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## Trends in family ratings of experience with care and racial disparities among Maryland nursing homes

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### Abstract

**Background**—Providing equitable and patient-centered care is critical to ensuring high quality of care. Although racial/ethnic disparities in quality are widely reported for nursing facilities, it is unknown whether disparities exist in consumer experiences with care and how public reporting of consumer experiences affects facility performance and potential racial disparities.

**Methods**—We analyzed trends of consumer ratings publicly reported for Maryland nursing homes during 2007–2010, and determined whether racial/ethnic disparities in experiences with care changed during this period. Multivariate longitudinal regression models controlled for important facility and county characteristics and tested changes overall and by facility groups (defined based on concentrations of black residents). Consumer ratings were reported for: overall care; recommendation of the facility; staff performance; care provided; food & meals; physical environment; and autonomy & personal rights.

**Results**—Overall ratings on care experience remained relatively high (mean=8.3 on a one-to-ten scale) during 2007–2010. Ninety percent of survey respondents each year would recommend the facility to someone who needs nursing home care. Ratings on individual domains of care improved among all nursing homes in Maryland ( $p<0.01$ ) except for food & meals ( $p=0.827$  for trend). However, site-of-care disparities existed in each year for overall ratings, recommendation rate, and ratings on all domains of care ( $p<0.01$  in all cases), with facilities more predominated by black residents having lower scores; such disparities persisted over time ( $p>0.2$  for trends in disparities).

**Conclusions**—Although Maryland nursing homes showed maintained or improved consumer ratings during the first 4 years of public reporting, gaps persisted between facilities with high versus low concentrations of minority residents.

### Keywords

nursing home; race and ethnicity; experience with care; public reporting; disparities

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## INTRODUCTION

Nursing home care in the United States, with annual expenditures estimated at \$143 billion in 2010,<sup>1</sup> covers 1.4 million older and disabled Americans who resided in about 16,000 nursing facilities.<sup>2</sup> In 2008, racial/ethnic minorities comprised 17 percent of all nursing home residents.<sup>3</sup> Between 1999 and 2008, the number of elderly black residents in nursing homes increased 10 percent and the number of Hispanic and Asian elderly residents both increased over 50 percent; in contrast, the number of white residents in nursing homes declined 10 percent during the same period.<sup>3</sup> Given these demographic trends in nursing homes, which will likely continue in the foreseeable future,<sup>3,4</sup> it is critical that nursing homes provide care that is culturally appropriate, patient- and family-centered, and equitable for the increasingly diverse resident population.

The current literature on nursing homes suggests three important patterns of racial/ethnic disparities in quality of care. First, disparities are widespread, spanning diverse diagnoses and conditions such as chronic pain,<sup>5</sup> influenza and pneumococcus vaccinations,<sup>6,7</sup> and pressure ulcers.<sup>8,9</sup> Second, nursing home care tends to be highly segregated with racial/ethnic minority residents disproportionately concentrated in facilities with more limited clinical and financial resources;<sup>4,8-11</sup> thus, widespread disparities are largely an issue of the type of facilities serving the residents (i.e. a site-of-care issue). Finally, emerging evidence suggests that disparities tend to persist over time, despite overall improvements in quality for all residents and nursing homes that were potentially brought about by strengthened nursing home regulations and broadly targeted quality improvement initiatives such as public reporting.<sup>12-15</sup> For example, Li and colleagues<sup>8</sup> report that despite the reduction of overall risk-adjusted rate of pressure ulcers in nursing homes during 2003–2008, racial/ethnic disparities in risk-adjusted rates remained unchanged.

This study assesses overall trends of family reports of experiences with care in Maryland nursing homes from 2007 to 2010, and determines whether racial/ethnic disparities in reported care experiences changed during this period. Since 2007, all Maryland nursing homes have been required to collect and publicly report consumer survey measures developed by the Maryland Health Care Commission. By analyzing the ratings of Maryland nursing home care, this study addresses an important limitation of current investigations that almost exclusively focused on disparities in clinically-oriented indicators, largely ignoring the care issues from the consumers' perspective.<sup>16-18</sup> Evaluation of Maryland public reporting data also provides important information about whether overall improvements are accompanied by enduring or changing site-of-care disparities in experiences with nursing home care.

