

**The Association of State Home- and Community-Based Services Spending with  
Prevalence of Low-Care Residents in Nursing Homes**

**By**

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## **Introduction**

### *Background*

Older adults are a significant population within the American healthcare landscape, and this group is only growing. Those aged 65 and older are expected to reach up to 25% of the U.S. population (94.7 million individuals) by 2060.<sup>1</sup> Of those who live to age 65, over 50% will use long-term services and supports (LTSS) at some point.<sup>2</sup> LTSS provided in the community assists older adults to live independently, including home-based care, transportation, home-delivered meals, telehealth, or home modifications. These home & community-based services (HCBS) are a growing part of the LTSS landscape as older adults increasingly want to “age in place”.<sup>3-5</sup> Significant investment into HCBS will be critical, as the U.S. currently faces a facility-based LTSS workforce shortage, and there is an inadequate number of nursing homes needed to support the aging U.S. demographic.<sup>6</sup>

The Centers for Medicare and Medicaid Services (CMS) defines HCBS as “types of person-centered care delivered in the home and community... [addressing] the needs of people with functional limitations who need assistance with everyday activities, like getting dressed or bathing.”<sup>7</sup> Coverage for HCBS services is meant to enable people to stay in their homes, rather than moving to a facility for care. Many HCBS can be paid for through Medicaid and are administered on a state level, through funding mechanisms such as 1915(c) waivers. These state-level waiver programs are designed to offer targeted social and functional support, including “wraparound services” outside the umbrella of clinical care for older adults who would otherwise need institutional services. These include services such as personal care, home-delivered meals, home repairs, financial and legal services, non-medical transportation, and adult day care centers.

Currently, there are over 267 active 1915(c) waiver programs across 39 states administered through state Medicaid programming.<sup>8,9</sup> Other HCBS Medicaid funding mechanisms include 1115 waivers, 1915(j) waivers, and state plan benefits such as Community First Choice and 1915(i).<sup>9</sup> In addition to providing culturally sensitive and highly individualized care provided in familiar settings, HCBS programs are about half the cost of nursing home care.<sup>7</sup> This makes HCBS an attractive alternative to nursing homes for care recipients and government payers alike.

The current HCBS funding model has created a patchwork system of waiver-based services that vary from state to state. The U.S. spent a total of \$286.5 billion on HCBS via Medicaid waivers in 2020.<sup>10</sup> However, this spending is split disproportionately between various states. The bulk of targeted HCBS waiver spending for older adult care comes from 1915(c) waivers, and states have flexibility to choose if/how to spend 1915(c) waivers.<sup>8,9</sup> The funding—and results—are incongruent from state-to-state. A 1915(c) waiver for older adults in Alabama covers services such as case management and homemakers; however, a 1915(c) waiver in Minnesota also includes coverage for adult day care and respite care.<sup>11</sup> This variation presents an opportunity to evaluate how state-level measures of interest impact facility-level admission and health outcomes. Several studies have shown that HCBS is generally associated with lower nursing home admission rates, particularly for white individuals with Alzheimer’s Disease and related dementias (ADRD) or childless older adults<sup>12-14</sup>. However, there is a gap in recent literature characterizing specific HCBS state-level policies impact nursing home admissions and associated health of long-term care residents.

In addition to HCBS delineated by Medicaid, other wrap-around services assist older adults in retaining independence. Transportation and housing are critical components of state-level investments in older adult services. They allow for mobility, access to services, and sustained

social life for adults of all ages. Limited public transportation options can cause delays in health care access, particularly for those with low socioeconomic status or who have a physical disability.<sup>15,16</sup> However, the relationship between public transportation, housing, HCBS, and older adult LTSS outcomes is not well characterized. Theoretically, older adults with less cognitive and functional impairment should be able to be supported by various HCBS to remain living at home, and we would expect to see those admitted to nursing homes to have higher levels of impairment.

### *Study Objective and Hypothesis*

The objective of this thesis was to examine relationships between different state-level “push factors” – i.e. state investment in HCBS, public transportation, and housing– that drive nursing home admission. Using publicly available state and nursing home data from the AARP LTSS Scorecard and LTCFocus, I conducted a cross-sectional study to accomplish the following aim:

**To examine the extent to which state-level investment in HCBS, public transportation, and affordable housing are associated with nursing home use among persons with low care needs.**

I hypothesized that states with higher investment in HCBS, housing, and transportation would have fewer low care residents admitted to nursing homes.

## Methods

This project included data from publicly available datasets and scorecards and contained no identifiable information regarding human subjects. No IRB approval was required.

