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Original Study

Alzheimer's Disease Services, Staffing, and Outcomes in Adult Day Health Centers

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A B S T R A C T

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Objectives: Increasing rates of Alzheimer disease and related dementia (ADRD) has resulted in greater reliance on adult day health centers (ADHCs) and their skilled workforce. Little is known about staffing in ADHCs that provide ADRD services compared with ADHCs that do not. This study examines whether there are differences in staffing between ADHCs that offer ADRD services versus those that do not, and whether the percentage of ADHC participants with ADRD is associated with staffing levels. It also examines whether staffing levels and provision of ADRD services are associated with participant outcomes. **Design:** Cross-sectional analysis of secondary survey data.

Setting and Participants: We used facility-level data from the 2014 National Post-acute and Long-term Care Study Adult Day Services Center module. This survey is completed by administrators of ADHCs, who provide information about their ADHC's organization, services, participants, sources of payment, staffing, and participant outcomes.

Methods: Bivariate comparisons and multivariate regressions were used to compare scope of services, staffing, and participant outcomes for ADHCs that offered ADRD programs compared with those that did not.

Results: ADHCs with ADRD programs had similar average daily attendance, less revenue from Medicaid and self-payment, and greater proportions of Black and female participants. ADHCs with ADRD programs had similar staff hours per participant day for all staff categories; licensed nurse staffing increased and social worker staffing decreased with the proportion of participants with ADRD. Staffing had significant associations with participant outcomes.

Conclusions and Implications: ADHCs that have more participants with ADRD have greater staffing of licensed nurses but fewer social workers. Participant outcomes are associated with staffing, but the results suggest that there are unmeasured dimensions of participant risk that confound the relationship.

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Adult day health centers (ADHCs) offer vital community services including social and recreational activities, assistance with activities of daily living, and medical services, such as skilled nursing care and assistance with therapeutic treatments.¹ In 2016, an estimated 286,300 people were enrolled in 4600 ADHCs in the United States.²

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Research findings demonstrate that participation in ADHCs has positive health, social, psychological, and behavioral effects for both participants and their caregivers.^{3–5} The growing need for specialized care and caregiver respite, including for people living with Alzheimer disease and related dementias (ADRD), has contributed to the growth of ADHCs over the past 25 years.^{6–8} Approximately 28% of ADHC participants had ADRD in 2018,⁹ and this percentage is expected to increase as rates of ADRD grow with the aging of the population.¹⁰

ADHC staffing includes registered nurses (RNs), licensed practical/vocational nurses (LPNs), nursing aides, social workers, activity professionals, and occupational and physical therapists. Licensed nurses, RNs and LPNs, assess patients, develop care plans, and provide medical care that cannot be delegated to nursing aides. States require that ADHCs that offer any medical services employ licensed nurses, and

some states have minimum staffing requirements for RNs and/or LPNs.¹¹ Nursing aides carry out a range of tasks, including support with activities of daily living and instrumental activities of daily living. In some states, nursing aides are allowed to administer medications, perform some tests such as checking blood glucose, and changing wound dressings.¹² Social workers provide care management and navigation,¹³ and licensed clinical social workers may provide therapy. Activity staff are responsible for development and execution of recreational and social activities for center participants. Physical and occupational therapists provide rehabilitation services and therapy. Most states have minimum staff-to-participant staffing ratios, which ranged from 1-to-4 to 1-to-10 in 2014, and some states have separate staffing ratios for participants with dementia, typically 1-to-4.¹¹

ADHCs vary in the services they provide, particularly with respect to the degree to which they offer medical versus social support, and some ADHCs focus on specific populations and services such as dementia or rehabilitation care.^{14–16} ADHCs that offer more medical services tend to have participants with an older age distribution and with a greater need for assistance with activities of daily living.¹⁷ Staffing also varies by ADHC services; it has been reported that ADHCs that offer a greater extent of medical services have fewer average staff hours per participant per day.¹⁷ However, there has not yet been any research on whether staffing varies between ADHCs that offer services for participants with ADRD or that have a greater proportion of participants with ADRD. As the population with ADRD rises, changes in staffing demands could have long-term implications for workforce planning and development. This study measures whether there are differences in staffing and participant outcomes among ADHCs that provide ADRD services compared with ADHCs that do not, and between ADHCs that serve larger versus smaller proportions of participants with ADRD.

