

Competition Between Long-Term Care Providers: Evidence from the Introduction of Nursing Home Compare

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Abstract

Nursing homes have long been the dominant source of institutional long-term care for Medicaid and private-paying residents. In the past 20 years, alternative long-term care providers, such as Assisted Living Facilities, have entered the long-term care market. These facilities primarily serve private paying residents and face less stringent regulatory and licensing requirements. We do not know the extent of the relationship between these two types of providers. Do they compete for private-paying residents or do Assisted Living Facilities complement the services provided in nursing homes? We exploit a change in nursing home quality reporting requirements to evaluate the response of Assisted Living Facilities (ALFs) to potential competitors' information disclosure. We used a proprietary dataset to examine ALF inventory responses and market-level price and occupancy changes to gauge whether and ALFs are substitutes or complements to private paying residents. We find that, following the launch of Nursing Home Compare Five-Star ratings and subsequent increase in own-market NH competition and prices, ALFs responded by increasing inventory, first by reallocating existing units and then by constructing new units. Further, our results suggest existing NH competition and quality matter: ALF inventory changes were more pronounced in the most competitive NH markets and near high-quality NHs. We also find subsequent increases in average rent and occupancy in ALFs following the launch of NH Compare. Combined, these results suggest positive cross elasticity between ALFs and NHs and strengthen the prior assertion that ALFs compete with NHs for more lucrative private paying residents.

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The authors acknowledge with gratitude the National Investment Center for data sharing. This research was supported by National Institutes of Aging grants R01AG057501, 1P30AG059302-01, and 5T32HS26116-02.

The authors are also grateful for the helpful comments received in the Indiana University Health Policy Working Group.

Introduction

Nursing homes (NH) were traditionally the only providers of residential long-term care facilities in the US. Nursing homes provide 24-hour care to long-term residents. Heavily regulated, there were significant barriers to traditional forms of competition in the market by design due to “Roemer’s law”: a built bed is a filled bed in an insured population. NHs faced Certificate of Need laws limiting expansion and significant limitations on competition on price, since most NH residents are covered by Medicaid or Medicare (Trinkoff et al., 2019b). In highly competitive markets, quality was one of the few metrics on which to compete. Yet information about quality was hard to ascertain. In December 2008, CMS introduced a more detailed and digestible quality metric, Nursing Home Compare’s (NHC) Five Star Quality rating system (Figure A1), in hopes of increasing consumer engagement and consideration of quality when choosing nursing homes. For nursing homes, NH Compare should spur quality improvements and increase competition within a market. And indeed, it worked to some extent. In competitive markets, public quality reporting led to higher NH quality (Castle et al., 2008; Zhao, 2016). As expected, consumers responded to NH Compare as well: following the release of Five Star Quality Rating, NHs with high quality ratings gained an estimated 6% in market share, while NHs with low quality ratings lost 8% in market share (Werner et al., 2016). Similarly, the private pay price differential between the highest and lowest quality NHs widened, particularly in more competitive markets (Huang & Hirth, 2016). Taken together, these studies highlight one central point: consumers and nursing homes respond to publicly reported quality information, particularly in competitive markets.

Over the last 20 years, there has been exponential growth in alternative residential long-term settings, primarily in the form of Assisted Living Facilities (ALF). ALFs provide assistance with activities of daily living (ADLs), medication management and personal care services for residents living in private quarters resembling apartments (Trinkoff et al., 2019a). They frequently offer additional amenities to residents, including personal laundry services, book clubs, and recreational trips (AARP, 2019). While regulated, they do not face the same constraints as nursing homes; as of 2018, around 10 states have Certificate of Need laws, but they are much less binding given the rise in the ALF industry. While both nursing homes and assisted living facilities are subject to state health inspections, only Medicare and Medicaid-certified nursing homes undergo the stringent quality rating algorithm reported by CMS. ALFs are also filled predominately with private-pay residents, since they are typically not covered by Medicare or Medicaid, and thus do not face the same price-taker status as NHs. Thus, ALFs could be competing with NHs, especially for private-pay residents, on all three dimensions: location, price, and quality.

More recently, there has been an increase in hybrid models of long-term care. One example of these hybrid models is the Continuing Care Retirement Community, which houses a Nursing Care segment and Assisted Living and/or Independent Living³ (ILF) segments within the same facilities. Other hybrid models include some combination of Assisted Living Facilities and Independent Living or Memory Care⁴

³ Independent Living Facilities (ILF) offer the same amenities as ALFs for long-term care residents who do not require nursing care.

⁴ Memory Care Facilities are similar to other long-term care settings but specialize care for residents with Alzheimer’s disease or other forms of dementia.

(MC) facilities. These settings provide residents the opportunity to transition to different types of care as needed without transferring to another facility altogether.

There is growing interest in understanding the role ALFs play in long-term care. Do they compete with NHs for private pay patients? Or do they expand the continuum of long-term care services available by providing different service bundle? Research to date has been fairly limited, primarily due to data limitations (Grabowski & Town, 2011; Stevenson & Grabowski, 2010). Silver et al. (2018) find evidence of ALFs serving as intermediaries between seniors living independently and moving into nursing homes in high income areas, reducing the private pay revenue and occupancy of NHs. However, the associations between AL entry on NH are ambiguous: there has been no evidence showing private pay prices in NHs change (Bowblis, 2014), and the effects of ALF entry on NH quality are mixed (Bowblis, 2012).

We take a complementary approach to further provide evidence on the question of whether ALFs compete with NHs. In this paper, we assess how ALFs responded to the introduction of NH Compare, an exogenous change in the structure of the residential long-term care market, NH public quality reporting. We bring a unique proprietary data set to the question, using a multi-year panel of quarterly Assisted Living inventory to study entry, occupancy, and pricing patterns.

We find a 1.8% increase in Assisted Living Facility inventory following the introduction of NH public quality reporting. Further we find a \$4 per day (0.31%) increase in NH prices and 0.6 percentage point overall increase in occupancy after the launch of NH Compare. As expected, ALF response was strongest near high-quality nursing homes in the most competitive areas. The mechanism in which ALFs responded to NH Compare differed over time. In the first 3 years after NH Compare launched, ALFs with the flexibility reallocated inventory from Memory Care or Independent Living facilities to ALFs, sometimes establishing an ALF where one did not previously exist. In the fourth and fifth years after NH Compare, increases in ALF inventory came in the form of new construction.

Our analysis is novel in several aspects. First, we utilize a novel dataset, NICMAP, that provides inventory, prices, and occupancy for long-term care facilities in a select number of Metropolitan Statistical Areas (MSAs). More importantly, while existing research has shown an association between NHs and ALFs suggesting they are substitutes, our analysis seeks to strengthen the link. We present the first estimates of the ALF price and price changes in response to NH price changes and long-term care demand changes.

The findings from this study are of substantial policy importance. There is evidence that NHs engage in cost shifting, increasing private pay prices when Medicaid prices are lower (Hackmann, 2019). If ALFs successfully compete with NHs for private paying residents, this potentially reduces the quantity of private paying residents admitted to nursing homes. Limits revenue of NHs, particularly since NHs are price-takers for Medicaid residents. The spiral continues until there are no private paying residents. This is more likely to affect high quality NHs in highly competitive areas, as ALFs competition is strongest there, but is likely to be offset by the increase in quality due to increased competition.