### *Literature review*

I first identified key state and nursing home-level characteristics associated with nursing home admissions and discharges through a review of the existing literature. This review focused on papers concerning public transit, affordable housing, and factors related to nursing home admission in the United States. The goal was to understand the past literature and to identify key measures of interest for my own analysis. I used PubMed and included search the queries below:

- ((nursing home) AND (HCBS)) AND ((public transportation) OR (transportation))
- (nursing home) AND (admission) AND (HCBS)
- ((HCBS) AND ((public transit) OR transportation))
- (public transit) AND (cognitive ability) AND (older adults)
- ((HCBS) AND ((housing) OR (independent living)) OR (aging in place)))

A title review was conducted on initial search results to identify relevant articles which then underwent abstract and full-text review with Covidence<sup>17</sup>. Studies with populations or outcomes not relevant to the questions of interest were excluded. Additional citation mining from relevant papers was used when search query results were insufficient. Ultimately, 40 citations were picked and informed the LTSS Scorecard measures selected *a priori* for analysis.<sup>14,18-56</sup>

### *Data Sources*

I used two data sources for this project: the 2023 AARP Long-Term Services and Supports (LTSS) Scorecard, and 2021 LTCFocus.

The AARP LTSS Scorecard is a dataset released by AARP to track state-level performance for key measures of LTSS success. Every three years, researchers compile data from a variety of sources and synthesize their findings into the key measures identified by AARP. The most recent state-level scorecard data used in this analysis is from 2023. Variables are grouped into five categories of LTSS focus: affordability and access, choice of setting and provider, safety and quality, support for family caregivers, and community integration<sup>57</sup>.

LTCFocus Data is a dataset of facility-level measures for over 15,000 nursing homes across the U.S. Data are aggregated from Certification And Survey Provider Enhanced Reports (CASPER), the Minimum Data Set (MDS), and Medicare claims and published in a yearly dataset. When variables are not available to be calculated, a score is imputed from previous years' data. The most recent year of facility-level data used is 2021. LTCFocus is sponsored by the National Institute on Aging (1P01AG027296) through a cooperative agreement with the Brown University School of Public Health<sup>58</sup>.

### *Measures of interest*

The primary independent variable was HCBS spending per state from the AARP LTSS Scorecard. This measure is calculated as the percentage of all LTSS spending on programs used primarily by older adults that is exclusively used on HCBS (i.e., nursing homes, other institutional LTSS, Money Follows the Person, Community First Choice, Program of All-Inclusive Care for the Elderly, 1915(c), 1915(j), and 1115/1915(b) waivers). The latest available

data from 2020 was used in the AARP LTSS Scorecard measures for HCBS spending. I then grouped states into high, medium, and low tertiles of HCBS spending for final analysis.

The primary outcome was the prevalence of “low-care” residents in nursing homes.<sup>58</sup> This is an LTCFocus measure, calculated as the percentage of all long-stay residents in a nursing home as of the 1<sup>st</sup> Thursday in April with low-care needs. A resident is determined to be ‘low care’ if residents “...do not require physical assistance in any of the four late-loss [activities of daily living] (ADLs)—bed mobility, transferring, using the toilet, and eating” or is not categorized in any other Resource Utilization Group (RUG-IV).<sup>58</sup> The “low-care” score in LTCFocus is created using the current CMS case-mix methodology from 2019-onwards, and is imputed into a corresponding RUG-IV score. The measure is averaged on a facility, county, and state level.<sup>58</sup>

State level covariates were also derived from AARP LTSS. These included measures of *transportation* and *housing* quality in the state, each reported as an index score on a scale of 0-100, calculated based on tracked metrics and policies set *a priori* by AARP.<sup>57</sup> Additionally, I included *nursing home costs* and *home health aide supply*. Nursing home costs were calculated by calculating the annual state median private-room rate (daily rate multiplied by 365 days), divided by the state median household income for adults 65 and older. Price data was calculated from the 2021 Genworth Cost of Care Survey and 2019 American Community Survey Public Use Microdata, calculated by the AARP Public Policy Institute. Home health aide supply was calculated by using state census data on personal care, nursing, psychiatric, and home health aide case workers in the workforce in the last year, per 100 individuals aged 18 and older with ADL needs. The population ratio for each state was averaged across two “current years” to calculate the current state values.<sup>57</sup>

Nursing home covariates included facility and resident characteristics and were derived from LTCFocus. Facility characteristics included total bed number, resource status (high or low), for-profit status (for or non-profit), metropolitan designation, payer mix, and percent occupancy (as a mean percentage of Medicare, Medicaid, and private payers out of total residents on the first Thursday in April). Resident population characteristics included race/ethnicity (mean percentage of Black, White, and Hispanic patients per nursing home), gender (mean percentage of female residents), and mean ADL score per facility (with all residents scored on seven ADLs on a scale of 0, 0 being independent and 28 being completely dependent).<sup>58</sup>

### *Data Cleaning*

I downloaded the 2023 AARP LTSS Scorecard dataset and imported it into STATA18<sup>59</sup>. I then cleaned the data and consolidated individual LTSS Scorecard measures into a state-level dataset. After creating the state-level dataset, I cleaned the LTCFocus nursing home dataset and merged it with the AARP data to create my final facility-level dataset. I added a state FIPS code and state abbreviation to the dataset for easy identification and analysis. Finally, I dropped duplicate facilities based on unique facility identification number and dropped facilities with no state identified. I also excluded facilities within Puerto Rico, Virginia, and Pennsylvania because the AARP LTSS Scorecard data did not contain state-level measures of interest for these states.

