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Racial and ethnic disparities in social engagement among US nursing home residents

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Abstract

Background—The numbers and proportions of racial and ethnic minorities have increased dramatically in U.S. nursing homes in recent years. Concerns exist about whether nursing homes can serve appropriately the clinical and psychosocial needs of patients with increasingly diverse ethnic and cultural backgrounds. This study determined racial and ethnic disparities in social engagement among nursing home long-term residents.

Methods—We analyzed the 2008 national Minimum Data Set supplemented with the Online Survey, Certification, and Reporting File and the Area Resource File. We estimated multivariable logistic regressions to determine disparities and how disparities were explained by individual, facility, and geographic factors. Stratified analyses further determined persistent disparities within patient and facility subgroups.

Results—Compared to white residents (n=690,228), black (n=123,116), Hispanic (n=37,099) and other (n=17,568) residents showed lower social engagement, with overall scores (mean±SD) being 2.5±1.7, 2.2±1.6, 2.0±1.6, and 2.1±1.6, respectively. Disparities were partially explained by variations in individual, facility and geographic covariates, but persisted after multivariable adjustments. Stratified analyses confirmed that disparities were similar in magnitude across patient and facility subgroups.

Conclusions—Although nursing home residents showed overall low social engagement levels, racial/ethnic minority residents were even less socially engaged than white residents. Efforts to address disparities in psychosocial well-being and quality of life of nursing home residents are warranted.

Keywords

nursing home; race and ethnicity; social engagement; disparities

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INTRODUCTION

Nursing home care is an important long-term care option in the United States. In 2010, nursing homes served 1.4 million Americans who were too frail to be supported in community settings.[1] Approximately half of the nursing home residents are aged 85 years or over, and many are physically and/or cognitively disabled with diagnoses of multiple chronic conditions.[2]

For frail elders, placement in nursing home means both a disruption of their prior social and family connections, and an imposition of institutional rules and care routines for everyday life in the institution.[3] Given the high prevalence of disabilities among residents and the limited opportunities for social interaction provided by most nursing homes, nursing home residents tend to be seriously impaired in their abilities to establish and maintain social relationships.[3–6] Although active participation in social life is a critical component of the well-being of nursing home residents, many of them are socially disengaged exhibiting inadequate abilities to initiate actions and to respond to social overtures from peer residents and care providers. Previous studies have shown that impaired social engagement for elderly persons may predict higher mortality rate,[7–9] deteriorated cognition,[10] and reduced recovery after disease onset,[9] among other health outcomes.[9,11,12]

Racial/ethnic minorities comprised about 16 percent of the nursing home population in 2004.[2] Between 1999 and 2008, the number of elderly black residents in nursing homes increased by 10 percent and the number of Hispanic and Asian residents both increased by over 50 percent.[13] In contrast, the number of non-Hispanic white residents in nursing homes declined by 10 percent during the same period.[13] These demographic changes in nursing homes may be driven, at least in part, by the rapid growth of older minority populations in the nation.[13,14] Meanwhile, the historical access barriers to nursing home care may have improved substantially for minority populations, given the overall reduced demand for institutional long-term care and the increased availability of home- and community-based long-term care alternatives.[15,16] Nevertheless, these shifting long-term care patterns raise concerns about whether nursing homes are able to serve appropriately the clinical and psychosocial needs of patients with increasingly diverse ethnic and cultural backgrounds.

Current studies of disparities in nursing home care are limited in one aspect that they have largely examined racial disparities for black residents but not disparities among other racial/ethnic groups.[14,17] Another potential shortcoming of the literature is that up to now, it has focused exclusively on clinical care of nursing home residents, with reported disparities spanning a wide array of clinical areas such as management of cancer pain,[18] influenza and pneumococcus vaccinations,[19,20] development of pressure ulcers,[21] and hospitalization rate.[22] No prior research has investigated potential racial/ethnic disparities in the psychosocial well-being among US nursing home residents. Although a wealth of research has shown that among community-living elders, racial minorities tend to have reduced access to social groups and reduced participation in non-church related activities compared to whites,[23–25] it is unknown whether these differences in social engagement are directly generalizable to the institutionalized population.

