

CLINICAL INVESTIGATION

Home time and state regulations among Medicare beneficiaries in assisted living communities

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Abstract

Background: Home time is an important patient-centric quality metric, which has been largely unexamined among assisted living (AL) residents. Our objectives were to assess variation in home time among AL residents in the year following admission and to examine the associations with state regulations for direct care workers (DCW) training and staffing and for licensed nurse staffing.

Methods: Medicare beneficiaries who entered AL communities in 2018 were identified, and their home time in the year following admission was measured. Home time was calculated as the percentage of time spent at home per day being alive. Resident characteristics and state regulations in DCW staffing, DCW training, and licensed staffing were measured. We used a multivariate linear regression model with AL-level fixed effects to estimate the relationship between person-level characteristics and home time. Linear regression models adjusting for resident characteristics were used to estimate the association between state regulations and residents' home time.

Results: The study sample included 59,831 new Medicare beneficiary residents in 12,143 ALs. In the year following AL admission, residents spent 94% (standard deviation = 14.6) of their time at home. Several resident characteristics were associated with lower home time: Medicare–Medicaid dual eligibility, having more chronic conditions, and specific chronic conditions, for example, dementia. In states with greater regulatory specificity for DCW training and staffing, and lower specificity for licensed staffing, residents had longer adjusted home time.

Conclusion/Implications: Home time varied substantially among AL residents depending on resident characteristics and state-level regulatory specificity. AL residents eligible for Medicare and Medicaid had substantially shorter home time than the Medicare-only residents, largely due to longer time spent in nursing homes. State AL regulatory specificity for DCWs and licensed staff also impacted AL residents' home time. These findings may guide AL operators and state legislators in efforts to improve this important quality of life metric.

KEYWORDS

assisted living, home time, staffing, state regulations, training

INTRODUCTION

Assisted living (AL) communities are an important residential care option for older adults in the United States. Close to 800,000 Americans are estimated to reside in more than 28,000 AL communities, nearly half of which are certified by Medicaid.¹ Large variations in care utilization (e.g., hospital admissions, emergency department visits) and outcomes (e.g., readmissions, nursing home placement) among AL residents have been observed.^{2–8} However, independently, these measures might not adequately reflect residents' overall experiences and quality of life.

In recent years, there has been an increasing interest in measures that align with patients' values and preferences, and home time has emerged as an important patient-centered metric for evaluating the quality of care and life.^{9–11} Home time is defined as days alive and not in healthcare institutions over a given time period. This metric accounts for care utilization and mortality and is considered to reflect quality of life, thus representing an important endpoint for individuals and policymakers. First studied among patients with acute events such as stroke and heart failure,^{12–14} home time has also been examined among Medicare beneficiaries living in the community,¹⁵ discharged from skilled nursing facilities,¹⁶ and in the last 6 months of life.¹⁷ Home time has been shown to be a meaningful and a robust patient-centered outcome on its own but is also associated with other outcome measures (e.g., self-rated health, mobility impairment, and depression),¹⁵ and with consumers' online satisfaction reports.¹⁸ Although this measure is not without controversy,¹⁹ it is one of the few available aggregate metrics reflecting what is important to AL residents, that is, ability to age in place while remaining in a relatively stable health.²⁰ To date, there has been only one study of home time in ALs, focusing largely on its association with residents' online reviews.¹⁸

Unlike nursing homes, uniform measures allowing comparisons between lower and higher quality ALs are largely absent. This is further confounded by the fact that, unlike nursing homes, ALs are loosely regulated by states and are typically owned by mixed senior housing and service corporations.²¹ Prior studies have shown that state AL regulations and their specificity or stringency with regard to AL staffing were associated with the risk of hospitalization, hospice use, end of life care quality, and with staff perceptions of patient safety.^{7,22,23} State variation in AL staffing and training has been shown in prior studies,^{24,25} and some have suggested that less specific regulations may have resulted in unmet resident care needs.²⁶ Findings from these prior studies would suggest that state regulations may also influence home

Key points

- Assisted living (AL) residents spent 94% of their time at home (AL) in the year following admission.
- Resident factors such as dual eligibility, having more chronic conditions or having certain chronic conditions were significantly associated with variations in home time.
- Longer home time was associated with greater specificity in state regulations for direct care workers training and staffing, and lower specificity for licensed staffing.

