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RESEARCH ARTICLE

State home and community-based services expenditures and unmet care needs in the United States: Has everyone benefitted equally?

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Abstract

Objective: To test whether the impacts of Medicaid's Home and Community-Based Services (HCBS) expenditures have been equitable.

Data Sources and Study Setting: This is a secondary data analysis. We linked annual data on state-level Medicaid HCBS expenditures with individual data from U.S. Health and Retirement Study (HRS; 2006–2016).

Study Design: We evaluated the association between state-level HCBS expenditure quartiles and the risk of experiencing challenges in basic or instrumental activities of daily living (I/ADLs) without assistance (unmet needs for care). We fitted generalized estimating equations (GEE) with a Poisson distribution, log link function, and an unstructured covariance matrix. We controlled demographics, time, and place-based fixed effects and estimated models stratified by race and ethnicity, gender, and urbanicity. We tested the robustness of results with negative controls.

Data Collection/Extraction Methods: Our analytic sample included HRS Medicaid beneficiaries, aged 55+, who had difficulty with ≥ 1 I/ADL ($n = 2607$ unique respondents contributing 4719 person-wave observations).

Principal Findings: Among adults with IADL difficulty, higher quartiles of HCBS expenditure (vs. the lowest quartile) were associated with a lower overall prevalence of unmet needs for care (e.g., Prevalence Ratio [PR], Q4 vs. Q1: 0.91, 95% CI: 0.84–0.98). This protective association was concentrated among non-Hispanic white respondents (Q4 vs. Q1: 0.82, 95% CI: 0.73–0.93); estimates were imprecise for Hispanic individuals and largely null for non-Hispanic Black participants. We found no evidence of heterogeneity by gender or urbanicity. Negative control robustness checks indicated that higher quartiles of HCBS expenditure were not associated with (1) the risk of reporting I/ADL difficulty among 55+ Medicaid beneficiaries, and (2) the risk of unmet care needs among non-Medicaid beneficiaries.

Conclusion: The returns to higher state-level HCBS expenditures under Medicaid for older adults with I/ADL disability do not appear to have been equitable by race and ethnicity.

KEYWORDS

aging/elderly/geriatrics, long term care, Medicaid, social determinants of health

See commentary by Miller and Thunell, "The critical role of Medicaid home- and community-based services in meeting the needs of older adults in the United States."

What is known on this topic

- Prior research has demonstrated some important impacts of greater HCBS spending under Medicaid.
- The expansion of HCBS spending has been linked to a population-level decline in the use of long-term care based in institutionalized settings.

What this study adds

- We evaluated whether the impacts of Medicaid's HCBS expenditures on unmet care needs have been equitable.
- Higher levels of state-level HCBS expenditure were associated with a lower prevalence of unmet needs for care for non-Hispanic white older adults.
- The returns to higher state-level HCBS expenditures under Medicaid do not appear to have been equitable by race/ethnicity.

1 | INTRODUCTION

It is estimated that more than 12 million older adults need some form of long-term care and this number is expected to reach 27 million by 2050.¹ Medicaid is the primary funder for Long-Term Services and Supports (LTSS) for those who cannot afford it, including institutional care (e.g., nursing home), Home and Community-Based Services (HCBS) or both. In 2020, LTSS recipients accounted for 31.3% of total Medicaid spending (i.e., \$197.0 billion) although they constituted 5.3% of Medicaid beneficiaries.² Before the 1990s, Medicaid LTSS expenditures predominantly covered care in institutionalized settings, which is costly and not aligned with the preference held by the vast majority of older adults to age in place—in their homes and communities.^{3–5} Since then, Medicaid has been rebalancing towards a higher share of spending on HCBS.⁶ Between 2011 and 2015, a specific initiative introduced by the Affordable Care Act, the Balancing Incentive Program, provided \$2.4 billion in federal enhanced matching payments to 21 states committing to increase investments in HCBS.⁷ As a result of these actions, HCBS expenditures grew from accounting for about 19% of overall Medicaid LTSS expenditures in 1996 to 57% in 2016.⁸

While this funding shift better aligns with older adults' desire to age in place, little is known about the population-level impact of increased HCBS expenditures on the risk of unmet needs for care among community-dwelling Medicaid beneficiaries and whether any impacts have been experienced equitably. Moreover, the effort to shift towards HCBS, as well as LTSS spending per capita, exhibits significant variation among states due to distinct eligibility criteria, enrollment limitations, and various sociopolitical factors, including disparities in population health and the financial status of each state.^{6,9,10} Indeed, older adults in states with lower Medicaid LTSS expenditures reported receiving more informal caregiving hours (e.g., from family and friends) and were more likely to be from racial and ethnic minority groups.¹¹ Moreover, greater Medicaid spending on HCBS has been associated with improved physical, psychological, and cognitive health for older beneficiaries.¹² Higher HCBS expenditures may help older people avoid or delay any nursing home care,¹³

and as a result, the expansion of HCBS spending has been linked to a population-level decline in the use of long-term care based in institutionalized settings.⁹ However, the association between increased state HCBS expenditures and reduction in nursing home placement is observed for white Medicaid beneficiaries, but not for their Black counterparts,¹⁴ suggesting that the impacts of efforts to enable aging in place may not have had an equitable impact.