The present study is designed to determine both racial and ethnic disparities in psychosocial well-being (as measured by a social engagement index) among the nation's nursing home residents. We analyzed both overall disparities and disparities in subgroups of residents defined by key resident and facility characteristics, in light of the varied risks for impaired social engagement associated with individual demographic and functional status,[3,6,26] and the highlighted issue of racial/ethnic segregations in nursing home care.[14,21,27]

METHODS

Data sources and resident population

We used the national nursing home Minimum Data Set (MDS) of 2008 as the primary source of data to identify long-term care residents. The MDS is a standardized and comprehensive tool that all nursing homes certified by the Centers for Medicare and Medicaid Services (CMS) are required to use for resident assessment and development of care plans. Over 90% of nursing facilities in the US are certified by the CMS.[2] The MDS full assessments contain over 350 items for patient demographics, socio-economic status, physical, cognitive, and mental health status, disease diagnoses, as well as routine treatments received. For long-term residents, full assessments are performed by nursing staff at admission, annually thereafter, and when residents incur a significant change of health status; abbreviated assessments are also performed quarterly following admission. MDS assessments are considered to be accurate and valid,[28,29] and have been widely used for nursing home quality of care assessment.[30]

We first identified all long-term care residents using annual assessment records; we initially identified 875,593 long-term residents. According to the mandate by the Executive Office of Management and Budget (OMB) in 1996, MDS (version 2.0) recorded race and ethnicity of residents as White, not of Hispanic origin; Black not of Hispanic origin; Hispanic; Asian/ Pacific Islander; or American Indian/Alaskan native. For each resident, only one category that most closely corresponds to the resident's self-identified race/ethnicity was recorded.

We sequentially excluded a small number of residents with missing record on any of the social engagement items (n=3,655) or on race/ethnicity (n=3,927). To ensure adequate number of residents in each racial/ethnic group, we re-categorized race/ethnicity as non-Hispanic white, black, Hispanic, and other race/ethnicity, combining Asian/Pacific Islander and American Indian/Alaskan native into the "other" group.

We linked the patient file to two external databases. First, the 2008 Online Survey, Certification, and Reporting (OSCAR) file, which is a facility-level database maintained by CMS for annual certification and other purposes. And second, the 2008 Area Resource File (ARF) obtained from the Health Resources and Services Administration in order to characterize the county where each nursing home is located.[27] The final analytic **database** included **868,011** residents in 15,204 nursing facilities.

Variables

The dependent variables were the individual and overall scores of the social engagement measure developed by Mor and colleagues.[3] The six-item social engagement scale

emphasizes positive behaviors of residents by measuring residents' ability and willingness to take advantage of opportunities for social interaction in the facility, as well as to initiate such interaction. Specifically, dichotomous MDS items were used to assess whether or not residents, during the last 7 days, were (1) at ease interacting with others, (2) at ease doing planned or structured activities, (3) at ease doing self-initiated activities, (4) able to establish own goals, (5) able to pursue involvement in life of facility, and (6) able to accept invitations into most group activities. The inter-rater reliabilities of these items ranged from 0.51 (at ease interacting with others) to 0.64 (able to establish own goals) between trained research nurse and facility nurse.[31] In addition, Mor et al have demonstrated that these items measure a single construct of social engagement that is distinct from measures of mood, conflicted relationships and behavior problems, and are well correlated with actual participation in the life of the facility.[3] Finally, all items can be robustly assessed across long-term resident groups characterized by varied levels of physical and cognitive functioning.[3]

We defined separate binary variables for individual items (1 = yes, and 0 = no), and another ordinal variable for overall social engagement by summing scores of all items; the overall score ranged from 0 (lowest engagement with all items scored zero) to 6 (highest engagement with all items scored one). The independent variables of our analyses were three binary variables for black (1=black, and 0=otherwise), Hispanic (1=Hispanic, and 0=otherwise), and other minority (1=other, and 0=otherwise) residents, respectively.