Why does this paper matter?

This study shows that home time is an accessible, person-centered quality metric for AL residents. It also demonstrates that state-level AL regulatory specificity may be important in efforts to improve care quality that home time measures.

time and the ability of AL communities to allow residents to age in place.

Our first objective was to examine variation in home time among AL residents in the year following admission, and its association with resident-level characteristics. The second objective was to explore the relationships between risk-adjusted home time and state AL staffing and training regulations. We hypothesized that, controlling for individual-level characteristics, more prescriptive or specific state regulations on AL staffing and direct care worker (DCW) training were associated with longer home time.

METHODS

Data source and study sample

This study utilized CY2018–2019 data from a national inventory of AL communities, Medicare Beneficiary Summary File (MBSF), Medicare Provider and Review (MedPAR), Minimum Data Set 3.0 (MDS), and Medicare outpatient and hospice claims. Data on state regulations were obtained from our prior work.²⁴

We identified the study cohort using a previously described methodology,²⁷ which employed 9-digit ZIP codes to identify Medicare beneficiaries residing in AL communities in CY2018–2019. We constructed an analytic sample using the following criteria. First, we limited our sample to residents who entered AL between January

and December of 2018 (i.e., new residents, $N = 96,965$). Second, we excluded those who were enrolled in a Medicare Advantage (MA) plan in any month of the study period, because information on their chronic conditions is mostly missing from the Chronic Conditions Warehouse (CCW) database and their claims data also tend to be incomplete.²⁷ Our final analytical sample included 59,831 fee-for-service (FFS) Medicare beneficiaries who became AL residents in 12,143 ALs. To calculate home time, all residents were followed for 365 days from the date of AL entry.

Outcome variable—Home time

Home time was defined as the percentage of days alive and at home (in AL), ranging from 0% to 100%. We first calculated the number of days alive in the 1-year follow-up period and the number of days spent in hospitals (using MedPAR), emergency rooms (ER) (outpatient claims), nursing homes (MDS), and in institutional hospice (hospice claims). We then subtracted the number of days spent in these care settings, from the number of days alive, to obtain the number of days alive and at home. In calculating home time, the numerator was the number of days at home and the denominator was the number of days alive. Similarly, we separately calculated the percentage of days alive spent in ER, hospital, nursing home, or hospice. For hospice days, we only consider days of care provided in hospice facilities. Hospice care provided in AL was treated as care provided in individual's home. If hospice was provided in a nursing facility, we consider these days as nursing home days to avoid double-counting.

Key independent variable—State regulations

DCWs provide the majority of the hands-on care and support in AL communities, but regulations regarding DCW staffing and training vary significantly across states.^{7,28,29} Licensed staff, that is, registered nurses (RN) or licensed practical/vocational nurses (LPN/LVN), are also employed in ALs, and regulatory specificity regarding their staffing levels is also highly variable.³⁰ The staffing level and the skill mix of DCWs and licensed nurses have implications for residents' care and outcomes.

Regulatory specificity refers to the level of detail contained in state regulations. Following prior practice, and relying on CY2019 state regulatory databases,²³ we coded state AL regulations as three level categorical variables, ranging from least to most specific or detailed. DCW

training was coded as training hours not specified or requiring 10 or fewer hours (least specific); requiring 11–20 h of training (minimum range specified); or requiring more than 21 h of training (most specific). Similarly, DCW staffing was coded as not mentioned or required but numbers not specified; required and minimum number specified; or staffing required in proportion to residents. States' regulation on licensed staffing was coded as not mentioned or required but numbers not specified; required and minimum number specified; or number required in proportion to residents. State variations in these regulatory categories are depicted in supplemental Figure S1.

Other covariates—Resident characteristics

Residents' sociodemographic characteristics such as age, gender, race, Medicare–Medicaid dual eligibility, and date of death were obtained from the MBSF base segment. Residents were identified as dually eligible based on their status in the month of AL entry. Residents' health conditions, including the total number of chronic conditions and indicators for the presence of specific conditions such as Alzheimer's disease and related dementias (ADRD) and chronic obstructive pulmonary disease (COPD), were obtained from the MBSF Chronic Conditions and Other Chronic or Potentially Disabling Conditions segments. The presence of a specific chronic condition was coded as a binary variable with 1 indicating the resident had the chronic condition at baseline (before AL entry). These variables were constructed by comparing the AL entry date against the date that the beneficiary first met the claims criteria for the condition. If the date that the beneficiary first met claims criteria was before the AL entry date, the condition was noted as present at baseline and coded as 1.

