Effects of long-term care setting on spousal health outcomes

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Objective: To provide empirical evidence on the effects of home and community-based services (HCBS) (vs nursing home) use on spousal health.

Data Sources: Merged data from the 1996 to 2012 Health and Retirement Study (HRS) and the Area Health Resource File (AHRF).

Study Design: We assess the impact of HCBS use on spousal health. We use an instrumental variable (IV) approach to account for the potential endogeneity of the choice of care setting and reverse causality. Our instrument is the supply of skilled nursing home beds per 1000 people older than 65 years.

Data Extraction Methods: Our sample includes spouses of HCBS or nursing home users, resulting in 8608 observations.

Principal Findings: We find that HCBS use leads to harmful effects on spousal physical health, which may be caused by increased informal care responsibilities. We also find improved spousal mental health, especially in depression symptoms, which may be caused by increased satisfaction.

Conclusions: We find evidence of both beneficial (mental health) and harmful (physical health) consequences for spouses of individuals receiving LTC at home relative to in an institution. Our results are important in estimating the potential cost and effectiveness of HCBS expansion.

KEYWORDS

home and community-based services, instrumental variable, nursing home

1 | INTRODUCTION

Over the past three decades, there has been a large expansion in noninstitutional long-term care (LTC) use, and public financing of long-term care services has been shifting away from nursing homes toward home and community-based services (HCBS). Medicaid, the primary payer for LTC for elderly people, spent 46% of its total LTC dollars on HCBS on average as of 2013, up from 13% in 1990.¹ The rationale for this expansion is based mainly on two assumptions: (a) LTC users generally prefer HCBS to institutional care, and (b) for nursing home residents with less intensive care needs, HCBS may be cheaper.²

Although family members usually participate in LTC decisions and are inevitably affected by the decision to use HCBS in lieu of nursing home care, prior studies in this area have mainly focused on the preferences and well-being of LTC users in different care

settings. The desirability of HCBS among the family members is often taken as self-evident. Yet it remains unclear whether and how HCBS (vs institutional care) use may affect health outcomes for the family members of care recipients—especially the spouses—who are themselves typically elderly and potentially vulnerable, yet play an important role in providing care and making LTC decisions. This issue is largely ignored in the drive to expand HCBS and estimates of the overall potential cost savings associated with HCBS.

A related strand of literature on the health impact of informal care provision on caregiver's health finds mostly harmful effects. Substantial evidence suggests that, compared to noncaregivers, informal caregivers are at higher risk of having depression, anxiety, psychiatric problem, poor self-rated health, chronic diseases, and functional limitations.³⁻¹⁰ Furthermore, greater caregiver burden and worse health outcomes are found among female caregivers,¹⁰⁻¹² caregivers with more intensive caregiving responsibility,¹³⁻¹⁵

caregivers for mentally impaired individuals,^{5,7,16} and spousal caregivers.¹⁷ Meanwhile, a small body of literature finds beneficial mental health effects of caregiving such as improved self-esteem and appreciation of life,¹⁸⁻²⁰ and beneficial physical health effects such as reduced mortality.^{21,22}

Results from those studies may not apply to our research question and population. First, care settings may affect spousal health through mechanisms other than informal care provision. For example, spouses may derive higher satisfaction and better mental health from living with their partners at home.²³⁻²⁷ Second, prior studies compare health outcomes of caregivers against noncaregivers, whereas our study compares health outcomes of spouses of HCBS users against spouses of nursing home users. Since the negative health effects caused by informal caregiving are well established, a more important question is whether HCBS (vs institutional care) may lead to relatively better spousal health outcomes, given that both scenarios may involve caregiving. Our study informs the potential health outcomes of spouses under different LTC settings. Third, many prior studies of caregiving focus on nonspousal caregivers such as adult children. Since spousal caregivers are usually older and at a higher risk of age-related physical and cognitive decline,²⁸ they constitute an especially important and understudied group. In addition, most of the studies are cross-sectional, and may not address the endogeneity of informal care provision and establish a causal relationship.²⁹ Only two prior papers address this endogeneity issue using an instrumental variable (IV) approach.^{11,30} Therefore, the overall impact of HCBS use on spousal health remains unclear.

