Approximately one third of nursing homes are located in non-metropolitan areas (Jones, Dwyer, Bercovitz, & Strahan, 2006). However, these rural nursing homes have received little attention in health services research and, in fact, are often excluded from research due to their rural status (Gruneir, Lapane, Miller, & Mor, 2008; Zinn, Mor, Feng, & Intrator, 2009). Rural Mountain West states such as Nevada, Utah, and Wyoming have some of the fastest growing older adult populations in the country (He, Sengupta, Velkoff, & DeBarros, 2005). Rural nursing homes in this region are located in areas dominated by mountain ranges and deserts, which isolate rural residents and restrict access to health care. Older adults who live in rural counties tend to be older, poorer, and have more physical limitations than those in urban areas (Institute of Medicine, 2005). Larger proportions of rural residents 75 and older use nursing homes than their urban peers (Phillips, Hawes, & Leyk Williams, 2004). Thus, given the growth in the proportion of older adults and the challenges faced by this population, it is important to examine factors that influence quality of care in this region.

ABSTRACT

We examined the effect of market and organizational characteristics on nursing home quality as measured by deficiencies (number and weighted) on states in a rural region of the United States. Rural nursing homes in five Mountain West states (N = 161) were sampled from the Online Survey Certification and Reporting system between January 1, 2004 and June 15, 2005. State comparisons indicated that rural nursing homes in Nevada had a higher number of deficiencies and weighted deficiency score as compared with Utah, Colorado, Wyoming, and Idaho. Using regression analyses, we found that a higher percentage of licensed practical nurses in the staffing mix were predictive of a greater number of deficiencies. Nursing homes with more beds or higher Medicaid occupancy had higher weighted deficiency scores. Although rural Mountain West nursing homes average a similar number of deficiencies as nursing homes nationwide, these nursing homes had a greater number of serious deficiencies and higher weighted deficiency scores, suggesting greater actual harm to resident health and safety.

Predictors of Quality in Rural Nursing Homes Using Standard and Novel Methods

Gail L. Towsley, PhD, NHA; Susan L. Beck, PhD, APRN, FAAN; and Ginette A. Pepper, PhD, RN, FAAN

Dr. Towsley is Assistant Professor, Dr. Beck is Professor, Robert S. and Beth M. Carter Endowed Chair, and PhD Program Director, and Dr. Pepper is Director, Hartford Center of Geriatric Nursing Excellence, Professor and Helen Bamberger Colby Endowed Chair, and Associate Dean for Research and PhD Programs, University of Utah College of Nursing, Salt Lake City, Utah.

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Address correspondence to Gail L. Towsley, PhD, NHA, Assistant Professor, University of Utah College of Nursing, 10 South 2000 East, Salt Lake City, UT 84112; e-mail: Gail.towsley@nurs.utah.edu.

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Nursing home quality is a widespread concern but is particularly critical in rural communities because of the central role these facilities play in serving the health needs of the older adult members of these communities. Poor quality of care can result in a number of adverse outcomes for the older adult population, including the closure of nursing homes that are unable to meet regulatory standards. Consequently, older adults in these rural communities, who are already an underserved population, may be left with even fewer health care options. The purpose of this study was to examine the influence of market and organizational characteristics on nursing home quality as measured by deficiencies in a rural region of the western United States. We used a standard approach—number and type of deficiency—and a novel approach—a weighted deficiency score. The weighted deficiency score is a potentially more informative measurement approach that accounts for the both the extent and effect of deficiencies.