Statistical analysis

To examine the relationship between home time and resident characteristics, we specified multivariate linear models with overall home time and time in ER, hospital, nursing home, or hospice as outcomes. We included AL-level fixed effects in the model to focus on comparisons between residents in the same AL and to account for time invariant AL-level differences that may influence home time. We also included an indicator of death within the 1-year follow-up as a proxy for unmeasured resident health status. Robust standard errors were estimated with clustering at the AL level. To examine how home time was related to state regulations, we fit separate

TABLE 1 Resident characteristics.

Sample characteristics	N	% or Mean (SD)
Age	59,831	81.2 (11.6)
<65	4544	7.6
65–74	8916	14.9
75–84	18,062	30.2
85+	28,309	47.3
Female	37,634	62.9
Race		
Non-Hispanic White	54,091	90.4
Non-Hispanic Black	2741	4.6
Hispanic	1460	2.4
Other race	1539	2.6
Dual eligibility	10,157	17.0
Deceased	7279	12.2
Number of chronic conditions		
≤10	17,714	29.6
11–19	32,750	54.7
20+	9367	15.7
Chronic conditions		
Alzheimer's disease and related dementias	23,527	39.3
Acute myocardial infarction	4553	7.6
Atrial fibrillation	16,277	27.2
Chronic kidney disease	28,670	47.9
Chronic obstructive pulmonary disease	21,991	36.8
Heart failure	24,500	40.9
Diabetes	24,413	40.8
Ischemic heart disease	36,404	60.8
Osteoporosis	21,766	36.4
Rheumatoid arthritis/osteoarthritis	44,224	73.9
Mobility impairments	5951	9.9
Obesity	15,608	26.1
Cancer	12,541	21.0
Anxiety/depression	36,958	61.8
Mental illness	11,692	19.5
Hip/pelvic fracture	1848	3.1
Stroke/transient ischemic attack	5829	9.7
Pressure ulcers and chronic ulcers	7374	12.3
Drug use disorder	5346	8.9
Outcomes	Mean	SD
Percentage of alive days at home	94.0	14.6
Percentage of alive days in ER	0.4	0.9

(Continues)

TABLE 1 (Continued)

Sample characteristics	N	% or Mean (SD)
Percentage of alive days in hospital	1.8	4.9
Percentage of alive days in nursing home	3.6	12.2
Percentage of alive days in hospice	0.2	2.6

Note: Cancer includes breast cancer, colorectal cancer, endometrial cancer, lung cancer, and prostate cancer. Mental illness includes bipolar disorders, personality disorders, schizophrenia, and schizophrenia and other psychotic disorders.

Abbreviations: ER, emergency room; SD, standard deviation.

multilinear regression models adjusting for residents' characteristics without AL-fixed effects. The exclusion of AL fixed effects allows for the comparison of home time between AL residents living in different facilities and different states, thereby facilitating the examination of the cross-sectional association between state regulations and home time, conditional on adjustment for observable measures of resident acuity. Standard errors were also clustered at the AL level. All analyses were performed using Stata version 17 (Stata Corp LP, College Station, TX). This study was approved by the Institutional Review Board.

RESULTS

Table 1 presents the summary statistics for the study cohort. Of the 59,831 residents included in the study sample, the average age was 81.2 (standard deviation [SD] = 11.6), with nearly half of the residents being older than 85 (47.3%). Residents were predominately female (62.9%) and non-Hispanic White (90.4%), with 17% being dually eligible for Medicare and Medicaid. In the first year following admission, 12.2% of the residents died ($N = 7279$). A significant proportion of the residents had more than 10 chronic conditions (70.4%). During the first year following AL entry residents spent, on average, 94% (SD = 14.6) of their time at home/AL, 0.4% in ER, 1.8% in hospital, 3.6% in nursing home, and 0.2% in hospice.

In Table 2, we present unadjusted home time and time spent in other care settings by regulatory specificity and license type. Higher regulatory requirements for licensed staff appeared to have been associated with lower home time and more days spent in nursing homes. Higher DCW training regulations seemed to have a reverse effect, and the association of home time and DCW staffing regulations was less clear.