To inform policy makers about the potential costs and benefits of HCBS expansion for spouses of HCBS recipients and help them to design programs to better support spouses, a rigorous evaluation of the impact of HCBS (vs nursing home) on spousal health outcomes is needed. To the best of our knowledge, our study is the first to examine this causal relationship. By focusing on spouse caregivers, we are able to study the family members that are potentially most vulnerable to HCBS expansion. We address the potential endogeneity of the choice of care setting and reverse causality using an IV approach.

2 | CONCEPTUAL FRAMEWORK

Theoretically, HCBS may affect spousal health through several mechanisms. The shift to HCBS might harm spousal health, since substituting HCBS for nursing home care may increase spouse's caregiving burden. At the same time, spouses may derive satisfaction and better mental health outcomes from providing more intensive informal care ("warm-glow giving"^{23,24}), from enabling care recipients to stay in their preferred LTC setting ("altruistic spouse"^{25,26}), and from utility gains from living together with the care recipients ("cohabitation model"²⁷). Because these theories provide potentially conflicting directions of health effect, this question must be studied empirically.

The potential endogeneity of the care setting poses a key challenge of identifying the causal relationship between care setting and spousal health. In many cases, the care setting is chosen by care

recipients and/or their spouses and may, therefore, be correlated with factors that also affect spousal health. We use Andersen's behavioral model³¹ to inform the choice of LTC setting. The model posits that the health services used by an individual are a function of the predisposing and enabling characteristics of the individual and her need for medical care. In this case, the predisposing variables include those that describe the propensity of an individual to use HCBS, such as age, sex, race, and care setting preference. The enabling variables include resources that one has available to her for the use of HCBS, such as wealth, health insurance, and the availability of different formal and informal LTC services. Health care need refers to one's health status and LTC need, in this case mainly functional and cognitive impairment. Informed by the Andersen model, we control for a rich set of socioeconomic status, family structure, health status attributes, and state and year fixed effects. We further address potential endogeneity bias and reverse causality using an IV approach.³²

3 | METHODS

3.1 | Data

Our primary source of data is the Health and Retirement Study (HRS), a longitudinal study that surveys a nationally representative sample of Americans older than 50 and their spouses every 2 years. The HRS collects detailed information on respondents' socioeconomic status, health, health service utilization, health care expenditures, and family structure. We also use the original HRS data and the Cross-Wave Geographic Information (detail) file to match respondents to area-level information. In addition, we collect the county-level number of skilled nursing home beds per 1000 elderly people older than 65 years (the IV) from the Area Health Resource File (AHRF). We use data from waves 3-11 (1996-2012) of the HRS for our analyses because these are the years for which all our datasets and key variables are available.

3.2 | Sample

We use a pooled person-wave sample and account for multiple observations of the same individuals in the error structure in our regression analyses. A schematic of our analysis sample is pictured in Figure S1. From the combined HRS sample, we limit our primary analysis sample to spouses if (a) they are in two consecutive waves and have a partner, (b) the care recipients used only HCBS or only nursing home in the later wave, and (c) they lived in the same county for both waves. We omit observations where neither HCBS nor nursing home was used, as our focus is on the comparison by setting of care for individuals who could potentially use either type. To enable cleaner identification of a treatment effect, we do not include spouses of recipients who used both services, as we cannot determine which type of service was used first or predominantly during the two-year look-back period. Our final sample includes 8608 observations of 5931 spouses and 4678 households. Most of the LTC users used HCBS or nursing home care for only one wave.

3.3 | Dependent variables: spousal health outcomes

We examine physical and mental health outcomes of the spouses.

3.3.1 | Self-rated health

We use a dichotomous variable to indicate whether the respondent has good or better self-rated health.

3.3.2 | Activities of Daily Living (ADLs)

We use a dichotomous variable to indicate whether the respondent needs help with ADLs.