BACKGROUND

Quality Performance: Deficiencies

Nursing home quality can be measured in multiple ways (e.g., staffing levels, number of resident pressure ulcers, deficiencies). In this study, we focused on the number and type of deficiencies identified through a systematic certification review and audit process. A deficiency is a failure to meet a specific nationwide standard established as important to the provision of safe, quality care. Deficiency citations are organized into 16 categories and range from direct resident care to the physical environment. Deficiencies are evaluated based on scope (the pattern of occurrence) and severity (the degree of harm) (Table 1). Deficiency categories are listed in Table 1. Usual measures of deficiencies include a total count of all types and counts within categories. Severe, repeated, or numerous deficiency citations may indicate problems with the quality of care. The Office of Inspector General (OIG, 2008) reported that more than 91% of nursing homes nationwide (N=15,046) were cited for deficiencies from 2005 to 2007. Phillips, Holan, Sherman, Leyk Williams, and Hawes (2004) indicated that the average number of “quality care” deficiencies in nursing homes from a nationwide sample in the year 2000 were: urban = 7.0, large town = 6.4, small town = 5.9, isolated locale = 5.0. Their report did not include data on scope and severity. Deficiencies have been linked to involuntary and staff turnover, increased costs, and a number of other outcomes. A national comparison of deficiency data from October 1999 through March 2003 by state indicated a wide range in number of quality of care deficiencies—from 4.4 to 25—at the most recent evaluation (Matthews-Martin, Gruhn, & Decker, 2003).

Organizational Characteristics and Quality

Numerous organizational characteristics, including nursing home size, profit status, affiliation with a chain organization, ownership changes, case mix, staffing hours, and staffing mix, may influence nursing home quality. Across urban and rural locations, large-for-profit nursing homes are more likely to have more deficiencies on care standards (O'Neill, Harrington, Kitchener, & Saliba, 2003). For-profit nursing homes also had more total deficiencies than not-for-profit or government-affiliated nursing homes (Harrington, Woolhandler, Mullan, Carrillo, Himmelstein, 2001; Harrington, Zimmerman, Karon, Robinson & Beutel, 2000; O'Neill et al., 2003), as well as serious deficiencies, which were categorized as F level or higher (O'Neill et al., 2003). Comondore et al. (2009) conducted a systematic review and meta-analysis of four quality measures: staffing, pressure ulcers, physical restraints, and deficiencies. Seven studies were represented in the meta-analysis examining deficiencies. While the data showed a trend of fewer deficiencies in not-for-profit nursing homes, statistical differences in deficiencies between for-profit and not-for-profit nursing homes were not found (Comondore et al., 2009).

Ownership changes, which occur when nursing homes are sold or leased to new managers, are more common among for-profit and chain-affiliated nursing homes than not-for-profit facilities (Castle, 2005; Holmes, 1996). Approximately 16% of certified U.S. nursing homes closed between 1998 and 2008 (Feng et al., 2011), and those that experienced ownership changes one time compared to two or more times between 1996 and 2005 were 26% and 44%, respectively, more likely to withdraw from the Medicare and Medicaid program (Zinn et al., 2009). Such terminations may indirectly reflect low quality of care.

Case mix may also influence deficiencies and is connected to staffing. Little research has examined the relationship of case mix to deficiencies; no studies focused

**Table 1. Usual measures of deficiencies**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staffing</td>
<td>Differences in staffing hours and mix</td>
</tr>
<tr>
<td>Pressure Ulcers</td>
<td>Differences in pressure ulcer prevalence and severity</td>
</tr>
<tr>
<td>Physical Restraints</td>
<td>Differences in physical restraint use</td>
</tr>
<tr>
<td>Deficiencies</td>
<td>Differences in overall deficiency rate</td>
</tr>
</tbody>
</table>

These measures are used to assess the quality of care, with lower rates indicating better care. Additionally, these measures may be influenced by various factors such as staffing levels, resident health status, and management practices. These factors play a crucial role in determining the quality of care provided in nursing homes.
in one study, nursing homes whose residents had lower acuity levels (along with more staff and more residents receiving Medicare services) had fewer deficiencies (Wan, Zhang, & Unruh, 2006).

The influence of staffing on quality of care has been a significant focus of nursing home research. In a recent systematic review of 50 studies, Spilsbury, Hewitt, Stirk, and Bowman (2011) concluded that there is tentative evidence to support the impact of staffing hours (cumulative hours worked by all types of nursing employees in the nursing home and the number of hours worked per resident per day [HPRD]) on quality indicators. The methods across studies varied considerably. In addition to a plethora of ways to define staffing, more than 42 indicators of quality, including three ways of defining deficiencies, were identified.

