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Surveying Multiple Health Professional Team Members within Institutional Settings: An Example from the Nursing Home Industry

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Abstract

Quality improvement and cost containment initiatives in health care increasingly involve interdisciplinary teams of providers. To understand organizational functioning, information is often needed from multiple members of a leadership team since no one person may have sufficient knowledge of all aspects of the organization. To minimize survey burden, it is ideal to ask unique questions of each member of the leadership team in areas of their expertise. However, this risks substantial missing data if all eligible members of the organization do not respond to the survey. Nursing Home Administrators (NHA) and Directors of Nursing (DoN) play important roles in the leadership of long-term care facilities. Surveys were administered to NHAs and DoNs from a random, nationally-representative sample of U.S. nursing homes about the impact of state policies, market forces, and organizational factors that impact provider performance and residents' outcomes. Responses were obtained from a total of 2686 facilities [Response Rate=66.6%] in which at least one individual completed the questionnaire and 1693 facilities [Response Rate=42.0%] in which both providers participated. No evidence of non-response bias was detected. A high-quality representative sample of two providers in a long-term care facility can be obtained. It is possible to optimize data collection by obtaining unique information about the organization from each provider while minimizing the number of items asked of each individual. However, sufficient resources must be available for follow-up to non-responders with particular attention paid to lower resourced, lower quality facilities caring for higher acuity residents in highly competitive nursing home markets.

Keywords

surveys; response rate; non-response bias; nursing home; healthcare providers

Introduction

Quality improvement and cost containment initiatives in health care increasingly involve interdisciplinary teams of providers. To understand organizational functioning, information is often needed from multiple members of the leadership team since no one person may have sufficient knowledge of all aspects of the organization. Nursing Home Administrators (NHA) and Directors of Nursing (DoN) specifically play important roles in the leadership of long-term care facilities. These providers are continually onsite yet differ in their experiences and knowledge. NHAs are generally responsible for administrative operations of the facility, including: hiring and training of employees; administering budgets; and maintaining and developing operating procedures. On the other hand, DoNs are usually responsible for the clinical operations of the facility with oversight responsibilities for direct patient care. Perspectives from both individuals are often important in understanding the administrative and clinical issues faced by long-term care institutions. To minimize survey burden, it is ideal to ask unique questions of each provider in the areas of their expertise rather than duplicating questions by asking similar items of both providers. However, this risks substantial missing data if all eligible providers do not respond to the surveys, and low response rates by one or more providers prohibit assessment of the differing provider perspectives. Low response rates can also increase survey error due to lowered statistical power, increased sampling error, and reduced generalizability (Groves et al., 2009; McLeod, Klabunde, Willis, & Stark, 2013).

Long-term care is an area in which the perspectives of multiple types of providers have been more likely to be included. Providers in these studies have most often included physicians (e.g., Medical Directors), nurses (e.g., Directors of Nursing [DoN]), or administrators (NHA) with response rates for these providers varying greatly depending on the sampling frame, study size, and mode of data collection. For example, in a study of samples drawn from professional membership lists, Colon-Emeric and colleagues (Colon-Emeric et al., 2005) reported a response rate of 40% for Medical Directors and 48% for DoNs for a mailed survey. On the other hand, Shirts and colleagues (Shirts et al., 2009) reported response rates of 16% for physicians and 11% for nurse practitioners for an internet survey. Response rates varied similarly when participants were recruited from specific nursing homes (Boyce, Bob, & Levenson, 2003; Jogerst, Daly, Dawson, Peek-Asa, & Schmuck, 2006; Resnick, Manard, Stone, & Castle, 2009; Young, Inamdar, Barhydt, Colello, & Hannan, 2010).

While several studies have included more than one long-term care provider from a facility, only a limited number of investigators have reported the combined response rate for these providers. Responses to a mailed survey from the NHA or DoN were received for 90% of 409 facilities in one state (Daly & Jogerst, 2005; Jogerst et al., 2006). In a study of four facilities in which physicians, pharmacists, nurse practitioners/physician assistants and nurses were asked to complete a mailed questionnaire, the facility rates ranged from 56%–93% (Handler et al., 2007). However, in another study including 300 facilities in one state, the Medical Director and DoN both only responded in 17% of the facilities (Young et al., 2010). Finally, in nationally-representative mailed survey of NHAs and DoNs from 6000 facilities across the United States, responses were received from at least one provider in 63% of the facilities (Castle & Decker, 2011; Castle, Wagner, Ferguson, & Handler, 2011).

Similarly, in another nationally-representative mailed survey of 1056 facilities, either the NHA or DoN responded in 57% of facilities but both providers participated in only 22% of facilities (Banaszak-Holl, Castle, Lin, & Spreitzer, 2012). These response rates are comparable to the relatively limited number of studies in other healthcare settings that explicitly attempted to enroll more than one respondent from an organization (for example, see (Ward, Teno, Curtis, Rubenfeld, & Levy, 2008) and (Rogove, McArthur, Demaerschalk, & Vespa, 2012)).

While response rates have been used as a proxy for the amount of response bias in a survey, prior studies have demonstrated that there is not necessarily a correlation between response rate and response bias (Asch, Jedrzewski, & Christakis, 1997; Groves & Peytcheva, 2008; Halpern & Asch, 2003; Halpern, Ubel, Berlin, & Asch, 2002). Therefore, while response rates had been used as the most common standard for measuring the quality of provider surveys (Cull, O'Connor, Sharp, & Tang, 2005), they are no longer considered the sole indicator of survey quality, and assessment of nonresponse bias is emerging as more informative for understanding a survey's limitations (Johnson & Wislar, 2012).

As part of a Program Project grant, *Shaping Long-Term Care in America*, funded by the National Institute on Aging, we conducted a survey of attitudes and practices of providers from a nationally-representative sample of U.S. nursing homes for use in addressing the aims of three projects about the impact of state policies, market forces, and organizational factors that impact provider performance and residents' outcomes. Both the Administrator (NHA) and Director of Nursing (DoN) from selected facilities were recruited to complete self-administered questionnaires in their respective areas of expertise about the nursing home. We describe our experiences with surveying both providers, including: (1) survey response and cooperation rates; (2) individual characteristics of respondents; (3) facility-level characteristics associated with provider participation; (4) survey non-response bias; and (5) costs associated with survey administration.

Methods

Sample

The sampling frame was the 2008 Online Survey Certification and Reporting (OSCAR) system. The OSCAR contains nursing home facility-level aggregate information collected by the Centers for Medicare and Medicaid Services (CMS) as part of the annual inspection and certification process for nursing homes. Therefore, except for a few non-participating, exclusively private pay facilities, all licensed nursing homes in the U.S. are included in the OSCAR database. To meet the substantive needs of the three projects, our goal was to have a representative sample of nursing homes with 30-499 beds from across the contiguous United States (excluding Alaska, Hawaii, and Washington, DC) with less than 20% of the beds in AIDS or pediatric units. Facilities were excluded if they had participated in previous phases of the study (n=285). Also, to meet the goals of the projects, it was important to have sufficient nursing homes in each of the following categories: (1) states with more versus fewer nursing homes (above versus at or below median number of homes); (2) type of ownership (for-profit freestanding, non-profit freestanding, hospital-based); (3) size of nursing home (30-120 beds versus >120 beds); and percentage of minority residents (10%

versus >10%). Based on these characteristics, we created 19 strata of interest (See Table 1). Although there was potential for 24 strata, all hospital-based facilities were combined, regardless of nursing home density and owner type, because: these facilities are under the ownership of a hospital; are most often on the hospital campus; are generally smaller than the average, non-rural freestanding facility; and frequently share staff with other general medicine nursing units in the hospital.