3.3.3 | Instrumental Activities of Daily Living (IADLs)

We use a dichotomous variable to indicate whether the respondent needs help with IADLs.

3.3.4 | Psychiatric problems

We use a dichotomous variable to indicate whether the respondent has reported the onset of emotional, nervous, or psychiatric problems since the last interview.

3.3.5 | CESD8 index

We use the well-established Center for Epidemiologic Studies Depression (CESD) scale to measure depression. It is the sum of six self-reported “negative” measures (whether the respondent experienced depression, everything is an effort, sleep is restless, felt alone, felt sad, and could not get going, all or most of the time over the week prior to the interview) minus 2 “positive” measures (whether the respondent felt happy and enjoyed life, all or most of the time over the week prior to the interview). We use a dichotomous variable to indicate whether the respondent has a score of 3 or above, which is consistent with probable clinical depression.^{33,34} It is worth noting that the symptoms in the scale are among those on which a clinical diagnosis of depression is based, but other diagnoses may also be necessary to determine the disease.³⁴

3.4 | Key independent variable: HCBS use

The HRS questions for HCBS use are “Since the previous interview, has any medically-trained person come to your home to help you?”, and “In the last two years, did you use any special facility or service such as: an adult care center, a social worker, an outpatient rehabilitation program, or transportation or meals for the elderly or disabled?”. The HRS question for nursing home use is “Since the previous interview, have you been a patient overnight in a nursing home, convalescent home, or other long-term health care facility?”. Individuals are considered to be HCBS users if they answer

“yes” to any of the two HCBS questions, and are considered to be nursing home users if they answer “yes” to the nursing home question.

3.5 | Control variables

We control for (or in some cases, stratify by) a rich set of spouse- and user-level variables available in the HRS that might be related to both LTC setting and the spouse's health outcomes. We use year fixed effects to account for general time trends in spousal health, such as changes over time in the macroeconomy that could affect depression symptoms. We use state fixed effects to account for unobserved time-invariant state characteristics that may affect spousal health outcomes.

3.6 | Empirical model

We begin by estimating the impact of care settings on spousal health using a naïve logistic regression model:

$$\text{logit}(P(H_{s,t} = 1)) = \gamma_0 + \gamma_1 \text{HCBS}_{r,t} + \gamma_2 H_{s,t-1} + \gamma_3 X_{s,t} + \gamma_4 X_{r,t} + \gamma_5 \text{Year}_t + \gamma_6 \text{State}_{st}, \quad (1)$$

where $H_{s,t}$ is the spousal health at t , $\text{HCBS}_{r,t}$ indicates whether the care recipient used HCBS at t , $H_{s,t-1}$ is a vector of baseline health measures for spouse at time $t-1$, $X_{r,t}$ and $X_{s,t}$ are vectors of recipient- and spouse-level controls at time t . We also control for state and year fixed effects.

3.7 | Instrumental variable design

The main concerns with the naïve logistic regression estimates are potential endogeneity bias and reverse causality. We use an IV approach to address these issues.³² An ideal instrument should predict the treatment (HCBS vs nursing home care) but should not affect spousal health after observed confounders are controlled for. Theoretically, if an IV balances both measured and unmeasured characteristics between treatment and control groups, then the selection bias can be minimized.^{35,36}

Our instrument is based on the exogenous variation in HCBS use caused by differences in nursing home supply in the local market. Specifically, we use the county-level number of skilled nursing facility beds per 1000 people older than 65 years as our IV. The nursing home care market option that a family faces has a direct impact on their effective demand for nursing home care and ability to get alternative care arrangements. Therefore, our instrument should be negatively correlated with HCBS use.

There is substantial variation in our IV: the county-level numbers of skilled nursing home beds per 1000 people older than 65 years range between 0 and 165.9, with a mean of 42.8 and a standard deviation of 18.2. Regression results of the first-stage model show that a 1 unit increase in the IV leads to a 0.1 percentage-point reduction in likelihood of using HCBS, and a 1 standard deviation increase in the IV leads to a sizable 1.8 percentage-point reduction in likelihood of using HCBS (Table S1).