Despite this important prior work, few studies have directly evaluated whether increased HCBS expenditures reduce unmet care needs for community-dwelling older adults who experience difficulty with basic or instrumental activities of daily living (I/ADLs; e.g., bathing, preparing meals, paying bills). If higher HCBS spending leads to reductions in unmet needs for care, this could contribute to a lowered risk of hospitalization and other adverse health outcomes for older adults.^{15–17} However, many older adults face challenges with accessing HCBS, including due to the limited availability of qualified caregivers and other challenges or preferences related to non-family in-home caregiving. These challenges could persist even in the context of increased state-level spending.

There is also a critical need to understand whether any beneficial impacts of increased HCBS spending have been experienced equitably. Studies have shown inequities in the overall risk of unmet needs for older adults—including for those who are Medicaid beneficiaries—with a greater risk of unmet needs for racially and ethnically minoritized older adults and those living in rural settings.^{18–24} Analyses of national Medicaid claims data from 2012 indicated that among HCBS users, white older adults spent more on HCBS and also had lower hospitalization rates and hospital spending than Black and Hispanic older adults.²⁵ These and other findings suggest that HCBS beneficiaries from minoritized groups may not be capturing an equitable share of HCBS spending—or that other factors (e.g., inequities in the quality of HCBS) may in turn yield inequities in adverse outcomes.

This paper presents an empirical evaluation of the association between state-level Medicaid spending on HCBS and the risk of having difficulty with ADL but not receiving care (i.e., the risk of unmet needs for care). Between-state variation in HCBS spending is substantial given differing state priorities in Medicaid LTSS allocations. This

study covers a period of substantial within-state variation as most states increased their share of HCBS spending under Medicaid. We expected that higher HCBS spending would be associated with lower risk of unmet care needs, but that this association would be concentrated among those who have historically benefitted from a wide range of structural privileges (i.e., White older adults vs. older adults of color, men vs. women, and urban or suburban vs. rural residents). To our knowledge, no prior studies have leveraged multiple years of time-varying HCBS expenditure data available throughout the first decade or more of the 21st century to evaluate impacts on unmet needs for care or evaluated potential population-level inequities in these impacts.

2 | STUDY DATA AND METHODS

2.1 | Data

We linked individual-level data from the 2006 to 2016 biennial waves of the U.S. Health and Retirement Study (HRS) to annual data on state-level Medicaid HCBS expenditures in Centers for Medicare and Medicaid Services (CMS). HRS is an ongoing panel study (since 1992) that surveys a nationally representative sample of community-dwelling adults aged over 50 years and their spouses (of any age). To maintain the representation of the 50+ population in the US, HRS enrolls a new birth cohort every 6 years. The response rates during the study period ranged from 74% in 2016 to 89% in 2006 and 2012.²⁶ Data on state-level Medicaid expenditures come from the annual report of Medicaid LTSS expenditures, which is compiled by the CMS.⁸ We focused on the years 2006 to 2016, a period of accelerated transformation of rebalancing Medicaid LTSS spendings from primarily institutional services to HCBS. The amount of missing data for fiscal years 2017 through 2019 (the most recently updated year) is high. We linked restricted HRS data to state-level Medicaid HCBS expenditure data based on respondent's state of residence and study year.

Our analytic sample included community-dwelling respondents aged 55+ who self-reported enrollment in Medicaid. We further restricted the analytical sample to observations in which respondents self-reported a difficulty with at least one I/ADLs because only those who report I/ADL difficulty are asked whether they receive care relevant to these I/ADLs. We also excluded 112 observations with incomplete information on covariate variables. We also excluded five observations in two states that contributed limited information, per the protocols governing the use of restricted HRS data. Respondents who were excluded were more likely to be non-Hispanic white, Hispanic, and without a high school degree. There were no differences between the excluded versus analytic sample in terms of age, gender/sex, living arrangement (living alone vs. with others), residential area (urban vs. suburban vs. rural), and cognitive status. This exclusion strategy yielded a final analytical sample of 2607 unique respondents (1.8 observations per respondent) for a total of 4719 person-wave observations (see eFigure 1).

2.2 | Measures

2.2.1 | Unmet needs for care (i.e., I/ADL difficulty with no help received)

Our primary outcome is unmet needs for care, which we defined as reporting difficulty with any I/ADLs without assistance from others. Difficulty with basic ADLs was assessed across six self-care tasks: dressing, walking across room, bathing, eating, getting in and out of bed, and toileting.²⁷ Difficulty with instrumental ADL(IADLs) was assessed across five more complex activities: preparing a hot meal, shopping for groceries, making phone calls, taking medications, and managing money.²⁷

Respondents were first asked “because of a health or memory problem do you have any difficulty with” each of these 11 tasks. We classified respondents as having difficulty if they answered “yes” or “can't do” and classified those as having no difficulty if they answered “no”. We set to missing those who answered “don't do”, “don't know”, or “refused”. We summed ADLs and IADLs and then created a binary indicator of whether respondents reported difficulty with any (≥ 1) I/ADLs (0 = none vs. 1 = any).