We also defined a set of patient, nursing home, and county covariates for multivariable analyses. First, we obtained from MDS a range of patient demographic, clinical, and functional characteristics that were potentially correlated with individual social engagement.[3–8] These a priori determined covariates included age (in years); male gender (yes/no); marital status (married or not married [i.e. never married, widowed, separated, or divorced]); difficulties in the activities of daily living; cognitive performance scale (CPS) score; hearing ability (categorized as adequate, with minimal difficulty, hears in special situations only, highly impaired); vision ability (adequate, impaired, moderately impaired, highly impaired, severely impaired); whether the resident had adequate communication abilities (yes if the primary mode of expression was speech and the resident was able to make herself understood by others, and no otherwise);[4] and the presence or absence of a set of diagnoses including diabetes, other endocrine disease, cardiovascular disease, musculoskeletal disease, dementia (Alzheimer disease or other types of dementia), neurologic disease other than dementia, psychiatric disorders (anxiety disorder, depression, schizophrenia and bipolar disorder), pulmonary disease, sensory disease, and other diseases (one dummy for each category of diagnoses).

Activities of daily living included bed mobility, transferring, dressing, eating, toilet use, personal hygiene, and bathing. We coded each ADL component into 5 categories, from 0 (independence) to 4 (total dependence), resulting in a total range of the aggregate ADL score of 0 to 28. The CPS score was defined using a validated MDS algorithm developed by Morris et al and had a range of 0 (cognitively intact) to 6 (very severely impaired in cognition).[32]

Nursing home covariates obtained from the OSCAR file included a continuous variable for total number of beds, profit status (categorized as for-profit, nonprofit, or government), chain affiliation (yes/no), and a measure of facility financial capability based on the percentage of Medicaid-covered residents. Furthermore, we used the Area Resource File to compute several county covariates that included the percentage of elderly population (≥65 years), a measure of market competition for long-term care residents using a county-level Herfindahl–Hirschmann Index (HHI),[33] and urban vs rural location. Lastly, we defined a set of dummy variables to identify the states where nursing homes operated.

Analysis

We performed bivariate analyses to examine racial and ethnic differences in individual and overall social engagement scores, and in resident, facility, and county characteristics. We determined differences in means with analyses of variance and differences in proportions with χ^2 tests.

We estimated separate sets of multivariable logistic regression models to determine the independent associations of race and ethnicity with the likelihoods of being socially engaged as measured by individual and overall scores. Because the overall engagement score was defined on an ordinal scale, for ease of analyses we dichotomized the score as ≥3 (high social engagement of the resident) versus otherwise (low social engagement of the resident). For each individual and the (redefined) overall score, we first estimated a base model for unadjusted racial and ethnic effects by including only race and ethnicity in the model (model 1), and then sequentially added to the base model patient age, gender and marital status (model 2); other resident characteristics (model 3); facility characteristics (model 4), and county covariates and state dummies (model 5). These sequential estimates aimed to determine the extent to which overall disparities in social engagement were mediated or explained by these covariates. In all models we used the Huber-White robust standard error estimates,[34] estimates that can be easily obtained in STATA (STATA Corporation, College Station, TX), to adjust for the potential clustering of residents in the same facility. The robust standard errors corrected for correlations among each nursing home's residents but assumed independence across nursing homes. Given the large number of residents in our analyses, we did not estimate GEE (generalized estimating equation) or hierarchical models which are more computationally intensive to implement.[35]

We further explored the possibility that disparities in social engagement varied within subgroups of residents. We estimated additional logistic regression models of the overall social engagement score (≥3 or not) that were stratified by (1) key patient characteristics including age categories (<65; 65–74; 75–84; and ≥85), gender, marital status, hearing (adequate or with minimal difficulty; more than minimal difficulty), vision ability (adequate, impaired or moderately impaired; highly or severely impaired), and communication abilities (adequate or not); and (2) key facility attributes including facility size (number of beds≥153 [mean] or otherwise), profit status (for-profit or otherwise), chain affiliation status, percentage of Medicaid residents (≥70.6% [mean] or otherwise), and rural or urban location. Stratified models adjusted for all patient, facility, and county covariates and state dummies, except for the variable used for stratification.

Lastly, we performed two-way stratified analyses by first categorizing residents into one of four mutually exclusive groups defined by both physical and cognitive functions: high versus low physical function (i.e. ADL score<17 versus otherwise) and high versus low cognitive function (i.e. CPS<3 versus otherwise). For residents in each subgroup (e.g. the group of both high physical and high cognitive functions), we estimated a logistic model of the overall social engagement status adjusting for patient, facility, and county covariates and state dummies.