## METHODS

### Maryland nursing home surveys

The Maryland Health Care Commission (MHCC) has conducted the annual surveys and publicly reported ratings of all nursing facilities in the state since 2007. There are approximately 227 nursing homes in Maryland in each year. During each survey,

questionnaires were mailed to designated responsible parties of all long-term care residents, i.e. residents with length-of-stay of 90 days or longer (each year, approximately 10 facilities serving exclusively short-term, post-acute care residents were excluded from the survey).<sup>19–22</sup> During each year of 2007–2010, responsible parties were most often family members (e.g. 83% were adult children or spouses of the residents in 2007<sup>19</sup>), but could be non-relatives such as friends. In 2007, two-thirds of the respondents visited the nursing home 20 times, and approximately 80 percent visited the nursing home 10 times, within 6 months before the survey;<sup>19</sup> similar visitation patterns were found for other years. Each year, approximately 17,000 surveys were mailed to responsible parties, and the annual response rate ranged from 55 to 60 percent. The Commission used various approaches (e.g. repeated mails, follow-up calls, reminder postcard) to achieve a minimum of 50 percent response rate for individual facilities. The surveys were generally conducted between September and December and responses reflected experiences with care of the corresponding year.<sup>19–22</sup>

Before the first public reporting in 2007, the MHCC extensively pilot-tested and revised the questionnaires based on feedbacks from multiple stakeholders such as nursing home administrators and caregivers. Throughout 2007–2010, the questionnaires and survey approaches remained unchanged with one exception. In 2007, the survey asked two questions about overall ratings and questions about experiences with seven domains of care. However, in order to reduce data collection burdens, questions related to two domains of care (and several screening questions) were removed from the questionnaires in the following survey years.

The five domains of care evaluated by responsible parties throughout 2007–2010 included staff and administration, care provided to residents, food & meals, autonomy & resident rights, and physical aspects of the facility. Each domain contains several questions that in the majority of cases rate experience with care on a scale of 1 to 4 (1=never, 2=sometimes, 3=usually, 4=always). An example of such questions is “in the last 6 months, if you asked for information about the resident, how often did you get the information within 48 hours?” (for the staff and administration domain). There are also several other questions with possible responses being yes and no (e.g. “in the last 6 months, did you have issues or concerns with the care the resident received in the nursing home?” for care provided to residents). For each question, the score of a nursing home can be calculated by averaging responses across all respondents of the facility (for each yes/no question, the percentage of those responding “yes” can be calculated and linearly transformed to a 1–4 possible range). The rating of each domain is calculated as the average of the scores of all questions within the domain; the domain score ranges between 1 and 4 with higher value indicating better reported experience with care.<sup>19–22</sup> Most of the domain-specific questions were adapted from the nursing home Consumer Assessment of Healthcare Providers and System surveys that the CMS and the Agency for Healthcare Research and Quality developed and tested.<sup>16,23</sup> A recent comprehensive report<sup>16</sup> shows at least acceptable interval consistency, validity and other psychometric attributes for individual items and composite scores used in Maryland surveys. In addition, our analyses revealed high correlations between domain composites and two additional global ratings (see below and the Results section), suggesting their high concurrent validity.

The surveys of each year also asked two separate questions about (1) overall rating of care on a scale from 1 (worst possible care) to 10 (best possible care); and (2) whether the respondent would recommend the facility to someone he/she knows who need nursing home care (yes/no). Each year, the Maryland Health Care Commission published scores of overall ratings and ratings of individual domains of care.