To determine the final sample size, each of the three substantive projects determined required sample sizes to address their specific research questions. The majority of proposed analyses were identification of differences in facility level responses to one or more survey items that differed between states with and without a particular state policy related to long-term care such as case-mix reimbursement, bed hold, and pay-for-performance. Therefore, based on the average of the project-specific sample sizes, a response from the Administrator or Director of Nursing was required from a minimum of 1800 facilities.

We created a stratified random probability sample with allocation proportionate to size. We sampled facilities in two phases. In the first phase, we randomly selected 8005 facilities from the 14,703 eligible facilities in the OSCAR database. In Phase 2, we randomly sampled 4149 of the 8005 facilities, estimating that response rates may be as low as 40–45%. Each facility was then contacted to obtain the names and contact information for the Administrator (NHA) and Director of Nursing (DoN). We determined that 114 facilities (2.7%) were not long-term care facilities, were out of business, or were not able to be contacted for other reasons. Therefore, a total of 4035 facilities were eligible for participation. Probabilities of selection were recorded for each facility in the sample and appropriately used in all analyses.

Data Collection

The NHA and DoN at each facility was mailed a questionnaire, self-addressed return envelope, cover letter with a user-name and password for web-response if they preferred this mode, as well as a letter of support from the facility ownership if it was available or from the professional organization with which the facility was associated. The data collection procedures were based on findings from a prior randomized trial of survey design characteristics with a similar sample (Clark et al., 2011).

The questionnaires for NHAs and DoNs were unique, contained items relevant to each of the three projects, and were designed to be completed in 20–30 minutes. Based on the randomized trial, we also created 5–10 minute versions of each of the questionnaires that included only a minimal set of critical items to address the substantive research. These shorter versions were offered to participants who refused the standard length versions. The questionnaires were designed in the form of a booklet with a graphic on the front cover. In addition, we designed three mailed reminder cards with seasonal pictures as a source of non-respondent contact.

The standard length versions of both the NHA and DoN questionnaires included items measuring opinions about long-term care policies in addition to demographic information. The DoN survey also included items about staffing and characteristics of providers;

hospitalization and emergency department practices; palliative care and hospice practices; and experiences with resident centered care. The NHA survey also included items about nursing home organization and environment; provider practices; management and staff participation; medical director employment and practice; and cost of care and financial considerations.

Data collection occurred from July 2009–July 2011, with active recruitment ending April 2011. Facilities were released for participation in waves of 250–500 to allow for sufficient follow-up of non-responders while balancing study resources. Telephone/e-mail/fax contacts were initiated with non-respondents two weeks after the initial mailing of the questionnaires. The type and schedule of contact with non-respondents varied throughout the study period and were determined by information available about the participant and/or facility. For example, participants in some facilities provided e-mail addresses while others did not have, or were unwilling to provide, an e-mail address. If information was mailed, e-mailed, or faxed to a participant, we waited at least 14 days between contacts. If we spoke with, or left voicemail for, the participant or the participant's assistant, we waited at least six days between contact attempts. A mailed reminder card was sent after approximately 10 telephone contacts with a facility. During these contacts, participants were offered the option of completing the questionnaire by telephone in addition to the mailed and web response options. Regardless of mode, providers who completed the questionnaire were mailed a \$35 gift card. The study was reviewed and determined to be exempt by the university's Institutional Review Board.

Measures

Individual and facility level characteristics—We included variables that have been associated with lower provider participation in prior studies of long-term care as well as measures that represent the economic, clinical, and administrative challenges faced by an individual facility that may ultimately affect the ability and willingness of providers to participate in a survey (Maas, Kelley, Park, & Specht, 2002; Menten & Tripp-Reimer, 2002; Tilden, Thompson, Gajewski, Buescher, & Bott, 2012). Characteristics of NHAs and DoNs included length of time as a provider, length of time in the position at the facility, and whether they were a provider for more than one long-term care facility. Facility-level measures were derived from the OSCAR (described above), Minimum Data Set (MDS), and Residential History File (RHF). MDS data are person-level data related to nursing home residents' clinical and functional status that are collected for every nursing home resident on admission and at least quarterly thereafter. We aggregated individual data to create facility-level measures. The RHF is a concatenated file of Medicare claims and MDS assessments that allows the tracking of patients' location on every day following their admission to a nursing home (Intrator, Hiris, Berg, Miller, & Mor, 2011). Facility-level characteristics were divided into three categories: (1) structural factors; (2) measures of quality of, and stress on, a facility; and (3) market factors. Structural factors included ownership type, facility size, and state Medicaid reimbursement rate (i.e. the daily amount paid to a facility for the care of residents on Medicaid). Measures of possible stress on a facility were percent of non-white residents and percent of residents whose primary support was Medicaid (Mor, Zinn, Angelelli, Teno, & Miller, 2004). Measures of quality were nursing direct care hours per

patient day (total productive hours for all nursing staff in a facility, standardized by the total number of resident days in each facility); and deficiency score (severity weighted number of quality and regulatory deficiencies found during the most recent regularly scheduled state inspection using federal inspection guidelines). Market factors included: number of nursing homes in a state; percent of nursing home days in a facility that were skilled nursing facility (SNF) Medicare-covered days; admissions per bed (number of admissions to a facility divided by total number of beds); nursing case mix index (relative intensity of care of different nursing home populations for all residents using the RUG-III resident classification system (Feng, Grabowski, Intrator, & Mor, 2006; Fries et al., 1994), percent of residents covered by a Medicare Health Maintenance Organization (HMO); and resident acuity index (a measure of care needed by residents and calculated based on the number of residents needing different levels of activities of daily living assistance, receiving special treatments such as respiratory therapy or IV treatment, and with certain diagnoses such as dementia). Unless specified, all characteristics were categorized at or below the median value versus above the median value.

Outcomes—We considered four outcomes: (1) survey response and cooperation rates; (2) number of contact attempts per survey completion; (3) survey non-response bias; and (4) costs associated with survey administration.

Response and cooperation rates: Individual-level response rates for NHAs and DoNs were defined as the number of returned questionnaires divided by the number of eligible respondents (AAPOR Response Rate 2; (American Association of Public Opinion Research, 2010)). In addition, two facility-level response rate measures were calculated. First, a facility was considered complete if at least one respondent at the facility returned the questionnaire. Second, a facility was considered complete if we received returned questionnaires from both the NHA and DoN (facility response rate). During the course of the study, participants were not able to be contacted because of position vacancies, facility closures, and facility restructuring. Therefore, cooperation rates were defined as the number of returned questionnaires divided by the number of eligible respondents contacted (AAPOR Cooperation Rate 2; (American Association of Public Opinion Research, 2010)). We computed cooperation rates for the NHA and DoN separately as well as for both eligible respondents at a facility (facility cooperation rate).