All respondents who indicated that they had difficulty with a given ADL or IADL (either “yes” or “can't do”) were then asked “does anyone ever help you” with that specific task. Those who answered “yes” were coded as receiving help with their I/ADLs and those who answered “no” were coded as not receiving help. Those who answered “don't know” or “refused” were set to missing. We constructed a binary variable of unmet needs for care based on whether respondents had difficulty with any I/ADLs but without assistance from others: (0 = having difficulty and with help received vs. 1 = having difficulty but no help received). We assessed ADL and IADL unmet needs separately in sensitivity analyses (see eTable 6).

2.2.2 | State HCBS expenditures

We obtained data about state HCBS expenditures from CMS and the number of state residents aged 65+ from the American Community Survey (ACS; one-year estimates). We constructed a state-year measure of Medicaid HCBS expenditure, defined as the per capita Medicaid LTSS spending on HCBS for older people and people with physical disabilities across different authorities including both state plan benefits programs (i.e., home health services, personal care services community first choice, and section 1915(i)) and HCBS waivers (section 1915 (c) and section 1115).^{8,28,29} We transformed this measure of Medicaid HCBS expenditure into quartiles, with a lower quartile indicating lower Medicaid HCBS expenditures at a given year relative to other states' spending in that year. Because of within- and between-state variation over the study period, states could be represented in different quartiles across time (i.e., given within-state increases or decreases in per capita spending as well as due to changes in states' relative position as other states shifted their expenditures). We also created an alternative measure of state-year HCBS

quartiles using available HCBS expenditures per dual Medicaid-Medicare beneficiary in 2006–2012 for sensitivity analysis.

2.2.3 | Covariates/confounders

We controlled for respondent-level socio-demographic characteristics. Age in years was assessed at the time of interview. Sex/gender was based on respondent's self-report with males as the reference group. In HRS, respondents were asked about their race/ethnicity (White/Caucasian, Black or African American, or other) and their Hispanic/Latinx/a/e/o ethnicity. To be consistent with HRS question wording, we use the term "Hispanic". We combined the two variables and constructed a four-category race and ethnicity variable (non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic other). We included a four-category measure of educational attainment: less than high school, high school/GED, some college, and 4 years college or above. The urbanicity of respondents' area of residence was assessed based on county-level population density and classified as urban, suburban, or rural residence. We also controlled for living arrangement (living alone vs. with others), and whether a respondent's cognitive impairment status, based on the Langa-Weir classification (normal vs. probable cognitive impairment or dementia).³⁰

2.3 | Statistical analyses

We first provided socio-demographic characteristics of our sample—community-dwelling Medicaid beneficiaries aged 55+ with ≥ 1 I/ADL difficulty at the time of interview. We pooled data from the six HRS waves and analyzed these data akin to a repeated cross-sectional analysis, accounting for the non-independence of respondents included in multiple waves via our modeling approach. We evaluated the association between state-level HCBS expenditure quartiles and the risk of difficulty with I/ADLs with no help received via generalized estimating equations (GEE) with a Poisson distribution, log link function, and an unstructured covariance matrix. We evaluated heterogeneity in associations separately by sex/gender, race and ethnicity, and urbanicity with stratified models as well as multiplicative interaction terms (e.g., between quartile of state-level HCBS expenditures and race and ethnicity). In all models, we adjusted for socio-demographic covariates, and accounted for the complex survey design by applying survey weights. Our primary models included time-fixed effects to account for time-variant effects.

We conducted several sensitivity analyses as robustness checks. First, we additionally included census region, census division, and state-fixed effects to disentangle the impacts of between versus within-state influences and between-state impacts could be confounded by many other state-level factors. Notably, we had somewhat limited statistical power due to the relatively small sample of older adults with I/ADL difficulty and who were Medicaid beneficiaries, even after pooling across repeated waves of the HRS.

Second, we conducted a negative control analysis by evaluating whether there was an association between state-level HCBS expenditures and the risk of unmet needs with I/ADLs among *non-Medicaid beneficiaries*. State-level Medicaid spending on HCBS should not have influenced outcomes for non-Medicaid beneficiaries. As such, evidence of association for this group might suggest that other state-level factors coinciding with HCBS expenditures were instead driving any associations observed in our primary analyses.

Third, we evaluated whether there was an association between state HCBS expenditure quartiles and the risk of reporting *difficulty with any I/ADLs* among all community-dwelling Medicaid beneficiaries aged 55+. In general, state-level spending on HCBS should not have directly influenced the risk of I/ADL difficulty, but only the risk of unmet needs care for those with I/ADL difficulty. However, there may have been some indirect associations between HCBS expenditures and I/ADL difficulty, for example, if increased spending on HCBS allowed more individuals with I/ADL difficulty to remain in the community.

