. The specified growth models assume linearity in the model covariates and normally distributed and homoscedastic random components. Violation of these assumptions can bias the model estimates, their standard errors, or both. We thus performed several specification tests for each model, including Ramsey's (1969) RESET test, Pregibon's (1980) link test, and Pagan and

Vella's (1989) conditional moments (CM) test of normality. The test results were uniformly supportive of the growth model estimates reported in this article.[2] As an additional specification check, we estimated each model using a consistent least squares procedure with a robust covariance formula (Binder 1983). While less efficient than the maximum likelihood approach of our main analysis, this estimator allows valid inference in the presence of non-normal and heteroscedastic errors that are arbitrarily correlated within subject and facilities. Notably, this robust least squares procedure leads to precisely the same conclusions on cross-setting differences in outcome growth trajectories as our main analysis.

Because the study subjects self-selected into the settings in which they were observed, our estimates of cross-setting differences in growth trajectories could be subject to selection bias. This would occur if the unmeasured factors affecting outcome trajectories were correlated with determinants of the subjects' setting choices. To address this concern, we applied the CM testing procedure for selection bias suggested by Pagan and Vella (1989) and found no evidence that the estimated models for any of the outcomes are subject to selection bias (ADL: $p = .825$; PWB: $p = .760$; pain/discomfort: $p = .639$). These results suggest that the covariates included in the outcome models sufficiently control for systematic patient differences related to setting choice.

RESULTS

Table 2 presents the distribution of the outcome variables at each time period by type of setting. Case-mix differences are apparent when the data are presented using descriptive statistics.

GROWTH MODELS: BASE

The base models for ADLs and pain and discomfort have significant mean effects for the slope and the intercept and significant variance components, suggesting significant individual and mean variation in the growth trajectories. The PWB base model results show a significant mean effect for the intercept and significant variance components for both the slope and intercept, but the mean effect for the slope was not significant ($\beta_1 = -0.435$, $p = .345$). The base model results suggest that the individual variation in psychological well-being was mostly random variation since the coefficient for the mean growth rate was insignificant.

Table 2: Means and Standard Deviations of Outcome Variables by Setting over Time

	ADL	*PWB*	*Pain and Discomfort*
Baseline			
ALF	16.88	76.04	12.62
NF	57.09	71.35	12.97
Six months			
ALF	20.24	77.70	12.35
NF	61.83	69.28	12.97
One year			
ALF	24.92	75.67	12.63
NF	65.92	68.80	13.48

Note: Sample sizes for ALF: ADLs ($N = 428$); PWB ($N = 272$); pain and discomfort ($N = 257$). Sample sizes for NF: ADLs ($N = 348$); PWB ($N = 80$); pain and discomfort ($N = 79$).

GROWTH MODELS: FULL

Functional Status

The ADL base model analysis found that individuals in the two types of long-term care facilities had an average ADL score of 35 at the start of the study period and that ADL scores increased by four points on average per six-month period during the study. The variance components for the intercept and the slope were also significant, suggesting that individuals varied in their level of ADL functioning at the start of the study and that individuals varied in their ADL functioning growth rates. Table 3 presents the results of the ADL full model where we introduced a set of person-level characteristics into the level 2 intercept and slope equations.[3] The intercept results suggest that the type of setting was strongly related to functional ability at the start of the study ($\beta_0 = 29.863$, $p = .000$), but the slope results indicate that the type of setting was not significantly related to individual growth rates ($\beta_1 = -0.656$, $p = .465$). On average, ALF residents were 30 points less disabled on the ADL scale than NF residents at baseline. Interestingly, different variables in the fixed effects were significant for predicting the variation in the intercept and the slope. Only age ($\beta_0 = -0.261$, $p = .021$; $\beta_1 = -0.183$, $p = .001$) was predictive of ADL intercept differences both at baseline and of individual growth rates. Individuals with a hip fracture diagnosis were, on average, ten points more disabled than those without a hip fracture at baseline ($\beta_0 = 10.49$, $p = .003$). General health status was inversely related to average baseline

Table 3: Summary of Growth Model Results for ADLs, Waves 1–3 (Scale Range: 0–100; $N = 776$)