### Variables from other databases

Several other databases of 2007–2010 were linked to corresponding years' Maryland survey files to define additional variables for facility and county characteristics. The On-line Survey, Certification And Reporting (OSCAR) files were developed by the CMS for tracking and reporting findings of state government inspections of care, nurse staffing, and other facility characteristics.<sup>2</sup> We obtained the following variables from OSCARs which may be associated with consumer ratings according to previous reports:<sup>17,19–22,24</sup> total number of beds, occupancy rate, ownership status (for-profit versus otherwise), affiliation with a chain (yes/no), percentage of Medicaid residents, percentage of Medicare residents, whether the nursing home has an Alzheimer's disease special care unit, staffing levels (hours per resident per day) for registered nurse (RN), licensed practical or vocational nurse (LPN/LVN), and certified nursing assistant; and number of deficiency citations received during annual inspection. Concerns exist that the staffing data in OSCAR may be recorded unreliably.<sup>25</sup> We performed sensitivity analyses where we excluded from the multivariate models (described below) several facilities with staffing values outside two standard deviations of the mean; we confirmed the robustness of our estimates in these additional analyses.

We also used data from the [LTCFocUS.org](http://LTCFocUS.org) website to obtain 2 additional variables. These data were created by the Center for Gerontology and Healthcare Research at Brown University by combining multiple sources of data.<sup>26</sup> The first variable we obtained is the percentage of black residents (not of Hispanic origin) in the nursing home on the first Thursday of April which was originally defined using the race and ethnicity information in the Minimum Data Set and enrollment databases. We also obtained a variable for facility-level case mix, which was derived from the RUG (resource utilization group) III classification of all residents in the facility on the first Thursday of April;<sup>26</sup> the facility case-mix index was calculated by averaging the acuity scores of all residents in the facility, with higher value indicating higher average acuity.

We further used corresponding years' area resource files to define county-level covariates. We first defined market competition using the Herfindahl–Hirschmann Index (HHI) given our expectation that competition may impact nursing home quality<sup>27–29</sup> and thus consumer ratings. We also defined 2 other county-level covariates that could be associated with the supply of and the demand for high quality nursing home care: the medium household income of residents in the county and the percentage elderly population (> 65 years) in the county. Finally, we used the zip-code level rural urban commuting area file<sup>30</sup> to define rural versus urban location of the nursing home in order to capture possible rural-urban differences in care patterns.<sup>31</sup>

## Analysis

In all analyses described below, the dependent variables were overall and domain-specific rating scores for each facility, and the independent variables were facility's concentration of black residents, year dummies, and their interactions. In main analyses, we categorized facilities into four site-of-care groups according to concentration of blacks: low (<10%), medium (10–29.9%), medium-high (30–59.9%), and high (≥60%). We performed sensitivity analyses to examine alternative cutoff points for categorization; the results were similar and are available upon request.

In descriptive analyses, we first estimated Pearson correlations among the overall and domain ratings. For each year, we compared rating scores, facility characteristics, and county covariates across site-of-care groups using Kruskal Wallis one-way ANOVA for continuous variables, and chi-square tests for categorical variables.

In the longitudinal analyses of each consumer rating, we first estimated an unadjusted OLS (ordinary least squares) regression model that included year dummies, dummies for site-of-care groups, and site-year interactions; this model accounted for the clustering of nursing homes due to multiple observations over time using the Huber-White estimators of covariance.<sup>32</sup> We then expanded the model by further adjusting for nursing home and county covariates. In both models, we performed joint F-tests to determine overall differences in reported experience with care over time (main effect of years), across site-of-care groups (main effect of sites), and differential trends by sites (effect of site-year interactions).

After determining that trends in score did not differ significantly by sites of care (based on the joint F-test of interaction terms) for any rating, we re-estimated the adjusted OLS models by only including the main effects of years and site-of-care groups (and all covariates). We obtained adjusted ratings based on predictions of these models, and we present adjusted ratings stratified by sites. To determine the robustness of our analyses, we performed sensitivity analyses where we tested additional interactive effects, re-categorized facilities based on all minority residents, and tried alternative fixed-effects modeling (see the Appendix for details).

## RESULTS

### Trends in experiences with care

In 2010, the correlation between overall experience with care and recommendation of the facility was 0.86 ( $p<0.01$ ). Each of the overall and recommendation ratings was also highly correlated with the 4 domain-specific ratings for staff & administration, care provided, autonomy & patient rights, and physical environment ( $r>0.65$ ,  $p<0.01$  in all cases); ratings among the 4 domains of care were also highly correlated ( $r>0.65$ ,  $p<0.01$  in all cases). Correlations between family ratings for food & meals and ratings for overall or other domains of care were lower, ranging from 0.30 to 0.50 ( $p<0.01$  in all cases). Similar correlation patterns were found for other years.