Methods

We conducted a retrospective cross-sectional analysis of secondary survey data. We hypothesized that staffing levels would be higher in ADHCs that offer ADRD services and that have a larger proportion of participants with ADRD diagnoses. We also hypothesized that higher staffing levels, if present, would be associated with better participant outcomes, such as lower rates of hospitalizations, emergency department (ED) visits, and falls, after controlling for participant demographics and other ADHC characteristics.

Data Source and Sample Selection

We analyzed data from the 2014 National Post-acute and Long-term Care Study (NPALS, formerly called the National Study of Long Term Care Providers). The NPALS is a biennial survey conducted by the National Center for Health Statistics and includes a module on ADHCs.¹⁸ ADHCs included in the survey are licensed or certified by their state, accredited by the Commission on Accreditation of Rehabilitation Facilities, or authorized or otherwise set up to participate in Medicaid. They also had participants enrolled and attending at the time of the survey. We used the restricted-use facility-level data from the 2014 survey, which had a response rate of 58.0% and was completed by 2763 ADHCs. We excluded ADHCs that reported that 100% of their participants had severe mental illness (26 cases) or 100% had developmental diagnoses (408 cases). We also excluded centers with 95% or more of their population aged 55 years and younger (109 cases). ADHCs that focus on supporting these populations are likely to offer a different range of services and supports than ADHCs that primarily serve older adults with physical care needs and/or ADRD.³

Variables

We used the question “Does this adult day services center offer any disease-specific programs for participants with the following conditions? a. Alzheimer’s disease and other dementias” (ALZPROG) to identify the presence of specific services for people living with ADRD. We computed the proportion of participants with an ADRD diagnoses by dividing the number of participants with an ADRD diagnosis by the total number of participants.

The dataset provided multiple measures of staffing. For each of RNs, LPNs, nursing aides, social workers, and activities staff, the numbers of full-time and part-time employees and contract personnel were reported. The dataset also included the number of full-time equivalent (FTE) personnel for each of these occupational categories, calculated by assuming that a full-time employee is 1 FTE and a part-time employee is 0.5 FTE. The FTE variables were used to calculate average hours per participant day (HPPD), assuming that each FTE results in 35 productive working hours per week. The derived HPPD variables were coded as 24 for any values that were greater than 24.¹⁸ We added employee and contract HPPDs together to obtain total HPPD for each occupational category and then summed all occupations to measure total ADHC staffing per participant day. We excluded 20 ADHCs for which total HPPD (regular plus contract staff) were greater than 24 (20 cases) or LPN HPPD were greater than 10.5 (3 cases) as these were outlier values.

The 3 participant outcomes included in the dataset were the numbers of participants in the past 90 days who had an overnight hospital stay (OVERNITE), an ED visit (EMERNUM), or fall (FALLNUM), with both on-site and off-site falls included. We computed the proportions of participants with these outcomes by dividing by the total number of participants (TOTPART).

We hypothesized that participant and ADHC characteristics also influence staffing levels and participant outcomes, and thus controlled for them in multivariate regressions. These variables were selected based on prior research using these data^{19,20} and after examining correlations to identify variables that were moderately or strongly correlated with each other and thus likely measured similar characteristics.

Demographic variables included in the analyses measured the race/ethnicity of program participants (ie, percentages identifying as Hispanic/Latino, White, Black, Asian/Pacific Islander), the percentage that was male, and the percentage aged 75 years or older. Prior research has reported that differences in ADHC services and payer mix are associated with the race/ethnicity of participants.²⁰ The percentages of revenue from Medicaid, Medicare, insurance, other government programs, and self-payment were included, as these may affect the revenues available to hire staff. The health and disability of participants were hypothesized to influence participant care needs and risks of adverse outcomes, and thus were included as control variables.²¹ These were measured as the percentages needing assistance with toileting, the percentage receiving medication-related services (eg, storing medications, administering medications), and the percentages diagnosed with depression, a developmental disability, diabetes, or cardiovascular disease. Other measures of participant care needs, such as needing assistance with bathing and dressing, were moderately or strongly correlated with needing assistance with toileting and thus we treated toileting assistance as a proxy for all of these needs.