### *Statistical Analysis*

First, I completed a descriptive analysis comparing characteristics of nursing homes in states with high and low percentages of HCBS spending, as shown in **Table 1**. I also plotted geographic variation of key AARP LTSS Scorecard measures by state in **Figure 2**. Then, I generated a scatter plot of the percentage of total state LTSS spending used on HCBS by the

percentage of state low-care facility residents and weighted each point by number of nursing homes per state, generating a line of best fit (see **Figure 3**).

I then estimated the association between state HCBS spending and the percent of nursing home residents with low-care needs, using a linear regression model (**Figure 4**). I built a simple bivariate regression model with the primary exposure—low, middle, or high state-level HCBS spending—and outcome—percent of low-care nursing home residents. Subsequent iterations of the linear regression model controlled for state characteristics (affordable housing, public transportation, nursing home cost, and home health aide availability), and then state and facility characteristics (ownership, Medicare payer mix, and urban/rural designation). The final model included an interaction between state HCBS spending and state nursing home cost. This interaction was added based on model fit, which showed inconsistencies in HCBS spending categories and associated change in low-care population when comparing low HCBS spend states to medium HCBS spend states, and low HCBS spend states to high HCBS spend states. This suggested the relationship was impacted by another covariate-- median state cost of nursing homes. Adding the interaction term resulted in the model of best fit.

## **Results**

The final study sample included 14,105 nursing homes across the U.S. **Table 1** shows key descriptive characteristics of this sample, stratified by nursing home location in a state with high vs. low HCBS spending. 71.5% of all facilities were for-profit, and mean facility bed size was 105.5 beds.

Compared to nursing homes in high HCBS spending states, nursing homes in low-HCBS spending states were on average smaller (bed size 100.0 vs. 111.4), had a larger share of

residents on Medicaid (61.2% vs. 58.4%), were less likely to be for profit (69.3% vs 73.8%), had a higher proportion of female residents (64.3% vs. 62.1%), and had lower transportation livability index scores (mean 45.8 vs. 48.2). Nursing homes in high HCBS spending states had a higher state facility cost (224.4% of median older adult annual income, vs. 212.7%), higher rate of home health aides per capita (29.9% vs 17.3%), and had a higher mean resident ADL score (17.2 vs. 16.6), when compared to low HCBS spending states. There was no observable difference between low-resources facility prevalence or percentage occupancy rates in low vs. high HCBS spending states.

**Figure 2** illustrates the variation between states of four measures of interest: HCBS spending by state, state median percentage of low-care residents, AARP transportation score, and AARP state housing affordability score. Higher HCBS spending largely clustered in the Pacific West census region (Washington, Oregon, and California), and New England and Middle Atlantic regions (Massachusetts, Vermont, New York, and New Jersey); there were a few outliers in Midwest and Mountain regions. States with low-care populations are clustered in the Midwest and Mountain West census regions, including Montana, North and South Dakota, Missouri, Oklahoma, Iowa, and into West South Central states of Kansas and Arkansas. States with the highest housing affordability scores were largely grouped in the Mountain West/Midwest regions, with Maine and Arizona as outliers. States with higher transportation access scores clustered in the Mountain West and New England regions; East South Central, East South Atlantic, and East North Central census regions had the lowest average transportation access scores.

**Figure 3** is a scatter plot visualizing the relationship between HCBS spending by state and the state median percentage of low-care residents. The line of best fit has a slight negative

slope, indicating a negative correlation between increased HCBS spending and percentage of low-care residents in nursing homes. States were weighted by the number of nursing homes in the state. Those with a larger number of nursing homes were scattered along the line of best fit, indicating that the negative correlation between increasing HCBS and low care population persists regardless of nursing home frequency; however, this scatter plot does not tell us anything about the number of nursing homes per capita. States ranged in HCBS spending percentage from about 15% to 80% of total LTSS allocated spending and had low-care resident population percentages from less than 5% of the total resident population to over 20%.

**Table 2** summarizes regression results. Compared to nursing homes in states with the lowest HCBS spending, nursing homes within states in the highest HCBS tertile had 1.08 percentage points (95% CI: -2.15, -0.01) fewer low-care residents, while nursing homes in the middle HCBS tertile had 1.25 percentage points (95% CI: -1.81, -0.68) fewer low-care residents compared to those in the lowest HCBS spending category. However, we observed a significant interaction between state median nursing home cost and HCBS spending in the final regression model. In states with low nursing home costs, the adjusted mean of low-care residents was 11.0% (95% CI: 10.55, 11.46) in the lowest HCBS tertile, vs. 9.92% (95% CI: 9.47, 10.04) in the highest HCBS tertile. By contrast, in states with high nursing home costs, the adjusted mean of low-care residents was 7.47% (95% CI: 6.94-8.00) in the lowest HCBS tertile, vs. 9.93% (95% CI: 9.01-10.84) in the highest HCBS tertile. State housing availability did not have a statistically significant relationship with prevalence of low-care nursing home residents within the final regression model.