Conceptual Model

Prior to the introduction of Nursing Home Compare, nursing home quality information was available, but not easily obtained or interpreted by potential consumers. Nursing homes competed on private pay price and location; there was an implicit inference of average quality among all nursing homes. The introduction of Nursing Home Compare Five-Star Quality Ratings potentially added an additional dimension of competition between nursing homes, so that they may compete on private pay prices, quality, and location. Prior research shows that nursing homes indeed began to compete on quality with the introduction of Nursing Home Compare. Consistent with theories of the effect of public information disclosure, the launch of NH Compare led to higher NH quality in competitive markets (Castle et al., 2008; Zhao, 2016). Previous research on the effect of information disclosure suggests consumers respond by shifting demand toward higher quality products, increasing prices and market share among the highest quality products (Mathios, 2000). Indeed, consumers responded to NH Compare as well: following the release of Five Star Quality Rating, NHs with high quality ratings gained an estimated 6% in market share, while NHs with low quality ratings lost 8% in market share (Werner et al., 2016). Most relevant to this study is Huang and Hirth's (2016) finding that the private pay price differential between the highest and lowest quality NHs widened following the launch of Nursing Home Compare Five-Star Ratings, particularly in more competitive markets. Taken together, these studies highlight one central point: consumers and nursing homes respond to publicly reported quality information, particularly in competitive markets.

Previous research on the effect of NH Compare has focused primarily on competition between NHs. What is not known is the effect of a differentiated product, ALFs in our case, on mandatory quality disclosure of NHs. The response by ALFs to NH Compare may differ depending on their strategic role on the long-term care continuum. If ALFs are simply providing different services to a different set of individuals, the public quality reporting standards of NHs would mandate no action from ALFs. In this case, NHs and ALFs are targeting different populations, so one provider's standards for competitiveness would be independent of the other. However, if ALFs are competing for a subset of the NH's potential market, changes in the standards of competitiveness for NHs would ostensibly change standards of ALFs as well. Previous research (Bowblis, 2012; Silver et al., 2018; Stevenson & Grabowski, 2010) hints at ALFs competing with nursing homes for private paying long-term residents. We aim to improve this link by exploiting the change in nursing home quality reporting and the ensuing increases in NH competition to estimate the response, if any, by Assisted Living Facilities.

We take the increase in prices resulting from public quality reporting as given based on the prior research and investigate the ALF response to those increased NH prices, using changes in ALF planned inventory as a proxy for changes in demand for Assisted Living care. For this study, we abstract away from the exact estimate of NH price changes and cross-price elasticity; instead, we focus on the direction of the sign to determine the competitive relationship between ALFs and NHs. If indeed NHs and ALFs are substitutes and competing for private paying residents, we expect the sign of the cross-price elasticity to be positive, i.e., we expect an increase in the available ALF inventory (Figure A2). Because of the relationship between competition and quality described by Zhao, 2016, we expect the most substantial activity to take place in the most competitive markets.

Timing in competition is essential, and if an ALF is indeed competing with a nearby NH, the profit maximizing firm responds to changes in demand quickly. We hypothesize non-CCRC hybrid long-term care settings converted quickly unoccupied ILF or MC inventory to ALFs in response to the ALF demand shift. Construction of new ALF units, if any, followed in later years due to the inevitable lag time associated with construction and regulation for opening new facilities.

We also hypothesize that, since ALFs are price-setters rather than price-takers, demand increases will be met with modest increases in prices. Likewise, increases in demand should be reflected in increases in ALF occupancy.

Data

We constructed a longitudinal dataset of nursing homes using the 2006-2013 CMS Provider of Service files, which detail the location and bed count of each Medicare- and Medicaid-certified NH. We matched these NHs with their 2009 Nursing Home Compare Five-Star Quality ratings. NHs that did not have a recorded quality rating in 2009 were eliminated from the analysis.

We also compiled the inventory of ALFs using proprietary data of long-term care facilities supplied by the National Investment Center (NIC MAP). NIC MAP consists of facility-level longitudinal data that tracks Memory Care, Nursing Home, Assisted Living Facility, and Independent Living Facility inventory and construction in the most populous Metropolitan Statistical Areas (MSAs) by quarter. NIC MAP data are categorized by the property construction status (Expansion or New Construction) and include property characteristics such as whether the facility exists solely as an ALF or a combination of different types of facilities. We restricted NIC MAP data to 31 Metropolitan Statistical Areas (MSAs) for which data exist between 2006 and 2013. We eliminated facilities that may also offer nursing home beds on-site, sometimes referred to as Continuing Care Retirement Communities (CCRCs), which may be directly affected by the introduction of NH Compare. We also obtained county-level rent and occupancy levels from NIC MAP.

Empirical Strategy

To determine whether ALFs responded to NH public quality reporting, we defined a market for each nursing home within 31 Metropolitan Statistical Areas (MSAs) using the prior year's nursing home admissions data. We then characterized potential ALF competitors by matching ALFs to nursing homes in which the pairwise distance placed the ALF within the established nursing home market. We aggregated ALF inventory by nursing home market and measured the change in ALF inventory after the introduction of nursing home quality reporting, accounting for factors that may influence both supply and demand.

Defining Nursing Home Markets and Competitive Markets

We followed Bowblis (2014) and defined the market for each nursing home as the geographic area in which 90% of that NH's patients were admitted. Using initial admission assessments from the 2008 Minimum Data Set, we ranked zip codes based on the count of patients admitted. We then calculated

the Euclidean distance between the NH and patient zip code and defined the size of each NH market as the median distance of zip code-NH pairs⁵.

To understand the existing competition between NHs, we calculated the distance between each pair of NHs in the dataset. For each NH in the dataset, we preserved the potential competitors where the distance between the two NHs falls within the bounds of the NH market. We then used the bed count of each individual NH's competitors to calculate a Herfindahl-Hirschman Index (HHI)⁶ for each NH market.

We determined which ALFs are within NH markets by calculating the distance between each NH-ALF pair. We retained pairs where the distance falls within the NH market.

Outcomes

Our primary outcomes of interest are changes in ALF market entry, prices, and occupancy. ALF market entry is measured in two ways: change in the number of NH markets with ALF activity (extensive margin) and change in the number of ALF planned units in each nursing home market (intensive margin). We explicitly decomposed the changes in ALF inventory into three components: ALF entry and exit, expansion through construction of a new facility or expansion of an existing facility, and reallocation of existing units within combined facilities.

ALF prices and occupancy are at the county-level, which we match with respective ALFs in each NH market.

Evaluating the Effect of the NH Compare Introduction on ALF Construction

For each NH market m in quarter-year t and county c , we estimate the effect of NH Compare on outcomes using the following equation:

$$Y_{mt} = \alpha_0 + \sum_{\tau=1}^5 \beta_{\tau} NHCompare_{t-\tau} + X'_{ct}\gamma + \delta_m + \epsilon_{mct} \quad (1)$$

In this equation, Y_{mt} is the ALF construction by year (t) and NH market (m). The policy variable, $NHCompare_{t-\tau}$, represents the quarter relative to 2006-2008, the period prior to the NH Compare introduction. This is a count variable to allow for differential effects over time since the introduction of NH Compare. δ_m accounts for nursing home market-level fixed effects. To account for changes in demand and supply due to the economic downturn, we included county-level covariates, denoted as X'_{ct} , that describe the market for long-term care and the state of economy for the county in which each NH is located. These include: the fraction of population over age 65, calculated using 2006-2013 waves of the American Community Survey; quarterly unemployment levels from the Bureau of Labor Statistics (BLS); annual inflation-adjusted per-capita income as reported by the Bureau of Economic Analysis

⁵ A small percentage of nursing homes admitted residents from distances that exceeded a plausible nursing home market size. To account for these outliers, we Winsorized the NH market size, eliminating the highest 10% of NH distances. This reduced the average NH size from 18.3 miles to 16.5 miles.