A limited number of these studies have examined the relationship of number and/or hours of staffing to deficiencies as an indicator of quality. In an examination of longitudinal panel data in a sample of California nursing homes (N = 1,099) from 1999 to 2003, greater total nurse staffing hours was associated with fewer total, quality of care, and serious deficiencies (Kim, Kovner, Harrington, Greene, & Mezey, 2009). Higher levels of total RN staffing hours were associated with fewer total number and quality of care deficiencies, whereas licensed practical nurse (LPN) staffing was associated with more total number and quality of care deficiencies. Serious deficiencies were not statistically significant with RN or LPN staffing (Kim, Kovner, et al., 2009). Harrington et al. (2000) also reported a negative association (more hours, fewer deficiencies) between RN hours and total care deficiencies and quality of care deficiencies but no significant association between LPN hours and deficiencies.

The systematic review on staffing and quality concluded that focusing on numbers of staff provides a limited capacity to understand the relationships between staffing and quality (Spilsbury et al., 2011). It is also important to examine staffing mix, which refers to the ratios of full-time equivalents (FTE) worked by certified nursing assistants (CNAs), LPNs, and RNs to all nursing staff FTE or in comparison to each other (e.g., RN to LPN). CMS has identified minimum staffing thresholds of 2.8 nurse aide and 1.3 licensed nursing (RN and LPN) HPRD, suggesting that staffing levels below these thresholds potentially place residents at risk for poor outcomes that may be reflected in deficiencies (Abt Associates Inc., 2001).

Research examining the relationship between staffing mix and quality, especially deficiencies, has been very lim-

---

**TABLE 1**

<table>
<thead>
<tr>
<th>DEFICIENCY CATEGORIES</th>
<th>SCOPE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEVERITY</strong></td>
<td>*</td>
</tr>
<tr>
<td>Immediate jeopardy to resident health or safety</td>
<td><strong>Isolated</strong></td>
</tr>
<tr>
<td>Actual harm that is not immediate jeopardy</td>
<td>J</td>
</tr>
<tr>
<td>No actual harm but with potential for more than minimal harm that is not immediate jeopardy</td>
<td>G</td>
</tr>
<tr>
<td>No actual harm but with potential for more than minimal harm</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEFICIENCY CATEGORIES</th>
<th>SCOPE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEVERITY</strong></td>
<td>*</td>
</tr>
<tr>
<td>Immediate jeopardy to resident health or safety</td>
<td><strong>Isolated</strong></td>
</tr>
<tr>
<td>Actual harm that is not immediate jeopardy</td>
<td>J = 32</td>
</tr>
<tr>
<td>No actual harm but with potential for more than minimal harm that is not immediate jeopardy</td>
<td>D = 5</td>
</tr>
<tr>
<td>No actual harm but with potential for more than minimal harm</td>
<td>A = 0</td>
</tr>
</tbody>
</table>

Note. Adapted from Office of Inspector General (2008) and Matthews-Martin, Gruhn, and Decker (2003). Scale ranges from A (least scope and severity) to L (greatest scope and severity). Shaded areas denote deficiencies considered substandard in the weighted deficiency model. Others consider serious deficiencies as G level and higher (Grabowski & Stevenson, 2008). *Ranging from most to least severe.*
Nursing home competition, occupancy rates, availability of special care units, and participation in Medicare and Medicaid are important market characteristics that may influence quality. Competition for residents potentially serves as an incentive to provide innovative programs (Banaszak-Holl, Zinn, & Mor, 1996). Better quality, such as lower proportions of residents with catheters or restraints, has been associated with more competition in the service area (Zinn, 1994).

Median occupancy rates in U.S. nursing homes have hovered at approximately 87% to 88% during the past several years (American Health Care Association, 2011). Higher occupancy may be indicative of high care demand or a result of care quality (Zinn, 1994). Occupancy rates fluctuate, but low occupancy rates have been associated with more deficiencies (Kim, Harrington, et al., 2009) and Medicare and Medicaid terminations (Angelelli et al., 2003). Higher proportions of Medicaid occupancy were associated with poorer clinical practices, such as higher proportions of catheterization (Zinn, 1994).