## Discussion

In this thesis, I examined the extent to which state-level investment in HCBS, public transportation, and affordable housing are associated with nursing home use among persons with low care needs. After statistical analysis, we can see the largest state-level determinant of low care residents is HCBS spending. Higher state HCBS spending is associated with a lower prevalence of low-care residents in nursing homes. However, this relationship is attenuated in states with higher nursing home costs. In high-cost states, the low-care resident population is less prevalent than that of low-cost states. These findings address how variance in HCBS spending across states—caused by differences in funding mechanisms, such as Medicaid 1915(c) waiver coverage—can drive admission prevalence of low-care populations who have the potential to live at home, in a non-nursing home setting.

These findings demonstrate that HCBS investment is an effective policy lever to prevent unnecessary nursing home admission of older adults with limited physical or cognitive disability. This aligns with prior literature studying state investment in other wraparound services and the associated prevention of nursing home admission. One such example is Meals on Wheels programming, funded by Title III of the Older American Act. Analysis of increased Meals on Wheels delivery services showed an associated decrease in low-care nursing home populations.<sup>60</sup>

While aligning with prior findings, this study adds to the relevant body of literature by describing the attenuation of the relationship between HCBS spending and low-care nursing home admission by the state cost of nursing home. It demonstrates that HCBS spending—via Medicaid waiver programs—is a powerful policy lever to decrease low-care populations in nursing homes. However, changes in HCBS spending should be tested in states with lower

nursing homes costs, as their associated low-care populations are higher. These low-cost nursing home states also see decreased prevalence of low-care residents when comparing low HCBS spending states to the middle- and high-HCBS spending states.

Increasing HCBS investment through Medicaid waivers might be less effective in states with higher nursing home costs. The smaller population of low-care nursing home residents in these high-cost states indicates that cost might be a barrier to nursing home admission. However, this does not necessarily mean that older adults are provided adequate access to health services while living independently in their communities. Waiver-based services are limited in scope and states can choose to cap enrollment to control funding. In 2020, state Medicaid waivers had a national total of over 665,000 individuals on waitlists for HCBS.<sup>9</sup> This signals that reduced low-care population in states with high nursing home costs could indicate unaddressed need in those not admitted in nursing home, and is not necessarily an indicator of lower care needs.

The limited information available about this low-care population outside of a nursing home setting means that different funding mechanisms might be required to address access issues. Geographic variation could also account for differences in nursing home population characteristics. Access to nursing homes in rural areas is limited, and those that do exist have smaller bed counts on average.<sup>61</sup> Though geographic variation is accounted for in my analysis model, other access to health services for rural low-care populations outside of a nursing home setting is not well characterized.

### *Limitations*

There are several limitations to this quantitative study. Nursing homes in Virginia, Pennsylvania, and Puerto Rico were dropped due to lack of state-level measures in the original

AARP LTSS Scorecard, leading to a smaller number of facilities in the final analysis. Additionally, the independent variable of HCBS spending is not broken down further into various services, such as home-delivered meals, adult day centers, or specific wraparound services. Therefore, variation in HCBS supply between state waivers could not be accounted for in final analysis.

## **Conclusion**

This analysis is an exploration of the various state-level characteristics driving nursing home admission, with state-level HCBS spending being the single largest driver of low-care population prevalence in nursing homes. As the U.S. population continues to age, health service researchers will need to better identify which factors lead to unnecessary nursing home admission. This includes examining how specific services covered under state HCBS waivers are associated with health outcomes, or quality of life and satisfaction measures from older adults. It is clear that HCBS investment will not be a one-size-fits-all solution across various states, and targeted interventions merit further study. For every percentage point decrease of low-care populations in nursing home settings, the real-life implications are magnified across millions of dollars, worker hours, and older adults in long-term care. My hope is that these findings show the potential of state HCBS spending as a cost-effective way to reduce low-care nursing home populations.

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**Table 1: Characteristics of nursing homes in states with low vs. high spending on Medicaid home- and community-based services in 2021 (N=14,108)**

|                                            | % of State HCBS Spending |              | p-value |
|--------------------------------------------|--------------------------|--------------|---------|
|                                            | Low                      | High         |         |
| N                                          | 7237                     | 6871         |         |
| Facility Characteristics                   |                          |              |         |
| Total facility beds, mean (SD)             | 100.0 (48.6)             | 111.4 (66.8) | ***     |
| Low-resource facility (N)                  |                          |              | 0.22    |
| No                                         | 6578 (91.0%)             | 6289 (91.6%) |         |
| Yes                                        | 653 (9.0%)               | 580 (8.4%)   |         |
| % Medicaid primary payer, mean (SD)        | 61.2 (22.9)              | 58.4 (24.5)  | ***     |
| % Medicare primary payer, mean (SD)        | 13.1 (13.4)              | 13.9 (13.8)  | ***     |
| For-profit facility (N)                    |                          |              | ***     |
| No                                         | 2222 (30.7%)             | 1799 (26.2%) |         |
| Yes                                        | 5009 (69.3%)             | 5070 (73.8%) |         |
| % Occupancy, mean (SD)                     | 73.6 (16.7)              | 73.6 (17.6)  | 0.87    |
| Resident Characteristics                   |                          |              |         |
| Race & Ethnicity                           |                          |              |         |
| % Black residents, mean (SD)               | 14.6 (19.8)              | 11.1 (15.8)  | ***     |
| % White residents, mean (SD)               | 79.4 (22.3)              | 73.2 (25.3)  | ***     |
| % Hispanic residents, mean (SD)            | 1.8 (6.2)                | 8.2 (13.8)   | ***     |
| % Female residents, mean (SD)              | 64.3 (13.2)              | 62.1 (14.0)  | ***     |
| % ADRD, mean (SD)                          | 46.5 (16.0)              | 45.3 (17.5)  | ***     |
| Successful discharge rate, mean (SD)       | 0.5 (0.2)                | 0.5 (0.2)    | ***     |
| Resident ADL score, mean (SD)              | 16.6 (2.3)               | 17.2 (2.5)   | ***     |
| % Low-care resident, mean (SD)             | 10.5 (10.7)              | 7.8 (9.8)    | ***     |
| State Characteristics                      |                          |              |         |
| Housing livability index, mean (SD)        | 48.8 (4.1)               | 45.2 (4.7)   | ***     |
| Transportation livability index, mean (SD) | 45.8 (3.4)               | 48.2 (3.1)   | ***     |
| % NH annual cost, mean (SD)                | 212.7 (41.5)             | 224.4 (43.4) | ***     |
| Aides/100 ADL 18+ adults, mean (SD)        | 17.3 (4.3)               | 29.9 (9.2)   | ***     |