Figure 1 presents overall and domain-specific ratings by year and site of care. Analyses on overall trends suggested that ratings for (1) overall experience, (2) recommendation of facility and (3) food & meals did not change significantly over time ( $p=0.161$ ,  $0.956$ , and  $0.827$ , respectively, from the joint F-tests on year dummies in adjusted models). In contrast, scores for staff & administration (3.49 in 2007 to 3.68 in 2010 on average for all facilities), care provided (3.45 in 2007 to 3.52 in 2010 on average for all facilities), autonomy & patient rights (3.13 in 2007 to 3.53 in 2010 on average for all facilities), and physical environment (3.32 in 2007 to 3.43 in 2010 on average for all facilities) showed significant improvements for all facilities during 2007–2010 ( $p<0.01$  in all F-tests on year dummies in both unadjusted and adjusted models).

### Disparities in experiences with care

In 2010, the average scores for overall experience with care ranged from 7.76 for facilities with high concentrations of blacks to 8.84 for facilities with low concentrations (Table 1). Similarly, the average recommendation rates ranged from 83% to 95% across the 4 facility groups, suggesting similar site-of-care disparities. Results in table 1 also suggest site-of-care disparities in all domain-specific ratings ( $p<0.01$  in all cases). In addition, higher facility black concentrations were associated with larger bed size, for-profit and chain ownership, reliance on Medicaid payment, location in lower-income urban areas, and poorer quality of care as indicated by staffing patterns and higher deficiency citations. Similar results were found for other years' data.

Longitudinal analyses adjusting for facility and county characteristics confirmed significant racial disparities across sites of care for all overall and domain-specific ratings ( $p<0.01$  in all cases from F-tests on dummies for sites of care). Finally, in longitudinal analyses of all ratings, the joint F-tests on year-by-site interactions were non-significant ( $p>0.1$  in all cases) suggesting that site-of-care disparities persisted and did not change significantly during 2007–2010. Table 2 presents adjusted ratings scores by site highlighting persistent disparities (see Table e6 in the Appendix for detailed information on model estimates).

To address the potential concern that number of deficiency citations may be endogenous and thus bias our estimates, we reran all models without this variable as a control; the results did not change appreciably, suggesting that endogeneity is not a concern empirically. Additional sensitivity analyses further confirmed the robustness of estimated disparities (see the Appendix).

## DISCUSSION

During the first 4 years of Maryland nursing home public reporting (2007–2010), overall experience with care reported by family members was relatively high, with the mean overall ratings on a one-to-ten scale being 8.3. An average of 90% of respondents each year also indicated that they would recommend the facility to someone who needs nursing home care. During the same period, reported experiences with individual domains of care covering staff performance, care provided, patient autonomy and facility environment, improved among all nursing homes in the state. However, racial disparities in rating scores remained roughly the same each year, with facilities serving higher proportions of black residents having lower



reported ratings. Multivariate analyses confirmed these persistent gaps across sites of care despite overall maintained or improved consumer ratings for all nursing homes in Maryland.

Consensus exists that delivering care in a patient-centered manner is a defining component of high-quality care.<sup>33</sup> In nursing homes, enhancing resident care experience or engagement of residents and families is considered to be an integral part of continuous quality improvement and any efforts to improve residents' quality of life.<sup>16,18,34</sup> Important efforts have been made in recent years to promote resident-centeredness in nursing homes. For example, the MDS version 3.0, a new version implemented in October 2010, incorporated direct resident surveys about individual preferences and care experiences beyond traditional assessment items such as functional status and medical conditions.<sup>35</sup> In addition, several states, including Maryland, have been conducting routine resident and/or family member surveys and publicly released facilities' rating scores on state websites, with the hope that it will inform consumer choices and stimulate facility-wide improvement in resident-centeredness.<sup>17,24</sup> The CMS together with the Agency for Healthcare Research and Quality is also developing standardized consumer assessment instruments for nursing homes that could be implemented nationally.<sup>16</sup>