The survey included organizational characteristics of each ADHC, including the number of years it had been in operation (categories: <5 years, 5–9 years, 10–19 years, 20+ years), its ownership, and services offered. We hypothesized that ADHCs with a longer duration of operation may have different strategies for staffing due to their experience in the field. Ownership reflects the underlying goals of the organization, including the incentive to maximize profits by reducing

Table 1
Characteristics of ADHCs With and Without ADRD Programs

	All ADHCs: Weighted Mean / % Weighted N = 3802			ADHCs with Skilled Nursing Services: Weighted Mean / % Weighted n = 2612		
	No ADRD Program	Has ADRD Program	P Value	No ADRD Program	Has ADRD Program	P Value
% participants with ADRD	27.29	45.85	<.001	27.52	41.82	<.001
ADHC characteristics						
Average daily attendance	39.40	38.65	.593	45.84	44.06	.36
Duration of operation, y						
<1	2.38	2.63	.021	1.20	2.16	.045
1–4	19.27	16.88		18.23	14.63	
5–9	20.79	17.94		19.47	18.29	
10–19	32.32	37.31		35.32	39.94	
20 or more	25.24	25.23		25.79	24.97	
% revenue from Medicaid	60.48	56.32	.004	74.68	63.94	<.001
% revenue self-pay	12.95	21.07	<.001	8.84	16.47	<.001
ADHC is licensed by state	94.22	94.13	.903	94.65	94.41	.803
Ownership						
Private nonprofit	45.74	48.07	.027	42.16	46.32	.354
Private for-profit	39.82	37.22		42.64	40.45	
Publicly traded company/LLC	9.25	7.73		8.76	7.89	
Government	4.26	6.27		5.19	4.48	
Unknown	0.93	0.72		1.24	0.86	
Affiliated with a chain	39.38	38.44	.584	38.32	40.82	.246
Electronic health records	18.76	24.87	<.001	19.88	28.53	<.001
Provides skilled nursing	59.05	72.41	<.001			
Screens for depression	18.57	36.03	<.001	20.16	41.66	<.001
Provides hospice services	0.48	3.14	<.001	0.37	3.55	<.001
Cardiovascular program	19.05	79.17	<.001	23.38	84.37	<.001
Depression program	14.46	73.44	<.001	14.13	77.99	<.001
Diabetes program	28.87	83.17	<.001	35.62	89.30	<.001
Participant demographics						
% Hispanic/Latino	17.83	15.78	.087	19.17	15.51	.02
% Asian/Pacific Islander	10.21	7.96	.019	9.72	9.01	.558
% Black	19.01	21.35	.029	22.41	22.70	.844
% Male	40.47	38.27	<.001	40.14	38.70	.03
% 75–84 years	25.61	32.09	<.001	24.99	30.92	<.001
% 85+ years	14.54	20.84	<.001	14.08	19.81	<.001
% with developmental disability	24.53	14.22	<.001	22.51	14.82	<.001
% with depression	23.69	28.29	.001	25.72	28.02	.112
% needing help toileting	30.50	39.16	<.001	31.67	40.26	<.001
% getting medication help	24.34	28.02	<.001	29.28	31.15	.14
Census region						
Northeast	20.29	21.41	.080	26.18	25.05	<.001
Midwest	21.53	18.05		17.65	16.15	
South	37.48	38.46		44.22	37.84	
West	20.70	22.08		11.95	20.95	
Urban status						
Metropolitan	80.26	83.72	.021	80.54	86.17	.001
Micropolitan	12.75	10.18		11.87	8.18	
Neither metro- nor micropolitan	6.99	6.10		7.58	5.65	

staffing costs. This was measured as private nonprofit, private for-profit, publicly traded company/LLC, government, or unknown. ADHCs could also indicate if they were part of a multisite chain.

ADHCs reported whether they provided a variety of services, including physical, occupational, or speech therapy services, skilled nursing services, transportation, and hospice. For each of these services, respondents indicated whether the service was provided by the center, available by referral, or not provided. We found that many of these services were correlated with each other and selected whether the ADHC screened for depression and provided hospice services as measures of the scope of services offered.

In preliminary analyses, we found that ADHCs that did not offer skilled nursing services had other characteristics that were notably different from ADHCs that offered ADRD services; their participants had fewer physical care needs and their overall scope of services was more limited. We thus focused some analyses on ADHCs that offered skilled nursing services to focus differences associated with offering ADRD programs within a more homogeneous group of ADHCs.

ADHCs were asked to report if they were licensed by the state, which we hypothesized might be associated with staffing, as the ADHC may have a greater degree of regulatory oversight. ADHCs indicated whether they had an electronic health record system, which may affect the ability of ADHCs to track participant outcomes and result in higher reported rates. Finally, we controlled for the Census region in which the ADHC was located and whether the ADHC was in a metropolitan, micropolitan, or rural location, as an ADHC's staffing patterns may be affected by local labor markets.