Some potential threats to IV exogeneity should be considered. First, the IV would be endogenous (and therefore not a valid IV) if people move to counties with their preferred care settings, so people are not “randomly assigned” to different care settings based on where they live. Although only <2% of our sample reported moving to their current home due to health or health services reasons, we exclude all individuals who moved from a different county 2 years before they used LTC services, and in a sensitivity analysis, we further exclude individuals who moved from a different county 4 years before they used LTC services. Second, the IV would be endogenous if supply of nursing homes responds to demand. This is unlikely to be a concern, especially in the short run, because the supply of nursing homes is often constrained due to state moratoria on building and Certificate of Need regulation³⁷ and high entry costs. We find that the average annual change in number of nursing home beds is only about 0.8% during our study period. Third, the IV would be endogenous if it is correlated with county-level variables (eg, area-level wealth and education) that may be correlated with spouse-level variables that may in turn affect spousal health. Therefore, we carefully control for a rich set of socioeconomic status variables, and present an “IV balance check” table to assess whether treatment and control observations are plausibly balanced on observable characteristics at the individual level, lending support to the idea that our instrument pseudorandomizes observations.³⁸ Table S2 shows the correlation coefficients and *P* values between the nursing home supply IV and each of the independent variables while controlling for the other independent variables, as the exogeneity requirement is conditional.³² While a few minor differences in observable characteristics for counties with more or fewer nursing home beds emerge as statistically significant (spouse ethnicity; LTC user's mobility and pain), the differences in all the other observed characteristics are not statistically significant at the 0.10 level. These results show that the IV approach has greatly improved sample balance in observed characteristics, providing support for the validity of the IV.

3.8 | Instrumental variable models

We use the two-stage residual inclusion (2SRI) method since our dependent variables are binary.³⁹ Our first-stage, logistic regression model uses the IV to predict HCBS use:

$$\text{logit}(P(H_{s,t} = 1)) = \alpha_0 + \alpha_1 IV_{r,t} + \alpha_2 H_{s,t-1} + \alpha_3 X_{s,t} + \alpha_4 X_{r,t} + \alpha_5 \text{Year}_t + \alpha_6 \text{State}_{s,t} \quad (2)$$

where $IV_{r,t}$ is the county-level number of nursing home beds per 1000 people older than 65 for LTC recipient *r* at time *t* and the other variables are the same as described in Equation (1). We then calculate the response residuals $\widehat{r}_{s,t}$ from the first-stage model. These residuals are included in the second-stage model below as additional regressors to produce the correct adjustment for endogeneity in the outcome equation:

$$\text{logit}(P(H_{s,t} = 1)) = \beta_0 + \beta_1 \text{HCBS}_{r,t} + \beta_2 H_{s,t-1} + \beta_3 X_{s,t} + \beta_4 X_{r,t} + \beta_5 \text{Year}_t + \beta_6 \text{State}_{s,t} + \beta_7 \widehat{r}_{s,t} \quad (3)$$

where $H_{s,t}$ is the health outcome, and the other variables are the same as described above. We use the second-stage model to estimate the impact of one's HCBS use on spousal health. In all of our regression models, we estimate Huber–White standard errors to account for multiple observations per individual. Finally, we perform a bootstrap procedure for both stages, with 500 iterations to correct standard errors.⁴⁰