A recent study of Massachusetts nursing home family surveys showed that from 2005 to 2009, ratings remained stable at relatively high levels on average; however, cross-facility variations were evident for each year which tended to be explained by variations in quality of care indicators (e.g. staffing levels and deficiency citations), facility's key operational attributes such as ownership status, and unmeasured consumer preferences and practice styles.<sup>17</sup> Our study using more recent data from Maryland largely confirmed these findings. After longitudinally controlling for quality indicators and other key characteristics, our study further revealed that consumer ratings for certain domains of care improved in Maryland although overall ratings remained unchanged, and that the racial composition of the facility is an important factor associated with consumer-reported experiences with care.

Although public reporting intends to inform consumer choices and promote market competition on quality, empirical evidence is mixed regarding its impact on global performance improvement. Nursing homes have been shown to respond to the "Nursing Home Compare" publications and take actions to improve practices affecting published quality measures.<sup>14</sup> However, the association of public reporting with improved care was in general modest, and was only documented for some but not all (published or unpublished) process-of-care and outcome indicators.<sup>27,28</sup> Although our analyses of Maryland consumer reports could not establish causal relationship due to the lack of control groups, it is reassuring to observe that after Maryland released the data publicly, consumer ratings improved for several important areas of care. Meanwhile, the unchanged ratings on overall care over time may reflect the facts that improvements in specific domains of care were generally modest in magnitude (especially in later years), and that performance did not improve in other published (i.e. for food & meals served) and possibly unpublished areas of care.

Despite these maintained or improved consumer ratings across all facilities, the enduring gaps between minority-serving and other facilities were troubling. It has to be acknowledged

that the publication of Maryland nursing home consumer ratings, like almost all other public reporting systems currently ongoing, aims for global performance improvement; it does not incorporate any efforts to address racial disparities or create additional market incentives for minority-serving facilities to improve performance. A priori, it is uncertain whether and how such reporting would affect racial disparities in consumer ratings. However, concerns have been expressed that such generic quality improvement approaches may have unintended consequences of sustained or even increased racial disparities in quality of care.<sup>29,36,37</sup> A nascent body of evidence from both hospital<sup>37</sup> and nursing home<sup>7,8</sup> settings tended to support these unintended effects, showing sustained disparities at best concomitant with global improvements in care.

The enduring site-of-care disparities in consumer ratings found in our study may be a result of multiple factors. In particular, minority-serving facilities tend to be financially constrained, have less optimal staffing and clinical resources, and deliver care of poorer quality.<sup>4,10,11</sup> Although our analyses attempted to control for these organizational, care-delivering, and other characteristics such as geography, it is possible that they were not perfect measures and the level of minority concentrations in the facility captures the effect of unmeasured factors directly related to consumer evaluations of care. Given the relatively low level of ratings on minority-serving facilities in the first reporting year (i.e. 2007), these facilities should have more rooms or better opportunities for improvements in later years (i.e. 2008–2010) compared to other facilities. However, the fact that these minority-serving facilities tended to have lower financial and clinical resources may have made additional improvements less likely to occur; the parallel improvements across facility groups could reflect a balance of these two counteracting factors.

The persistent disparities could also in part reflect potential differences in expectations of care between minority and white family members of residents. Research has shown that higher expectations of care held by the patient may result in less generous evaluations on the performance of healthcare providers.<sup>38,39</sup> If minority family members and residents have higher expectations of nursing home care to which they historically had less access,<sup>3,4</sup> they may report lower scores even if the actual care is not measurably different. In addition, it is unknown if disparities in reported ratings could also be attributed to cultural differences across racial/ethnic groups, through which minority respondents might report lower scores for the same level of experience with care. Further in-depth studies are necessary to explore the extent to which individual preferences, expectations of care, and cultural differences may drive consumer evaluations of care.