⁶ We follow the guidance from the United States Department of Justice (<https://www.justice.gov/atr/horizontal-merger-guidelines-08192010#5c>) to calculate market concentration.

(BEA); annual population as estimated by the United States Census and reported in the American Community Survey (ACS); the fraction of population that is female, also from the ACS; and the Housing Price Index (HPI), obtained from the Federal Housing Finance Agency (FHFA).

We estimated the likelihood of ALF activity following the launch of NH Compare using a fixed effects logit model with bootstrapped standard errors. We estimated the number of planned ALF units (construction and conversion), prices, occupancy with fixed-effects linear regressions, clustering standard errors at the NH market level.

We stratified by market concentration to evaluate whether ALF construction changes were more pronounced in more competitive markets. We also examined whether there were differential ALF responses near higher- or lower-quality nursing homes by categorizing NHs by the average quality rating over 4 quarters in 2009.

Results

Our final dataset consisted of 2,688 Assisted Living Facilities and 4,258 nursing homes. The average nursing home just prior to the launch of NH Compare contained 135 beds. At the end of 2013, the average nursing home size decreased slightly to 134 (Table 1). In 2009, the average quality rating among nursing homes was 2.90 out of five possible stars. The median nursing home market spans 16 miles (Figure 1), while the mean distance between a nursing home and the potential ALF competitor is 10 miles. Each nursing home has, on average, 14 potential ALF competitors with 777 ALF total units (Figure 2). Slightly fewer than 9% (380 of 4,258 NHs) of all nursing home markets experienced no ALF activity throughout the study period.

Of the 2688 ALFs, 979 are freestanding ALFs and the remaining 1,709 combined with Independent Living Facilities and/or Memory Care Facilities for at least some of the study period. The total number of ALF units across all 31 MSAs increased from 213,928 at the end of 2008 to 236,648 at the end of 2013 (Table 1). The average size of ALFs across NH markets prior to NH Compare was 77 beds per ALF; after NH Compare, this increased to nearly 85 beds. Across all 31 MSAs, the unadjusted mean ALF daily price and occupancy were relative constant throughout the study period (\$132 and 90%, respectively).

ALF Entry and Exit

We first examined the overall and decomposed changes in ALF activity in response to the launch of Nursing Home Compare. In Figure 3, we show graphically the total number of ALFs entering and exiting the long-term care market in all 31 MSAs. Over the course of the study period, 478 ALF opened (67 freestanding) and 99 ALFs closed (62 freestanding). Entry of new ALFs (left side of Figure 3) remained unchanged throughout the study period. Likewise, the count of ALFs exiting markets remained unchanged throughout the study period (right side of Figure 3). Following the launch of NH Compare, some facilities diversified long-term care offerings; there was a notable increase in the number of facilities that previously offered only Memory Care and/or Independent Living adding Assisted Living units.

In Table 2, we show the likelihood of ALF activity (construction of new units or conversion of existing units to ALF units) following the introduction of NH Compare, displayed as odd ratios. In the first two years following the launch of NH Compare, ALF were less likely to enter new NH markets (OR=0.44 and 0.50, respectively) overall compared to the period prior to the policy change (2006-2008). In years 4 and 5, ALFs were 3.6 and 6.2 times more likely to initiate activity in a NH market relative to the period prior to NH Compare. ALFs were more likely to enter NH markets with higher populations (OR 1.67), fewer individuals over age 65 (OR 0.3), and lower unemployment (OR 0.9). Throughout the study period, ALFs were consistently less likely to initiate construction of new facilities. However, beginning in year 2 after NH Compare, facilities with ILF or MC components were much more likely to initiate activity by converting existing units from ILF or MC units to ALF units. By year 5, the odds ratio was 11.5. Firms were more likely to initiate a conversion of units in areas with highly dense populations (OR 3.1), lower per capita income (OR 0.7), a lower fraction of individuals under 65 and female (OR 0.8 and 0.66, respectively), and lower unemployment (OR 0.8). Overall, our regression-adjusted estimates show the likelihood of ALF activity in a market after NH Compare was not statistically different from the likelihood of ALF activity prior to NH Compare (not shown), with the likelihood of ALFs constructing units in new markets offsetting the likelihood of ALF conversions in new markets.

ALF Net Inventory Changes

We next evaluate changes in ALF inventory following the introduction of NH public quality reporting. Figure 4 shows the unconditional regression-adjusted difference in Assisted Living Facility inventory following the launch of Nursing Home Compare, relative to the period prior to NH Compare (2006-2008). Overall, ALF inventory increased by nearly 14 units, or 1.8% (14/777), per NH market following the launch of nursing home public quality reporting. ALF response to NH Compare varied by year; the largest increases in ALF inventory per NH market occurred in the first year after NH Compare. By the fourth year after the policy change, the change in overall inventory by NH market was statistically zero. ALF inventory increases happened almost exclusively in the most competitive NH markets (HHI<500) (Figure 5 and Table 4).

We further examine inventory changes to NH Compare by separating ALF activity into new construction and conversions within existing facilities. The second and third columns of Table 3 and Figure 6 show the construction of new ALF units and reallocation of units within existing long-term care facilities by NH market. In the first year after the launch of NH Compare, ALFs added nearly 4 new beds per NH market through new construction in the first year after NH Compare, then none in the second year. In years 4 and 5 after NH Compare, ALFs added just over 2.5 beds per NH market from new construction relative to the period prior to NH Compare.

Our results reflect activity in all NH markets, including those where no ALF activity occurs throughout the study period. However, nearly 40% of the 4,258 NH markets had no ALF activity between 2006 and 2013 (first column of Table 6). We also examined ALF construction and conversion activity conditional on any activity in the NH market during the study period (Columns 4-6 of Table 3). We find modest differences between these analyses and the unconditional regressions. However, if we focus only on the time periods in which the activity took place, we find the increase in inventory is driven strongly by conversion of existing units within combined facilities in the first three years after the launch of NH

Compare, then construction of new units in the last two years. Consistent with the overall inventory increase, the conversion of existing units within combined facilities is highest in the most competitive NH markets (Table 5).

Does Quality Matter?

We further examined whether the availability of quality information, and the associated diminished search costs for potential consumers, versus the quality rating itself drove ALF decisions following the launch of NH Compare. If the information disclosure is more important than the quality ratings themselves, any changes in ALF activity should be proportionate across NH markets, regardless of the quality level. However, if the quality rating itself matters, the ALF firm response should be concentrated among higher quality NH markets where the private-pay nursing home prices increased the most.