We construct multiple alternative specifications to test the robustness of our results. In Model (i), we measure health outcomes 2 years later (*t* + 1 wave) to examine the longer-run effects. In Model (ii), we include the lagged dependent variable as a predictor to construct dynamic models. Although the use of an instrumental variable arguably creates balanced treatment and control groups on baseline health such that examining incidence is superfluous, the inclusion of lags may help with any residual endogeneity. Since the onset of emotional, nervous, or psychiatric problems is already an incident health outcome, it is not included in this analysis. Next, we attempt to exclude short-term postacute care users to focus on long-term custodial care users. However, HRS questions do not clearly distinguish these two types of users. In practice, because Medicare covers rehabilitation of up to 100 days in a nursing home with a substantial copayment after the 20th day, most nursing home stays for postacute purposes are shorter than 30 days.⁴¹ Therefore, in Model (iii), we exclude spouses of care recipients who use nursing home services for <30 days. Similarly, in Model (iv), we include only care recipients who have problems with ADLs, IADLs, memory, or cognitive functioning as the group likely to be most directly affected by this choice. Further, we examine the effects of HCBS among spouses of new users since repeated users and their spouses may rely on prior experience and thus face a different information set. In Model (v), we include only nonprevalent LTC users (who do not use LTC in previous wave). Similarly, in Model (vi), we include only the first observation for each household. Then, in Model (vii), we exclude households with coresident children. We provide additional sensitivity analyses in our Appendix S1. Model (A) tests the IV exogeneity excluding people who moved from another county 4 years ago. Model (B) examines the longer-run (*t* + 1 wave) effects with the 30-day nursing home sample. Model (C) uses the change in dependent variable as the outcomes and includes only the first observation for each household. Model (D) uses the change in dependent variable as the outcome and includes only the first observation for each household that does not have coresident children.

4 | RESULTS

4.1 | Descriptive statistics

Table 1 provides descriptive statistics on our sample. In an unadjusted comparison, there are significant differences between spouses of HCBS users and spouses of nursing home users. On

TABLE 1 Descriptive statistics of independent variables, by care setting

Independent variables	Nursing home (N = 521)	HCBS (N = 8087)	P values
Spouse SES			
Age (mean)	75.7 (10.2)	68.1 (10.0)	<0.001
Female (%)	54.1	49.5	0.041
Race (white is omitted) (%)			
Black	13.4	10.4	0.022
Other races	5.0	3.6	
Hispanic (%)	10.0	7.5	0.037
Education (less than high school is omitted) (%)			
GED	4.0	4.3	<0.001
High school	30.9	30.1	
Some college	16.9	22.2	
College and above	13.4	25.2	
Retired (%)	66.6	52.8	<0.001
Household wealth			
Log total financial assets (\$)	7.3 (5.0)	8.3 (4.9)	<0.001
Log total income (\$)	10.4 (1.1)	10.9 (1.0)	<0.001
Family			
Number of children (0 is omitted) (%)			
1	10.9	8.3	0.001
2	23.4	26.6	
3+	59.5	61.8	
Spouse health insurance			
Uninsured (%)	2.9	4.3	0.114
Has LTCI (%)	13.4	14.6	0.473
Care recipient health insurance			
Has medicare (%)	89.8	68.0	<0.001
Has medicaid (%)	28.4	8.1	<0.001
Has LTCI (%)	13.6	14.6	0.535
Spouse health			
Lagged # diagnosed disorder (0 is omitted) (%)			
1	20.0	25.6	<0.001
2	27.4	26.0	
3+	40.5	31.2	
Lagged # mobility tasks cannot do (0 is omitted) (%)			
1	20.2	19.1	<0.001
2+	40.3	26.0	
Lagged any psychiatric problems (%)	21.7	15.7	<0.001
Lagged any pain problems (%)	38.8	32.8	0.005

(Continues)

average, spouses of HCBS users are younger, are less likely to be female, are more likely to be white, are less likely to be Latino, are more educated, are less likely to be retired, are wealthier, have more

TABLE 1 (Continued)

Independent variables	Nursing home (N = 521)	HCBS (N = 8087)	P values
Care recipient health			
# diagnosed disorder (0 is omitted) (%)			
1	11.3	17.7	<0.001
2	21.1	27.1	
3+	64.3	49.3	
# mobility tasks cannot do (0 is omitted) (%)			
1	14.4	19.6	<0.001
2+	71.0	45.4	
Any psychiatric problems (%)	30.7	22.6	<0.001
Any pain problems (%)	39.9	49.2	<0.001
# ADL tasks cannot do (0 is omitted) (%)			
1	10.2	12.6	<0.001
2+	53.9	16.3	
# IADL tasks cannot do (0 is omitted) (%)			
1	9.6	10.7	<0.001
2+	54.7	14.4	
Any memory problems (%)	23.4	4.2	<0.001

Note: The comparisons between the two treatment arms are calculated based on simple two-sample t-tests or chi-squared test. Standard deviations in parentheses.

children, and have better-lagged health. In addition, not surprisingly, HCBS users are also healthier and are less likely to have Medicare or Medicaid than nursing home users. The many differences in observed variables suggest the existence of self-selection and the necessity of using the IV approach.