Number of contact attempts: The number of contact attempts required for survey completion was calculated in two ways: (1) number of attempts to a facility required for receipt of a first questionnaire; and (2) additional contact attempts to a facility required for the receipt of a second questionnaire after receipt of the first one.

Non-response bias: The extent of bias associated with facilities that responded to the survey was determined by comparing response rates across measures of facility quality and resident acuity. We chose the deficiency score as a measure of quality because it reflects how well each facility adheres to states' regulatory requirements based on detailed inspections of structural, process, and outcomes of residents' experiences. We used three measures of resident impairment (nursing home case-mix, prevalence case-mix index, and long-term

case mix) to reflect the clinical complexity of residents admitted and residing in a facility for which the leadership team must have sufficient numbers of trained staff for the acuity level of care required. Response differences by these quality and acuity measures would provide indication that the sample was biased toward sufficiently resourced, high performing facilities with leadership teams that were willing and able to take the time to complete a survey.

Costs: Costs of the study were based on the perspective of a researcher and did not account for costs to the providers themselves. Because the majority of costs associated with the study involved personnel, we first tracked staff time and individual contacts to providers. We used staff records to determine the number of minutes spent for each contact. Contact time included: mailing initial questionnaires; waiting on hold to speak with a provider; directly speaking with a provider or his/her assistant; sending e-mail reminders; and resending questionnaires by mail or fax. We calculated personnel costs as the sum of costs of direct staff time with potential participants but did not include administrative and supervision costs. Personnel costs were based on average staff salaries of \$20 per hour. We used budget records to estimate all other direct costs associated with the study including: incentives; office supplies; postage; printing and graphic services; and telephone charges. We added personnel costs and other direct costs together to determine total direct costs and computed costs per completed questionnaire with and without incentive costs (\$35 per respondent) included.

Analysis Plan

First, we calculated individual and facility-level response and cooperation rates. Second, descriptive statistics were calculated to compare individual-level characteristics of NHAs and DoNs. Third, using facility-level measures, we computed multivariable logistic regression models to assess characteristics associated with both providers in a facility completing the surveys. Next, to better understand the study resources required for obtaining an acceptable response rate from both providers, we conducted descriptive analyses (F tests) to assess characteristics associated with mean number of contact attempts for survey completion. Next, we conducted a five-step nonresponse bias analysis by: (1) creating stratum-specific, non-response adjusted weights for the NHA, DoN, and Facility; (2) comparing the response rates of facilities in the top half to those in the bottom half of the deficiency score, nursing case-mix index, and prevalence case-mix index; (3) examining nine of the most substantively important items in the NHA and DoN questionnaires to determine if there were significant differences in the means/proportions by deficiency score and long-term case-mix index among those who participated in the study; (4) examining the means/proportions for the nine items using stratum-specific, non-response adjusted weights and comparing these with the means/proportions for the same items using post-stratification weights to account for differential response rates; and (5) recalculating the non-response adjusted weights, treating short survey responders as non-responders and examining five survey items available in both the short and standard versions based on the weights used. Finally, we calculated overall costs for the survey administration.

Results

Response and Cooperation Rates

We obtained responses from a total of 2686 facilities [Response Rate (RR) = 66.6%, Cooperation Rate (CR) = 75.1%] in which at least one individual (Administrator [NHA], Director of Nursing [DoN], or both) completed the questionnaire and 1693 facilities [RR = 42.0%, CR = 47.3%] in which both providers completed the questionnaires. Overall, we obtained responses from 2215 NHAs [RR = 54.9%, CR = 62.6%] and 2164 DoNs [RR = 53.6%, CR = 61.5%]. Strata-specific rates are shown in Table 1. The overall refusal rate was 1.3% (NHAs: 5.8%; DoNs: 4.4%). A total of 55 NHAs (2.5%) and 122 DoNs (5.6%) completed the short rather than standard version of questionnaire.

Over half of participants (n=2553, 58.2%) completed the questionnaire by mail (NHA: n=1320, 59.5% and DoN: n=1233, 56.9%) with an additional 1831 (41.8%) completing by web (NHA: n=815, 36.7% and DoN: n=789, 36.4%) or telephone (NHA: n=84, 3.8% and DoN: n=143, 6.6%).

At the end of the survey period, vacancies in the NHA and DoN positions were reported by 42 (1.0%) and 61 (1.5%) of the eligible facilities, respectively. However, throughout the duration of the study, vacancies were reported at least once for the NHA position in 80 facilities (1.9%) and for the DoN position in 138 facilities (3.4%). A total of 24 (0.6%) facilities reported vacancies in the same position more than once and 6 facilities (0.1%) reported vacancies in both positions at the same time.

On average, it took 85.4 days (standard deviation [std] = 99.9; range=0–587 days) from the time the initial questionnaire was mailed until the providers completed the survey. More time was required for DoNs (91.2 days, std = 102.4; range=0–587 days) than for NHAs (79.5 days, std = 97.1; range 0–550 days). Less than 20% of providers (NHAs: 19.1%, DoNs: 14.2%) completed the questionnaire without any follow-up contacts. After initially mailing the questionnaire, we made an average of 7.1 (std=5.8) follow-up contacts to participants who ultimately completed the survey and an additional 14.1 (std=5.4) contacts to participants who did not complete it prior to study completion.

As shown in Figure 1, the cumulative proportion of completed questionnaires reached a plateau after 25 contact attempts to non-responders (top line, right axis), and there were minimal gains in the number of completed questionnaires after 10 contacts to individual providers (bottom line, right axis). Making at least three contacts to a facility increased the likelihood of obtaining responses from both providers in that facility. In addition, the number of responses from both providers peaked after eight, 19, and 25 contacts to a facility.

Characteristics of Respondents

Among respondents, 54.7% of the NHAs had been a nursing home administrator for more than 10 years while 30.4% of DoNs had worked as a DoN for more than 10 years ($\chi^2=98.76$, $p<.0001$). However, on average, there were no differences in the length of time the individuals had worked in their respective roles at the sampled facilities (mean=67.5 months

[std=81.9] for NHAs vs mean=54.4 months [std=65.7] for DoNs; $t=1.25$, $p=.213$). NHAs were more likely than DoNs to report serving in their respective roles at more than one long-term care facility (6.9% vs. 4.4%; $\chi^2=2.09$, $p=.0374$).

Characteristics of Participation

After obtaining a completed questionnaire from one provider in a facility, it took an average of 81 days (std=97.3, range: 0–540 days) and an average of 3.9 follow-up contacts (std=3.8; range: 0–21 contacts) to obtain a completed questionnaire from the other provider. Table 2 shows facility-level characteristics associated with at least one or both providers participating in the study. At least one provider (Column 2) or both providers (Column 3) were more likely to participate from facilities with lower deficiency scores, those that cared for primarily white residents, those with lower percentages of Medicaid residents, and in facilities located in states with fewer nursing homes. Both providers were also more likely to participate from smaller facilities and facilities with a lower admission case mix index. They were less likely to participate from facilities in states with lower Medicaid reimbursement rates.