In summary, numerous organizational and market characteristics may influence quality; these characteristics often interact, and no clear logic model exists. For example, for-profit nursing homes located in poorer rural counties have been linked to lower occupancy and a higher likelihood of ownership changes (Mor, Zinn, Angelelli, Teno, & Miller, 2004)—all of which may influence quality. Special care units are less likely to be located in rural areas (Kang, Meng, & Miller, 2011; Rhoades, Potter, & Krauss, 1998; Shaughnessy, 1994). Additionally, nursing homes were less likely to have special care units if they had a higher percentage of Medicaid occupancy (Zinn & Mor, 1994) or were part of a chain (Kang et al., 2011). Little research has examined the influence of these characteristics on the quality of care in rural areas. Rural areas vary greatly by region, and we chose to examine these relationships within five states of the Mountain West.

**METHOD**  
**Design**

This study used a federal public-use database, the Online Survey Certification and Reporting system (OSCAR), to (a) examine the association of organizational and market characteristics with quality performance as measured by deficiencies, defined as violations of regulatory standards; and (b) conduct an exploratory analysis to examine the association of organizational and market characteristics with a weighted deficiency score (WDS) that accounts for both the scope and severity of deficiencies. The Institutional Review Board approved this study.

**Sample**

Rural nursing homes in OSCAR comprised 35% of 475 nursing homes in five states: Colorado, Idaho, Nevada, Utah, and Wyoming. This study included all rural and frontier nursing homes (N = 171) that are located in these five states and met the following eligibility criteria: (a) licensed as a nursing home, (b) certified by Medicare or Medicaid, (c) annual certification survey date fell between January 1, 2004 and June 15, 2005; and (d) located in an area that had a Rural Urban Commuting Area (RUCA) of 4 or greater (described below). Ten nursing homes that either had incomplete or missing OSCAR data (n = 6) or identified as having primary commuting flows to larger/urban areas (n = 4) were excluded from the analysis. The final sample consisted of 161 nursing homes.

**Measures**

Operational definitions of organization and market predictor variables of interest are summarized in Table 2. To determine rural location (i.e., large town, small town, isolated locale), we used the RUCA codes, which range from 1 to 10 and correspond with ZIP codes. ZIP codes that fall in categories 4 through 10 designate non-metropolitan areas. We classified nursing homes as located in a large town (RUCA 4 to 6), small town (RUCA 7 to 9), or isolated locale (RUCA 10) (Economic Research Service, 2004).

OSCAR is a large database available from CMS and contains information on Medicare/Medicaid-certified nursing homes, including reports from the nursing home's certification survey. Data include facility and aggregate resident characteristics, fire safety information, staffing, and deficiency information. Deficiencies typically are measured by the number of total deficiencies or the number of deficiencies in a subset classification, such as quality care deficiencies (Harrington et al., 2000; O'Neill et al., 2003). In this study, deficiencies were a sum of violations related to the
deficiency categories outlined in Table 2; we excluded fire safety violations.

Substandard quality care is defined by the number of serious deficiencies, as well as those that are isolated, pattern, or widespread, and the degree of harm caused to one or more residents. Table 1 displays the scope and severity grid and shows that the most serious deficiencies were categorized as J, K, L, H, I, and F (OIG, 2003). More recently, one team defined serious deficiencies as G level or higher (Grabowski & Stevenson, 2008). Data are collected at the
time of the annual certification survey, conducted every 9 to 15 months by trained surveyors. The survey process lacks auditing procedures to assume inter-surveyor reliability, in particular between states (Castle, Engberg, & Men, 2007), which potentially reduces the reliability and validity of OSCAR data. Despite these limitations, these data are the best available for health services research purposes in nursing homes.

Matthews-Martin et al. (2003) proposed a novel approach to examine deficiencies by numerically weighting categories based on scope and severity of deficiencies designated by CMS (Table 1). This approach is proposed to be superior to counts of total deficiencies because the relative impact in terms of harm to residents (severity) is modeled concurrently with the extent of the deficiency (scope). Scope identifies the number of affected residents: isolated, pattern, or widespread. Severity identifies the potential for harm, actual harm, or immediate jeopardy to resident health and safety. We applied this novel approach and calculated a WDS using the scoring matrix in Table 1 (Matthews-Martin et al., 2003). In the weighted analysis, we excluded nursing homes with no deficiencies for consistency with the scoring matrix (Matthews-Martin et al., 2003). A score was assigned to each deficiency based on the scope and severity combination; nursing homes with deficiency-free surveys would yield a score of zero. A higher WDS indicates greater scope, severity, or both. For example, a nursing home with four B level deficiencies (weight of 1) would have a WDS of 4 (WDS = 1 × 4), compared with a nursing home that had four I level deficiencies (weight of 28) would have a WDS of 112 (WDS = 28 × 4).