TABLE 2 Unadjusted home time and time spent in other settings: By state regulations.

DCW training regulations				
Percent of days alive and at mean (SD)	Hours not specified or ≤10 h required (N = 36,536)	Required 11–20 h (N = 10,755)	Required 21+ h (N = 12,540)	p-Value
Home	93.8 (14.9)	94.5 (13.7)	94.4 (14.1)	<0.001
Emergency room	0.4 (0.9)	0.3 (0.8)	0.4 (1.1)	<0.001
Hospital	1.8 (5.0)	1.7 (4.8)	1.7 (4.8)	0.077
Nursing home	3.8 (12.6)	3.3 (11.3)	3.3 (11.7)	<0.001
Hospice	0.2 (2.6)	0.2 (2.5)	0.2 (2.5)	0.770
DCW staffing regulations				
Percent of days alive and at mean (SD)	Not mentioned, or required but numbers not specified (N = 14,267)	Required and minimum specified (N = 26,148)	Required in proportion to residents (N = 19,416)	p-Value
Home	94.0 (14.9)	94.3 (14.2)	93.8 (14.8)	<0.001
Emergency room	0.4 (0.8)	0.4 (0.8)	0.4 (1.1)	<0.001
Hospital	1.8 (4.9)	1.6 (4.6)	2.0 (5.3)	<0.001
Nursing home	3.8 (12.6)	3.6 (12.0)	3.6 (12.1)	0.120
Hospice	0.1 (2.0)	0.2 (2.5)	0.2 (3.0)	<0.001
Licensed staffing regulations				
Percent of days alive and at mean (SD)	Not mentioned, or required but numbers not specified (N = 42,578)	Required and minimum specified (N = 14,842)	Required in proportion to residents (N = 2411)	p-Value
Home	94.2 (14.2)	93.9 (15.1)	92.5 (17.3)	<0.001
Emergency room	0.4 (0.9)	0.3 (0.7)	0.4 (1.2)	<0.001
Hospital	1.8 (5.0)	1.7 (4.7)	2.1 (5.3)	<0.001
Nursing home	3.4 (11.7)	3.9 (13.0)	4.9 (14.9)	<0.001
Hospice	0.2 (2.5)	0.2 (2.8)	0.2 (2.1)	0.970

Abbreviations: DCW, direct care worker; N, number of assisted living residents in states with specified regulations, by license type; SD, standard deviation.

Figure 1 depicts variations in average home time across states in the year following AL admission. Residents in Hawaii, Washington, Oregon, Idaho, Utah, Arizona, and the District of Columbia had the longest home time (>95%), whereas residents in New York, Missouri, and Arkansas, had the lowest home time (<93%).

In Table 3, the associations between resident characteristics and home time, based on the regression models, are presented. All else being equal, compared with residents aged 65–75, residents aged 85 or older spent more time at home (0.53 percentage points [pp], $p < 0.05$), which was mainly driven by less time spent in hospitals (−0.55 pp, $p < 0.001$). Residents with more than 20 chronic conditions spent 0.77 pp ($p < 0.05$) less time at home, 0.19 pp ($p < 0.001$) more time in ER, and 0.53 pp ($p < 0.001$) more time in hospital, as compared

with those with fewer than 10 chronic conditions. Presence of certain chronic conditions was negatively associated with home time. For example, residents with ADRD (−1.14 pp, $p < 0.001$), hip/pelvic fracture (−8.56 pp, $p < 0.001$), and pressure ulcers and chronic ulcers (−4.2 pp, $p < 0.001$) had less home time than residents without those conditions. Residents who died within 1 year of AL admission spent 10.72 pp ($p < 0.001$) less of their time alive at home, 0.27 pp ($p < 0.001$) more time in ER, 5.05 pp ($p < 0.001$) more time in hospital, 4.32 pp ($p < 0.001$) more time in nursing home, and 1.08 pp ($p < 0.001$) more time in hospice, compared with those who did not die. Lastly, compared with the Medicare-only residents, the dually eligible spent less time at home (−2.13 pp, $p < 0.001$) and more time in ER (0.11 pp, $p < 0.01$) and nursing home (1.94 pp, $p < 0.001$).