4.2 | Regression results of the main models

Table 2 reports the results of our main models.

We expect spouses of HCBS users to have worse physical health outcomes due to potentially greater informal caregiving responsibility. In line with this hypothesis, we find that relative to nursing home use, HCBS use leads to a 9.3 percentage-point reduction in the likelihood of the spouse having good or better self-rated health, a statistically significant effect of sizable magnitude. HCBS use also leads to a 3.4 percentage-point increase in the likelihood of needing help with ADLs, and a 4.0 percentage-point increase in the likelihood of needing help with IADLs. The estimated effect on ADLs, while meaningful in size, is statistically insignificant. While this may indicate lack of the hypothesized effect, other potential explanations for the lack of a statistically significant finding for ADLs include the following: (a) we have limited power to detect differences in outcomes given the modest sample size, and (b) we only examine the effects of one wave of HCBS use, which may be too short to significantly affect one's functional status.

TABLE 2 Estimates of marginal effects on spouse outcomes, base models

	(1)	(2)	(3)	(4)	(5)
Base models	Good health	ADL problems	IADL problems	Psychiatric problems	CESD ≥ 3
No IV models					
Marginal effect	-0.029	-0.004	-0.011	0.007	-0.048***
SE	(0.018)	(0.014)	(0.014)	(0.007)	(0.018)
Observations	8790	8795	8769	8513	8023
IV models					
Marginal effect	-0.093***	0.034	0.040*	-0.003	-0.086**
Bootstrap SE	(0.031)	(0.025)	(0.024)	(0.018)	(0.035)
First-stage <i>F</i> -statistics	10.6	10.6	10.6	10.7	7.7
Mean of dependent variable	0.725	0.171	0.163	0.024	0.210
Observations	8606	8608	8608	8386	7800

Note: Standard errors in parentheses.

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$.

For mental health outcomes, we find that HCBS use leads to an 8.6 percentage-point reduction in having a CESD score of 3 or more for the spouses—a large and statistically significant effect. The effect on new mental health diagnoses is consistent in direction but smaller and not statistically significant: a 0.3 percentage-point reduction in the likelihood of having had diagnosed emotional, nervous, or psychiatric problems since last interview. A stronger effect for the CESD outcome than for diagnoses is not surprising, as (a) the CESD is a screening test for depression and depressive disorder and is designed to be more sensitive, and (b) psychiatric disorders are usually underdiagnosed, especially among informal caregivers.

4.3 | Regression results of sensitivity analyses

Table 3 reports the results of our sensitivity analyses.

The results of the longer-run models show that the harmful effects on physical health persist at the $t + 1$ wave, suggesting possible cumulative effects in functional disability. On the other hand, the effects on both mental health outcomes are in the harmful direction, but both are insignificant and small in magnitude, suggesting the beneficial mental health effects are transient.

The IV estimates of the lagged dependent variable models are generally consistent with our main estimates in direction and significance, but are slightly smaller in magnitude. Given that lagged dependent variable models often suffer from autocorrelation, which tends to bias coefficients toward zero, we tested for first-order autocorrelation and found it to exist for three of our four outcomes. Thus, autocorrelation may explain the smaller magnitude in these models, but the consistency of direction and significance suggests that our IV estimates are robust to the inclusion of lags.