We evaluated case mix by examining activities of daily living (ADLs), such as eating, toileting, and transferring, a proxy for acuity available within OSCAR. We calculated the percentage of residents who needed assistance with each ADL for each nursing home. Competition was based on resident days of care of the nursing homes within each county using the Herfindahl Index, a common market concentration measure. This index is a ratio-level measure and ranges from 0% to 100% (100% = no competition).

Data Analysis

We conducted data analysis using SPSS version 14.0. The dataset was modified by conducting data cleaning procedures, such as eliminating duplicates and constructing variable and value labels, to facilitate analysis. We examined the distributions of scores on each variable to determine out-of-range scores and missing data, and to evaluate assumptions of statistical tests. We managed extreme values during the multivariate analysis by identifying extreme cases using dfbetas, which measure change in regression coefficients (Garson, 2007). Five cases had missing deficiency values. After comparing the nursing home and survey date to Nursing Home Compare (CMS, 2012), we concluded that the missing values meant the nursing home did not have a deficiency in that category. In these cases, zero was entered for deficiency data. Summary statistics were performed to describe the sample, and multiple regression analyses were conducted to examine the factors associated with number of deficiencies and the WDS.

Regression Modeling Considerations

For our first research aim, the dependent variable was the total number of deficiencies. Independent variables were location variables, organizational characteristics, and market characteristics. We created dummy variables for profit status, rural location, and state. The contribution of each independent variable to quality was examined using stepwise multiple regression analyses. Variables were ordered in a hierarchal manner in two blocks. The first block consisted of the state variables, with Nevada as the reference state because it had the highest number of deficiencies (Table 2). Variables were entered into the second block if the analysis of the relationship between each candidate variable and total number of deficiencies (dependent variable) was significant at a level of p < 0.1. Given the limited sample size, a conservative approach for screening outliers was selected to balance the need to retain the sample while simultaneously guarding against excessive influence of outliers. Dfbeta cut-off points in the literature range from small values, such as 0.20, to large values, such as ±2 (Garson, 2007). Cases with dfbetas greater than ±2 were excluded from this analysis. Based on this criteria, two cases were excluded from the deficiency regression analysis.

We followed the same procedure for our second research aim, the exploratory regression model analysis evaluating the WDS. Here, we excluded nine cases from this analysis. Consistent with the Gannett News Service weighting schema, we excluded nursing homes that had deficiency-free surveys (n = 5). To examine whether this exclusion biased the findings, we also ran the regression analysis with the five deficiency-free surveys included; the differences were negligible, so we used the sample without deficiency-free surveys for consistency and comparability. We also excluded nursing homes that showed dfbetas greater than ±2 (n = 4).
RESULTS
Rural Nursing Home Location

The 161 nursing homes were located in Colorado (62), Idaho (39), Nevada (13), Utah (16), and Wyoming (31). State comparisons of organizational and market characteristics have been reported previously (Towsley et al., 2011). These nursing homes averaged 67.5 beds. The mean occupancy rate for this sample of nursing homes was 77%. Just more than half were not part of a chain, and larger proportions of these freestanding nursing homes were located in isolated areas. Approximately one third of nursing homes in this sample were government affiliated. For-profit nursing homes were primarily located in large towns, whereas government-affiliated nursing homes were mainly located in isolated locales. The rate of ownership change was 41%. On average, nurse staffing HRPD for CNAs, LPNs, and RNs in these nursing homes were 2.29, 0.71, and 0.52, respectively. Among residents in these rural nursing homes, there were substantial rates of dependence with eating (48%), toileting (77%), and transferring (72%). Only 8 (of 44) nursing homes located in isolated locales provided Alzheimer’s disease specialty care beds.