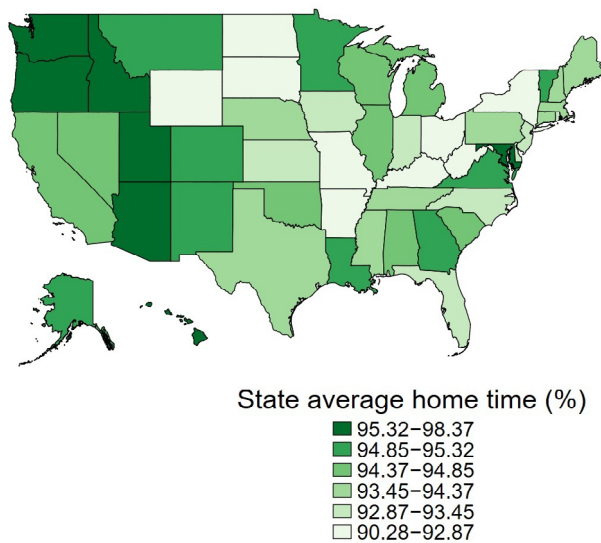


FIGURE 1 Variations in average home time across states.

Please note, that for each covariate, it is possible to present the percent change relative to the mean by dividing the beta coefficient by the sample mean and multiplying by 100. For example, compared with the Medicare-only, home time for the dually eligible residents was a 2.26% decrease relative to the mean $[(-2.13/94)*100\%]$.

Table 4 depicts the estimated associations between states' regulations and home time, as well as time spent in other settings, adjusting for individual characteristics. Compared with residents in states requiring DCW training but not specifying hours, or requiring fewer than 10 h of DCW training, residents in states requiring more training (11–20 and more than 21 h) had 0.38 pp (0.4% increase relative to the mean, $p < 0.05$) and 0.48 pp (0.5% increase relative to mean; $p < 0.01$) longer home time, respectively. Increases in home time were mainly driven by reduced time spent in nursing homes. In states with highest specificity for DCW staffing (i.e., in proportion to residents), residents spent 0.42 pp (0.44% relative increase to the mean; $p < 0.05$) more time at home, 0.03 pp (7.5% increase relative to the mean, $p < 0.01$) more time in ER, 0.6 pp less time in nursing homes (16.7% decrease relative to the mean, $p < 0.001$), and 0.12 pp more time in hospice (a 60% increase relative to the mean, $p < 0.001$), than in states in which DCW staffing was less specific. We also found that greater specificity in regulations regarding licensed staff was negatively associated with home time. Compared with states where licensed staff levels were neither mentioned nor specified, in states that specified minimum staffing or required licensed staff in proportion to residents, time at home was shorter by 0.97 pp (1.03% decrease relative to the mean $p < 0.001$

and -1.09 pp) (1.2% decrease relative to the mean $p < 0.01$), respectively, due largely to increased time spent in nursing homes (1.09 pp, or 30.3% increase relative to the mean, $[p < 0.001]$).

DISCUSSION

This study is the first to examine variations in home time among AL residents and associated resident and state regulatory factors. On average, AL residents spent 94% of their days at home in the year following admission. Of the 3 weeks (20.6 days) that were spent outside of home, about 60% (12.3 days) were in a nursing home.

Consistent with prior studies of post-acute care patients and the general Medicare population, we found that in AL home time was associated with resident age, dual eligibility, and chronic conditions.^{16,31} All else being equal, dually eligible residents spent fewer days (7.3 days) at home than the Medicare-only residents. We also observed that the reduction in home time was largely due to higher utilization of nursing homes among the dually eligible AL residents. There may be several reasons for the observed difference in home time between duals and the Medicare-only AL residents. In general, duals have higher healthcare needs and are known to have more limitations in activities of daily living (ADLs); thus, they may need a higher mix of services than their AL communities are able or willing to provide. It is also possible that AL providers may prefer these residents to leave to replace them with more profitable private-pay residents or with less costly duals. Moreover, the dually eligible tends to congregate in certain AL communities, which are likely to have fewer resources and may not be able to help them remain in their AL. Although states provide financial assistance for personal care services in AL through the Medicaid program, there are wide variations in state generosity³¹ that may make it financially less feasible for duals to stay in AL, particularly as their families also need to cover room and board costs for AL stays.^{4,32} Because Medicaid covers nursing home costs for duals, including room and board, some may choose to move to nursing homes as they spend down their resources, even if their care needs can still be met in AL communities.