Statistical Analyses

We began by calculating means, standard deviations, and frequencies for each variable to identify outliers, missing data, and other data issues. We then compared ADHCs that offered ADRD services with those that did not by calculating means and cross-tabulations. Statistical significance was determined using *t*-tests and χ^2 tests, with significance set at $P < .05$.

Table 2
Comparisons of Staffing and Participant Outcomes in ADHCs With and Without ADRD Programs

	All ADHCs: Weighted Mean / % Weighted N = 3776			ADHCs with Skilled Nursing Services: Weighted Mean / % Weighted n = 2599		
	No ADRD Program	Has ADRD Program	P Value	No ADRD Program	Has ADRD Program	P Value
HPPD						
RN HPPD	0.278	0.328	.004	0.317	0.358	.014
LPN HPPD	0.175	0.201	.080	0.205	0.215	.569
Aide HPPD	0.752	0.861	.008	0.743	0.802	.155
Social Worker HPPD	0.156	0.171	.245	0.149	0.172	.118
Activity Staff HPPD	0.717	0.597	.008	0.481	0.482	.984
Total HPPD	2.096	2.172	.360	1.917	2.043	.128
Contract Staff % of FTEs						
RNs	16.34	12.45	.001	15.93	11.83	.007
LPNs	2.56	2.58	.97	1.63	2.52	.141
Aides	2.21	2.04	.706	2.57	1.60	.108
Social Workers	6.07	6.56	.548	5.66	7.18	.140
Activity Staff	3.56	2.81	.164	3.46	2.42	.104
Participant Outcomes						
% with overnight hospitalization	5.41	6.42	<.001	6.27	6.60	.321
% with ED visit	6.58	7.70	<.001	7.54	7.71	.655
% with fall	6.77	8.90	<.001	7.22	8.77	<.001

To test our primary hypothesis that staffing levels per participant day were greater for ADHCs that offered ADRD services, we estimated multivariate linear regressions with total, licensed nurse (RN+LPN), social worker, and activity staff HPPD as the dependent variables. We estimated 2 regressions for each outcome; the explanatory variable in the first model was whether the center offered an ADRD program and the explanatory variable in the second model was the percentage of participants with ADRD. Control variables included participant demographics, center ownership, whether the center offered depression screening or hospice services, length of time the center had been in operation, presence of an electronic health record system, percentages of participants with developmental disabilities and depression, percentage of participants receiving medication services, and percentage of patients needing toileting assistance. The regressions were estimated only for ADHCs that reported they offered skilled nursing services to test for staffing differences among a more homogeneous group of ADHCs.

Finally, to explore whether participant outcomes (hospitalizations, ED visits, and falls) differed by staffing level and by ADRD services, we calculated means, using *t*-tests to measure statistical significance, and then estimated multivariate Poisson regression models in which the dependent variable was the count of participants with each outcome. The exposure variable was average daily attendance. In these models, the predictor variables of interest were total HPPD, whether the ADHC offered an ADRD program, and the percentage of participants with ADRD diagnoses. We report incidence rate ratios for ease of interpretation.

All analyses were conducted in Stata, using the weights provided with the dataset to account for nonresponse bias and unknown survey eligibility.

Results

There were 2321 ADHCs in our final dataset; some ADHCs did not report all variables and thus the number of observations in each analysis differs slightly.

Descriptive Comparison of ADHC and Participant Characteristics

Table 1 compares the characteristics of ADHCs with and without ADRD programs. The first 3 columns include all ADHCs and reveal some important differences. ADHCs that had ADRD programs were in operation somewhat longer than those that did not ($P = .021$). ADHCs

offering ADRD programs had a smaller average percentage of revenues coming from Medicaid (56.3% vs 60.5%, $P = .004$) and higher percentage from self-payment (21.1% vs 13.0%, $P < .001$) compared with ADHCs that did not have an ADRD program. ADHCs with ADRD programs were more often private nonprofit (48.1% vs 45.7%) or government-owned (6.3% vs 4.3%) and less likely to be a for-profit organization ($P = .027$). ADHCs that offered ADRD programs were more likely to have electronic health records (24.9% vs 18.8%) and to offer other services, including skilled nursing services, depression screening, hospice services, and cardiovascular, depression, and diabetes programs ($P < .001$ for all).

ADHCs that offered ADRD programs also had different participant characteristics than other ADHCs. They had a lower percentage of Asian/Pacific Islander participants (8.0% vs 10.2%, $P = .019$) and a higher percentage of Black participants (21.4% vs 19.0%, $P < .029$). They reported fewer male participants (38.3% vs 40.5%, $P < .001$) and more participants 75 years and older ($P < .001$). They also reported greater percentages of participants who needed assistance with toileting (39.2% vs 30.5%, $P < .001$) and receiving assistance with medications (28.0% vs 24.3%, $P < .001$). Finally, ADHCs with an ADRD program had a greater proportion of participants with depression (28.3% vs 23.7%, $P < .001$).