Table 7 displays the probability of ALF activity by NH market after the introduction of NH Compare, stratified by the average 2009 quality rating. Consistent with the overall results in Table 2, ALFs were less likely to have any activity across all NH quality levels in the first two years after the introduction of NH quality reporting. However, we find that response differs by quality rating of the nearby NH, with a substantially lower odds ratio of new ALF activity, relative to the period prior to NH Compare, in the higher quality NH markets. In the fourth and fifth years following NH Compare, the probability of new activity in NH markets increased substantially in all except markets with NH quality below 1 star.

In Tables 2 and 7, we found that firms concentrated ALF activity on a select few markets in the first 2 years following the launch of NH Compare. In Tables 3 and 8, we show that, although there were fewer NH markets in which ALF activity took place, the intensity of ALF activity in those markets was much higher relative to the period prior to NH Compare, and the response was highly concentrated among high quality NH markets. Indeed, in markets with the highest quality NHs (4-5 stars), ALF inventory increased by 10% following NH Compare, and by over 14% in markets with NH quality ratings between 3 and 4 stars.

ALF Occupancy and Prices

We hypothesized that, if ALFs competed with NHs and NH prices increased after the launch of NH quality disclosure, ALF prices would increase as well. Table 9 shows the price responses of the ALF industry following the introduction of NH Compare. On average, ALF rent increased by \$4 dollars per day over the pre-NH Compare daily rate of \$132. Consistent with the early ALF response of marginal reallocation of existing inventory, the price increase was highest in the first year following NH Compare, relative to 2006-2008. As market-level ALF inventory increased due to construction of new units, price increases relative to pre-NH Compare levels were lower, but still positive and statistically significant.

Consistent with our hypothesis that ALF demand would increase following the introduction of NH quality reporting, we expected ALF occupancy to increase accordingly. Indeed, occupancy consistently increased each year following the launch of NH Compare, ending year 5 at 1.77 pp above the occupancy levels in 2006-2008. Overall, occupancy increased by 0.6 percentage points over the pre-NH Compare occupancy rate of 90%.

Conclusion

In this paper, we evaluated the response of potential competitors to firms' mandatory quality disclosure in the context of NHs and ALFs. We examined whether ALFs were NH substitutes for private-paying long-term care residents. To do this, we used a policy change that revealed NH quality and, subsequently, higher NH prices to quantify a demand response, if any, by ALFs within potential NH markets. Our analyses show ALFs responded in much the same way as NHs to the launch of NH Compare: ALF inventory increased by 1.8% overall compared to inventory prior to the policy change. In the short term, ALF inventory changes were driven by reallocation of existing MC and ILF units; in the long run, ALF inventory increases were driven by construction of new units.

The changes in ALF inventory were concentrated among the most competitive markets and nearest the highest quality nursing homes, suggesting the quality rating of the nursing home, not just the availability of new information, matters in the ALF response. Specifically, our results suggest ALFs co-locate near high quality NHs to signal high quality in the absence of actual ALF quality information.

Given the faster price growth among high quality nursing homes (relative to lower quality NHs) and increased ALF inventory near these high quality NHs, we expected ALF rent to increase in response. Indeed, we find ALF prices increased by 0.3% overall following NH Compare. Additionally, we find occupancy increased 0.6 percentage points overall following NH Compare.

Our analyses do contain some limitations, most of which are associated with imperfect data. While we have shown changes in ALF prices and occupancy following the policy change, our price and occupancy data are limited to certain counties within the 31 MSAs. Our analyses are limited in that we do not have ALF-specific price and occupancy data. Additionally, there are some counties for which price and occupancy data are omitted. These may introduce a potential selection bias in our estimates of price and occupancy.

Aside from the economic relevance of information disclosure and competition between differential products, these findings raise questions of policy relevance. Given the cost-shifting that exists within NHs between Medicaid and private payers (Hackmann, 2019), our results suggest there are real consequences to ALFs competing with NHs on price, location, and, implicitly, quality. If nearby ALFs attract private paying residents as a substitute for NHs, the proportion of Medicaid residents to private paying residents within NHs increases, and there are fewer opportunities for NHs to supplement Medicaid revenue. Lower NH revenue can lead to lower NH quality, primarily through reduced NH staffing (Hackmann, 2019). How competing NHs, particularly higher quality NHs, respond to ALF competition is unclear and a potential avenue for further investigation.

References

AARP. (2019). *Assisted Living Facilities: Weighing the Options*.

<https://www.aarp.org/caregiving/basics/info-2017/assisted-living-options.html>

Bowblis, J. R. (2012). Market structure, competition from assisted living facilities, and quality in the nursing home industry. *Applied Economic Perspectives and Policy*, 34(2), 238–257.

<https://doi.org/10.1093/aep/pps006>

Bowblis, J. R. (2014). Nursing home prices and market structure: The effect of assisted living industry expansion. *Health Economics, Policy and Law*, 9(1), 95–112.

<https://doi.org/10.1017/S174413311300025X>

Castle, N. G., Liu, D., & Engberg, J. (2008). The association of Nursing Home Compare quality measures with market competition and occupancy rates. *Journal for Healthcare Quality : Official Publication of the National Association for Healthcare Quality*, 30(2), 4–14. <https://doi.org/10.1111/j.1945-1474.2008.tb01129.x>

Grabowski, D. C., & Town, R. J. (2011). Does information matter? Competition, quality, and the impact of nursing home report cards. *Health Services Research*, 46(6 PART 1), 1698–1719.

<https://doi.org/10.1111/j.1475-6773.2011.01298.x>

Hackmann, M. B. (2019). Incentivizing better quality of care: The role of medicaid and competition in the nursing home industry. *American Economic Review*, 109(5), 1684–1716.

<https://doi.org/10.1257/aer.20151057>

Huang, S. S., & Hirth, R. A. (2016). Quality rating and private-prices: Evidence from the nursing home industry. *Journal of Health Economics*, 50, 59–70. <https://doi.org/10.1016/j.jhealeco.2016.08.007>

Mathios, A. D. (2000). The impact of mandatory disclosure laws on product choices: An analysis of the salad dressing market. *Journal of Law and Economics*, 43(2), 651–677.

<https://doi.org/10.1086/467468>

- Silver, B. C., Grabowski, D. C., Gozalo, P. L., Dosa, D., & Thomas, K. S. (2018). Increasing Prevalence of Assisted Living as a Substitute for Private-Pay Long-Term Nursing Care. *Health Services Research, 53*(6), 4906–4920. <https://doi.org/10.1111/1475-6773.13021>
- Stevenson, D. G., & Grabowski, D. C. (2010). Sizing up the market for assisted living. *Health Affairs, 29*(1), 35–43. <https://doi.org/10.1377/hlthaff.2009.0527>
- Trinkoff, A. M., Yoon, J. M., Storr, C. L., Lerner, N. B., Yang, B. K., & Han, K. (2019a). Comparing residential long-term care regulations between nursing homes and assisted living facilities. *Nursing Outlook, 0*, 1–9. <https://doi.org/10.1016/j.outlook.2019.06.015>
- Trinkoff, A. M., Yoon, J., Storr, C. L., Lerner, N. B., Yang, B. K., & Han, K. (2019b). Residential long-term care regulations: comparison between nursing homes and assisted living facilities. *Nursing Outlook*. <https://doi.org/10.1016/j.outlook.2019.06.015>
- Werner, R. M., Konetzka, R. T., & Polsky, D. (2016). Changes in Consumer Demand Following Public Reporting of Summary Quality Ratings: An Evaluation in Nursing Homes. *Health Services Research, 51*, 1291–1309. <https://doi.org/10.1111/1475-6773.12459>
- Zhao, X. (2016). Competition, information, and quality: Evidence from nursing homes. *Journal of Health Economics, 49*, 136–152. <https://doi.org/10.1016/j.jhealeco.2016.05.004>