Quality Performance: Deficiencies

Table 3 shows the breakdown of deficiencies by rural location and state. Ninety-seven percent of nursing homes in this study were cited for deficiencies; only five nursing homes were deficiency free. The mean number of deficiencies was 8.45 (SD = 6.30). Deficiencies did not differ based on large town, small town, or isolated locale. The most frequently cited categories of deficiencies were quality of care (30%), resident assessment (16%), and quality of life (11%). Twenty-eight percent of nursing homes in this sample were cited for serious deficiencies (G level and higher); these facilities averaged 1.87 serious deficiencies. The mean WDS was 53.84 (SD = 47.81). A one-sample t test revealed a significant difference in the WDS, t(155) = 3.33, p = 0.001, between this sample and the nationwide mean of 41.1 (Matthews-Martin et al., 2003). Because the nationwide sample excluded nursing homes that were deficiency free, we similarly excluded these nursing homes in this analysis to allow for comparison. A high correlation was found between total deficiencies and the WDS (r = 0.878, p < 0.001), which is not surprising since the WDS is created from the deficiency score data.

The first research aim examined the association of organizational and market characteristics with nursing home quality as measured by number of deficiencies. When controlling for state differences, all states were different from Nevada relative to deficiencies. In addition, Medicaid occupancy and LPN mix, were significant positive predictors of the number of deficiencies and accounted for a significant amount of variance, F(10, 158) = 4.90, p < 0.001 (adjusted R^2 = 0.16, Table 4). Thus, nursing homes located in Nevada or nursing homes with higher percentages of Medicaid occupancy, or those with higher percentages of LPNs in the staffing mix had more deficiencies. In our exploratory analysis (second research aim), all states were different from Nevada relative to deficiencies. In addition, Medicaid occupancy and LPN mix, were significant positive predictors of the number of deficiencies and accounted for a significant amount of variance, F(10, 158) = 4.90, p < 0.001 (adjusted R^2 = 0.16, Table 4). Thus, nursing homes located in Nevada or nursing homes with higher percentages of Medicaid occupancy, or those with higher percentages of LPNs in the staffing mix had more deficiencies. In our exploratory analysis (second research aim), all states were different from Nevada relative to the WDS. In addition, nursing home size (total beds) and Medicaid occupancy were significant positive predictors of nursing homes’ WDS, F(6, 151) = 4.02, p = 0.001 (adjusted R^2 = 0.11, Table 4). Nursing homes located in Nevada or nursing homes with more total beds had a higher WDS, as did those with higher Medicaid occupancy.

DISCUSSION

Rural nursing homes play an important role in their communities, and their characteristics may influence the nursing home’s stability and care quality. In this article, we examine the quality of these nursing homes by the number of deficiencies and the WDS.
Ninety-seven percent of nursing homes in this sample were cited for deficiencies, compared with 91% of nursing homes nationwide (OIG, 2008). No significant differences were found in number of deficiencies across locations by degree of rurality, and the average was comparable to the national mean of eight deficiencies (CMS, 2012). Both regression models illustrated that Nevada was different from the other four states. An examination of the means showed that Nevada had more deficiencies and a higher WDS. Because previous national reports on deficiencies in rural nursing homes did not clearly explain what categories were included in scoring, it is difficult to compare these findings with previous work (Phillips, Holan, et al., 2004). Additionally, published state data include both rural and urban homes, also limiting the value of comparison (Matthews-Martin et al., 2003).

Our rural sample of nursing homes averaged 0.52 serious deficiencies (G level or higher), which was greater than the 0.19 in the longitudinal and national sample of nursing homes that underwent ownership conversions (Grabowski & Stevenson, 2008). Furthermore, 28% of nursing homes in our sample were cited G level and higher deficiencies compared with 19% in a California sample (Kim, Kovner, et al., 2009). Lee et al. (2006) found that citing deficiencies categorized as G, H, or I was uncommon; in their study, which examined survey teams in Kansas, no team cited deficiencies categorized as J, K, or L. Seven nursing homes in our study received deficiencies in J, K, or L categories. The average WDS (53.84) for this sample of rural nursing homes that were not deficiency free was significantly higher compared with a 2003 nationwide sample of urban and rural facilities (41.1) (Matthews-Martin et al., 2003). Despite a similar mean number of deficiencies in rural Mountain West nursing homes and in nursing homes nationwide, more serious deficiencies and higher weighted scores in rural Mountain West nursing homes suggest lower quality and greater potential for actual harm to resident health and safety.