Among the subset of ADHCs that offered skilled nursing services, the differences between those offering ADRD services versus not were similar to those described previously with a few exceptions. Among this subset, there was not a significant difference in the distribution of ownership. There were no significant differences in the percentages of participants who were Asian/Pacific Islander ($P = .558$) or Black ($P = .844$), but there was a significantly lower percentage of Hispanic/Latino participants in ADHCs with ADRD services versus without (15.5% vs 19.2%). Among this subset, ADHCs that offered ADRD programs continued to offer more services, on average, than ADHCs that did not offer ADRD programs. There was a significantly different geographic distribution of ADHCs with ADRD programs versus without, with ADRD programs more often found in the West and less often in the South ($P < .001$).

Descriptive Comparison of Staffing and Participant Outcomes

Table 2 compares staffing and participant outcomes for ADHCs that offered ADRD programs and those that did not, both for all ADHCs and for the subset that offered skilled nursing services. ADHCs that offered ADRD programs had significantly greater numbers of HPPD compared

Table 3
Multivariate Regressions of Staff HPPD for ADHCs With Skilled Nursing Services

Dependent Variable	Total HPPD		Licensed Nurse HPPD		Social Worker HPPD		Activity Staff HPPD	
	Has ADRD Program	% Participants With ADRD	Has ADRD Program	% Participants With ADRD	Has ADRD Program	% Participants With ADRD	Has ADRD Program	% Participants With ADRD
ADHC has ADRD program	-0.022		0.031		-0.018		-0.032	
% participants with ADRD		0.324***		0.200*		-0.051***		0.079
ADHC characteristics								
Average daily attendance	-0.016***	-0.015***	-0.005***	-0.005***	-0.001***	-0.001***	-0.004***	-0.004***
% revenue from Medicaid	-0.003	-0.002	0.000	0.001	0.000*	0.000	-0.001**	-0.001*
ADHC is licensed by state	0.133	0.127	0.019	0.027	-0.031	-0.032	0.151***	0.152***
ADHC is affiliated with a chain	-0.153*	-0.146*	-0.078***	-0.071***	-0.019*	-0.019*	-0.040	-0.040
Electronic health records system	-0.156*	-0.148*	-0.071***	-0.070***	0.007	0.005	-0.068**	-0.069**
Ownership (ref=Private nonprofit)								
Private for-profit	-0.041	-0.029	0.076*	0.082*	-0.059***	-0.062***	-0.009	-0.010
Public-traded company/LLC	-0.204	-0.208	0.018	0.015	-0.096***	-0.096***	-0.059	-0.068
Government	-0.101	-0.108	0.050	0.039	-0.007	-0.003	-0.110*	-0.119*
Unknown	0.132	0.181	0.225**	0.242**	-0.145***	-0.150***	0.245	0.249
Duration of operation (ref=<5 years)								
5–9 years	-0.403**	-0.398**	-0.189***	-0.192***	-0.058***	-0.059***	-0.059	-0.067
10–19 years	-0.585***	-0.583***	-0.246***	-0.256***	-0.049**	-0.047**	-0.164***	-0.173***
20 or more years	-0.587***	-0.580***	-0.262***	-0.273***	-0.033	-0.033	-0.074	-0.085*
Census region (ref=Northeast)								
Midwest	0.440***	0.423***	0.045	0.044	-0.025	-0.025	0.211***	0.209***
South	0.139	0.133	0.100**	0.096**	-0.053***	-0.052***	-0.001	-0.005
West	0.227*	0.208*	0.023	0.016	0.029*	0.031*	0.032	0.026
Urban status (ref=Metropolitan)								
Micropolitan	0.609***	0.596***	0.352***	0.344***	0.030	0.030	0.063	0.059
Neither Metro- nor micropolitan	0.990***	1.020***	0.222***	0.237***	0.094**	0.088*	0.096	0.102*
ADHC services								
Screens for depression	-0.063	-0.056	-0.020	-0.013	0.055***	0.052***	-0.042	-0.043*
Provides hospice services	0.176	0.215	0.027	0.110	0.048*	0.041*	-0.028	-0.016
Participant demographics								
% Hispanic/Latino	-0.683***	-0.628***	-0.255***	-0.226***	-0.003	-0.011	-0.139**	-0.128**
% Asian/Pacific Islander	-0.055	-0.010	-0.094*	-0.071	0.059	0.054	0.047	0.062
% Black	-0.322**	-0.313**	-0.137**	-0.136**	0.027	0.026	-0.064	-0.062
% Male	-0.561*	-0.575*	-0.055	-0.066	0.088	0.087	-0.197*	-0.179*
% 75 years or older	0.177	0.103	0.052	0.016	0.109**	0.117***	0.084	0.061
% with developmental disability	0.082	0.194	-0.056	0.005	-0.013	-0.024	0.052	0.077
% with depression	0.499**	0.457**	0.134**	0.107*	0.088	0.095*	0.152	0.140
% needing help toileting	0.685***	0.597***	0.220***	0.171**	0.013	0.024	-0.028	-0.054
% getting medication help at ADHC	0.057	0.049	0.178**	0.169**	0.007	0.009	0.015	0.009
Constant term	2.995***	2.849***	0.761***	0.711***	0.176***	0.184***	0.745***	0.697***
R-squared	0.251	0.254	0.208	0.214	0.105	0.107	0.141	0.145
No. observations	1445	1459	1445	1459	1445	1459	1445	1459