Main Figures and Tables:

Figure 1: Winsorized Distribution of Nursing Home Market Sizes. Notes:

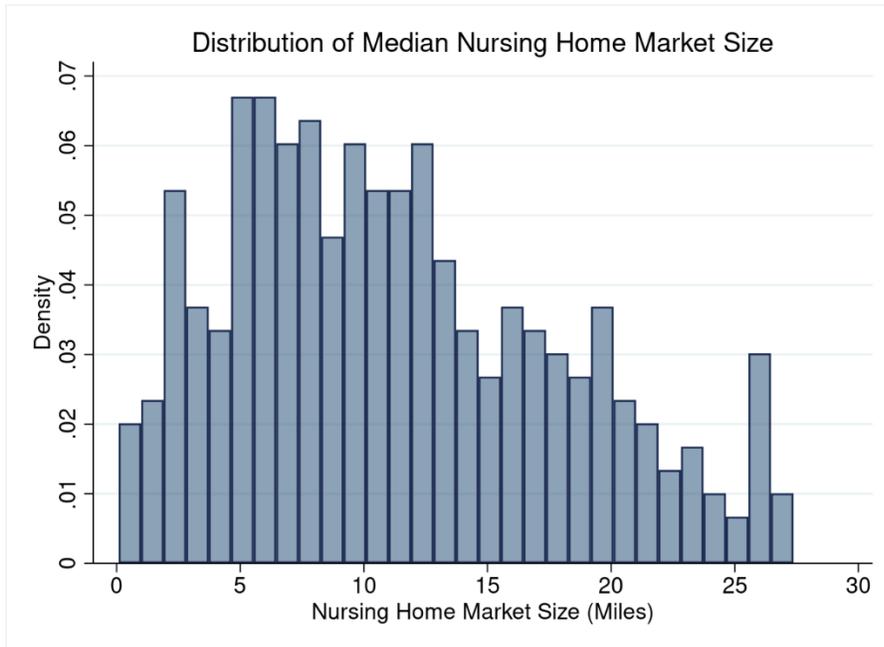


Figure 2: Distribution of potential ALF competitors per NH market. The average nursing home is surrounded by 14 potential ALF competitors.

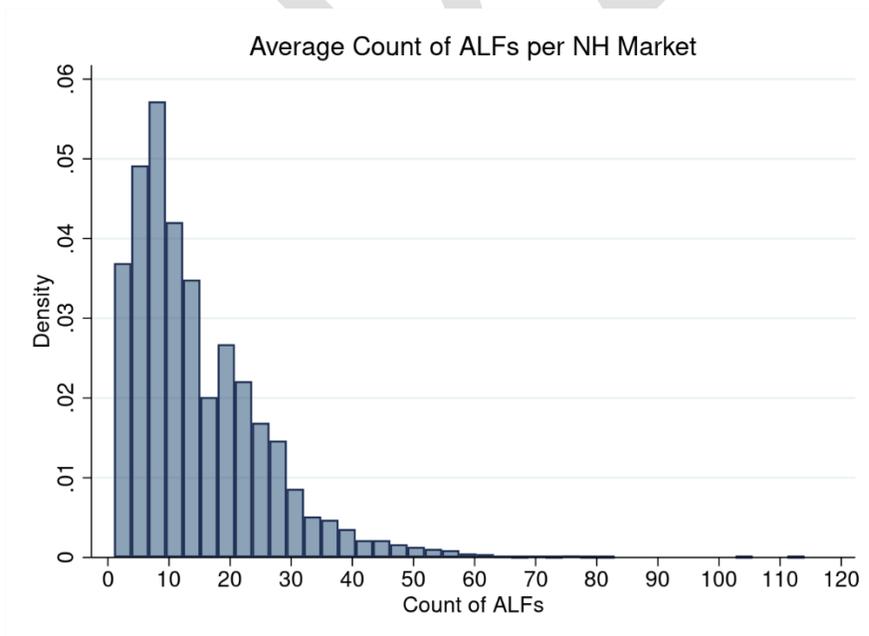
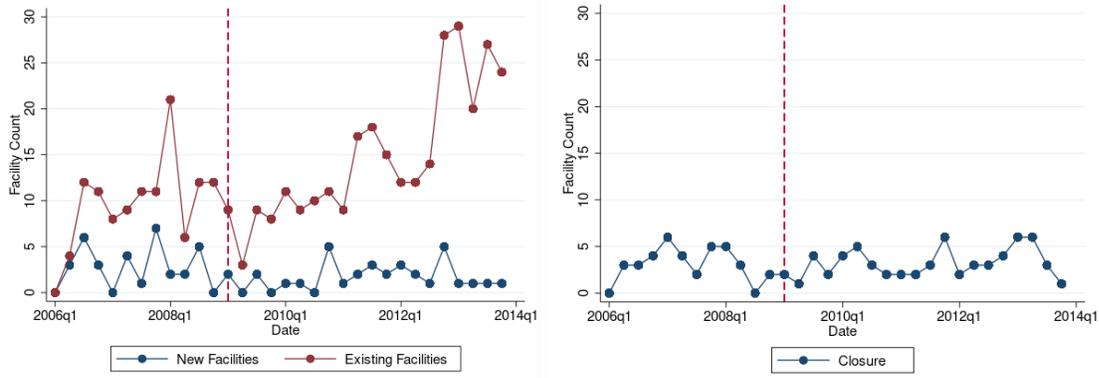
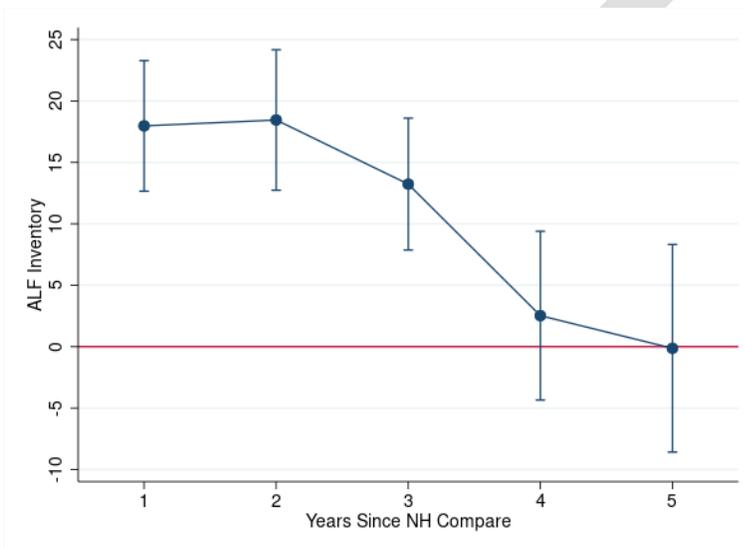