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>$p$ Value</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>$F$</th>
<th>$p$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV: Deficiencies</td>
<td>4.39</td>
<td>0.09</td>
<td>0.22</td>
<td>0.16</td>
<td>(10,158) 4.90</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: Colorado</td>
<td>–5.06</td>
<td>0.01</td>
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</tr>
<tr>
<td>Idaho</td>
<td>–4.74</td>
<td>0.02</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Utah</td>
<td>–9.00</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wyoming</td>
<td>–5.03</td>
<td>0.01</td>
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<tr>
<td>Ownership change</td>
<td>0.46</td>
<td>0.12</td>
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<tr>
<td>Profit status 1*</td>
<td>1.44</td>
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<tr>
<td>Profit status 2*</td>
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<td>0.74</td>
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</tr>
<tr>
<td>Medicaid occupancy</td>
<td>5.46</td>
<td>0.05</td>
<td></td>
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<tr>
<td>Percentage of LPNs in staffing mix</td>
<td>11.98</td>
<td>0.02</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>DV: Weighted Deficiency Score</td>
<td></td>
<td></td>
<td>0.14</td>
<td>0.11</td>
<td>(6,151) 4.02</td>
<td>0.001</td>
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<tr>
<td>Constant</td>
<td>38.89</td>
<td>0.03</td>
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<tr>
<td>IV: Colorado</td>
<td>–38.54</td>
<td>0.01</td>
<td></td>
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<tr>
<td>Idaho</td>
<td>–34.46</td>
<td>0.02</td>
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<tr>
<td>Utah</td>
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<td>Wyoming</td>
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<tr>
<td>Total beds</td>
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<tr>
<td>Medicaid occupancy</td>
<td>51.41</td>
<td>0.01</td>
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</tr>
</tbody>
</table>

Note. DV = dependent variable; IV = independent variable; LPN = licensed practical nurse.

* Dummy coded for regression: 1 = for profit versus nonprofit and government/county affiliated, 2 = for profit and nonprofit versus government/county affiliated.
The regression model for deficiencies indicated six significant predictor variables: the four state variables, Medicaid occupancy, and percentage of LPNs in the staffing mix. Similar to our findings, Kim, Harrington, et al. (2009) found that having more LPNs in the staffing mix was associated with a higher number of total and quality of care deficiencies. Interpreting the influence of staffing mix variables on deficiencies is complicated as these ratios are interdependent. For example, as LPN staffing ratio increases, RN staffing ratio potentially decreases. We handled this by including only one variable (LPN mix), which met our inclusion criteria (significance level of 0.05 with deficiencies) for the regression model. Seblega et al. (2010) reported an overall decrease of RNs in the staffing mix of 11,611 nursing homes from 1997 to 2007 and inferred that this decrease may be the result of substituting RNs with more readily available staff, such as LPNs and CNAs. As recommended in a recent review article, future research needs to consider not only staffing numbers but types and ratios of staff to better understand the relationships between staffing and quality (Spilsbury et al., 2011). Future research is needed to more thoroughly examine staffing mix variables. Some evidence indicates that RN staffing influences quality of care measures; however, the influence of LPN staffing has been inconsistent and unconvincing (Spilsbury et al., 2011). Why particular staff such as LPNs may influence deficiencies and whether this influence extends to other quality measures needs to be examined, especially since LPN staffing has increased (Seblega et al., 2010).

The exploratory regression analysis examining WDS also indicated state differences and two predictor variables: nursing home size and Medicaid occupancy. Higher Medicaid occupancy has been associated with more deficiencies (not weighted) in previous research (Kelly et al., 2008; Mor et al., 2004). Applying the WDS in this cross-sectional study provided us with information about the scope and severity of deficiencies in these rural nursing homes. Interpretation of this score is difficult as a value could indicate few high-level deficiencies or multiple low-level deficiencies. The number of deficiencies and a WDS are both recommended, as each provides a different aspect to assess quality. However, Matthews-Martin et al. (2003) questioned whether this rating system would be sensitive or specific enough over time if scores were converted into the current rating system that uses quintiles. They made several recommendations for standardizing ratings that will help make interpretations easier, especially for consumers. These include continuing to report the number of deficiencies each year versus using a rolling average, using both absolute scores and scores relative to other nursing homes, and using both separate and weighted scores. (Matthews-Martin et al., 2003).