As shown in Table 3, three facility-level characteristics were associated with mean number of contact attempts for receipt of a first questionnaire from a facility as well as characteristics associated with the mean number of additional contact attempts for the receipt of the second questionnaire after receipt of the first one. Fewer contact attempts with providers were required for those working in free-standing non-profit facilities, facilities with less resident acuity, and those that cared for primarily white residents. In addition, fewer contact attempts were required for receipt of a first questionnaire with providers from smaller facilities, facilities with lower deficiency scores, lower percentages of Medicaid residents, and those located in states with fewer numbers of nursing homes. Providers from facilities with lower percentages of SNF-Medicare covered days and less resident turnover (e.g., fewer numbers of resident admissions per bed) required fewer numbers of additional contacts to obtain a questionnaire from the second provider after one provider had participated.

Non-response Bias

We identified two strata (Strata 3 and 5) that had a differential response rate of 15% in either direction when comparing facilities in the top half to those in the bottom half of three measures of nursing home quality in facility-level analyses, as well as in separate analyses for NHAs and DoNs (participant-level analyses). We also identified one stratum (Strata 18) that had differential response among DoNs only (participant-level analyses). In addition, we found significant differences for only one stratum (Stratum 5) when examining the nine survey items to determine if there were significant differences in the means/proportions by deficiency score and long-term case-mix index among those who participated in the study (facility-level and participant-level analyses). However, we found no significant differences in the means/proportions for the survey items using stratum-specific, non-response adjusted weights when compared to the same items using post-stratification weights to account for differential response rates in stratum 5. Finally, we found no evidence of bias associated with the version (short vs. long) of the survey completed (participant-level analyses).

Costs

Research staff made a total of 47,422 contacts to providers in all the sampled facilities with an average of 15 minutes per contact. Including all direct costs, the average cost per survey completion by an individual provider (n=4379) was \$81 if incentive costs are excluded and \$116 if incentive costs are included. This increased to an average cost per survey completion of \$132 without incentive costs and \$188 with incentive costs for facilities in which at least one provider participated (n=2686) and \$208 without incentive costs and \$299 with incentive costs for facilities in which both providers participated (n=1693).

Discussion

We conducted unique surveys of Administrators and Directors of Nursing in a nationally-representative stratified probability sample of nursing homes in the United States. To our knowledge, this is the largest survey to date of nursing home providers conducted in the United States about the effect of state policies, market forces, and organizational factors on provider performance and residents' outcomes. We obtained responses from at least one provider in 67% of the facilities and responses from both providers in 42% of the facilities for a total of 4379 completed questionnaires. Response rates were comparable for Administrators (55%) and Directors of Nursing (54%). These response rates are higher than those of other nationally-representative mailed surveys of nursing home providers conducted since 2000, despite the fact that surveys of health professionals have been steadily declining (Cook, Dickinson, & Eccles, 2009; Cull, O'Connor, Sharp, & Tang, 2005; Cummings, Savitz, & Konrad, 2001; Hill, Fahrney, Wheelless, & Carson, 2006; McLeod et al., 2013).

Our ability to collect information from both providers was affected by vacancies in the provider positions. During follow-up contacts to non-responders, more than 200 facilities reported a vacancy in one or both of the provider positions, which supports other studies of staff turnover in long-term care organizations (Castle, 2006; Castle & Lin, 2010; Donoghue & Castle, 2007). Furthermore, the reported vacancy rate of approximately five percent is likely an underestimate of the actual turnover rate in sampled facilities because some facilities refused to provide any information about providers who did not respond to the survey. Our experiences also reinforce the sampling challenges highlighted by Tilden and colleagues who found that facilities that dropped out of a longitudinal research study had a significantly higher rate of turnover of key personnel compared to facilities that completed the study (Tilden et al., 2012).

Participation of one or both providers in a facility was associated with three of the four indicators of quality of, and stress on, a facility. Participation was lower among those working in facilities with more minority residents, residents whose care was primarily covered by Medicaid, and had more deficiencies related to care quality. In addition, it took more follow-up contacts to obtain questionnaires from providers in these facilities. Facilities with more minority and Medicaid residents typically have fewer resources, less staffing, and more deficiencies related to care quality. Therefore, respondents in these facilities may have little operating margin, be burdened with heavy clinical and administrative responsibilities, and/or may be more suspicious of studies asking about their facility. These findings are consistent with prior studies demonstrating that lack of time, heavy workloads, increased

stress, and perceived irrelevance of the research to day-to-day clinical and administrative responsibilities were associated with non-participation in surveys among other professionals (Barclay, Todd, Finlay, Grande, & Wyatt, 2002; Hummers-Pradier et al., 2008; Jepson, Asch, Hershey, & Ubel, 2005; Kaner, Haighton, & McAvoy, 1998; Stocks, Braunack-Mayer, Somerset, & Gunell, 2004; Sudman, 1985).

Participation by both providers was also associated with two of the three structural factors. Both providers were less likely to participate in larger facilities and those with lower Medicaid reimbursement rates. However, these structural factors were not associated with the number of contact attempts required to obtain completed questionnaires from both providers. Rather, ownership type was associated with contact attempts. Providers working in free-standing for-profit facilities required more follow-up contacts to complete the questionnaire than providers working in free-standing non-profit and hospital-based facilities. While we do not have data to explain these findings, providers at for-profit facilities were more likely than other providers to indicate during follow-up contacts that they had to obtain permission to participate from the owner of the facility prior to completing the questionnaire, thereby increasing the likelihood that additional follow-up contacts were required prior to research staff assigning a final study disposition. Our experiences with owners of for-profit facilities as gatekeepers are consistent with evidence from other studies that the presence of a gatekeeper contributes to a larger number of contact attempts and ultimately failure to complete surveys with other types of health care professionals (Beebe, Locke, Barnes, Davern, & Anderson, 2007; Klabunde et al., 2012; Parsons, Johnson, Warnecke, & Kaluzny, 1993; Parsons, Warnecke, Caza, Barnsley, & Kaluzny, 1994; VanGeest, Johnson, & Welch, 2007).

Provider participation was associated with only two of the six market factors. Unlike findings by Banaszak-Holl and colleagues (Banaszak-Holl et al., 2012), we did not find that occupancy rate was associated with participation. Rather, participation was lower and required more contacts to non-responders in facilities in states with higher numbers of nursing homes. In addition, both providers were less likely to participate in facilities in which the nursing case-mix was above the median value. Although not associated with actual participation, two other market factors, amount of post-acute care (e.g., SNF Medicare-covered days) and resident acuity, were associated with higher numbers of contact attempts. Providers from facilities with more post-acute care and higher resident acuity required more follow-up contacts to obtain completed questionnaires. Facilities with large numbers of post-acute care residents and residents requiring more intensive care (higher acuity levels) are likely burdened with highly stressful situations demanding considerable time from facility leadership, thereby decreasing time available to participate in research.