In sensitivity analyses, we redefined the overall social engagement score using alternative cutoffs (i.e. ≥4 versus not or ≥2 versus not) and re-estimated all overall and stratified models; we confirmed that the estimated disparities in sensitivity analyses (results available from the author on request) were closely similar to the base-case estimates reported in Tables 2–4.

RESULTS

Our study included 690,228 non-Hispanic white long-term residents, 123,116 black residents, 37,099 Hispanic residents, and 17,568 residents of other race/ethnicity in 2008 (Table 1). Compared to white residents, minority residents tended to be younger (82 years old for Whites versus 75–77 years old for minorities) and male (26% for Whites versus 36–42% for minorities). Physical and cognitive functions measured by the ADL and the CPS score, respectively, did not seem to vary considerably over resident groups. Racial/ethnic minority residents were more likely than Whites to have adequate hearing ability (68% for Whites versus 73–81% for minorities), but less likely to have adequate vision ability (61% for Whites versus 54% for minorities) and adequate communication abilities (51% for Whites versus 37–46% for minorities). Disease diagnoses also varied over patient groups, with minority residents having, for example, higher rates of diabetes but lower rates of musculoskeletal disease. Minority residents tended to live in larger, for-profit and urban facilities with higher percentages of Medicaid residents. Compared to white residents, minority residents tended to have lower social engagement measured by individual and overall scores (Table 1). For example, 81% whites versus 76% blacks, 70% Hispanics, and 72% other minority residents were at ease interacting with others in nursing homes ($p<0.001$); and the average overall social engagement scores were 2.5, 2.2, 2.0, and 2.1, respectively.

Multivariable analyses (Table 2) largely confirmed these crude racial and ethnic disparities except for one item (acceptance of invitations), and suggested that disparities could in part be explained by differences in patient, facility and regional characteristics. For example, in the analyses of overall social engagement (score≥3 or not), the odds ratios (OR) for blacks increased from 0.70 when no covariates were adjusted for to 0.87 in the model with full covariate adjustment; similarly, the OR increased from 0.58 to 0.78 for Hispanics and from 0.66 to 0.81 for other minorities in parallel analyses ($p<0.001$ in all cases). Persistent disparities seemed to be strongest in magnitude for Hispanics.

Results of stratified analyses in Table 3 suggested that for all racial/ethnic groups, younger age, not being married, and having better hearing, vision and communication abilities all

tended to be associated with high social engagement (score≥3). Social engagement may also vary over key facility characteristics. Despite these variations, racial/ethnic minority residents had lower social engagement than did White residents in almost all stratified multivariable analyses, with significant ORs ranging from 0.78 to 0.92 for Blacks, from 0.73 to 0.83 for Hispanics, and from 0.66 to 0.87 for other minority residents.

Results in Table 4 similarly suggested that both higher physical function and higher cognitive function were associated with higher social engagement for all residents. Nevertheless, persistent and significant racial and ethnic disparities were found within each functional group.

DISCUSSION

This national study of long-term care nursing home residents revealed remarkable racial and ethnic disparities in social engagement. Compared to white residents, minority residents were between 30% and 40% less likely to show overall high social engagement (score≥3). Variations in patient demographic, functional, and diagnostic characteristics, facility attributes, and regional factors explained a sizable portion of such disparities, but disparities persisted after multivariable adjustments for these factors. Persistent racial and ethnic disparities were also found within subgroups of residents defined according to key resident or facility characteristics.

Consistent with the findings of previous research,[3–6] our analyses showed overall low levels of social engagement for all nursing home residents, and that impaired social engagement was associated with functional and cognitive disabilities, losses in sensory and communication skills, and diagnoses of chronic conditions such as dementia or depression. Despite these well-documented functional and diagnostic correlates of social engagement, markedly little is known regarding racial and ethnic disparities among institutionalized populations. Our study for the first time reported lower social engagement among minority nursing home residents despite the parallel findings that minority residents tended to be younger and have similar functional and cognitive status compared to whites (Table 1). These findings are timely given the dramatic increase in racial/ethnic minority nursing home residents in recent years,[13,14,16] and contribute to existing literature documenting substantial disparities in clinical (rather than psychosocial) care quality in nursing homes.[17–22]

Although no nursing home studies exist to offer explanations for the racial/ethnic disparities in social engagement, our data revealed that compared to white residents, minority residents tended to have highly or severely impaired vision abilities, and have less adequate communication abilities. In addition, minority residents were more likely to be served in large urban nursing facilities with less financial resources. These group differences partially explained the observed disparities in social engagement as shown in our sequential analyses. Furthermore, it is plausible that other factors at both the individual resident level (e.g. racial discrimination or personal preferences) and at the nursing facility and staff level (e.g. practice patterns) underpin these findings.