Additionally, because the per capita HCBS expenditures were calculated by using the population of state residents aged 65 and above as the denominator, we also evaluated the association between state-level HCBS expenditures and the risk of unmet care needs with I/ADLs by restricting our sample to Medicaid beneficiaries aged 65 and above.

Lastly, as the associations between HCBS expenditure and unmet needs may differ among those with ADLs versus IADLs, we conducted sensitivity analyses to assess the associations separately for each group. As mentioned above, we also used an alternative measure of state-year HCBS quartiles which capture the HCBS expenditures per *dual Medicaid-Medicare beneficiary* in 2006–2012 for sensitivity analysis.

Data analysis and code review were carried out in Stata version 17 in the secure data enclave maintained by the Michigan Center for the Demography of Aging (MiCDA). Approval for this data analysis was obtained from the institutional review board at the University of California, San Francisco.

3 | RESULTS

3.1 | Descriptive statistics

The weighted descriptive statistics for HRS Medicaid beneficiaries with ≥ 1 I/ADL difficulty are presented in Table 1. The average age of our sample was 69 ($\pm$ SD = 11, range: 55–109 years), and 67% were women. Non-Hispanic white, non-Hispanic Black, and Hispanic, and non-Hispanic other respondents accounted for 43%, 25%, 27%, and 6% of the sample, respectively. Moreover, more than half reported less than high school completion (51%). About one-third of our sample was living alone at the time of interview (36%) and 53% met the criteria for probable cognitive impairment (ranging from mild cognitive impairment to probable dementia). Forty-six percent of respondents lived in urban areas, 26% in suburban areas, and 28% in rural areas.

TABLE 1 Descriptive statistics among Medicaid Beneficiaries aged 55+ with at least one basic or instrumental activities of daily living (I/ADL) difficulty (HRS 2006–2016; $n = 4719$ person-wave observations).

Variables	Mean or n	SD or %
Age (mean, standard deviation [SD])	68.6	10.7
Female (n , %)	3308	67.1
Race/ethnicity (n , %)		
Non-Hispanic White	1468	42.5
Non-Hispanic Black	1619	25.0
Hispanic	1429	27.0
Non-Hispanic Other	203	5.5
Urbanicity (n , %)		
Urban	2371	46.3
Suburban	1185	25.8
Rural	1163	27.9
Education (n , %)		
Less than high school	2571	50.8
High school/GED	1253	27.3
Some college	707	16.8
Bachelor and more	188	5.1
Living arrangement (n , %)		
Living alone	1608	36.4
Living with others	3111	63.6
Cognitive status (n , %)		
Normal	1984	46.7
Impaired	2735	53.3
Unmet needs for I/ADL care (n , %)	3208	70.9
HCBS quartiles (average expenditure; SD)		
Quartile 1 (least generous)	\$241.9	87.0
Quartile 2	\$410.7	82.6
Quartile 3	\$635.3	146.9
Quartile 4 (most generous)	\$1575.0	785.5

Note: The statistics, including mean, standard deviations (SD), and percentages, are weighted using average survey weights. For categorical variables, the numbers of observations reflect the sample characteristics without adjusting for average survey weights. All the statistics are based on 4719 person-wave observations, from 2607 unique respondents.

Over two-thirds of respondents reported having difficulties with I/ADLs but receiving no help or care (71%).

Figure 1 showcases the state-level variation in HCBS spending over time from 44 included U.S. states. We split these states into three sub-graphs based on the size of African American population from 2006 ACS estimates. HCBS expenditures across states generally increased over time from 2006 to 2016 as expected. This was not part of our primary analysis but provides important contextual information about how the distribution of HCBS spending under Medicaid clusters with other important population characteristics. Between state-variation in HCBS expenditures was remarkable and the within-state variation over time was also considerably large. For example, in

Arizona, per capita HCBS spending jumped from \$36 in 2006 to \$660 in 2016, however in New Jersey, the HCBS per capita in 2006 was \$766 and remained fairly stable over 10 years (e.g., \$808 in 2010 and \$616 in 2014). Moreover, the HCBS per capita in most states with a higher proportion of African American population (except for New York and District of Columbia, see the bottom panel in Figure 1) were relatively lower and had slower increases over time as compared to other states. In the supplementary materials, we present the distribution of the subsamples based on sex/gender, race/ethnicity, and urbanity across various HCBS quartiles (see eTable 1).