Despite differences in characteristics associated with participation, we did not find evidence of non-response bias in any of our analyses. This is similar to findings from a study of physicians in a large health network (Ziegenfuss et al., 2012). This may be due to our intensive efforts to follow-up with non-responders (Dillman, Smyth, & Christian, 2009), including phone, fax, e-mail, and seasonal reminder cards. In addition, similar to Parsons and colleagues (Parsons et al., 1994), we kept detailed records of the time and outcome of each contact attempt in order to monitor the efficiency of our recruitment efforts and tailored

our follow-up attempts based on information learned in prior contacts. However, our relatively high response rates and lack of response bias came with costs. To balance effort needed for follow-up with available resources, it took two years to complete all participant recruitment at an average of \$132 per facility for participation of at least one provider and \$208 per facility for participation of both providers, not including participant incentives.

We conducted resource intensive follow-up efforts to achieve the necessary sample sizes to conduct substantive analyses of interest across three projects. Berk (Berk, 1985) and Cull and colleagues (Cull et al., 2005) found that additional efforts to recruit difficult cases within provider surveys was not worthwhile because there were almost no difference in study conclusions with and without these cases included. However, given that we found that more contact attempts were required for facilities that cared for more minority and poor residents, limiting the number of contact attempts would have likely excluded many of them from our final sample. Therefore, future studies should continue to monitor the number, methods, and schedules of follow-up contacts and refusal conversions that are required to obtain cost-effective, high quality data from provider surveys (Klabunde et al., 2012).

Monetary incentives have been noted as important design effects for increasing response rates. For example, in a Cochrane review of randomized controlled trials evaluating ways to increase response rates to mailed surveys, Edwards and colleagues (Edwards et al., 2009) found monetary incentives to be the most effective method, more than doubling the odds of participation. Similarly, a meta-analysis by Yammarino and colleagues (Yammarino, Skinner, & Childers, 1991) found that incentives increased response rates about 12–18 percentage points on average in mailed surveys. In a recent analysis of all types of provider surveys, Cho and colleagues found that monetary incentives increased response rates by about 12 percent (Cho, Johnson, & VanGeest, 2013). However, the incentive amount can substantially affect the costs incurred for the study. To date, the optimal incentive amounts for provider surveys are unknown given the mixed results of prior studies (Field et al., 2002). For example, a review by VanGeest and colleagues (VanGeest et al., 2007) concluded that modest incentives are associated with improved physician response. Although the number of studies about nurses has been more limited, those that are available have shown any monetary incentive significantly improves response rates over no monetary incentive (Camunas, Alward, & Vecchione, 1990; Odon & Price, 1999; Ulrich et al., 2005; Ulrich & Grady, 2004; VanGeest & Johnson, 2011). However, Flanigan and colleagues (Flanigan, McFarlane, & Cook, 2008) have cautioned that too large of an incentive may be seen as a payment, thereby turning away many health professionals. We compensated participants \$35 for participation based on findings from a prior randomized trial of survey design characteristics with a similar sample (Clark et al., 2011). When we included incentive costs with other direct costs, the average costs increased to \$188 per facility for participation of at least one provider and \$299 per facility for participation of both providers.

Our results contribute to the growing body of research about methods to increase response rates and reduce nonresponse bias in provider surveys (Field et al., 2002; Klabunde et al., 2012; VanGeest et al., 2007), with specific consideration to the importance of determining the procedures and incentives for encouraging response among healthcare professionals other than physicians (Camunas et al., 1990; Gore-Felton, Koopman, Bridges, Thoresen, &

Spiegel, 2002; Kramer, Schmalenberg, & Keller-Unger, 2009; Ulrich et al., 2005; VanGeest & Johnson, 2011). Our experiences demonstrate that it is possible to obtain a high-quality representative sample of two providers in a long-term care facility. However, sufficient resources must be available for follow-up to non-responders with particular attention paid to lower resourced, lower quality facilities caring for more acuity ill residents in highly competitive nursing home markets. We recommend that future studies test whether comparably high response rates for more than one provider in an organization are possible in other types of healthcare settings such as hospitals, ambulatory care settings, and home health and hospice organizations, and the extent to which response rates are associated with organizational characteristics such as payment sources, patient acuity, and market competition. In addition, more research is needed about the extent to which study design features such as incentive structures and the number and type of re-contact methods can be applied across healthcare professionals or must be tailored to specific types of providers.

In conclusion, our findings have important implications for surveying healthcare professionals in institutional settings. As the U.S. healthcare system evolves and the organization, financing, and delivery of health services becomes more complex, surveys will remain a critical tool for studying provider attitudes and practices. However, to obtain an adequate number of observations at a reasonable cost (Kirchhoff & Kviz, 1981), it will be increasingly important to survey the most appropriate respondent based on the content of the questionnaire. Our experiences demonstrate that it is possible to optimize data collection by obtaining unique information about the organization from each provider based on their areas of expertise while minimizing the number of items asked of each individual. However, we also found that facility level characteristics were associated with non-response by both providers. Therefore, resources must be available to re-contact facilities with higher likelihood of non-response, thereby reducing the risk of non-response bias, lowered statistical power, and reduced generalizability, particularly among lower-resourced institutions.

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References

- American Association of Public Opinion Research. AAPOR Outcome Rate Calculator Version 3.1. 2010
- Asch DA, Jedrzewski MK, Christakis NA. Response rates to mail surveys published in medical journals. *J Clin Epidemiol.* 1997; 50(10):1129–1136. [PubMed: 9368521]
- Banaszak-Holl J, Castle NG, Lin M, Spreitzer G. An assessment of cultural values and resident-centered culture change in U.S. nursing facilities. *Health Care Manage Rev.* 2012;10.1097/HMR.0b013e3182678fb0
- Barclay S, Todd C, Finlay I, Grande G, Wyatt P. Not another questionnaire! Maximizing the response rate, predicting non-response and assessing non-response bias in postal questionnaire studies of GPs. *Fam Pract.* 2002; 19(1):105–111. [PubMed: 11818359]