Residents with chronic conditions, such as ARDR, also tend to spend less of their time at home in the year following admission. ARDR is characterized by a significant cognitive and functional decline and is the leading cause of nursing home placement.^{33,34} As the disease progresses, individuals with ARDR often require increasing levels of personal care.³⁵ However, AL communities, in general, have limited ability to provide more intensive personal and particularly skilled level care that these

TABLE 3 Multivariate linear regression analysis with assisted living (AL) fixed effects: associations between resident characteristics and outcomes.

	Percentage point share of days alive and in				
	Home	ER	Hospital	Nursing home	Hospice
Age (ref: 65–75)					
<65	0.38 (0.40)	0.12** (0.04)	0.67*** (0.15)	−1.11** (0.34)	−0.05 (0.04)
75–84	0.23 (0.24)	−0.06*** (0.02)	−0.24** (0.08)	0.10 (0.20)	−0.02 (0.04)
85+	0.53* (0.24)	−0.05*** (0.01)	−0.55*** (0.08)	0.14 (0.20)	−0.07 (0.04)
Female	0.26 (0.14)	0.01 (0.01)	−0.10 (0.05)	−0.21 (0.12)	0.03 (0.03)
Race (ref: Non-Hispanic White)					
Hispanic	−0.60 (0.53)	0.03 (0.03)	−0.30 (0.17)	0.79 (0.48)	0.08 (0.08)
Non-Hispanic Black	−0.21 (0.43)	0.01 (0.04)	0.02 (0.17)	0.19 (0.36)	−0.02 (0.05)
Other race	−0.40 (0.43)	0.05 (0.03)	0.12 (0.16)	0.17 (0.36)	0.06 (0.07)
Dually eligible (ref: Medicare-only)	−2.13*** (0.37)	0.11*** (0.02)	0.11 (0.11)	1.94*** (0.34)	−0.02 (0.06)
Number of chronic conditions (ref: ≤10)					
11–19	0.26 (0.17)	0.04** (0.01)	−0.03 (0.06)	−0.25 (0.15)	−0.01 (0.03)
≥20	−0.77* (0.34)	0.19*** (0.02)	0.53*** (0.12)	0.12 (0.29)	−0.06 (0.06)
Chronic condition indicators					
Alzheimer's disease and related dementias	−1.14*** (0.14)	0.04*** (0.01)	−0.06 (0.05)	1.11*** (0.12)	0.04 (0.03)
Acute myocardial infarction	−0.22 (0.26)	0.02 (0.02)	0.31*** (0.09)	−0.19 (0.22)	0.07 (0.05)
Atrial fibrillation	−0.30* (0.15)	0.00 (0.01)	0.24*** (0.05)	0.05 (0.13)	0.01 (0.03)
Chronic kidney disease	−0.63*** (0.13)	0.03** (0.01)	0.26*** (0.04)	0.38** (0.12)	−0.03 (0.03)
Chronic obstructive pulmonary disease	−0.40** (0.14)	0.02 (0.01)	0.16** (0.05)	0.22 (0.12)	0.00 (0.03)
Heart failure	−0.70*** (0.15)	0.02 (0.01)	0.24*** (0.05)	0.48*** (0.13)	−0.04 (0.03)
Diabetes	−0.30* (0.14)	−0.01 (0.01)	0.12** (0.05)	0.19 (0.12)	−0.00 (0.03)
Ischemic heart disease	−0.30* (0.14)	0.05*** (0.01)	0.11* (0.04)	0.10 (0.12)	0.04 (0.03)
Osteoporosis	−0.39** (0.14)	0.01 (0.01)	0.08 (0.05)	0.35** (0.12)	−0.05 (0.03)
Rheumatoid arthritis/osteoarthritis	−0.29 (0.16)	0.08*** (0.01)	−0.00 (0.06)	0.22 (0.13)	−0.00 (0.03)
Mobility impairments	−0.05 (0.25)	0.01 (0.02)	−0.23** (0.08)	0.20 (0.22)	0.08 (0.05)
Obesity	0.55*** (0.16)	0.01 (0.01)	0.30*** (0.05)	0.26 (0.14)	−0.01 (0.03)
Cancer	0.06 (0.14)	−0.00 (0.01)	−0.00 (0.05)	−0.10 (0.12)	0.04 (0.03)
Anxiety/depression	−0.40** (0.14)	0.04*** (0.01)	0.03 (0.04)	0.29* (0.12)	0.05 (0.03)
Mental illness	−0.66** (0.22)	0.03* (0.01)	0.22** (0.07)	0.37 (0.19)	0.03 (0.04)
Hip/pelvic fracture	−8.56*** (0.51)	0.04 (0.02)	1.66*** (0.16)	6.76*** (0.46)	0.10 (0.09)
Stroke/transient ischemic attack	−2.99*** (0.26)	0.15*** (0.02)	0.95*** (0.09)	1.86*** (0.22)	0.04 (0.04)
Pressure ulcers and chronic ulcers	−4.20*** (0.25)	0.04** (0.02)	1.04*** (0.08)	3.02*** (0.21)	0.10* (0.05)
Drug use disorder	−0.77* (0.30)	0.11*** (0.02)	0.40*** (0.10)	0.22 (0.26)	0.05 (0.05)
Decedent	−10.72*** (0.28)	0.27*** (0.02)	5.05*** (0.13)	4.32*** (0.23)	1.08*** (0.08)
Observations	59,831	59,831	59,831	59,831	59,831
Number of ALs	12,143	12,143	12,143	12,143	12,143