Notes: Analysis excludes ADHCs that report that 100% of their population has severe mental illness or developmental diagnoses. Centers with 95% or more of their population aged 55 years and younger are excluded.

* $P \leq .05$; ** $P \leq .01$; *** $P \leq .001$.

with other ADHCs for RNs ($P = .004$) and aides ($P = .008$). They had lower HPPD for activity staff ($P = .008$). ADHCs with ADRD programs also had a smaller percentage of contract RN staffing than ADHCs without ADRD programs ($P = .001$). Among the subset of ADHCs that offered skilled nursing services, the difference in HPPD was statistically significant only for RNs ($P = .014$) and for the percentage of contract RNs ($P = .007$).

ADHC participants had higher rates of overnight hospitalizations, ED visits, and falls in ADHCs with ADRD programs compared with ADHCs without such programs ($P < .001$ for all). However, when the comparison was limited to ADHCs that offered skilled nursing services, the differences were smaller and statistically significant only for falls ($P < .001$).

Multivariate Regression Analysis of Staffing

Table 3 presents the results of regressions with dependent variables of total, licensed nurse, social worker, and activity staff HPPD for ADHCs with skilled nursing services. The explanatory variable of interest in the first model was whether the ADHC had an ADRD program and the variable of interest in the second model was the percentage of

participants with ADRD. For all staffing types, whether the ADHC had an ADRD program was not significantly associated with HPPD. However, the percentage of participants with ADRD was associated with significantly greater total staffing and licensed nurse staffing and with lower social worker staffing. Other significant predictors of having more HPPD were being located in the Midwest or West (vs the Northeast), location in a micropolitan or rural area (vs metropolitan), and having greater percentages of participants with depression and needing help toileting. Significant predictors of having fewer total HPPD were higher average daily attendance, chain affiliation, having an electronic health record, longer time in operation, having more Hispanic/Latino and Black participants, and having more male participants.

ADHC characteristics significantly associated with higher licensed nurse HPPD included being a private for-profit organization, location in the South, micropolitan or rural location, and having greater percentages of participants with depression, needing help toileting, and getting medication help. Lower licensed nurse HPPD staffing was significantly associated with average daily attendance, chain affiliation, electronic health records, longer duration of operation, and greater percentages of Hispanic and Black participants.

Table 4
Incidence Rate Ratios (IRR) From Poisson Regressions of ADHC Participant Outcomes, for ADHCs With Skilled Nursing Services