Findings of this study have important policy implications. In particular, given the enduring racial disparities that span multiple domains of care, future efforts to improve patient-centeredness in nursing homes should pay closer attention to such disparities beyond overall improvements. Current generic quality improvement approaches such as public reporting could be revised or coupled with other disparity-eliminating efforts to effectively address both overall quality and equity of care in nursing homes.

This study has several limitations. First, because all nursing homes in our sample were subject to the public reporting in Maryland, our analyses were not able to use a control



group to more definitely determine the impacts of this reporting. To our knowledge, however, there was no other state-wide program in Maryland during this period that was designed to improve consumer experience of care in nursing homes. Thus, our findings may be highly suggestive of the effectiveness (or lack thereof) of this public reporting. Second, our analyses focused on the aggregated scores published for each facility and on the issue of site-of-care disparities; we did not have the data for each survey participant. Future studies are needed to explore the potential issue of within-site racial disparities (i.e. disparities among minority and white residents residing in the same facility). Finally, findings of this study were based on Maryland public reporting and may or may not be generalized to other states.

In summary, nursing homes in Maryland showed maintained or improved consumer ratings during the first 4 years of public reporting. However, gaps persisted during the same period between nursing homes with differential concentrations of minority residents. Persistent racial disparities in patient-centered care in nursing homes warrant more policy attention.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

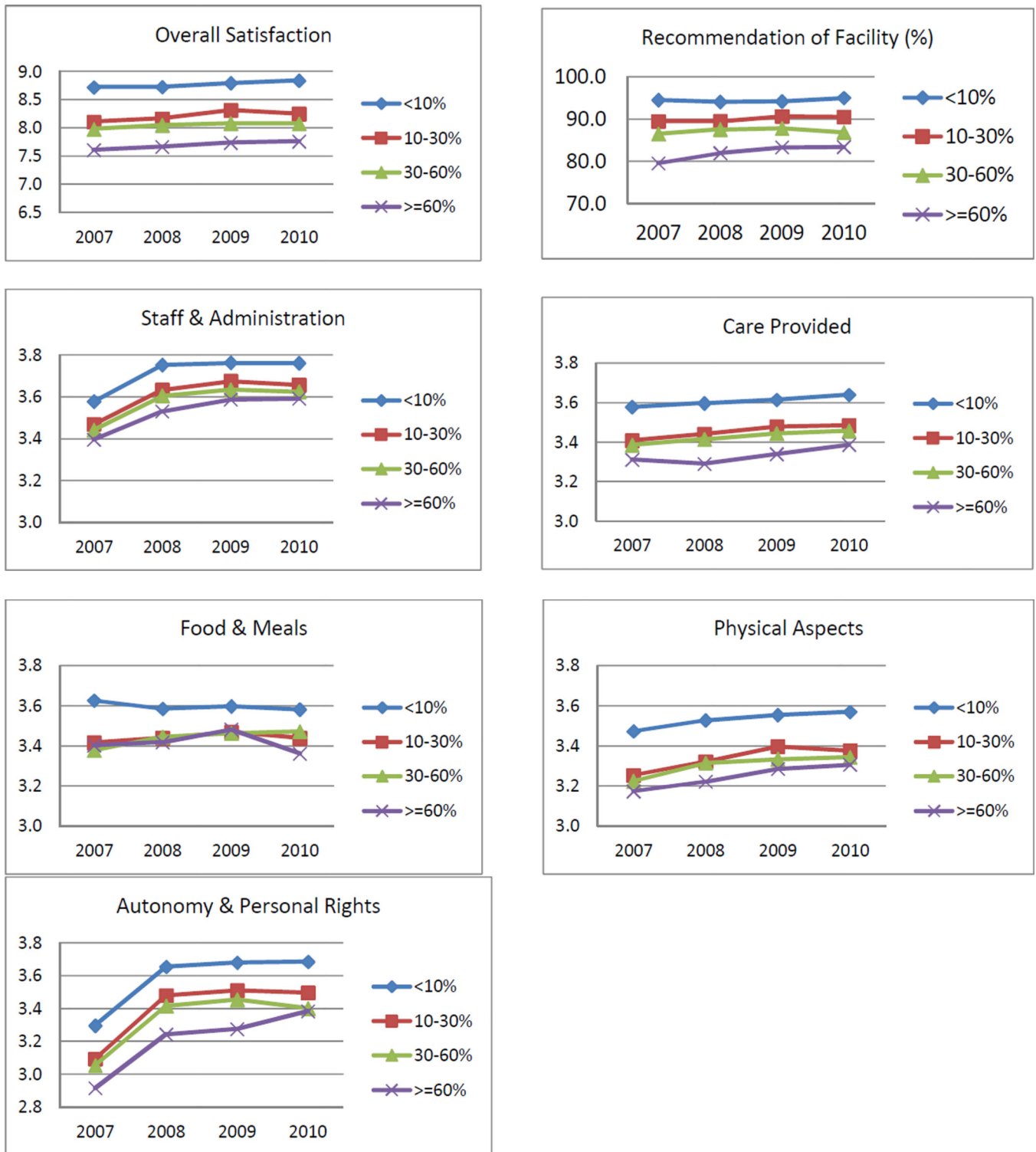
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**Figure 1.** Overall satisfaction, recommendation of the nursing home, and family experience ratings of individual domains of care by percentages of black residents in the nursing home, 2007–2010.