3.2 | Prevalence ratios: Unmet needs for care

In Table 2, we present results from weighted GEE models estimated for the overall sample, that is, HRS Medicaid beneficiaries with ≥ 1 I/ADL difficulty. Results with time-fixed effects suggest that higher quartiles of state-level HCBS expenditure (vs. quartile 1) were associated with a lower prevalence of unmet needs for care (See model 1; Prevalence Ratio [PR], Q2 vs. Q1: 0.95, 95% Confidence Interval [CI]: 0.89, 1.02; PR, Q3 vs. Q1: 0.93, 95% CI: 0.87, 1.00; PR Q4 vs. Q1: 0.88; 95% CI: 0.82, 0.94). Estimates from sensitivity analyses that included time and census region/division/state-fixed effects were very similar to those reported in model 1, although the magnitude of estimates in models with census division or state-fixed effects were attenuated; 95% CIs were also wider and crossed the null (see e-Table 2 in supplementary materials).

Table 3 shows the results of weighted GEE models stratified by sex/gender, race and ethnicity, and urbanicity. The sex/gender-stratified results are reported in panel A. Patterns for women (model A1) and men (model A2) were similar to those reported for the overall sample (models 1 & 2 in Table 2). The multiplicative interaction terms between HBCS expenditure quartiles and gender/sex were not statistically significant (Wald test p -value = 0.36).

Among non-Hispanic White respondents (model B1), higher quartiles of state-level HCBS expenditure were associated with a lower prevalence of unmet needs for care (PR, Q2 vs. Q1: 0.94, 95% CI: 0.85, 1.04; PR, Q3 vs. Q1: 0.92, 95% CI: 0.83, 1.02; PR Q4 vs. Q1: 0.81; 95% CI: 0.72, 0.92). Among non-Hispanic Black respondents (model B2), estimates were not monotonically decreasing with higher quartile of HCBS spending and estimates ranged from protective (e.g., PR, Q2 vs. Q1: 0.92, 95% CI: 0.83, 1.02) to null (PR, Q3 vs. Q1: 0.95, 95% CI: 0.85, 1.06; PR Q4 vs. Q1: 0.91; 95% CI: 0.81, 1.02). Estimates ranged from less protective to more protective direction for Hispanic respondents (model B3, PR, Q2 vs. Q1: 1.03, 95% CI: 0.82, 1.31; PR, Q3 vs. Q1: 0.87, 95% CI: 0.72, 1.04; PR Q4 vs. Q1: 0.93; 95% CI: 0.8, 1.06) although confidence intervals were wide and crossed the null. We also formally tested multiplicity interaction terms between HBCS expenditure quartiles and race/ethnicity (Wald test p -value = 0.70). The interaction term between 4th HCBS quartile and non-Hispanic Black was not significant (p -value < 0.10).

Higher quartiles of state-level HCBS expenditure were associated with lower prevalence of unmet needs for care among respondents