Figure 3: ALF Facility Openings and Closures by Date

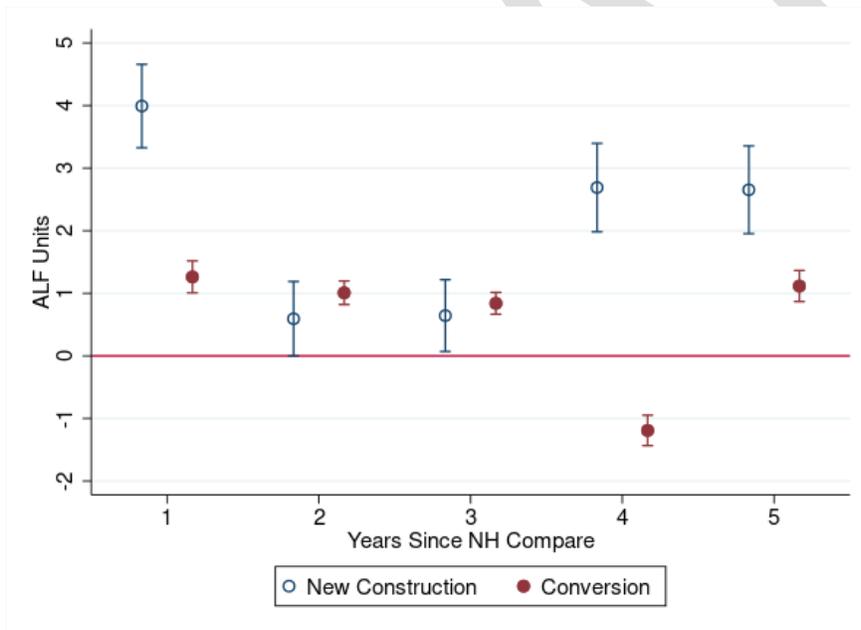
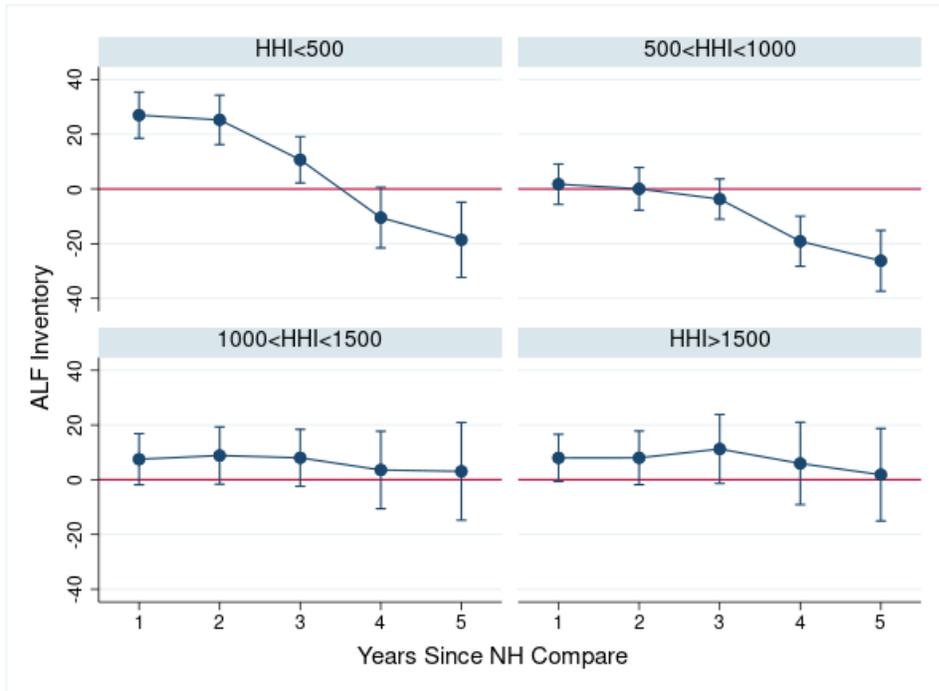


Notes: A new facility is defined as a facility in which no existing inventory (ALF, ILF, or MC) existed prior to addition of ALF units. An existing facility is defined as a facility in which no ALF units existed, but ILF or MC units existed prior to constructing the ALF.



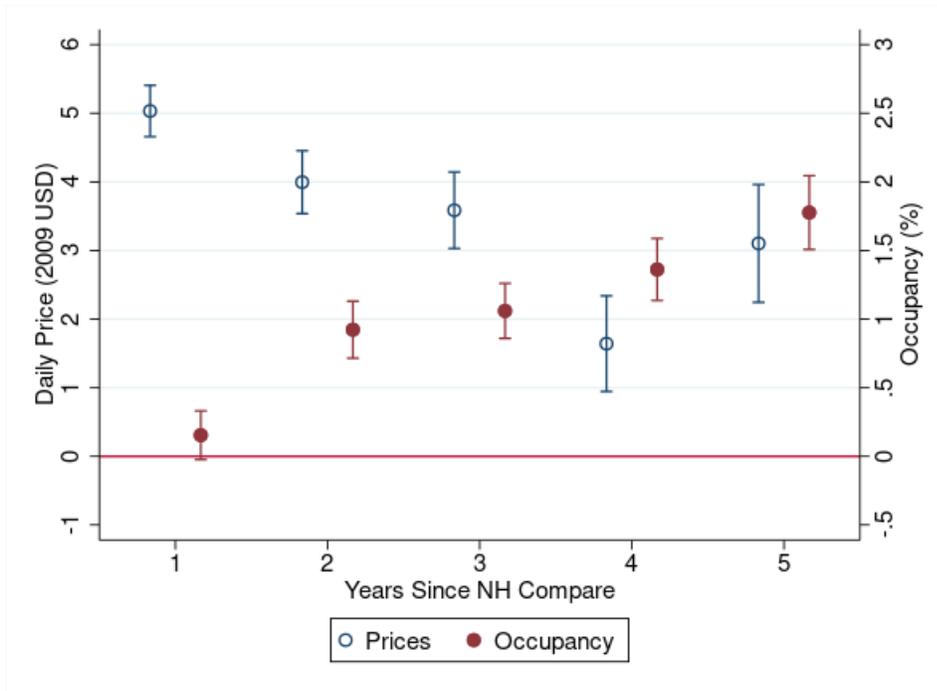
Notes: Change in ALF Inventory is relative to ALF inventory levels in 2006-2008, prior to the launch of NH Compare. There were 777 ALF units in the average nursing home market prior to NH Compare.

Figure 5: Change in ALF Inventory Following the Launch of NH Compare, by NH Market Concentration



Notes: The change in ALF inventory attributed to conversions is estimated as conditional on the ALF having ILF or MC units also associated with the property (i.e., conditional on the ALF not being freestanding).