	Intercept			*Slope*		
Resident Characteristics	*Coeff.*	*SE*	p-*Value*	*Coeff.*	*SE*	p-*Value*
Intercept	71.046	9.915	.000	−14.212	4.490	.002
Facility type (ALF)	**−29.863**	**1.986**	**.000**	**0.656**	**0.899**	**.465**
Age	−0.261	0.113	.021	0.183	0.051	.001
Length of stay	4.191	2.296	.067	−1.288	1.040	.216
Admitted to hospital	0.895	2.487	.719	−0.228	1.126	.840
General health	−4.240	0.981	.000	0.317	0.444	.475
Stroke	1.428	2.141	.505	1.914	0.970	.048
CHF	−0.883	2.341	.706	−0.815	1.060	.442
COPD	−5.270	3.022	.081	0.191	1.369	.889
Hip fracture	10.494	3.451	.003	−2.479	1.563	.112
MSQ	3.159	2.394	.187	0.373	1.084	.730
MSQ^2	−1.042	0.610	.087	0.167	0.276	.546
MSQ^3	0.094	0.040	.020	−0.016	0.018	.373
	Var. comp.	*df*	*Chi-square*	p-*Value*		
Variance component intercept	425.635	763	3577.204	.000		
Variance component slope	41.719	763	1222.731	.000		

ADL score ($\beta_0 = -4.240$, $p = .000$). Individuals with a stroke diagnosis had a hefty 1.914 addition to the average growth rate ($\beta_1 = 1.194$, $p = .048$). The addition of the person-level predictors to the full model accounted for 53.84 percent of the parameter variance in the intercept but only 9.38 percent of the parameter variance in ADL growth rates (slope).

Psychological Well-Being

In the PWB full model analysis (Table 4), we included as resident-level predictors type of setting, all the social variables, general health, pain interference with activities, diagnoses, MSQ, eyesight, LOS, and age. The base model results suggested that the individual variation in PWB was mostly random variation because the coefficient for the mean growth rate was insignificant. Thus, only the resident-level predictors of the intercept are of interest. The main variable of interest, type of setting, did not predict one's PWB at baseline ($\beta_0 = 2.197$, $p = .361$) after controlling for other resident-level

Table 4: Summary of Growth Model Results for Psychological Well-Being, Waves 1–3 (Scale Range: 0–100; $N = 352$)

	Intercept			*Slope*		
Resident Characteristics	*Coeff.*	*SE*	p-*Value*	*Coeff.*	*SE*	p-*Value*
Intercept	41.374	12.471	0.001	1.682	6.870	.807
Facility type (ALF)	**2.197**	**2.404**	**0.361**	**1.575**	**1.324**	**.235**
Age	0.125	0.120	0.294	−0.033	0.066	.613
Length of stay	−2.496	2.259	0.270	0.007	1.244	.996
ADLs	−0.023	0.044	0.600	−0.006	0.025	.793
General health	3.099	1.185	0.009	−0.077	0.653	.907
Pain interference	−4.423	0.824	0.000	0.190	0.454	.676
Eyesight	−1.439	0.918	0.117	0.589	0.506	.245
Stroke	−1.839	2.277	0.419	0.335	1.254	.790
CHF	−2.967	2.311	0.199	−1.399	1.273	.272
COPD	−1.022	2.881	0.723	1.550	1.587	.329
Hip fracture	−7.366	4.214	0.080	2.811	2.321	.226
MSQ	0.108	0.452	0.811	0.228	0.249	.362
Staff interaction	0.806	0.226	0.001	−0.038	0.125	.763
Family contact	0.921	0.579	0.112	0.290	0.319	.364
Friends contact	−0.788	0.657	0.230	0.341	0.362	.346
Social confidant	0.672	1.286	0.601	−0.197	0.709	.781
Solo activities	9.763	2.555	0.000	−3.578	1.407	.011
Group activities	2.673	2.500	0.285	−0.137	1.377	.921
	Var. comp.	*df*	*Chi-square*	p-*Value*		
Variance component intercept	143.606	333	799.445	.000		
Variance component slope	13.168	333	404.286	.005		

characteristics. However, several health and social variables were significantly related ($p \leq .05$) to initial PWB status (i.e., perceptions of staff, pain interference with daily activities, general health, and involvement in solo activities). The addition of the person-level predictors to the full model accounted for 36.16 percent of the parameter variance in the intercept.