Note: Cancer includes breast cancer, colorectal cancer, endometrial cancer, lung cancer, and prostate cancer. Mental illness includes bipolar disorders, personality disorders, schizophrenia, and schizophrenia and other psychotic disorders.

Abbreviation: ER, emergency room.

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

TABLE 4 Results from multivariate linear regression models estimating the relationship between state regulations and percent state regulations and days alive at home, emergency room (ER), hospital, nursing home, and in hospice.

	Percentage point share of days alive and in				
	Home	ER	Hospital	Nursing home	Hospice
DCW training (ref: hours not specified or ≤ 10 h required)					
11–20 h	0.38* (0.16)	–0.01 (0.01)	–0.03 (0.05)	–0.31* (0.14)	–0.03 (0.03)
21+ h	0.48** (0.16)	0.04*** (0.01)	–0.10 (0.05)	–0.39** (0.14)	–0.04 (0.03)
DCW staffing (ref: not mention, or required but numbers not specified)					
Required and minimum specified	0.21 (0.17)	–0.00 (0.01)	–0.10* (0.05)	–0.16 (0.15)	0.06* (0.03)
Required in proportion to residents	0.42* (0.17)	0.03** (0.01)	0.04 (0.06)	–0.60*** (0.15)	0.12*** (0.03)
Licensed staffing (ref: not mention, or required but numbers not specified)					
Required and minimum specified	–0.97*** (0.15)	–0.02** (0.01)	0.03 (0.05)	0.96*** (0.14)	0.00 (0.03)
Required in proportion to residents	–1.09** (0.36)	–0.02 (0.02)	0.05 (0.11)	1.09*** (0.32)	–0.04 (0.05)
Resident characteristics	Yes	Yes	Yes	Yes	Yes
Observations	59,831	59,831	59,831	59,831	59,831

Note: Each reported effect represents coefficients adjusted for resident-level characteristics. Robust standard errors (in parentheses) were estimated with clustering at the assisted living level.

Abbreviations: DCW, direct care worker; ER, emergency room.

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

residents likely need. Consequently, residents with ADRD may have to be transferred to nursing homes for more intensive long-term care. Indeed, we found that the loss in home time for residents with ADRD was mainly due to increased time spent in nursing homes. Although it is not clear to what extent care needs of residents with ADRD are met in AL communities, a prior study suggested that in ALs with licensed memory care units, residents had a lower risk of nursing home admissions compared with those residing in other AL communities³⁶, suggesting that specialized care may help residents with ADRD remain in ALs for a longer time.