Figure 7: Change in ALF Prices and Occupancy Following Launch of NH Compare



Tables:

Table 1: Summary Statistics

	Before NH Compare (2006-2008)	After NH Compare (2009-2013)
Nursing Homes (N=4,258)		
Average Number of Beds	134.98 (82.71)	133.68 (80.18)
Number of NH Beds	2,270,435	2,269,041
Average NH Rating (in 2009)	NA	2.90
Assisted Living Facilities (N=2688)		
Number of Units	213,928	238,648
Average Number of Units per ALF	77.20 (65.59)	84.78 (65.26)
Average Occupancy Rate	90% (3.96)	89% (4.40)
Average Rent	\$132.12 (26.60)	\$132.31 (24.82)
County Demographics		
Percent Over Age 65	12.20	12.98

	(2.93)	(2.92)
County Unemployment Rate	4.937	8.464
	(1.26)	(0.0301)
Income (Adjusted to 2009 USD)	47,024	45,827
	(12,579)	(12,334)
Percent Female	58.3	57.52
	(1.707)	(1.671)
Mean Housing Price Index (base=2000)	162.22	132.66
	(36.08)	(26.35)

Table 2: Change in ALF Activity in NH Markets After NH Compare Launch (Odds Ratios)

	Overall	Construction	Conversion
Year Following NH Compare			
Year 1	0.439*** (0.073)	0.405*** (0.053)	1.107 (0.190)
Year 2	0.498*** (0.080)	0.143*** (0.015)	2.742*** (0.482)
Year 3	1.173 (0.172)	0.215*** (0.028)	7.336*** (1.076)
Year 4	3.630*** (0.607)	0.436*** (0.069)	11.190*** (1.596)
Year 5	6.191*** (1.148)	0.653* (0.112)	11.547*** (1.913)
Population (100k)	1.667*** (0.128)	0.980 (0.075)	3.107*** (0.403)
% Over 65	0.296*** (0.027)	0.411*** (0.037)	0.793** (0.069)
Unemployment	0.897** (0.032)	0.970 (0.031)	0.802*** (0.041)
% Female	0.983 (0.107)	1.009 (0.126)	0.658** (0.093)
Per Capita Income (\$10k)	1.252 (0.176)	1.563*** (0.189)	0.692* (0.121)
Housing Price Index	0.990*** (0.002)	0.989*** (0.002)	1.000 (0.004)

<u>N</u>	<u>98194</u>	<u>101298</u>	<u>88640</u>
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Note: Table represents the likelihood of any ALF activity in a NH market after NH Compare, relative to 2006-2008. Coefficients represent odds ratios and standard errors are in parentheses. "Conversion" omits any freestanding ALFs.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Table 3: Main Effects: ALF Inventory, Construction, Conversion after launch of NH Compare

	Unconditional			Conditional on Any Activity			Conditional on Activity in That Time Period		
	Inventory	Construction	Conversion	Inventory	Construction	Conversion	Inventory	Construction	Conversion
Year Following NH Compare									
Year 1	17.971*** (2.710)	3.992*** (0.340)	1.395*** (0.133)	21.295*** (2.968)	4.390*** (0.378)	1.508*** (0.142)	22.761*** (3.124)	3.949 (3.561)	8.236*** (0.752)
Year 2	18.450*** (2.916)	0.594 (0.304)	1.114*** (0.095)	24.122*** (3.134)	0.707* (0.340)	1.075*** (0.094)	25.013*** (3.305)	-8.689* (3.903)	6.477*** (0.613)
Year 3	13.232*** (2.738)	0.644* (0.293)	0.871*** (0.088)	20.672*** (2.810)	0.669* (0.327)	1.006*** (0.082)	20.519*** (2.998)	-15.741*** (3.515)	4.320*** (0.615)
Year 4	2.528 (3.502)	2.690*** (0.360)	-0.802*** (0.120)	15.245*** (3.515)	2.591*** (0.396)	-0.654*** (0.120)	13.073*** (3.827)	8.131* (3.859)	-1.234 (0.764)
Year 5	-0.130 (4.310)	2.654*** (0.358)	1.117*** (0.131)	20.963*** (4.354)	2.727*** (0.400)	1.583*** (0.132)	16.863*** (4.770)	10.585* (4.122)	0.859 (0.874)
Population (100k)	14.804*** (1.775)	-0.039 (0.152)	0.792*** (0.058)	18.713*** (1.947)	0.088 (0.169)	0.513*** (0.055)	19.176*** (2.030)	1.698 (1.106)	4.106*** (0.336)
% Over 65	27.299*** (2.644)	-1.140*** (0.165)	0.192** (0.062)	27.515*** (2.893)	-1.196*** (0.189)	0.267*** (0.061)	29.974*** (3.245)	-3.113 (1.805)	1.231*** (0.346)
Unemployment	-4.817*** (0.897)	-0.359*** (0.083)	-0.361*** (0.034)	-4.103*** (1.021)	-0.367*** (0.094)	-0.391*** (0.034)	-4.391*** (1.089)	0.996 (0.825)	-1.451*** (0.182)
% Female	-33.290*** (3.281)	-0.108 (0.259)	0.135 (0.081)	-36.651*** (3.686)	-0.315 (0.291)	-0.004 (0.071)	-38.870*** (4.082)	5.897** (2.137)	-1.025 (0.559)
Per Capita Income (\$10k)	-16.329*** (2.648)	0.639* (0.280)	0.130 (0.151)	-13.372*** (2.832)	0.996** (0.305)	0.130 (0.176)	-12.218*** (2.939)	-6.530* (2.939)	1.908** (0.684)

Housing Price Index	-0.247*** (0.057)	-0.010* (0.004)	-0.014*** (0.002)	-0.361*** (0.062)	-0.003 (0.005)	-0.020*** (0.002)	-0.360*** (0.066)	0.098* (0.042)	-0.017 (0.013)
Quarter 2	4.189*** (0.138)	-0.513*** (0.155)	0.942*** (0.064)	5.791*** (0.139)	-0.510** (0.168)	1.102*** (0.067)	5.896*** (0.147)	5.205*** (1.240)	3.815*** (0.264)
Quarter 3	6.675*** (0.187)	-1.663*** (0.136)	0.045 (0.042)	9.348*** (0.189)	-1.677*** (0.148)	0.225*** (0.043)	9.476*** (0.203)	7.024*** (1.219)	0.341 (0.175)
Quarter 4	10.123*** (0.264)	-1.260*** (0.134)	1.049*** (0.071)	14.504*** (0.268)	-1.224*** (0.148)	1.408*** (0.074)	14.782*** (0.286)	3.162** (1.153)	3.846*** (0.259)
Constant	2295.234* ** (216.272)	25.724 (16.641)	-17.938*** (5.156)	1870.620 *** (243.278)	34.334 (18.688)	-6.213 (4.529)	1966.627*** (268.888)	-258.369 (133.506)	-21.293 (30.579)
N	133746	133746	128281	121969	121969	115680	115293	8564	33377

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Change in ALF Inventory Following NH Compare Launch, by NH Market Concentration