First, at the individual level, studies of community-living elders suggest several plausible reasons for such disparities among non-institutionalized populations. For example, compared to their white counterparts, community-living black and Hispanic elders tended to have smaller and family-based social networks due to historical racism and discrimination, which may lead to their more restricted access to social groups and reduced involvement in the larger society;[23,24,36,37] other social-economic obstacles beyond discrimination may also discourage minority persons' participation in social groups and activities. Furthermore, unmeasured cultural differences may exist among racial/ethnic groups in the preferred level of social participation which underpin differences in actual social involvement.[23,24] All these factors may continue to manifest themselves in nursing homes and contribute to the disparities we found in this study.

Regarding facility-level factors underlying the racial/ethnic disparities in social engagement, we recognize that social relationships and activities in nursing homes are likely differently developed and maintained than those in the community, due to differences in social networks and other social contexts across the two settings. It is also conceivable that institutional resources, staff, policies, and practice routines in nursing homes heavily influence residents' ability and desire to engage in meaningful social activities. For example, although in general larger nursing facilities may have more opportunities to offer organized social and recreational programs, smaller facilities may be better at fostering close resident-staff relationships and friendships. In addition, nursing staff are important in shaping the daily lives of residents both in terms of clinical and personal caregiving and of engaging residents in the life of the institution. Thus, facilities with varying financial and non-financial resources, staffing levels or practice patterns likely vary in their ability to promote residents' psychosocial well-being.

Substantial evidence has suggested that despite recent growth in the numbers of racial and ethnic minority nursing home residents, minority residents tend to be disproportionately served in "lower-tier" urban facilities characterized by poor resources (such as heavy reliance on Medicaid reimbursement), lower staffing level and higher staff turnover rate, and inferior quality of care.[14–16,27] These inferior facility characteristics seem to be driving part of the disparities in social engagement as suggested by our sequential analyses (Table 2). Nevertheless, adjusting for these facility (and other) covariates did not completely remove disparities, and further stratified analyses by facility characteristics found similarly reduced social engagement among racial/ethnic minorities across facility groups. Other unmeasured facility and practice factors may underpin the persistent disparities.

The functioning of U.S. nursing homes has been traditionally structured around the management of chronic conditions and disabilities largely ignoring the psychosocial needs of residents. However, recent efforts, including the "culture change" movement, have been made to provide a more home-like environment for residents and to foster person-centered care in nursing homes.[38,39] New attentions of state policies have also focused on improving the quality of life of residents. For example, state pay-for-performance programs have been designed to use financial incentives to improve nursing home performance, two of the targeted areas of performance being "culture change" implementation and consumer satisfaction with care.[40] In addition, several states have publicly reported scores of resident

and family member satisfaction with care in the hope of promoting person-centered nursing home care.[41]

The findings in this study suggest that reducing racial and ethnic disparities in quality of life should be another important policy goal beyond efforts for global improvement for all nursing home residents. Especially, facilities housing mostly minority residents may lack the capacity and expertise to better engage their residents socially, and targeted interventions to these facilities may improve resident quality of life in a more cost-effective way. In addition, as diversity of the nursing home population grows, programs designed to improve the attitudes, knowledge, and skills of nursing home staff for the provision of culturally competent care are essential to address disparities in residents' social engagement. Before such programs can be designed, more research is necessary to better understand the underlying reasons for the differential social involvement and activities among resident groups, and to inform evidence-based strategies for designing and implementing staff interventions.

The limitations of this study should be noted. First, the data are cross-sectional and do not provide a temporal for the observed associations between race/ethnicity and social engagement. Second, the accuracy of the MDS data may vary across nursing homes and states because, although disease diagnoses in MDS are usually confirmed with the residents' medical records, other components such as social engagement items, physical function, and cognitive status are based on facility nurse assessments. However, the overall accuracy and validity of MDS assessments has been documented,[28,29] especially for social engagement items.[31] Furthermore, our multivariable analyses including stratified analyses confirmed persistent racial/ethnic disparities in social engagement. Finally, although we ran detailed multivariable and stratified analyses to disentangle independent associations, it is possible that reported associations are partially mediated by unmeasured individual or other variables.