Dependent Variable	Hospitalizations		ED Visits		Falls	
	IRR	IRR	IRR	IRR	IRR	IRR
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Total HPPD	1.047***		1.062***		1.047*	
Licensed nurse HPPD		1.316***		1.251***		1.239***
Social worker HPPD		1.187		1.337**		1.986***
Activity staff HPPD		0.814***		0.909*		0.776***
% participants with ADRD	1.017	1.006	1.117	1.101	1.720***	1.618***
ADHC characteristics						
% revenue from Medicaid	0.999	0.999	0.999*	0.998**	1.000	0.999
ADHC is licensed by state	0.888	0.900	0.731***	0.740***	0.910	0.947
ADHC is affiliated with a chain	0.987	0.995	0.949	0.956	0.944	0.959
Electronic health records system	0.990	0.978	0.907	0.896	1.382***	1.353***
Ownership (ref=Private nonprofit)						
Private for-profit	0.687***	0.684***	0.699***	0.701***	0.685***	0.704***
Public-traded company/LLC	0.664***	0.661***	0.931	0.934	0.567***	0.582***
Government	0.988	0.956	0.888	0.872	0.865	0.846*
Unknown	0.280***	0.286***	0.468***	0.480**	0.244***	0.269***
Duration of operation (ref=<5 y)						
5–9 y	0.885	0.889	0.910	0.914	0.885	0.895
10–19 y	0.906	0.912	0.911	0.921	0.872	0.888
20 or more y	0.825**	0.833**	0.841*	0.848*	0.771*	0.790*
Census region (ref=Northeast)						
Midwest	0.886	0.908	0.918	0.940	1.156	1.198*
South	0.614***	0.611***	0.681***	0.684***	0.862*	0.876*
West	0.816**	0.802**	0.958	0.945	1.262**	1.192*
Urban status (ref=Metropolitan)						
Micro-politan	1.208	1.167	1.186*	1.154	1.094	1.036
Neither Metro- nor micropolitan	1.146	1.119	1.188	1.168	1.100	1.021
ADHC services						
Screens for depression	1.119*	1.098	1.150***	1.128**	1.273***	1.214***
Provides hospice services	0.989	0.974	1.131	1.106	1.339**	1.288**
Participant demographics						
% Hispanic/Latino	0.833*	0.841	1.031	1.038	0.575***	0.568***
% Asian/Pacific Islander	0.996	1.030	0.853	0.868	1.216	1.223
% Black	1.271*	1.266*	1.202	1.193	0.820	0.780*
% Male	1.050	1.056	0.854	0.851	0.714	0.703
% 75 years or older	0.893	0.889	0.690**	0.684**	1.072	1.064
% with developmental disability	0.468***	0.471***	0.666*	0.670*	1.038	1.043
% with depression	1.625***	1.650***	1.821***	1.816***	1.844***	1.798***
% needing help toileting	0.989	0.997	1.109	1.123	1.141	1.157
% getting medication help	1.525***	1.519***	1.475***	1.473***	1.452***	1.457***
Constant term	0.152***	0.156***	0.206***	0.209***	0.103***	0.105***
F-statistic	18.01	20.40	15.26	16.80	43.26	47.10
No. observations	1445	1445	1442	1442	1444	1444

Notes: Exposure is average daily attendance. Analysis excludes ADHCs that report that 100% of their population has severe mental illness or developmental diagnoses. Centers with 95% or more of their population aged 55 years and younger are excluded.

* $P < .05$; ** $P < .01$; *** $P < .001$.

Social worker HPPD was significantly larger in ADHCs in rural locations, that screened for depression, and had a greater percentage of participants 75 years or older. It was lower in ADHCs with greater average daily attendance, chain affiliation, for-profit ownership (private or publicly traded), 5 to 19 years of operation, and location in the South.

Activity staff HPPD was significantly larger in ADHCs that were licensed by their state and located in the Midwest, and lower for ADHCs with higher average daily attendance, a greater percentage of revenue from Medicaid, electronic health records, government ownership, 10 to 19 years duration of operation, a greater percentage of Hispanic participants, and a greater percentage of male participants.

Multivariate Regression Analysis of Outcomes

Table 4 presents the results of multivariate linear regressions in which the predictors of interest were staffing and the percentage of participants with ADRD. The staffing variables of interest were total HPPD in Model 1 and each of licensed nurse, social worker, and activity staff HPPD in Model 2. Greater HPPD were significantly

associated with higher rates of hospitalizations, ED visits, and falls. In Model 2, greater licensed nurse HPPD also was significantly associated with higher rates of hospitalizations, ED visits, and falls, and higher social worker HPPD was significantly associated with higher rates of ED visits and falls. Conversely, higher activity staff HPPD was significantly associated with lower rates of these 3 outcomes. The percentage of participants with ADRD was not associated with rates of hospital and ED visits but was positively associated with rates of falls.

Other significant predictors of adverse participant outcomes included having an electronic health record (falls only, which may reflect better measurement), screening for depression, providing hospice services (falls only), having a larger percentage of Black participants (hospitalizations only), and having greater percentages of participants with depression and receiving medication assistance. Significant predictors of better participant outcomes included being licensed by the state (ED visits only), being a private for-profit organization (both private and publicly traded), being in operation 20 or more years, location in the South, having a larger percentage of Hispanic participants (falls only), having a greater percentage of participants 75 years or older (ED visits only), and having more participants with development disability (hospitalizations and ED visits only).