*Abbreviations.* HCBS, home- and community-based services; SD, standard deviation, ADL, activities of daily living; ADRD, Alzheimer’s disease and related dementias; NH, nursing home

*Notes.* Facility characteristics measured from LTCFocus. State characteristics measured from the 2023 AARP Long-Term Services and Supports Scorecard. States are classified as having low HCBS spending if the state cost of nursing homes is below 218.43% of median annual income for adults 65+, and state have high HCBS spending if the cost of nursing homes is above 218.43% of median annual income for adults over 65+. P-values represent ANOVA test outcomes for continuous variables, comparing means between high and low HCBS spending groups; p-values represent chi-squared outcomes for categorical variables.

**Table 2: Linear regression of low-care nursing home population on low, medium, and high state-level spending on Medicaid home- and community-based services (HCBS) in 2021 (N=14,105)**

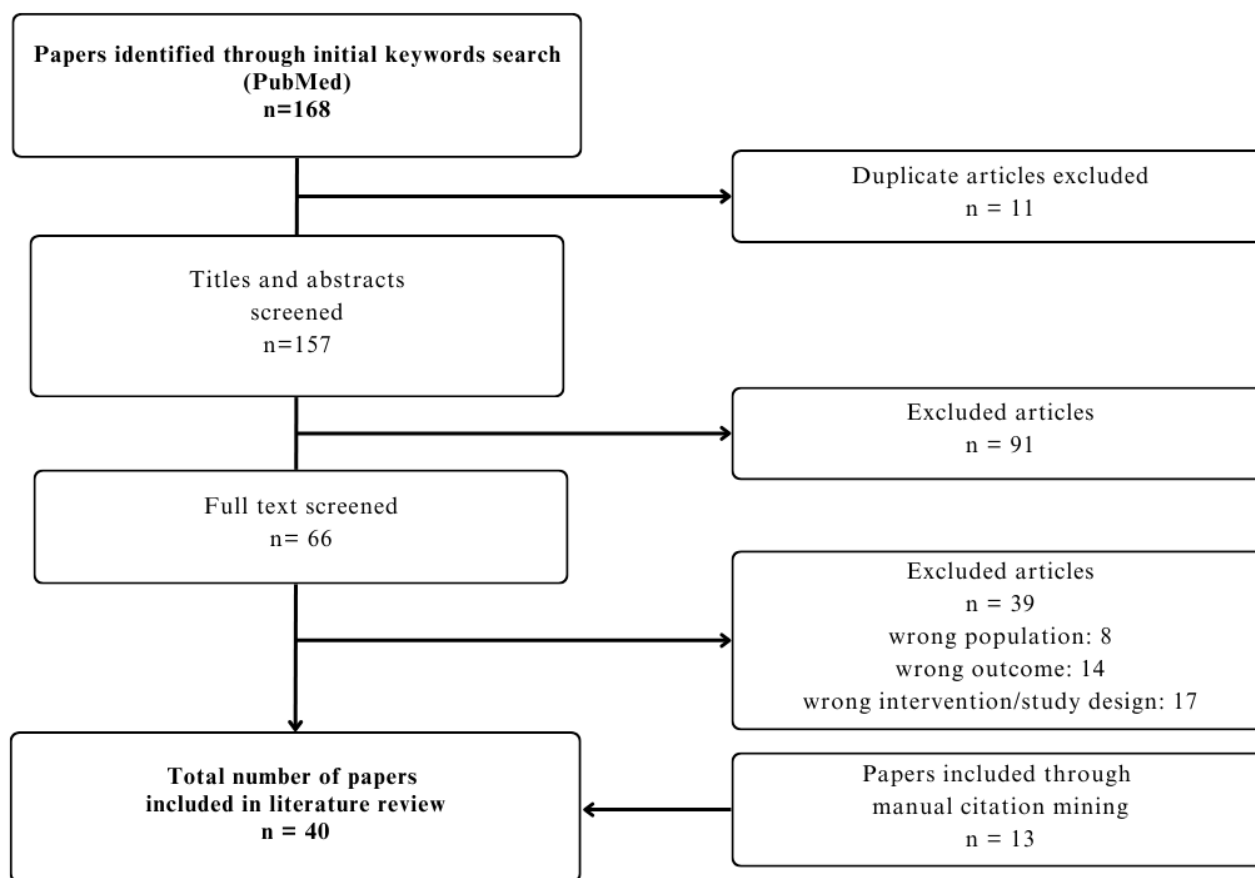
|                                                    | Model 1     |       |                      |       | Model 2     |       |                      |       | Model 3     |      |                      |       |
|----------------------------------------------------|-------------|-------|----------------------|-------|-------------|-------|----------------------|-------|-------------|------|----------------------|-------|
| Variables                                          | Coefficient | P>t   | [95% conf. Interval] |       | Coefficient | P>t   | [95% conf. Interval] |       | Coefficient | P>t  | [95% conf. Interval] |       |
| State Characteristics                              |             |       |                      |       |             |       |                      |       |             |      |                      |       |
| HCBS Spending (ref: lowest tertile)                |             |       |                      |       |             |       |                      |       |             |      |                      |       |
| 2. Mid-tertile                                     | -1          | ***   | -1.53                | -0.47 | -0.83       | **    | -1.34                | -.33  | -1.25       | ***  | -1.81                | -0.68 |
| 3. Top tertile                                     | .20         | 0.616 | -0.57                | 0.96  | .44         | 0.234 | -.29                 | 1.18  | -1.08       | *    | -2.15                | -0.01 |
| High nursing home cost state (ref: low-cost state) | -2.63       | ***   | -3.07                | -2.18 | -1.83       | ***   | -2.25                | -1.40 | -2.58       | ***  | -3.15                | -2.01 |
| Transportation score (10%)                         | 2.77        | ***   | 2.16                 | 3.37  | 2.57        | 0.427 | 1.99                 | 3.14  | 2.35        | ***  | 1.76                 | 2.93  |