- Beebe TJ, Locke GR 3rd, Barnes SA, Davern ME, Anderson KJ. Mixing web and mail methods in a survey of physicians. *Health Serv Res.* 2007; 42(3 Pt 1):1219–1234. [PubMed: 17489911]
- Berk ML. Interviewing physicians: the effect of improved response rate. *Am J Public Health.* 1985; 75(11):1338–1340. [PubMed: 4051077]
- Boyce BF, Bob H, Levenson SA. The preliminary impact of Maryland's medical director and attending physician regulations. *J Am Med Dir Assoc.* 2003; 4(3):157–163. [PubMed: 12854990]
- Camunas C, Alward RR, Vecchione E. Survey response rates to a professional association mail questionnaire. *J N Y State Nurses Assoc.* 1990; 21(3):7–9. [PubMed: 2213259]
- Castle NG. Organizational commitment and turnover of nursing home administrators. *Health Care Manage Rev.* 2006; 31(2):156–165. [PubMed: 16648695]
- Castle NG, Decker FH. Top management leadership style and quality of care in nursing homes. *Gerontologist.* 2011; 51(5):630–642. [PubMed: 21719632]
- Castle NG, Lin M. Top management turnover and quality in nursing homes. *Health Care Manage Rev.* 2010; 35(2):161–174. [PubMed: 20234222]
- Castle NG, Wagner LM, Ferguson JC, Handler SM. Safety culture of nursing homes: opinions of top managers. *Health Care Manage Rev.* 2011; 36(2):175–187. [PubMed: 21317661]
- Cho YI, Johnson TP, Vangeest JB. Enhancing surveys of health care professionals: A meta-analysis of techniques to improve response. *Eval Health Prof.* 2013; 36(3):382–407. [PubMed: 23975761]
- Clark M, Rogers M, Foster A, Dvorchak F, Saadeh F, Weaver J, Mor V. A randomized trial of the impact of survey design characteristics on response rates among nursing home providers. *Eval Health Prof.* 2011; 34(4):464–486. [PubMed: 21411474]
- Colon-Emeric CS, Casebeer L, Saag K, Allison J, Levine D, Suh TT, Lyles KW. Barriers to providing osteoporosis care in skilled nursing facilities: perceptions of medical directors and directors of nursing. *J Am Med Dir Assoc.* 2005; 6(3 Suppl):S61–66. [PubMed: 15890300]
- Cook JV, Dickinson HO, Eccles MP. Response rates in postal surveys of healthcare professionals between 1996 and 2005: an observational study. *BMC Health Serv Res.* 2009; 9:160. [PubMed: 19751504]
- Cull WL, O'Connor KG, Sharp S, Tang SF. Response rates and response bias for 50 surveys of pediatricians. *Health Serv Res.* 2005; 40(1):213–226. [PubMed: 15663710]
- Cummings SM, Savitz LA, Konrad TR. Reported response rates to mailed physician questionnaires. *Health Serv Res.* 2001; 35(6):1347–1355. [PubMed: 11221823]
- Daly JM, Jogerst GJ. Association of knowledge of adult protective services legislation with rates of reporting of abuse in Iowa nursing homes. *J Am Med Dir Assoc.* 2005; 6(2):113–120. [PubMed: 15871886]
- Dillman, DA.; Smyth, JD.; Christian, LM. *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method.* Hoboken, New Jersey: John Wiley & Sons; 2009.
- Donoghue C, Castle NG. Organizational and environmental effects on voluntary and involuntary turnover. *Health Care Manage Rev.* 2007; 32(4):360–369. [PubMed: 18075445]
- Edwards PJ, Roberts I, Clarke MJ, Diguiseppe C, Wentz R, Kwan I, Pratap S. Methods to increase response to postal and electronic questionnaires. *Cochrane Database Syst Rev.* 2009; (3):MR000008. [PubMed: 19588449]
- Feng Z, Grabowski DC, Intrator O, Mor V. The effect of state medicaid case-mix payment on nursing home resident acuity. *Health Serv Res.* 2006; 41(4 Pt 1):1317–1336. [PubMed: 16899009]
- Field TS, Cadoret CA, Brown ML, Ford M, Greene SM, Hill D, Zapka JM. Surveying physicians: do components of the "Total Design Approach" to optimizing survey response rates apply to physicians? Review]. *Med Care.* 2002; 40(7):596–605. [PubMed: 12142775]
- Flanigan, TS.; McFarlane, E.; Cook, S. Conducting survey research among physicians and other medical professionals-A review of current. 2008. Retrieved 9/27/10, <http://www.amstat.org/sections/srms/Proceedings/y2008/Files/flanigan.pdf>
- Fries BE, Schneider DP, Foley WJ, Gavazzi M, Burke R, Cornelius E. Refining a case-mix measure for nursing homes: Resource Utilization Groups (RUG-III). *Med Care.* 1994; 32(7):668–685. [PubMed: 8028403]

- Gore-Felton C, Koopman C, Bridges E, Thoresen C, Spiegel D. An example of maximizing survey return rates. *Methodological issues for health professionals. Eval Health Prof.* 2002; 25(2):152–168. [PubMed: 12026750]
- Groves, RM.; Fowler, FJ.; Couper, MP.; Lepkowski, JM.; Singer, E.; Tourangeau, R. *Survey Methodology*. 2. Hoboken, New Jersey: John Wiley & Sons, Inc; 2009.
- Groves RM, Peytcheva E. The impact of nonresponse rates on nonresponse bias. *Public Opin Quart.* 2008; 72(2):167–189.
- Halpern SD, Asch DA. Commentary: Improving response rates to mailed surveys: what do we learn from randomized controlled trials? *Int J Epidemiol.* 2003; 32(4):637–638. [PubMed: 12913043]
- Halpern SD, Ubel PA, Berlin JA, Asch DA. Randomized trial of 5 dollars versus 10 dollars monetary incentives, envelope size, and candy to increase physician response rates to mailed questionnaires. *Med Care.* 2002; 40(9):834–839. [PubMed: 12218773]
- Handler SM, Perera S, Olshansky EF, Studenski SA, Nace DA, Fridsma DB, Hanlon JT. Identifying modifiable barriers to medication error reporting in the nursing home setting. *J Am Med Dir Assoc.* 2007; 8(9):568–574. [PubMed: 17998112]
- Hill CA, Fahrney K, Wheelless SC, Carson CP. Survey response inducements for registered nurses. *West J Nurs Res.* 2006; 28(3):322–334. [PubMed: 16585808]
- Hummers-Pradier E, Scheidt-Nave C, Martin H, Heinemann S, Kochen MM, Himmel W. Simply no time? Barriers to GPs' participation in primary health care research. *Fam Pract.* 2008; 25(2):105–112. [PubMed: 18417465]
- Intrator O, Hiris J, Berg K, Miller SC, Mor V. The residential history file: studying nursing home residents' long-term care histories. *Health Serv Res.* 2011; 46(1 Pt 1):120–137. [PubMed: 21029090]
- Jepson C, Asch DA, Hershey JC, Ubel PA. In a mailed physician survey, questionnaire length had a threshold effect on response rate. *J Clin Epidemiol.* 2005; 58(1):103–105. [PubMed: 15649678]
- Jogerst GJ, Daly JM, Dawson JD, Peek-Asa C, Schmuck G. Iowa nursing home characteristics associated with reported abuse. *J Am Med Dir Assoc.* 2006; 7(4):203–207. [PubMed: 16698504]
- Johnson TP, Wislar JS. Response rates and nonresponse errors in surveys. *JAMA.* 2012; 307(17):1805–1806. [PubMed: 22550194]
- Kaner EF, Haighton CA, McAvoy BR. 'So much post, so busy with practice--so, no time!': a telephone survey of general practitioners' reasons for not participating in postal questionnaire surveys. *Br J Gen Pract.* 1998; 48(428):1067–1069. [PubMed: 9624749]
- Kirchhoff KT, Kviz FJ. A Strategy for Surveying Nursing Practice in Institutional Settings. *Res Nursing Health.* 1981; 4(3):309–315.
- Klabunde CN, Willis GB, McLeod CC, Dillman DA, Johnson TP, Greene SM, Brown ML. Improving the quality of surveys of physicians and medical groups: a research agenda. *Eval Health Prof.* 2012; 35(4):477–506. [PubMed: 22947596]
- Kramer M, Schmalenberg C, Keller-Unger JL. Incentives and procedures effective in increasing survey participation of professional nurses in hospitals. *Nurs Adm Q.* 2009; 33(2):174–187. [PubMed: 19305314]
- Maas ML, Kelley LS, Park M, Specht JP. Issues in conducting research in nursing homes. *West J Nurs Res.* 2002; 24(4):373–389. [PubMed: 12035911]
- McLeod CC, Klabunde CN, Willis GB, Stark D. Health care provider surveys in the United States, 2000–2010: a review. *Eval Health Prof.* 2013; 36(1):106–126. [PubMed: 23378504]
- Mentes JC, Tripp-Reimer T. Barriers and facilitators in nursing home intervention research. *West J Nurs Res.* 2002; 24(8):918–936. [PubMed: 12469727]
- Mor V, Zinn J, Angelelli J, Teno JM, Miller SC. Driven to tiers: socioeconomic and racial disparities in the quality of nursing home care. *Milbank Q.* 2004; 82(2):227–256. [PubMed: 15225329]
- Odon L, Price JH. Effects of a Small Monetary Incentive and Follow-up Mailings on Return Rates of a Survey to Nurse Practitioners. *Psychol Reports.* 1999; 85:1154–1156.
- Parsons JA, Johnson TP, Warnecke RB, Kaluzny A. The effect of interviewer characteristics on gatekeeper resistance in surveys of elite populations. *Eval Rev.* 1993; 17(2):131–143.