Discussion

We found notable differences in the characteristics of ADHCs that offered ADRD programs compared with those that did not and, accordingly, these ADHCs had participants with different demographics and health profiles. ADHCs that offered ADRD programs were more likely to offer other programs for disease-focused care (eg, cardiovascular program) and had participants with greater physical needs (eg, needing help with toileting). ADHCs with ADRD programs did not have significant differences in staffing after controlling for facility and participant characteristics. ADHCs with a greater percentage of participants with ADRD had higher staffing of licensed nurses but lower staffing of social workers.

Many ADHCs have large proportions of racial/ethnic minority participants, and ADHCs' participants are more diverse than those of other home- and community-based supports.^{22,23} We found only small differences in the racial/ethnic composition of ADHCs that offered ADRD programs compared with those that did not; but, we found that ADHCs with larger percentages of Black and Hispanic/Latino participants had fewer total HPPD and licensed nurse HPPD, even when controlling for other ADHC and participant characteristics. We did not find consistent patterns of association between participant racial/ethnic demographics and health outcomes.

Although other studies have reported that services for ADRD are more often offered in nonprofit ADHCs,²³ we did not find large differences in the distribution of types of ownership between ADHCs with and without ADRD services. We found that ADHCs that were for-profit organizations had lower social worker HPPD and chain-affiliated ADHCs had lower HPPD in total and for licensed nurses and social workers. For-profit ADHCs also had higher rates of hospitalizations, ED visits, and falls.

We found significant, positive associations between higher staffing levels and adverse participant outcomes, even after controlling for other organizational and participant characteristics. However, higher activity staff HPPD had a negative association with hospitalizations, falls, and ED visits. These results suggest that there are unmeasured differences in participant risk of adverse outcomes, which also are associated with higher staffing in total and for licensed nurses. Our results suggest that greater activity staff HPPD may be protective against adverse outcomes, but the presence of more activity staff might also indicate that the ADHC serves participants with more social needs and fewer physical needs. In this cross-sectional dataset, it was not possible to identify causal relationships. This is an important avenue for future research.

Strengths and Limitations

This study has several strengths. First, it is the first analysis of whether there are differences in staffing and participant outcomes among ADHCs that have ADRD programs compared with those that do not. The NPALS data provided rich information about ADHC characteristics, as well as the traits of their participants, and thus provide the opportunity for this type of analysis.

There are several limitations with this study, however. First, it was a cross-sectional analysis and thus it is not possible to identify causal relationships in the associations reported here. The second limitation is that there are many different services that ADHCs provide,^{14–16} and the variables in the NPALS dataset may not fully capture these services or the underlying health status of participants that use varying services. Thus, our results may be confounded by these unobserved factors. Third, the participant outcomes included in the dataset were reported by the survey respondent (generally the ADHC director) and may be measured with error. Finally, we had only organization-level data on participant outcomes, which may not reflect the range of

individual outcomes and may be reported with error by the organization.

Conclusion and Implications

The need for skilled and culturally appropriate community services for people living with ADRD and their care partners is projected to grow substantially in the future.¹⁰ ADHCs serve a large number of people, and their importance became more visible during the COVID-19 pandemic when many ADHCs were closed to reduce the spread of disease.²⁴ Families have struggled to support those living with ADRD and have reported high levels of stress and anguish associated with the loss of access to ADHCs.²⁴

ADHCs that offer ADRD programs are more likely to offer an array of other programs to meet participants' physical and behavioral health needs. Their staffing levels are higher for licensed nurses and aides, but lower for activity staff, and these differences vanish when other ADHC characteristics are controlled. Assessment of the relationship between ADHC staffing and participant outcomes with center-level data is complicated by limited measurement of participant risk; future research should strive to develop datasets that include both individual-level participant data and organization characteristics to facilitate use of multilevel models. This would support more detailed analyses of the relationships among patient characteristics, services provided, and optimal staffing configurations.

ADRD is among the major public health challenges of our century. By 2050, the number of people living with dementia in the United States is expected to rise to 16 million, with unpaid caregivers being expected to provide most of the care. Staff at ADHCs will continue play a vital role in providing support for persons with ADRD and their caregivers. We found that even ADHCs that did not have organized ADRD programs reported that 27% of their participants had an ADRD diagnosis. Thus, staff within ADHCs need training in the care of people living with ADRD, regardless of whether they work in an ADHC with a specific ADRD program.²⁵

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