Note: the possible ranges are 1–10 for overall satisfaction, 0–100 percent for recommendation of the nursing home, and 1–4 for family experiences with individual domains of care. In all cases higher score indicates better reported experience. The domain for staff & administration reflects family evaluations of staff and administrator responses to questions, and whether they treat residents and family members with courtesy and respect; the domain for care provided reflects family evaluations of the actual care provided to residents, responses of nursing homes to family concerns about care provided, and family participation in care planning; the domain for food & meals reflects family evaluations of staff availability to help with eating and drinking of residents; the domain for physical aspects reflects family evaluations of the cleanness and quietness of the facility and rooms; and the domain for autonomy & personal rights reflects family evaluations of respect for resident privacy and availability of private space for family visits.

Table 1

Maryland nursing home and county characteristics in 2010

	Nursing homes by concentration of black residents				p-value
	Low (<10%), n=89	Medium (10–29.9%), n=38	Medium-high (30–59.9%), n=49	High (≥60%), n=45	
	Mean, median (range) or %				
Nursing home characteristic					
Overall satisfaction (1–10)	8.84, 8.85 (7.57–9.94)	8.25, 8.25 (6.59–9.02)	8.08, 8.25 (6.73–9.27)	7.76, 7.81 (6.62–8.55)	<0.01
Recommendation (0–100)	95.02, 96.08 (80.00–100)	90.53, 93.81 (71.05–100)	86.92, 89.56 (53.85–100)	83.40, 84.26 (53.85–98.31)	<0.01
Reported experience with (1–4)					
Staff & administration	3.76, 3.78 (3.35–4.00)	3.66, 3.65 (3.26–3.83)	3.62, 3.65 (3.29–3.88)	3.59, 3.61 (3.28–3.81)	<0.01
Care provided	3.64, 3.64 (3.23–3.91)	3.49, 3.51 (3.00–3.71)	3.46, 3.50 (2.81–3.83)	3.39, 3.39 (2.91–3.65)	<0.01
Food & meals	3.58, 3.61 (3.00–4.00)	3.44, 3.48 (2.90–3.75)	3.47, 3.47 (2.93–4.00)	3.36, 3.39 (2.75–3.92)	<0.01
Autonomy	3.69, 3.70 (3.17–4.00)	3.50, 3.54 (3.11–3.81)	3.40, 3.43 (2.23–3.82)	3.39, 3.39 (3.08–3.73)	<0.01
Physical aspects	3.57, 3.58 (3.17–3.95)	3.38, 3.38 (2.97–3.59)	3.34, 3.40 (2.60–3.69)	3.31, 3.32 (3.00–3.59)	<0.01
Total number of beds	104,79, 99 (20–448)	147,79, 139 (55–558)	141,20, 135 (50–305)	135,64, 134 (31–257)	<0.01
Occupancy rate, %	87.87, 92.00 (34.62–100)	88.11, 88.47 (60.15–100)	86.93, 88.41 (62.79–100)	88.35, 90.34 (63.19–100)	0.02
For-profit ownership	51.76%	71.05%	79.60%	82.22%	<0.01
Chain affiliation	42.35%	57.89%	71.43%	75.56%	<0.01
Case mix index score	0.84, 0.84 (0.69–1.12)	0.86, 0.86 (0.76–0.96)	0.87, 0.86 (0.74–1.05)	0.88, 0.87 (0.70–1.20)	<0.01
Percentage of Medicaid residents, %	45.40, 50.36 (0–100)	60.04, 61.97 (32.74–88.52)	69.81, 70.83 (29.03–90.06)	74.26, 75.00 (41.74–100)	<0.01
Percentage of Medicare residents, %	16.17, 15.52 (0–44.00)	19.77, 17.98 (0–42.37)	14.32, 13.11 (0–53.76)	14.90, 12.66 (0–45.78)	0.04
Presence of Alzheimer's disease unit	16.47%	15.79%	18.37%	2.22%	0.09
Staff hours per resident per day					