In summary, our analyses of the nation's long-term nursing home residents revealed lower social engagement levels among racial/ethnic minority residents compared to white residents. Such disparities were in part explained by individual, facility and geographic characteristics but persisted in multivariable analyses. Given increased diversity of the nursing home population and recent effects to transform nursing homes to a more home-like and person-centered setting, our findings suggest that targeted efforts to address disparities in resident quality of life are warranted.

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Table 1

Characteristics of long-term nursing home patients in 2008, by race and ethnicity

Characteristic	White (n=690,228) % or mean±SD	Black (n=123,116) % or mean±SD	Hispanic (n=37,099) % or mean±SD	Other (n=17,568) % or mean±SD
Social engagement item				
Interaction with others	80.7	75.8	70.4	71.7
Planned activities	55.4	46.8	42.2	45.7
Self-initiated activities	51.2	41.6	37.0	40.5
Establishment of own goals	20.0	14.8	11.7	12.7
Involvement in life of facility	19.8	15.9	14.9	16.2
Accepting invitations	26.9	25.3	25.7	27.8
Overall score (0 – 6)	2.5±1.7	2.2±1.6	2.0±1.6	2.1±1.6
Patient characteristic				
Age in Years	81.5±12.9	74.6±15.6	75.1±16.1	77.4±15.5
Male gender	26.2	38.5	42.0	35.9
Married	17.1	12.5	18.9	23.8
Activities of daily living score (0–28)	17.0±7.8	17.5±8.6	17.3±8.6	17.3±8.6
Cognitive performance score (0–6)	2.9±1.7	3.0±1.8	3.2±1.8	3.1±1.8
Hearing ability				
Adequate	67.7	81.2	76.6	72.9
Hears with minimal difficulty	21.6	13.3	16.8	17.2
Hears in special situations only	9.0	4.2	4.9	8.0
Highly impaired	1.6	1.3	1.7	2.0
Vision ability				
Adequate	61.2	52.7	53.9	54.1
Impaired	20.3	24.0	23.8	24.2
Moderately impaired	7.5	8.2	7.8	8.1
Highly impaired	9.1	10.7	11.0	10.8
Severely impaired	2.0	4.5	3.4	2.8
Adequate communication abilities	51.1	46.4	39.5	36.6
Disease diagnosis, %				
Diabetes	28.3	43.2	44.1	40.9
Other endocrine disease	23.5	10.1	16.7	13.4
Cardiovascular disease	80.4	83.5	75.0	78.1
Musculoskeletal disease	51.9	37.8	36.7	41.6
Dementia	57.2	52.4	53.1	50.3
Neurological disease except dementia	39.8	51.0	45.9	49.4
Psychiatric disorders	66.9	52.6	59.2	45.9
Pulmonary disease	20.3	16.0	16.2	14.4
Sensory disease	23.0	24.8	22.1	22.5
Other disease	55.0	49.5	44.3	45.8

Characteristic	White (n=690,228) % or mean±SD	Black (n=123,116) % or mean±SD	Hispanic (n=37,099) % or mean±SD	Other (n=17,568) % or mean±SD
Facility characteristic				
Number of beds	146.2±100.2	179.4±139.8	185.1±170.7	186.8±186.2
Profit status				
For-profit	70.5	79.9	80.7	81.8
Non-for-profit	23.2	15.1	14.7	10.6
Government	6.3	5.0	4.6	7.6
Chain-affiliated	52.1	54.0	49.1	47.3
Percent of Medicaid residents, %	63.8±17.5	75.2±14.0	73.1±15.6	72.4±16.9
County characteristic				
Competition (1-HHI)	0.8±0.2	0.8±0.2	0.9±0.2	0.9±0.2
Percent of population≥65 yrs	13.9±3.5	12.6±2.8	11.9±2.8	12.3±2.7
Rural area	27.9	15.8	9.2	14.5

Note: P<0.001 for all comparisons among racial/ethnic groups based on χ^2 test or analysis of variance.