- Parsons JA, Warnecke RB, Cazja RF, Barnsley J, Kaluzny A. Factors associated with response rates in a national survey of primary-care physicians. *Eval Rev.* 1994; 18(6):756–766.
- Resnick HE, Manard B, Stone RI, Castle NG. Tenure, certification, and education of nursing home administrators, medical directors, and directors of nursing in for-profit and not-for-profit nursing homes: United States 2004. *J Am Med Dir Assoc.* 2009; 10(6):423–430. [PubMed: 19560721]
- Rogove HJ, McArthur D, Demaerschalk BM, Vespa PM. Barriers to telemedicine: survey of current users in acute care units. *Telemed J E Health.* 2012; 18(1):48–53. [PubMed: 22082107]
- Shirts BH, Perera S, Hanlon JT, Roumani YF, Studenski SA, Nace DA, Handler SM. Provider management of and satisfaction with laboratory testing in the nursing home setting: results of a national internet-based survey. *J Am Med Dir Assoc.* 2009; 10(3):161–166. e3. [PubMed: 19233055]
- Stocks N, Braunack-Mayer A, Somerset M, Gunell D. Bidders, fillers and filers--a qualitative study of GPs who don't return postal questionnaires. *Eur J Gen Pract.* 2004; 10(4):146–151. [PubMed: 15724124]
- Sudman S. Mail surveys of reluctant professionals. *Eval Rev.* 1985; 9(3):349–360.
- Tilden VP, Thompson SA, Gajewski BJ, Buescher CM, Bott MJ. Sampling challenges in nursing home research. *J Am Med Dir Assoc.* 2013; 14(1):25–28. [PubMed: 23041332]
- Ulrich CM, Danis M, Koziol D, Garrett-Mayer E, Hubbard R, Grady C. Does it pay to pay? A randomized trial of prepaid financial incentives and lottery incentives in surveys of nonphysician healthcare professionals. *Nurs Res.* 2005; 54(3):178–183. [PubMed: 15897793]
- Ulrich CM, Grady C. Financial incentives and response rates in nursing research. *Nurs Res.* 2004; 53(2):73–74. [PubMed: 15084990]
- VanGeest JB, Johnson TP. Surveying nurses: identifying strategies to improve participation. *Eval Health Prof.* 2011; 34(4):487–511. [PubMed: 21454329]
- VanGeest JB, Johnson TP, Welch VL. Methodologies for improving response rates in surveys of physicians: a systematic review. *Eval Health Prof.* 2007; 30(4):303–321. [PubMed: 17986667]
- Ward NS, Teno JM, Curtis JR, Rubenfeld GD, Levy MM. Perceptions of cost constraints, resource limitations, and rationing in United States intensive care units: results of a national survey. *Crit Care Med.* 2008; 36(2):471–476. [PubMed: 18216601]
- Yammarino FJ, Skinner SJ, Childers TL. Understanding mail survey response behavior: A meta-analysis. *Public Opin Quart.* 1991; 55(4):613–639.
- Young Y, Inamdar S, Barhydt NR, Colello AD, Hannan EL. Preventable hospitalization among nursing home residents: varying views between medical directors and directors of nursing regarding determinants. *J Aging Health.* 2010; 22(2):169–182. [PubMed: 20133957]
- Ziegenfuss JY, Shah ND, Fan J, Houten HK, Deming JR, Smith SA, Beebe TJ. Patient characteristics of provider survey respondents: no evidence of nonresponse bias. *Eval Health Prof.* 2012; 35(4): 507–516. [PubMed: 22357800]

Figure 1.
Number of surveys received by number of contact attempts

Table 1

Response Rates (RR) and Cooperation Rates (CR) by Strata

Number of Nursing Homes in State	Owner Type	Bed Size	% nonwhite	Stratum	Facility		Administrators		Directors of Nursing			
					RR (%)	CR (%)	RR (%)	CR (%)	RR (%)	CR (%)		
At or Below median number	Freestanding For-profit	Small (30-120)	10%	1	53.7	61.5	63.9	73.9	64.3	74.4		
			>10%	2	41.1	45.1	51.4	56.8	56.2	62.6		
		Large (120)	10%	3	42.4	48.3	56.1	63.8	54.5	63.2		
			>10%	4	44.3	47.0	56.8	61.7	53.4	56.6		
	Freestanding Non-profit	Small (30-120)	10%	5	63.0	68.2	71.4	79.4	71.4	77.3		
			>10%	6	50.0	59.4	65.8	80.6	65.8	78.1		
		Large (120)	10%	7	43.5	47.6	60.9	66.7	43.5	47.6		
			>10%	8	61.5	66.7	61.5	66.7	69.2	75.0		
		Above median number	Freestanding For-profit	Small (30-120)	10%	9	43.0	48.3	54.9	62.4	55.6	63.3
					>10%	10	35.0	40.0	48.7	56.2	45.8	53.5
Large (120)	10%			11	36.4	40.5	50.0	56.5	46.6	52.7		
	>10%			12	26.6	29.5	43.5	49.1	41.1	46.1		
Freestanding Non-profit	Small (30-120)		10%	13	53.7	59.1	65.3	71.8	63.4	70.8		
			>10%	14	39.6	46.0	55.4	64.4	45.5	54.1		
	Large (120)		10%	15	49.1	53.8	60.7	66.5	63.0	69.4		
			>10%	16	36.2	42.0	55.3	65.0	47.9	59.2		
	Hospital-Based		Small (30-120)	10%	17	51.0	61.6	61.5	76.2	68.3	84.5	
				>10%	18	31.6	63.2	50.0	100.0	39.5	93.8	
Large		Regardless	19	33.3	44.4	41.7	58.8	50.0	66.7			