Complicating the application of weighted deficiencies is the fact that investigators have used inconsistent approaches. For example, a recent study used different weights for scope and severity categories in an effort to account for state-to-state variations (Antonova & Zimmerman, 2012). Using consistent weighting will be necessary to fully assess quality in future research. Although we had few deficiency-free homes, we recommend including nursing homes that are deficiency free in future analyses. Such an approach would increase the generalizability of studies using the WDS to all nursing homes, not just those with deficiencies. Despite significant findings in the regression models, the percentage of variance explained for deficiencies and the WDS, respectively, was 22% and 14%, which suggests other factors influence deficiencies and the WDS. Rural nursing homes face inherent challenges (e.g., fewer resources) that may be important to care quality (Phillips, Holan, et al., 2004). For example, nursing homes have less auxiliary staff—a variable we did not measure but which may influence, positively or negatively, the nursing home’s ability to provide care that meets regulatory standards. Kang et al. (2011) proposed that even when staffing levels in rural nursing homes were comparable to nursing homes nationwide, quality was potentially poorer because rural nursing homes were less likely to hold accreditation status or have special care programs. Rural nursing homes may also have fewer resources to support quality improvement efforts. There are many facets to quality; the examination of aspects such as deficiencies, staffing, and services alone do not provide a holistic or comprehensive view of quality. Prospective research that examines nursing home quality more comprehensively is recommended.

LIMITATIONS

The cross-sectional nature of this study prohibited the examination of trends of nursing home improvement or decline over time. In addition, we could not assess the influence that some variables may or may not have had over time, such as changes in ownership or chain affiliation. The fixed sample size and Mountain West geographical location, which excludes urban nursing homes, decreases the generalizability of the findings, yet addresses the homogeneity of geography and resource issues inherent in the vast areas of the Mountain West. Although OSCAR data were suitable for the organizational and market character-
istics in this study, resident characteristics such as case mix and resident outcomes would be more appropriately obtained from Minimum Data Set (MDS) data (CMS, 2009). MDS data would allow for a more thorough examination of the relationships among resident acuity and deficiencies. Despite the potential usefulness of measuring scope and severity, these kinds of assessments could be biased at various levels—individual, region, or state—due to variability in training and evaluators. Moreover, as Kelly et al. (2008) suggested, each state’s demographic and political make-up may play a role in influencing state variation. Finally, deficiencies capture violations of care standards but not practices that contribute to and reflect good quality. Future research is encouraged to include and incorporate measurement tools that illustrate practices and outcomes of providing quality care.

CONCLUSIONS

Nursing home quality continues to be an important and salient policy issue; yet, little research has focused on rural nursing homes, although they constitute one third of nursing homes nationally. The concern for quality care is enhanced in rural areas where residents may not have access to quality services and nursing homes may be the primary source of health care. Exemplifying this concern, our findings suggest that nursing homes with higher percentages of LPNs have a greater number of deficiencies and nursing homes with more beds or more Medicaid occupancy had a higher WDS, which indicates poorer care and a lack of access to quality care. This lack of quality may be exacerbated in Nevada.

This report is one of the first to focus on the variability that occurs within a vast rural region. Some of the facility characteristics modeled in this study significantly explained a small portion of the variance in quality of care as measured by deficiencies and WDS identified in certification audits. These significant predictors represent factors important to types of resources that influence viability and stability (i.e., staffing mix, nursing home size, Medicaid occupancy). Deficiencies, especially those related to quality of care, are minimum standards for quality in long-term care, yet there is clearly a need for improvement. Further research is needed to identify, measure, and improve other factors that are important to the quality of long-term care. It will be essential to focus research in specific rural settings where there are unique challenges to providing long-term care. Considering state-to-state variability, which may be due to varying demographics, policies, and economic resources, will be important in future research. Given the growth of the older adult population in these Mountain West states, it is essential that nursing home providers, aging services, and government agencies work together to create viable options to ensure a variety of quality long-term care services are provided to residents in these communities.

REFERENCES


Phillips, C.D., Hawes, C., & Leyk Williams, M. (2004). *Nursing home residents in rural and urban areas, 2001*. College Station, TX: Texas A & M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center.