HHI= Herfindahl-Hirschman Index.

Table 2

Racial and ethnic disparities in social engagement among US long-term nursing home residents, 2008

Effect of race/ethnicity (compared to white)	Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	P	OR	P	OR	P	OR	P	OR	P
Interaction with others										
Black	0.75	<0.001	0.78	<0.001	0.86	<0.001	0.96	0.044	0.97	0.176
Hispanic	0.57	<0.001	0.59	<0.001	0.69	<0.001	0.75	<0.001	0.85	<0.001
Other	0.60	<0.001	0.62	<0.001	0.68	<0.001	0.75	<0.001	0.77	<0.001
Planned activities										
Black	0.71	<0.001	0.71	<0.001	0.76	<0.001	0.84	<0.001	0.91	<0.001
Hispanic	0.59	<0.001	0.60	<0.001	0.65	<0.001	0.71	<0.001	0.79	<0.001
Other	0.68	<0.001	0.69	<0.001	0.72	<0.001	0.77	<0.001	0.80	<0.001
Self-initiated activities										
Black	0.68	<0.001	0.60	<0.001	0.66	<0.001	0.71	<0.001	0.79	<0.001
Hispanic	0.56	<0.001	0.51	<0.001	0.56	<0.001	0.62	<0.001	0.73	<0.001
Other	0.65	<0.001	0.62	<0.001	0.66	<0.001	0.72	<0.001	0.80	<0.001
Goal establishment										
Black	0.70	<0.001	0.61	<0.001	0.68	<0.001	0.74	<0.001	0.81	<0.001
Hispanic	0.53	<0.001	0.48	<0.001	0.54	<0.001	0.61	<0.001	0.73	<0.001
Other	0.58	<0.001	0.55	<0.001	0.58	<0.001	0.67	<0.001	0.79	<0.001
Facility involvement										
Black	0.76	<0.001	0.70	<0.001	0.77	<0.001	0.83	<0.001	0.89	<0.001
Hispanic	0.71	<0.001	0.67	<0.001	0.76	<0.001	0.81	<0.001	0.90	0.005
Other	0.78	<0.001	0.76	<0.001	0.81	<0.001	0.83	0.005	0.91	0.091
Acceptance of invitations										
Black	0.92	<0.001	0.91	<0.001	0.95	0.007	0.99	0.647	1.00	0.843
Hispanic	0.94	0.069	0.96	0.175	1.00	0.900	1.03	0.394	0.98	0.655
Other	1.05	0.396	1.07	0.217	1.09	0.136	1.04	0.446	1.01	0.835
Overall high social engagement (score≥3)										
Black	0.70	<0.001	0.65	<0.001	0.72	<0.001	0.79	<0.001	0.87	<0.001
Hispanic	0.58	<0.001	0.56	<0.001	0.62	<0.001	0.69	<0.001	0.78	<0.001

Effect of race/ethnicity (compared to white)	Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	P	OR	P	OR	P	OR	P	OR	P
Other	0.66	<0.001	0.66	<0.001	0.69	<0.001	0.75	<0.001	0.81	<0.001

Model 1: no covariate.

Model 2: model 1 plus patient demographics (age, male gender, marital status).

Model 3: model 2 plus other patient characteristics (see Table 1).

Model 4: model 3 plus facility characteristics (see Table 1).

Model 5: model 4 plus county characteristics (see Table 1) and state dummies.

OR = Odds Ratio.

Table 3

Racial and ethnic disparities in social engagement (overall score≥3) among long-term nursing home residents, 2008: stratified by key patient and facility characteristic