| Housing score (10%)                                | .72         | **    | 0.27                 | 1.17  | -.18        | ***   | -.62                 | .26   | -0.11       | 0.62 | -0.56                | 0.33  |
| Home health aides per capita                       | -.07        | ***   | -0.94                | -0.39 | -.066       | ***   | -.09                 | -.04  | -0.07       | ***  | -0.10                | -0.04 |
| Nursing Home Characteristics                       |             |       |                      |       |             |       |                      |       |             |      |                      |       |
| For-profit ownership                               |             |       |                      |       | 1.41        | ***   | 1.05                 | 1.77  | 1.41        | ***  | 1.05                 | 1.77  |
| % Medicare                                         |             |       |                      |       | -.197       | ***   | -.21                 | -0.18 | -0.20       | ***  | -0.21                | -0.18 |
| Metropolitan (ref: rural)                          |             |       |                      |       | -3.38       | **    | -3.77                | -.99  | -3.36       | ***  | -3.75                | -2.97 |
| Interaction                                        |             |       |                      |       |             |       |                      |       |             |      |                      |       |
| Interaction: HCBS Low#NH cost high                 |             |       |                      |       |             |       |                      |       |             |      |                      |       |
| 2. HCBS Med#NH cost high                           |             |       |                      |       |             |       |                      |       | 1.19        | *    | 0.19                 | 2.19  |
| 3. HCBS High#NH cost high                          |             |       |                      |       |             |       |                      |       | 2.29        | ***  | 1.20                 | 3.37  |
| cons                                               | -4.09       | *     | -7.70                | -.49  | 4.74        | **    | 1.16                 | 8.31  | 5.87        | ***  | 2.26                 | 9.48  |

*Abbreviations.* HCBS, home and community-based services; NH, nursing home

*Notes.* HCBS Spending was calculated as the percentage of Medicaid LTSS spending allocated to HCBS measured from the 2023 AARP LTSS Scorecard and divided into tertiles of low (reference) medium, and high. States are classified as having low HCBS spending if spending is 0-34.4% of total LTSS-designated spending, medium spending if HCBS spending is 34.5%-46.8%, and high spending if HCBS spending is 46.9%-100%. State median percentage of low-care residents measured from LTCFocus data. Model 3 includes an interaction term between HCBS spending and nursing home costs. High nursing home costs was defined as the top 50% of median state nursing home cost.