The results of 30-day nursing home models and the recipients with ADL/IADL/cognitive problems models also support our main

findings. Both tests focus on populations more likely to be affected by the need for LTC. Conceptually, the robust results make sense—since the IV approach only identify the local average treatment effects (LATEs) for spouses of compliers (ie, spouses of care recipients who used HCBS because there is limited nursing home supply and who would have used a nursing home otherwise),⁴² and compliers are less likely to be individuals with minimal LTC need or individuals who only need postacute care, the actual individuals driving the estimate in the base models should be similar to those in these sensitivity analyses.

Further, compared with base models, limiting the sample to nonprevalent users produces similar effects on the likelihood of having ADL, IADL, and psychiatric problems, but smaller and less significant effects on the likelihood of having good health and having a CESD ≥ 3 . One potential explanation for the lack of significant findings is the weaker IV and large variance in this subsample. It is also possible that the HCBS has greater effects on spouses of repeated users.

The estimates of the first observations models are very similar to those of the nonprevalent user models. However, the effects of HCBS on the ADLs and IADLs outcomes are significant among spouses of first-time users but are insignificant among spouses of nonprevalent users, suggesting that HCBS has greater harmful impact on functional status among spouses of first-time users. This finding is reasonable since spouses of first-time users are less experienced in providing informal caregiving and may be, therefore, more vulnerable to physical stress.

Lastly, compared with base models, limiting the sample to households without coresident children produce similar effects on self-rated health, psychiatric problems, and CESD score outcomes. The effects on ADLs and IADLs are even less harmful, suggesting that the presence of coresident children does not improve spousal health outcomes.

TABLE 3 Estimates of marginal effects, sensitivity analyses

	(1)	(2)	(3)	(4)	(5)
Sensitivity analyses	Good health	ADL problems	IADL problems	Psychiatric problems	CESD ≥ 3
(i) Outcomes at $t + 1$					
Marginal effect	-0.083**	0.019	0.054*	0.009	0.004
Bootstrap SE	(0.039)	(0.033)	(0.032)	(0.014)	(0.039)
First-stage F -statistics	7.3	7.1	7.1	7.2	5.4
Mean of dependent variable	0.716	0.177	0.168	0.024	0.217
Observations	6298	6301	6300	6191	5744
(ii) Control for lagged dependent variables					
Marginal effect	-0.068**	0.031	0.022	N/A	-0.056*
Bootstrap SE	(0.031)	(0.023)	(0.022)	N/A	(0.033)
First-stage F -statistics	10.5	10.4	10.2	N/A	7.8
Mean of dependent variable	0.725	0.171	0.163	N/A	0.208
Observations	8604	8602	8602	N/A	7625
(iii) Keep NH > 30 days					
Marginal effect	-0.075**	0.026	0.021	-0.016	-0.120***
Bootstrap SE	(0.033)	(0.024)	(0.022)	(0.019)	(0.037)
First-stage F -statistics	12.3	12.3	12.3	12.3	9.3
Mean of dependent variable	0.727	0.171	0.163	0.024	0.209
Observations	8360	8364	8362	8185	7477
(iv) Keep care recipients with ADL/IADL/cognitive problems					
Marginal effect	-0.130***	0.024	0.039	-0.041	-0.111**
Bootstrap SE	(0.047)	(0.041)	(0.041)	(0.035)	(0.046)
First-stage F -statistics	3.5	3.5	3.5	3.6	1.4
Mean of dependent variable	0.577	0.328	0.313	0.034	0.292
Observations	4497	4499	4499	4185	3954
(v) Keep nonprevalent users (drop care recipients who used LTC at $t-1$)					
Marginal effect	-0.051	0.036	0.026	0.007	-0.034
Bootstrap SE	(0.041)	(0.032)	(0.029)	(0.021)	(0.042)
First-stage F -statistics	7.9	7.8	7.8	8.1	5.9
Mean of dependent variable	0.737	0.154	0.148	0.023	0.198
Observations	6117	6118	6118	5629	5483
(vi) Keep the first observation for each household					
Marginal effect	-0.052	0.052**	0.049*	0.008	-0.055
Bootstrap SE	(0.037)	(0.025)	(0.028)	(0.019)	(0.038)
First-stage F -statistics	5.9	5.8	5.8	6.1	4.3
Mean of dependent variable	0.731	0.159	0.151	0.026	0.212
Observations	5843	5842	5842	5763	5422
(vii) Exclude households with coresident children					
Marginal effect	-0.095***	0.010	0.007	-0.004	-0.085**
Bootstrap SE	(0.035)	(0.025)	(0.028)	(0.017)	(0.036)