Stratum	Unadjusted Rate, %				Multivariable Logistic Estimate*					
	White	Black	Hispanic	Other	Black		Hispanic		Other	
					OR	P	OR	P	OR	P
Stratified by patient characteristic										
Age										
<65	53.6	47.7	40.1	44.6	0.85	<0.001	0.82	<0.001	0.87	0.027
65–74	52.3	43.5	37.4	40.3	0.92	0.002	0.75	<0.001	0.81	0.001
75–84	49.0	38.3	35.6	38.5	0.86	<0.001	0.79	<0.001	0.81	<0.001
≥85	48.6	35.6	34.1	37.5	0.90	<0.001	0.81	<0.001	0.77	<0.001
Gender										
Female	49.8	39.7	36.5	39.3	0.88	<0.001	0.80	<0.001	0.79	<0.001
Male	49.1	42.5	36.3	39.8	0.86	<0.001	0.78	<0.001	0.84	<0.001
Marital status										
Married	43.8	35.9	31.9	33.3	0.89	<0.001	0.81	<0.001	0.78	<0.001
Not married	50.9	41.4	37.4	41.4	0.86	<0.001	0.78	<0.001	0.81	<0.001
Hearing										
Adequate or with minimal difficulty	50.7	41.6	37.2	40.3	0.87	<0.001	0.79	<0.001	0.80	<0.001
More than minimal difficulty	41.6	27.9	25.9	33.1	0.89	0.011	0.77	<0.001	0.85	0.081
Vision ability										
Adequate, impaired or moderately impaired	53.2	45.2	40.2	43.6	0.87	<0.001	0.78	<0.001	0.81	<0.001
Highly or severely impaired	22.2	17.1	14.6	14.7	0.91	0.023	0.79	0.006	0.80	0.022
Ability of communication										
Adequate	64.0	54.8	53.1	59.6	0.83	<0.001	0.79	<0.001	0.89	0.057
Not adequate	34.6	28.6	25.5	27.9	0.90	<0.001	0.77	<0.001	0.74	<0.001
Stratified by facility characteristic										
Facility size										
Large (# beds≥153)	48.5	40.2	34.4	37.7	0.84	<0.001	0.76	<0.001	0.73	<0.001

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Stratum	Unadjusted Rate, %				Multivariable Logistic Estimate*					
	White	Black	Hispanic	Other	Black		Hispanic		Other	
					OR	P	OR	P	OR	P
Small (# beds<153)	50.5	41.4	38.5	41.7	0.90	<0.001	0.82	<0.001	0.87	0.009
Profit status										
For-profit	48.4	40.8	36.4	39.0	0.91	<0.001	0.80	<0.001	0.87	0.006
Non-for-profit or government	51.7	39.2	36.2	37.6	0.78	<0.001	0.73	0.001	0.66	<0.001
Chain affiliation										
Yes	48.4	39.4	37.9	38.6	0.92	<0.001	0.90	0.008	0.86	0.006
No	50.8	41.6	34.9	38.7	0.82	<0.001	0.70	<0.001	0.77	<0.001
Percent of Medicaid residents										
High (≥70.6%)	48.2	41.0	35.4	39.3	0.89	<0.001	0.78	<0.001	0.82	<0.001
Low (<70.6%)	52.1	39.8	40.1	40.2	0.84	<0.001	0.83	0.017	0.76	0.001
Geographic location										
Rural	52.2	39.9	43.8	55.1	0.97	0.390	0.78	0.009	1.01	0.917
Non-rural	48.5	40.5	35.6	35.9	0.86	<0.001	0.79	<0.001	0.79	<0.001

* Multivariable logistic regression in each stratum adjusted for patient, facility, county characteristics (see Table 1), as well as state dummies.

OR=odds ratio.

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Table 4

Racial and ethnic disparities in social engagement (overall score≥3) among long-term nursing home residents, 2008: two-way stratified analyses by physical and cognitive functions

Stratum*	Unadjusted Rate, %				Multivariable Logistic Estimate**					
	White	Black	Hispanic	Other	Black		Hispanic		Other	
					OR	P	OR	P	OR	P
High physical & high cognitive functions	74.2	64.9	60.2	64.3	0.82	<0.001	0.76	<0.001	0.85	0.017
Low physical & high cognitive Functions	66.1	55.8	51.1	53.1	0.85	<0.001	0.82	<0.001	0.78	0.002
High physical & low cognitive Functions	55.7	47.4	42.1	45.8	0.89	<0.001	0.81	<0.001	0.82	0.001
Low physical & low cognitive functions	30.9	23.9	20.0	22.5	0.92	0.001	0.79	<0.001	0.80	<0.001

* High physical function is defined as activities of daily living (ADL) score<17, low physical function is defined as ADL score≥17; high cognitive function is defined as cognitive performance score (CPS)<3, and low cognitive function is defined as CPS≥3.

** Multivariable logistic regression in each stratum adjusted for patient, facility, county characteristics (see Table 1), as well as state dummies.

OR=odds ratio.