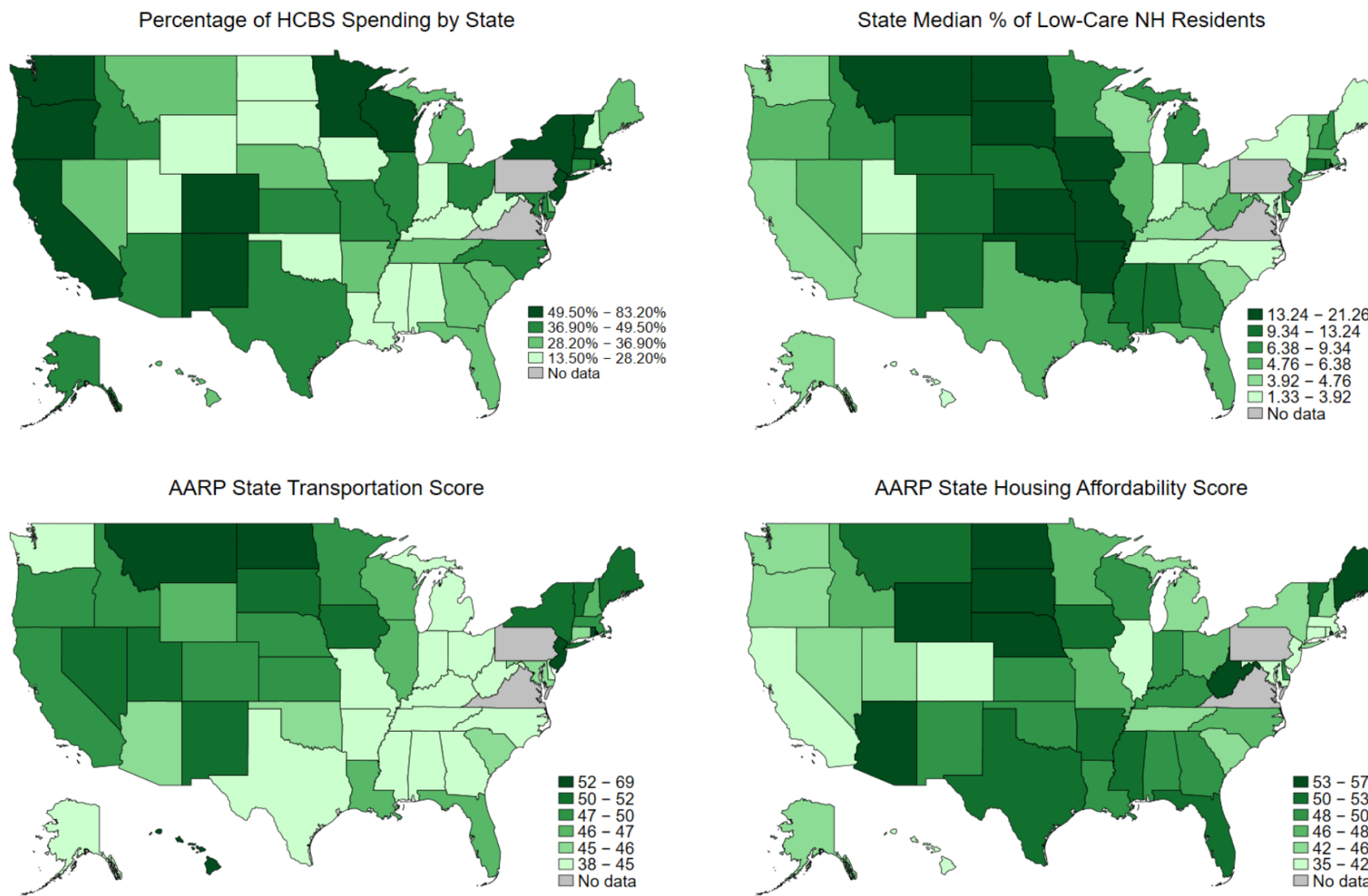
P values represent statistical significance (probability of observing the coefficient if there was no linear relationship between predictor and response variables.)

**Figure 1: Literature review flowchart**



*Notes:* Literature review conducted using Boolean search queries in PubMed, with additional citation mining.

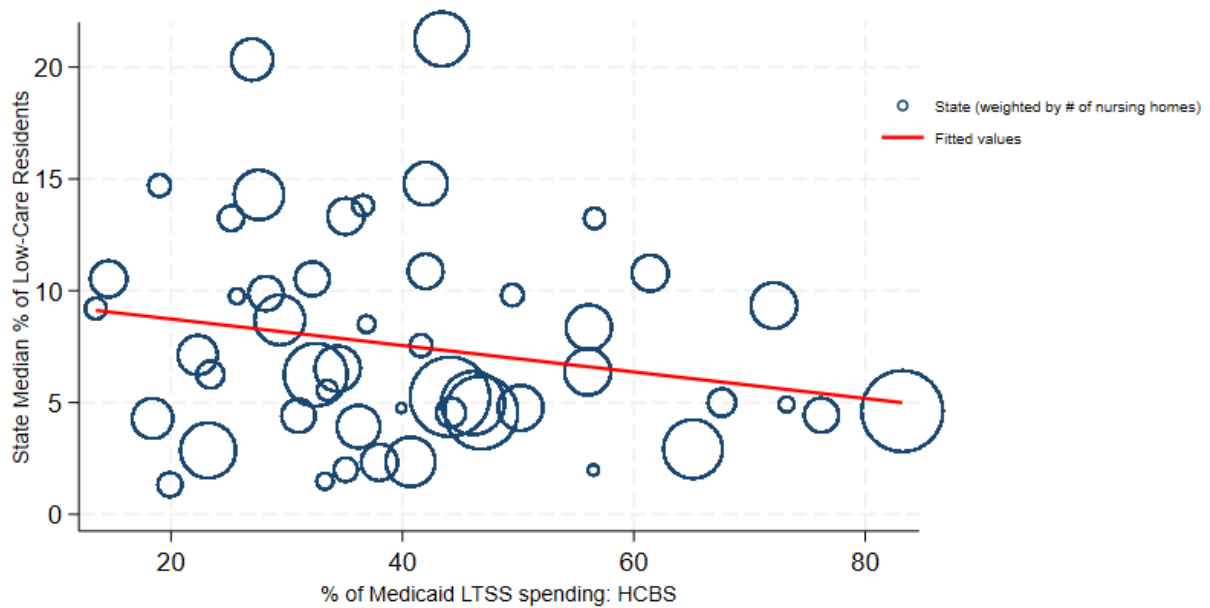
**Figure 2: State Variation in AARP LTSS Scorecard Measures**