(Continues)

TABLE 3 (Continued)

	(1)	(2)	(3)	(4)	(5)
Sensitivity analyses	Good health	ADL problems	IADL problems	Psychiatric problems	CESD ≥ 3
First-stage F-statistics	6.3	6.2	6.2	6.4	3.1
Mean of dependent variable	0.732	0.167	0.158	0.024	0.201
Observations	6854	6856	6856	6586	6244

Note: Standard errors in parentheses.

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$.

5 | CONCLUSIONS

Although there has been a large expansion in noninstitutional LTC during the past several decades, HCBS cost-effectiveness research has not focused on health or well-being of spouses. In this paper, we estimate the effects of HCBS use on key spousal health outcomes. We find that HCBS use is associated with consistently harmful effects on spousal physical health, both in the short term and the longer term, which may potentially be caused by increased informal care responsibilities. We also find improved spousal mental health outcomes, especially in depression symptoms, which may potentially be caused by increased satisfaction derived from providing more intensive informal care, from enabling their partners to stay in their preferred LTC setting, or from living together with their partners. Although the estimated effects of care setting on spousal health are modest, these effects are meaningful in light of the fact that most care recipients used HCBS or nursing home services for only one wave.

Our results are subject to several potential limitations. We employ various strategies in each case to address or minimize them to the extent possible.

First, IV estimation produces unbiased effects only if the assumptions required for IV validity are upheld. Although we provide conceptual and empirical evidence to support IV exogeneity, violations of the assumptions are still possible. Further, the F-statistics for the instrumental variable in several sensitivity analyses are <10 , suggesting a weak IV, and weak IV may lead to large variation and biased estimates. Therefore, estimates from those models should be viewed with the limitation that the IV is weak,

Second, the IV approach can only identify LATEs among compliers. Conceptually, compliers are individuals who are on the margin of using a nursing home and do not have a strong preference over care settings given the care recipient's health status. Therefore, compliers are less likely to be very healthy individuals who need minimal care nor very sick individuals who need intensive medical care. This feature of the compliers may help us to identify a more homogenous population and focus on individuals who are more likely to respond to policies that aim to expand noninstitutional LTC.

Third, questions from the HRS are not sufficient for distinguishing long-term custodial care users from postacute rehabilitation service users. Our robustness checks give limited reassurance on this issue.

Fourth, our results in the $t + 1$ models may be biased if spouses of HCBS users have a different likelihood of withdrawing from the study at $t + 1$ potentially due to death (ie, attrition bias). We find no statistical difference in the death-related withdrawal rate between control and treatment groups when age and preexisting conditions are controlled for, suggesting insignificant attrition bias.

Overall, our findings on spousal health outcomes under the HCBS model (relative to the nursing home model) are important in estimating the cost and effectiveness of HCBS expansion. We find evidence of both beneficial (mental health) and harmful (physical health) consequences for spouses of HCBS users. Although current policies that are focused on shifting from institutional to HCBS may be most relevant to the Medicaid population, Medicaid's shift to HCBS may induce supply expansions making HCBS more widely available, and preferences for HCBS are not limited to the Medicaid population. Therefore, our findings are important for both the Medicaid population and the non-Medicaid population.

Policies aimed at expanding HCBS to reduce nursing home use should consider the potential beneficial and harmful effects on spousal health, and future research examining the costs and benefits of HCBS should include the costs and benefits to spouses and other family members. To be fully effective and capitalize on widespread preferences for care in noninstitutional settings, policies expanding HCBS may need to include complementary policies that assist and support families, as the shift to HCBS inevitably shifts greater responsibility to them.

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DISCLOSURES

No other disclosures.

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