RR=Response rate

CR=Cooperation rate

Table 2

Characteristics Associated with Participation of Nursing Home Providers (Adjusted Odds Ratios [AOR] and 95% Confidence Intervals [CI])

Facility and State-Level Characteristics	Participation of at least one provider in a facility AOR (95% CI)	Participation of both providers in a facility AOR (95% CI)
Structural Factors		
Ownership		
Free-standing non-profit	0.99 (0.64, 1.54)	1.34 (0.94, 1.92)
Free-standing for-profit	0.69 (0.45, 1.05)	0.96 (0.68, 1.36)
Hospital-based	Reference	Reference
Facility size		
30-120 beds	1.16 (0.98, 1.37)	1.25 (1.07, 1.46)
>120	Reference	Reference
State Medicaid reimbursement rate		
At or below median	0.86 (0.73, 1.02)	0.85 (0.73, 0.99)
Above median	Reference	Reference
Indicators of Quality and Stress on a Facility		
Deficiency score		
At or below median	1.16 (1.00, 1.35)	1.19 (1.04, 1.36)
Above median	Reference	Reference
Nursing direct care hours per patient day		
At or below median	1.05 (0.90, 1.22)	0.98 (0.86, 1.13)
Above median	Reference	Reference
Percent non-white residents		
10%	1.36 (1.15, 1.60)	1.43 (1.23, 1.66)
>10%	Reference	Reference
Percent Medicaid residents		
At or below median	1.29 (1.09, 1.53)	1.30 (1.12, 1.51)
Above median	Reference	Reference
Market Factors		
Number of nursing homes in state		
At or below median	1.43 (1.15, 1.76)	1.46 (1.22, 1.74)
Above median	Reference	Reference
Percent nursing home days that were SNF Medicare-covered days		
At or below median	1.07 (0.89, 1.28)	1.12 (0.95, 1.32)
Above median	Reference	Reference
Admissions per bed		
At or below median	0.94 (0.78, 1.13)	0.98 (0.83, 1.16)
Above median	Reference	Reference
Nursing case mix index		
At or below median	1.01 (0.86, 1.19)	1.19 (1.04, 1.36)
Above median	Reference	Reference

Facility and State-Level Characteristics	Participation of at least one provider in a facility AOR (95% CI)	Participation of both providers in a facility AOR (95% CI)
Percent residents covered by a Medicare HMO		
At or below median	1.01 (0.86, 1.18)	0.93 (0.81, 1.08)
Above median	Reference	Reference
Resident acuity index		
At or below median	1.12 (0.96, 1.31)	1.08 (0.93, 1.24)
Above median	Reference	Reference

Table 3

Characteristics Associated with Number of Contacts Required for Questionnaire Completion

Facility and State-Level Characteristics	Number of contacts for first questionnaire completion Mean (SD) F test, p-value	Number of contacts for second questionnaire completion* Mean (SD) F test, p-value
Structural Factors		
Ownership		
Free-standing non-profit	2.0 (2.6)	3.2 (3.0)
Free-standing for-profit	2.4 (2.8)	3.7 (3.5)
Hospital-based	2.2 (2.6)	3.3 (3.5)
	$F(2, 2681) = 6.75, p=.001$	$F(2, 1690) = 4.54, p=.011$
Facility size		
30-120 beds	2.1 (2.6)	3.4 (3.3)
>120	2.6 (3.0)	3.7 (3.4)
	$F(1, 2682) = 16.13, p<.001$	$F(1, 1691) = 2.16, p=.142$
State Medicaid reimbursement rate		
At or below median	2.3 (2.8)	3.5 (3.3)
Above median	2.2 (2.7)	3.5 (3.4)
	$F(1, 2682) = 0.41, p=.520$	$F(1, 1691) = 0.00, p=.989$
Indicators of Quality and Stress on a Facility		
Deficiency score		
At or below median	2.1 (2.7)	3.4 (3.3)
Above median	2.4 (2.8)	3.7 (3.4)
	$F(1, 2682) = 8.58, p=.003$	$F(1, 1691) = 3.38, p=.066$
Nursing direct care hours per patient day		
At or below median	2.3 (2.8)	3.6 (3.3)
Above median	2.2 (2.7)	3.4 (3.4)
	$F(1, 2682) = 0.79, p=.375$	$F(1, 1691) = 1.17, p=.280$
Percent non-white residents		
10%	2.0 (2.6)	3.2 (3.2)
>10%	2.6 (3.0)	4.0 (3.6)
	$F(1, 2682) = 27.76, p<.001$	$F(1, 1691) = 20.39, p<.001$
Percent Medicaid residents		
At or below median	2.1 (2.7)	3.4 (3.3)
Above median	2.4 (2.8)	3.7 (3.4)
	$F(1, 2682) = 8.90, p=.003$	$F(1, 1691) = 3.76, p=.053$
Market Factors		
Number of nursing homes in state		
At or below median	2.1 (2.6)	3.3 (3.3)
Above median	2.3 (2.8)	3.6 (3.4)
	$F(1, 2682) = 4.02, p=.045$	$F(1, 1691) = 1.89, p=.169$
Percent nursing home days that were SNF Medicare-covered days		

Facility and State-Level Characteristics	Number of contacts for first questionnaire completion Mean (SD) F test, p-value	Number of contacts for second questionnaire completion* Mean (SD) F test, p-value
At or below median	2.2 (2.7)	3.3 (3.2)
Above median	2.3 (2.8)	3.7 (3.4)
	$F(1, 2682) = 2.86, p=.091$	$F(1, 1691) = 6.50, p=.010$
Admissions per bed		
At or below median	2.2 (2.7)	3.3 (3.2)
Above median	2.3 (2.8)	3.7 (3.5)
	$F(1, 2682) = 0.92, p=.338$	$F(1, 1691) = 5.06, p=.025$
Nursing case mix index		
At or below median	2.2 (2.8)	3.5 (3.3)
Above median	2.3 (2.7)	3.5 (3.3)
	$F(1, 2682) = 0.06, p=.810$	$F(1, 1691) = 0.00, p=.952$
Percent residents covered by a Medicare HMO		
At or Below median	2.3 (2.8)	3.5 (3.4)
Above median	2.2 (2.7)	3.5 (3.3)
	$F(1, 2682) = 0.64, p=.423$	$F(1, 1691) = 0.27, p=.603$
Resident acuity Index		
At or Below median	2.1 (2.6)	3.2 (3.2)
Above median	2.4 (2.9)	3.8 (3.4)
	$F(1, 2682) = 11.04, p<.001$	$F(1, 1691) = 13.04, p<.001$

* Additional number of contacts made to a facility to obtain second questionnaire after receipt of first questionnaire.