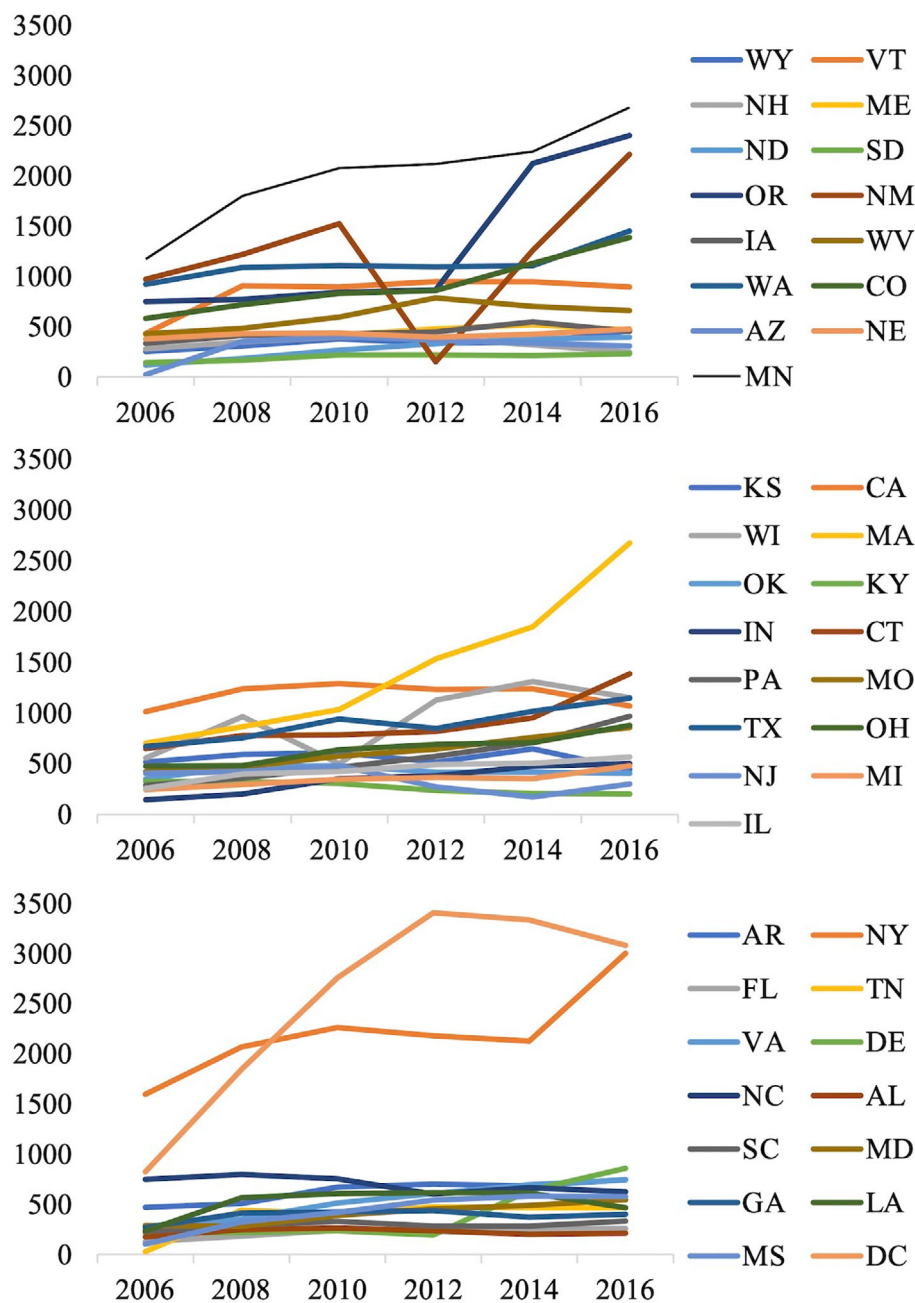


FIGURE 1 Trends of State Medicaid Home and Community Based Services Expenditures Per Capita Across 44 States in the United States. Data of state Medicaid home and community based services (HCBS) expenditures (2006–2016) come from Centers for Medicaid and Medicare Services from American Community Survey. The trends of Medicaid HCBS expenditures across states are ranked based on 2006 state African American population size estimated by American Community Survey. The upper panel (Figure 1A) includes 15 states with lower proportion of African American population (ranging from 0.8% in Wyoming to 5.2% in Minnesota), the middle panel (Figure 1B) includes 15 states with middle proportion of African American population (ranging from 5.9% in Kansas to 14.5% in Illinois), and the bottom panel includes 14 states with higher proportion of African American population (ranging from 15.4% in Arkansas to 50.7% in District of Columbia).

living in urban areas (model C1, PR, Q2 vs. Q1: 0.98, 95% CI: 0.88, 1.09; PR, Q3 vs. Q1: 0.92, 95% CI: 0.82, 1.03; PR Q4 vs. Q1: 0.90; 95% CI: 0.82, 0.99) and in suburban areas (model C2, PR, Q2 vs. Q1: 0.98, 95% CI: 0.87, 1.11; PR, Q3 vs. Q1: 0.93, 95% CI: 0.80, 1.09; PR Q4 vs. Q1: 0.84; 95% CI: 0.73, 0.97). Estimates were in the protective direction for respondents living in rural areas (model C3, PR, Q2 vs. Q1: 0.87, 95% CI: 0.76, 0.99; PR, Q3 vs. Q1: 0.88, 95% CI: 0.78, 1.00; PR Q4 vs. Q1: 0.86; 95% CI: 0.73, 1.02). The interaction terms between HCBS expenditure quartiles and urbanicity were not statistically significant (overall Wald test p -value = 0.85).

In sensitivity analyses, the associations between state-level HCBS expenditures and the risk of unmet needs for care among *non-*

Medicaid beneficiaries were null with fairly precise CIs (see eTable 3). Among Medicaid beneficiaries, we also observed null associations between HCBS expenditure and the *risk of I/ADL difficulty* (see eTable 4). The associations between state-level HCBS expenditures and the risk of unmet needs for care among Medicaid beneficiaries aged 65+ (see eTable 5) were very similar to the result reported in Table 2. The associations between state-level HCBS expenditures and the risk of unmet care needs for ADLs only and IADLs only were very similar to the primary models, although models for unmet IADLs care needs had relatively wide CIs (see eTable 6). The association between state HCBS per Medicaid-Medicare dual beneficiary and the risk of unmet care needs is shown in eTable 7.

TABLE 2 Unmet needs for basic or instrumental activities of daily living (I/ADL) care by State-Level Medicaid Expenditures on Home and Community Based Services (HCBS) expenditures (HRS 2006–2016; $n = 4572$).

	PR	95% CI
HCBS quartiles (ref: Quartile 1)		
Quartile 2	0.95	(0.89–1.02)
Quartile 3	0.93	(0.87–1.00)
Quartile 4 (most generous)	0.88	(0.82–0.94)
Female gender (ref: male)	0.97	(0.92–1.03)
Race/ethnicity (ref: non-Hispanic White)		
Non-Hispanic Black	0.97	(0.91–1.03)
Hispanic	0.99	(0.92–1.08)
Non-Hispanic other	0.95	(0.83–1.10)
Urbanicity (ref: urban)		
Suburban	1.04	(0.97–1.10)
Rural	0.98	(0.92–1.05)
Time fixed effects	Yes	

Note: Underlying data are pooled observations of Medicaid Beneficiaries aged 55+ with at least one IADL difficulty observed in the 2006–2016 waves of the Health and Retirement Study. Sample weights are set equal to the respondent's average weight in the sample. The prevalence ratios and their 95% confidence intervals are presented from a generalized estimating equation ("xtgee") configured to the Poisson distribution, logit link function, and unstructured within-group correlation. Covariates include age in years, educational attainment, living arrangement, and cognitive status. I/ADL, basic and instrumental activities of daily living (11 items including: dressing, walking across room, bathing, eating, getting in and out of bed, toileting, preparing a hot meal, shopping for groceries, making phone calls, taking medications, and managing money).