	Nursing homes by concentration of black residents				p-value
	Low (<10%), n=89	Medium (10– 29.9%), n=38	Medium-high (30–59.9%), n=49	High ( 60%), n=45	
RN	0.49, 0.41 (0.06–2.67)	0.43, 0.39 (0.08–1.16)	0.47, 0.45 (0.11–1.16)	0.38, 0.36 (0–0.80)	0.01
LPN/LVN	0.87, 0.80 (0.13–2.42)	0.95, 0.96 (0.34–1.45)	0.90, 0.91 (0.39–1.38)	1.11, 1.13 (0.57–1.57)	<0.01
CNA	2.38, 2.16 (0.77–8.01)	2.00, 1.87 (0.87–5.48)	1.90, 1.85 (0.74–3.51)	1.82, 1.64 (0.49–3.51)	<0.01
Number of deficiency citations	8.57, 8 (0–26)	12.58, 12 (2–27)	11.93, 12 (1–30)	15.35, 15 (5–32)	<0.01
Rural location	22.09%	21.05%	10.20%	0	<0.01
County characteristic					
Market competition	0.88, 0.90 (0.47–0.97)	0.80, 0.92 (0–0.97)	0.87, 0.96 (0.45–0.97)	0.95, 0.96 (0.93–0.97)	<0.01
Medium household income × \$1000	66.48, 62.30 (37.08–100.99)	72.04, 80.25 (38.13–88.56)	66.22, 62.30 (38.13–100.99)	59.56, 69.52 (38.19–88.56)	<0.01
Percentage population 65 y	13.77, 13.05 (9.44–23.71)	13.48, 12.32 (10.25–23.24)	13.33, 13.01 (9.44–23.71)	11.31, 11.73 (9.44–14.59)	<0.01

Note: p-values were calculated from Kruskal Wallis test for continuous variables, and chi-square test for categorical variables for comparisons of group difference.  
RN=registered nurse; LPN/LVN=licensed practical/vocational nurse; CNA=certified nursing assistant.

**Table 2**

Adjusted family experience ratings by nursing home racial concentrations, 2007–2010<sup>#</sup>

Concentration of black residents in nursing home	Overall satisfaction (1–10)	Recommendation (0–100)	Family experience with (1–4)				Physical environment
			Staff & administration	Care provided	Food & meals	Autonomy	
Low (<10%)	8.77	94.52	3.71	3.61	3.59	3.58	3.53
Medium (10–29.9%)	8.20**	89.85*	3.60**	3.45**	3.44**	3.37**	3.33**
Medium-high (30–59.9%)	8.05**	87.44**	3.57**	3.43**	3.44**	3.34**	3.31**
High ( 60%)	7.69**	81.94**	3.52**	3.34**	3.43*	3.20**	3.25**

<sup>#</sup> Predictions of adjusted scores are based on linear regression models that adjusted for the nursing home and county characteristics listed in Table 1, year dummies, dummies for facility concentration of black residents, and the clustering of nursing homes over years.

\* p<0.05 and

\*\* p<0.01 when compared to the adjusted score for facilities with low concentration of black residents.