Findings regarding the hypothesis, we posited were mixed. In states requiring higher DCW training regulations AL residents experienced longer home time, primarily driven by fewer days spent in nursing homes. States vary in topics they require for DCWs' training, which generally cover assistance with ADLs, resident rights, abuse and neglect prevention, resident emergency response, reporting requirements, and health and psychosocial needs of the population being served.³⁷ However, more hours of training required by state AL regulations suggest that DCWs may receive more training overall, thus benefiting residents' well-being. Furthermore, in support of our hypothesis, we found that greater regulatory specificity in DCW staffing was associated with longer resident home time. AL communities in states requiring DCW staffing to be proportional to the number of residents may be able to provide more supportive care to their residents, prolonging their home time. In these

states, AL residents not only spent fewer days in nursing homes, but also had more days of hospice at home. Indeed, hospice providers may have an incentive to “select” AL residents in states requiring higher DCW staffing, allowing them to minimize the use of their own personal care resources.

However, contrary to our hypothesis, we found a negative association between home time and greater state AL regulatory specificity for licensed staffing, with virtually all “lost” days being spent in nursing homes. Several possible explanations may be considered. Although higher licensed staffing requirements may increase the presence of licensed staff in AL communities,³⁸ it may also cause reallocation of resources from areas that are either not regulated or already exceeded the regulatory requirements.³⁹ This may lead to unintended consequences such as a less efficient staffing skill mix (e.g., DCW staff being reduced to below the optimal levels) and an overall decline in quality of care. Evidence of substitution has been reported in nursing home studies,^{40–42} but has not been evaluated in the AL industry. Another possibility is that greater licensed staffing requirements increase the ability of AL staff to identify residents needing a more intensive care that can be better provided in nursing homes.²² Licensed staff may have a better understanding of AL's capabilities and limitations in serving the residents, especially those with complex care needs. They may be better able to recognize residents' declining conditions and initialize appropriate care plans at an earlier stage, resulting in fewer days at home,

but perhaps a more appropriate level of care. Additional research in this area is needed to assess the extent to which more home time may be better or worse for residents with specific care needs.

Several study limitations should be noted. First, our study sample was limited to new AL residents and described their home time experiences in the first year of AL admission. Therefore, our results might not be reflective of the experiences of the general AL population, whose health conditions and care needs might change more dramatically over time. Second, we focused on the Medicare FFS beneficiaries residing in AL communities, and the results might not be generalizable to AL residents enrolled in MA plans. In addition, the method we used to identify Medicare beneficiaries residing in AL communities relies on postal addresses and 9-digit zip codes of AL residents. Therefore, we may not be able to identify Medicare beneficiaries who moved to ALs but did not change their postal addresses with the Social Security Administration. However, these residents may not differ enough from those who were identified in their utilization of medical services, and thus in home time. Finally, due to the nature of the observational study design, unobservable factors may bias the estimated associations. Models examining the association between home time and state regulations relied on cross-sectional between-state variation in regulatory specificity and may therefore be susceptible to confounding related to state policies affecting both who uses ALs and their home time in that setting.

In conclusion, we observed large variations in home time among Medicare FFS beneficiaries residing in AL communities. Home time was associated with resident characteristics, particularly with dual eligibility and some chronic conditions. In states with greater specificity in regulating DCW staffing and training, AL residents had longer home time. Our work contributes to the emerging literature on home time by providing important findings for residents being cared for in ALs. State policymakers engaged in rebalancing long-term services and reducing nursing home placement, thus focusing on Medicaid program's support for the dually entitled beneficiaries who also live in ALs, may consider these findings in planning and implementing state-level policies that relate to AL care.

AUTHOR CONTRIBUTIONS

Yunjiao Mao was responsible for study concept and design, data cleaning and management, data analysis and interpretation, and preparation of the manuscript, including review and approval of the final submission. Yue Li participated in study concept and design, data analysis and interpretation, and preparation of the manuscript, including review and approval of the final submission. Jinjiao Wang participated in study concept and design, data

analysis and interpretation, and preparation of manuscript, including review and approval of the final submission. Brian McGarry participated in study design, data analysis and interpretation, and preparation of the manuscript, including review and approval of the final submission. Helena Temkin-Greener participated in study concept and design, data analysis and interpretation, and preparation of the manuscript, including review and approval of the final submission.

CONFLICT OF INTEREST STATEMENT

The authors have indicated they have no potential conflicts of interest to disclose.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Figure S1. State variations in AL regulatory specificity for DCW training, DCW staffing, and licensed staffing.

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