4 | DISCUSSION

In this population-level study of older Medicaid beneficiaries who reported difficulty with I/ADLs, we found that higher levels of state-level HCBS expenditures were associated with a lower prevalence of unmet needs for care with these I/ADLs. The association followed a gradient, was large enough to be meaningful, and point estimates were consistent across different place-based fixed-effect models. A negative control analysis showing no association with unmet care needs among non-Medicaid beneficiaries supported the interpretation that HCBS expenditures under Medicaid—rather than other co-occurring state-level factors—were associated with a reduction in the prevalence of unmet care needs among Medicaid beneficiaries.

However, we also analyzed the associations of HCBS expenditure with unmet care needs across different demographic and geographic subgroups. First, we found that non-Hispanic White respondents benefited the most from higher levels of HCBS expenditure, with the strongest association observed for the highest quartile of expenditure. In particular, the estimates for the highest quartile of HCBS expenditure (Q4) compared to the lowest (Q1) were significantly protective

against unmet needs for care among non-Hispanic White respondents. However, among non-Hispanic Black respondents, associations were close to the null, suggesting no benefit of higher levels of HCBS expenditure. Indeed, the distribution of the HCBS spending is also inequitable as the HCBS per capita were lower and increased slower over time in the states with higher concentration of African American population (see Figure 1). We found the association was in the protective direction for Hispanic respondents only in the middle-upper quartile (i.e., Q3 but not Q2 or Q4). These findings suggest that non-Hispanic White respondents may benefit more from more generous state-level HCBS expenditures, which is consistent with prior findings using Medicaid claims data.²⁵ Reducing inequity in access to HCBS may require targeted efforts to improve access for other racial/ethnic groups. Future research should aim to understand the mechanisms underlying these inequities, including factors such as differences in eligibility criteria, outreach, and enrollment efforts, and the geographic distribution of HCBS programs.

We also tested heterogeneity by gender and urbanicity. Although there was no statistically significant evidence of heterogeneity by gender, the magnitude of the association between HCBS spending and unmet needs for care was larger for men as compared to women, specifically when comparing the highest versus the lowest HCBS spending quartiles. Among respondents living in urban areas, higher HCBS expenditure was associated with a lower prevalence of unmet care needs, while the associations for respondents living in suburban areas were null. The association was in the protective direction for respondents living in rural areas. These findings suggest that the benefits of more generous state-level HCBS expenditure may not be equally distributed across different gender and geographic areas, although we did not find evidence of heterogeneity across these subgroups.

We acknowledge several limitations. First, our estimates should be interpreted as associations rather than causal effects. Although we attempt to leverage within-state variation and conduct robustness checks to get at potential state-level confounding, our associations may still be confounded by between state differences. The focus on the Medicaid-eligible population could introduce some endogeneity issues since Medicaid take-up is likely to be associated with unobserved preferences that may also impact the risk of unmet needs. Indeed, it is possible that Medicaid beneficiaries may be more actively looking for home-based services compared to non-beneficiaries who are eligible for Medicaid (e.g., due to income) but have not applied or otherwise received coverage. Moreover, more generous HCBS spending could induce greater uptake and thereby shift the composition of Medicaid beneficiaries. However, recent research provides evidence against this so-called Woodwork effect in this context,¹³ reducing our concern regarding this as a potential source of bias. In addition, our models that apply state-fixed effects generally replicate our main findings, although they are imprecise. Finally, we might expect that unobserved confounders leading to spurious results in our analysis of unmet needs may have done the same in models of any I/ADL difficulty, but this was not the case.

TABLE 3 Unmet needs for basic or instrumental activities of daily living (I/ADL) care by State-Level Expenditures on Home and Community Based Services (HCBS) expenditures stratified by gender/sex, race/ethnicity, and urbanicity (HRS 2006–2016; $n = 4719$).