Pain and Discomfort

The pain and discomfort data fit a quadratic growth model. The positive sign on the slope squared coefficient ($\beta_1 = 0.274$, $p = .026$) in the base model suggests that, on average, individuals were experiencing pain and discomfort at an increasing rate over time (Table 5). In the pain and discomfort analysis,

Table 5: Summary of Growth Model Results for Pain and Discomfort, Waves 1–3 (Scale Range: 7–28; $N = 336$)

	Intercept			*Slope*			*Slope²*		
Resident Characteristics	*Coeff.*	*SE*	p-*Value*	*Coeff.*	*SE*	p-*Value*	*Coeff.*	*SE*	p-*Value*
Intercept	6.704	2.433	0.006	0.359	3.296	0.914	−0.127	1.557	0.935
Facility type (ALF)	**−0.500**	**0.562**	**0.373**	**0.615**	**0.761**	**0.419**	**−0.378**	**0.359**	**0.293**
Age	0.011	0.027	0.696	−0.009	0.037	0.801	0.007	0.017	0.667
Gender (female)	1.285	0.515	0.013	−0.727	0.697	0.298	0.337	0.329	0.307
Length of stay	−0.431	0.506	0.395	−0.182	0.685	0.790	−0.011	0.324	0.973
Admitted from hospital	0.368	0.530	0.487	−0.233	0.718	0.746	0.048	0.339	0.888
General health	1.695	0.245	0.000	−0.145	0.332	0.662	0.005	0.157	0.973
Stroke	−0.976	0.519	0.059	1.516	0.703	0.031	−0.598	0.332	0.071
CHF	1.364	0.517	0.009	−1.302	0.701	0.063	0.496	0.331	0.134
COPD	0.836	0.665	0.209	1.608	0.901	0.074	−0.594	0.426	0.163
Hip fracture	−0.637	0.955	0.504	0.659	1.293	0.610	−0.263	0.611	0.667
Cancer	1.053	0.917	0.251	0.451	1.243	0.717	0.188	0.587	0.748
ADL	0.023	0.010	0.022	0.016	0.013	0.242	−0.006	0.006	0.310
	Var. comp.	*df*	*Chi-square*	p-*Value*					
Variance component intercept	9.014	323	1354.591	0.000					
Variance component slope	0.750	323	466.290	0.000					

we included as predictors type of setting, all the health measures, age, gender, LOS, and whether the individual was admitted to the hospital within the last six months. Type of setting did not predict one's pain and discomfort score at baseline ($\beta_0 = -0.500$, $p = .373$), individual variation in the growth rates for pain and discomfort ($\beta_1 = 0.615$, $p = .419$), or the acceleration rate for pain and discomfort ($\beta_1 = -0.378$, $p = .293$). Several other variables were significantly related ($p \leq .05$) to initial pain and discomfort status. On average, females had 1.28 points more pain and discomfort on the scale than males, and individuals with a diagnosis of CHF had 1.364 points more pain and discomfort than those without CHF. Also, individuals with poorer general health and more disability had higher levels of pain and discomfort at baseline on average. At the .05 level, a diagnosis of stroke was the only predictor of the slope; a stroke diagnosis was associated with a 1.516-point addition to the growth rate. None of the variables in the pain and discomfort model were good predictors of the acceleration rate. The addition of the person-level predictors to the full model accounted for 24.29 percent of the parameter variance in the intercept, but only 2.91 percent of the parameter variance in pain and discomfort growth rate (slope).

DISCUSSION

We found baseline differences in case mix between assisted living and nursing facility residents, but no differences in outcomes in the three outcomes examined: physical functioning, psychological well-being, and pain and discomfort. Specifically, nursing facility residents were more disabled than assisted living residents at the start of the study, but average baseline levels of psychological well-being and pain and discomfort were similar for both types of residents after controlling for other health and social variables. For physical functioning and pain and discomfort, residents experienced change over the study period, but the change wasn't related to the type of facility they lived in. Also, change in pain and discomfort was not linear. Residents in the sample experienced change in psychological well-being over time, but the variation was random and did not exhibit a pattern of improvement or decline on average.