*Abbreviations.* HCBS, home- and community-based services; NH, nursing home; LTSS, long-term services and supports

*Notes.* State characteristics measured from the 2023 AARP LTSS Scorecard. State transportation score and state housing affordability scores are both scored on a scale 1-100, using aggregated metric and policy data set *a priori* by AARP Public Policy Institute. Data not available for Virginia and Pennsylvania.

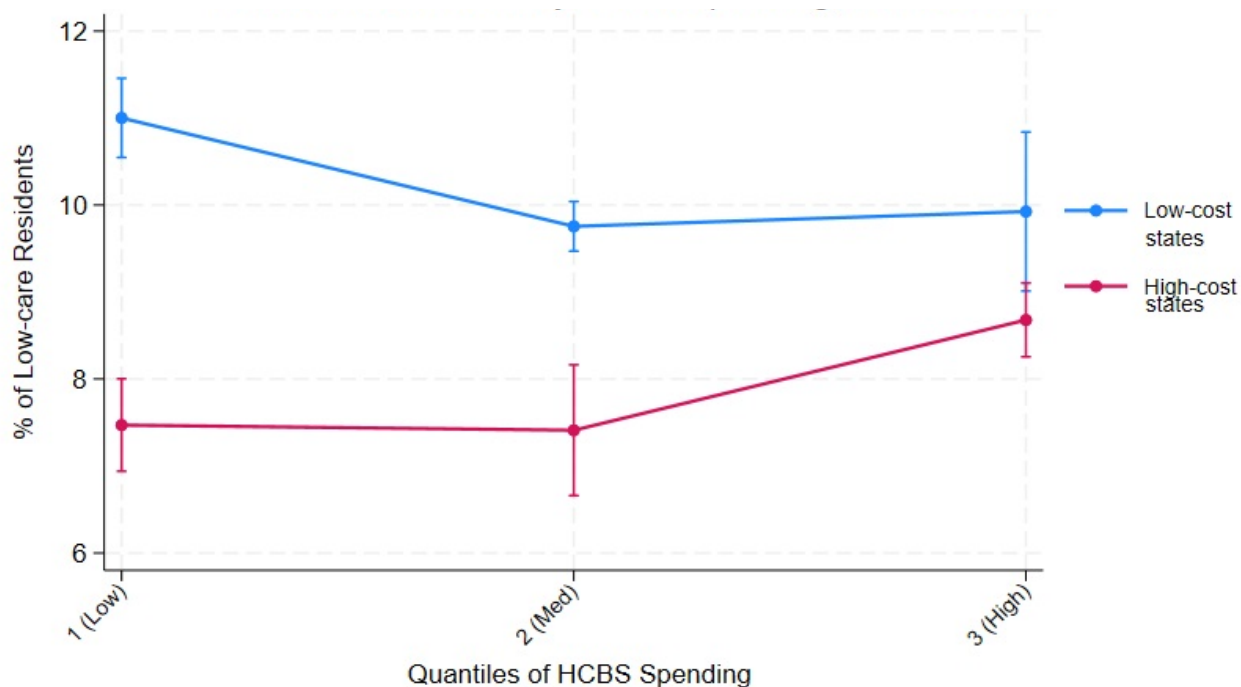
**Figure 3: HCBS % of total state LTSS spending, by % of state low-care facility residents weighted by number of nursing homes per state**



*Abbreviations.* HCBS, home- and community-based services; LTSS, long-term services and supports

*Notes.* Percentage of Medicaid LTSS spending allocated to HCBS measured from the 2023 AARP LTSS Scorecard. State median percentage of low-care residents measured from LTCFocus data. Each state data point is weighted by the number of nursing homes per state.

**Figure 4: Percentage of low-care residents by states classified as low, middle, and high HCBS spending states, with 95% Cis**



*Abbreviations.* HCBS, home- and community-based services; CI, Confidence Interval

*Notes.* Percentage of Medicaid spending allocated to HCBS measured from the 2023 AARP LTSS Scorecard. State median percentage of low-care residents measured from LTCFocus data. States were grouped into tertiles of low, medium, and high HCBS spending. States are classified as having low HCBS spending if spending is 0-34.4%, medium spending if HCBS spending is 34.5%-46.8%, and high spending if HCBS spending is 46.9%-100%. The interaction between nursing home cost and HCBS spending is represented by low-NH cost states (blue) and high-NH cost states (red).