		HCBS quartiles (ref: Quartile 1)					
		Quartile 2 versus Q 1		Quartile 3 versus Q 1		Quartile 4 versus Q 1	
Panel A by Sex/Gender		PR	95% CI	PR	95% CI	PR	95% CI
Model A1	Women ($n = 3308$)	0.92	(0.85–1.01)	0.94	(0.87–1.02)	0.88	(0.81–0.96)
Model A2	Men ($n = 1411$)	1.00	(0.89–1.13)	0.90	(0.79–1.02)	0.88	(0.78–1.00)
		2nd Quartile versus 1st Q		3rd Quartile versus 1st Q		4th Quartile versus 1st Q	
Panel B by Race/ethnicity		PR	95% CI	PR	95% CI	PR	95% CI
Model B1	NH White ($n = 1468$)	0.94	(0.85–1.04)	0.92	(0.83–1.02)	0.81	(0.72–0.92)
Model B2	NH Black ($n = 1619$)	0.92	(0.83–1.02)	0.95	(0.85–1.06)	0.91	(0.81–1.02)
Model B3	Hispanic ($n = 1429$)	1.03	(0.82–1.31)	0.87	(0.72–1.04)	0.93	(0.82–1.06)
		2nd Quartile versus 1st Q		3rd Quartile versus 1st Q		4th Quartile versus 1st Q	
Panel C by Urbanicity		PR	95% CI	PR	95% CI	PR	95% CI
Model C1	Urban ($n = 2371$)	0.98	(0.88–1.09)	0.92	(0.82–1.03)	0.90	(0.82–0.99)
Model C2	Suburban ($n = 1185$)	0.98	(0.87–1.11)	0.93	(0.80–1.09)	0.84	(0.73–0.97)
Model C3	Rural ($n = 1163$)	0.87	(0.76–0.99)	0.88	(0.78–1.00)	0.86	(0.73–1.02)

Note: Underlying data are pooled observations of Medicaid Beneficiaries aged 55+ with at least one IADL difficulty observed in the 2006–2016 waves of the Health and Retirement Study. Sample weights are set equal to the respondent's average weight in the sample. The prevalence ratios and their 95% confidence intervals are presented from a generalized estimating equation ("xtgee") configured to the Poisson distribution, logit link function, and unstructured within-group correlation. Model A1&2 controlled for age in years, race/ethnicity, educational attainment, living arrangement, cognitive status, and urban rural residency. Model B1-3 controlled for age in years, gender/sex, educational attainment, living arrangement, cognitive status, and urban rural residency. Model C1-3 controlled for age in years, gender/sex, race/ethnicity, educational attainment, living arrangement, and cognitive status. I/ADL, basic and instrumental activities of daily living (11 items including: dressing, walking across room, bathing, eating, getting in and out of bed, toileting, preparing a hot meal, shopping for groceries, making phone calls, taking medications, and managing money). We formally tested the heterogeneity via multiplicative interaction terms between HCBS quartiles and gender/sex, race/ethnicity, and urbanicity. Interaction terms between HCBS and gender were not statistically significant at 0.05; those between HCBS and urbanicity were not statistically significant at 0.05; but interaction terms between HCBS Q4 and non-Hispanic Black was not significant (p -value < 0.10).

Second, there may be some misclassification of the exposure, outcome, and measures used to define the analytic sample. For example, publicly CMS data does not specify expenditures between older adults and people with physical disability. Medicaid status was based on self-reports; research suggests people may underreport Medicaid status (as compared to claims data).³¹ We were not able to compare the validity of self-reports against claims data and/or evaluate impacts on the quantity of HCBS expenditures. While HRS asked participants about who helped with I/ADLs and whether it was paid or not, they did not ask about the specific source of funding (e.g., Medicaid, out-of-pocket). In addition, HRS questions on HCBS are limited to those pertaining to help with I/ADLs. It could be that participants receive other kinds of HCBS (e.g., with transportation, meals on wheels, social work) that are not reflected in the self-reports. Additionally, some of the unmet needs observed in our study could be addressed via increased Medicare home health care spending. Finally, it could be that some participants who report not receiving help with I/ADLs did not need support (e.g., are able to manage given less severe difficulty). The HRS does not allow us to tease apart those who have unmet needs from those who do not want or need assistance with a given I/ADL despite reporting difficulty.

5 | CONCLUSION

In this study, we examined associations between state-level HCBS expenditures and unmet needs for care among community-dwelling Medicaid beneficiaries with I/ADL difficulty by leveraging population-based data from the US HRS and annual state-level Medicaid spending data. Overall, our analysis suggests that higher levels of HCBS expenditure were associated with a lower prevalence of unmet needs for care. However, in analyses stratified by race and ethnicity, the protective associations were concentrated among non-Hispanic white older adults; associations for non-Hispanic Black older adults were null. These results highlight the importance of investing in HCBS as a strategy to improve access to care and reduce unmet needs among older adults. However, the variability by race and ethnicity also suggests that policy efforts to ensure equitable benefits of these increased expenditures are critical. If investments in HCBS disproportionately benefit older white adults, they are likely to exacerbate inequities in unmet care needs among older adults. For example, policymakers may need to consider targeted strategies to increase access to HCBS among racial and ethnic minoritized populations who may face myriad barriers related to structural and institutional racism,

historic lack of access to quality health care (which may limit provider referrals for HCBS), and challenges finding available HCBS services.

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SUPPORTING INFORMATION

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

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