Although there has been no prior evaluative work done on comparing assisted living to nursing facility residents, widespread differences in opinion exist on who assisted living can effectively serve. Many states have discharge and admission criteria in place that limit the amount of disability allowed in assisted living (Mollica 2000). Therefore, one might have expected nursing facilities to be more effective at managing pain and discomfort as well as physical disability, but there was no evidence for such an effect. A focus on process would likely have resulted in different conclusions because assisted living has less onerous staffing and structural requirements. Surprisingly, neither type of facility had a significant effect on psychological well-being; assisted living typically touts psychosocial outcomes as a selling point. The stability of psychological well-being on average may be intrinsic to the construct itself or the particular measure we employed here, the SF-36 mental health subscale. The available evidence suggests that both scenarios are a possibility (Costa, Zonderman, McCrae, et al. 1987; Ware, Bayliss, Rogers, et al. 1996). Using the SF-36, Ware, Bayliss, Rogers, et al. (1996) found that the four-year mental health outcomes of older adults (age ≥ 65) did not improve significantly over time. The significant individual variation in growth rates in long-term care residents and the absence of an overall trend suggest that the construct may be driven by random rather than predictable variation. More research is needed to determine whether long-term care providers can influence change in psychological well-being once individual health and psychosocial characteristics are taken into account. Moreover, if the construct is stable over time on average, we should reconsider its use as an outcome for assessing quality of care in long-term care settings.

Given that our principal finding is a lack of significant cross-setting differences in rates of outcome change, it is reasonable to question whether this result owes to low statistical power. To address this question, we used Monte Carlo simulation to estimate the power of our analyses to detect cross-setting growth rate differences. The simulation results suggest that our analyses had ample power to detect differences large enough to be of practical interest. Specifically, the pain and discomfort and psychological well-being analyses were able to detect a ± 10 percentage point cross-setting difference in annual rates of change, with 80 percent power at the .05 significance level, and the ADL analysis had 80 percent power to detect a ± 15 percentage point difference at the .05 level.

The study has some limitations. First, the sample is a mixed cohort; we drew a random sample of all residents in the facility at baseline rather than sampling only new admissions. Thus, we have people at very different points in their institutional experience. If we believe that residents experience linear outcome trajectories over time, it doesn't matter when we interview them. However, if growth trajectories are nonlinear, it matters. For instance, if one believes in adaptation to a long-term care setting, a lot of change may occur early in the facility stay and level off over time. Conversely, if people experience a fairly stable trajectory and then experience rapid change before death, the trajectory would be nonlinear. Linear growth models were the most appropriate models for psychological well-being and physical functioning. This suggests that the rate is linear no matter where you start. However, this is not true for pain and discomfort because it is nonlinear. It should also be noted that for all models, the dummy variable indicating new admission (less than six months) did not significantly affect the growth rate. Also, selective mortality has not been fully accounted for; analysis of the mortality data is in process to examine whether death is more likely in one setting when controlling for baseline status, but the current analyses include only survivors over the study period. To address in part the influence of selective attrition due to mortality or discharge, we also ran all the models using data from only the first two waves. The results for type of setting were comparable to the results from the three waves of data.

In conclusion, the lack of difference in growth trajectories for ADLs, pain and discomfort, and psychological well-being between the two settings was noteworthy. By focusing on outcomes rather than process, we are able to speak to the potential role of assisted living as a substitute for a broad range of nursing facility clients. However, this was not a true experiment and therefore had to contend with residents of assisted living being less disabled than nursing facility residents. Of interest is whether assisted living programs in Oregon can sustain their good outcomes if their case mix changes to a higher proportion of residents with heavy needs.

NOTES

1. Base model results are discussed in the Results section but are not presented in tabular format. They were merely a necessary step in specifying the full model, which contains the variable of interest.
2. Use of Cook's distance test on the PWB variable revealed a single case that had an extreme influence on the linearity of the model. This case was dropped from the analysis.
3. ADL analyses were also run stratifying by proxy status. We found similar effects for nonproxy respondents and all respondents with the exception of cognitive status. We did not find any significant predictors of growth rate for proxy respondents, due in all likelihood to a ceiling effect.

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