	HHI<500	500<HHI<1000	1000<HHI<1500	HHI>1500
Year Following NH Compare				
Year 1	26.97*** (4.293)	1.743 (3.766)	7.486 (4.762)	7.966 (4.388)
Year 2	25.25*** (4.611)	0.0423 (3.979)	8.834 (5.312)	7.996 (4.987)
Year 3	10.67* (4.308)	-3.695 (3.748)	7.998 (5.285)	11.22 (6.404)
Year 4	-10.47 (5.654)	-19.11*** (4.670)	3.558 (7.200)	5.941 (7.649)
Year 5	-18.59** (7.012)	-26.24*** (5.661)	3.054 (9.084)	1.830 (8.584)
Population (100k)	14.33*** (2.669)	7.825*** (2.226)	1.718 (6.576)	27.18*** (5.206)
% Over 65	48.69*** (4.943)	39.93*** (3.661)	13.34** (4.373)	17.43*** (4.255)
Unemployment	-7.938*** (1.500)	-0.706 (1.156)	-1.657 (1.458)	-1.055 (1.145)
% Female	-55.43*** (6.023)	-17.98*** (3.433)	-5.033 (4.602)	6.499 (7.220)
Per Capita Income (\$10k)	-11.04** (4.037)	1.648 (3.443)	-12.52 (8.308)	-17.53** (5.894)
Housing Price Index	-0.331*** (0.0967)	-0.101 (0.0759)	-0.291* (0.126)	0.0335 (0.0992)
Quarter 2	5.789*** (0.213)	2.837*** (0.211)	1.280*** (0.259)	1.274*** (0.232)
Quarter 3	9.116*** (0.293)	4.529*** (0.267)	2.812*** (0.380)	1.911*** (0.306)
Quarter 4	13.56*** (0.418)	7.083*** (0.365)	4.764*** (0.485)	3.406*** (0.437)
Constant	3575.8*** (402.3)	1018.4*** (225.9)	541.0 (283.7)	-503.9 (457.0)

<i>N</i>	72128	41114	10848	9656
<i>R</i> ² (overall)	0.000197	0.0308	0.000174	0.0330
<i>R</i> ² (between)	0.340	0.255	0.170	0.186
<i>R</i> ² (within)	0.000000105	0.0284	0.0000140	0.0331

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: ALF Reallocation Following NH Compare Launch, by NH Market Concentration

	HHI<500	500<HHI<1000	1000<HHI<1500	HHI>1500
Year Following NH Compare				
Year 1	5.965*** (0.574)	2.525*** (0.474)	0.597 (0.631)	0.760 (0.563)
Year 2	1.200* (0.509)	0.603 (0.448)	-1.335 (0.717)	-0.232 (0.515)
Year 3	1.319** (0.491)	0.297 (0.436)	-0.966 (0.649)	0.0897 (0.563)
Year 4	4.485*** (0.615)	1.257* (0.525)	-0.138 (0.757)	0.0543 (0.691)
Year 5	4.217*** (0.608)	1.614** (0.567)	0.0838 (0.875)	0.209 (0.739)
Population (100k)	-0.206 (0.218)	0.0773 (0.247)	1.543** (0.483)	-0.710 (0.663)
% Over 65	-2.123*** (0.349)	-0.559* (0.253)	-0.507 (0.316)	0.0155 (0.247)
Unemployment	-0.698*** (0.144)	-0.139 (0.115)	0.342* (0.149)	-0.0472 (0.121)
% Female	-0.543 (0.501)	0.255 (0.367)	-0.103 (0.437)	0.376 (0.409)
Per Capita Income (\$10k)	-0.0461 (0.448)	2.072*** (0.413)	0.998 (0.903)	-1.066 (0.562)
Housing Price Index	-0.0178* (0.00746)	-0.0102 (0.00665)	0.0344** (0.0104)	-0.0107 (0.00921)
Quarter 2	-0.484* (0.237)	-0.521* (0.256)	-0.360 (0.353)	-0.863* (0.336)
Quarter 3	-2.076*** (0.210)	-1.407*** (0.214)	-0.224 (0.341)	-1.287*** (0.318)

Quarter 4	-1.625*** (0.204)	-0.937*** (0.217)	-0.461 (0.351)	-0.812* (0.342)
Constant	73.63* (32.90)	-12.73 (22.77)	-8.001 (25.78)	-8.331 (23.75)
<i>N</i>	72128	41114	10848	9656
<i>R</i> ² (overall)	0.0105	0.000458	0.000578	0.000199
<i>R</i> ² (between)	0.00885	0.00358	0.00587	0.00458
<i>R</i> ² (within)	0.0948	0.000771	0.00809	0.00512

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Count and Percentage of Nursing Home Markets with ALF Activity by NH Quality Category, Before vs After NH Compare

	2006-2008	2009-2013	Difference	N
Quality<1	323 (66.3%)	443 (91%)	120 (24.6%)	487
1<Quality<2	556 (60.4%)	799 (86.8%)	243 (26.4%)	920
2<Quality<3	576 (62.7%)	797 (86.7%)	221 (24%)	919
3<Quality<4	717 (64.3%)	989 (88.7%)	272 (24.4%)	1,115
4<Quality<5	461 (59.3%)	660 (84.9%)	199 (25.6%)	777
	2,633 (61.8%)	3,688 (86.6%)	1,055 (24.7%)	4,258

Table 7: Change in ALF Activity in NH Markets After NH Compare Launch, by Quality Rating (Odds Ratios)

	Quality<1	1<Quality<2	2<Quality<3	3<Quality<4	4<Quality<5
Year Following NH Compare					
Year 1	0.821 (0.337)	0.882 (0.294)	0.382** (0.118)	0.359*** (0.082)	0.216*** (0.084)
Year 2	0.588 (0.241)	1.040 (0.308)	0.473* (0.141)	0.372*** (0.099)	0.338** (0.127)
Year 3	0.780 (0.268)	2.006* (0.608)	1.129 (0.317)	1.303 (0.324)	0.813 (0.288)
Year 4	1.434 (0.570)	4.433*** (1.488)	4.021*** (1.306)	4.973*** (1.419)	3.130** (1.215)
Year 5	1.754 (0.729)	7.685*** (3.079)	6.772*** (2.752)	9.071*** (3.172)	6.114*** (2.588)
Population (100k)	1.677* (0.406)	2.541*** (0.459)	1.694** (0.277)	1.491** (0.226)	1.144 (0.266)
% Over 65	0.588* (0.156)	0.342*** (0.065)	0.260*** (0.051)	0.284*** (0.046)	0.202*** (0.041)

Unemployment	0.790* (0.077)	0.766*** (0.047)	0.882 (0.064)	0.958 (0.056)	1.050 (0.089)
% Female	0.688 (0.192)	1.151 (0.275)	0.882 (0.154)	1.283 (0.302)	0.755 (0.203)
Per Capita Income (\$10k)	3.143** (1.312)	1.225 (0.317)	1.111 (0.323)	0.964 (0.267)	1.195 (0.391)
Housing Price Index	0.988 (0.008)	0.984*** (0.005)	0.987* (0.006)	0.994 (0.005)	0.992 (0.006)
N	11360	21325	21100	26457	17760
<i>Pseudo R</i> ²	0.082	0.100	0.115	0.115	0.105
# of Groups	355	667	660	828	555
χ^2	195.309	469.357	352.420	917.113	454.134

Table 8: Change in ALF Inventory After NH Compare Conditional on NH Market Activity, by Quality Level

	Quality<1	1<Quality<2	2<Quality<3	3<Quality<4	4<Quality<5
Year Following NH Compare					
Year 1	18.412* (8.923)	10.815 (7.052)	14.938* (5.808)	35.081*** (5.974)	24.217*** (5.853)
Year 2	20.896* (9.260)	13.876 (7.301)	19.766** (6.112)	37.805*** (6.412)	24.786*** (6.395)
Year 3	17.583* (7.912)	13.141* (6.498)	19.750*** (5.446)	31.199*** (5.759)	18.670** (6.193)
Year 4	5.566 (10.068)	7.437 (8.280)	17.380* (6.782)	25.162*** (6.926)	14.159 (8.296)
Year 5	7.744 (12.998)	14.751 (10.435)	23.339** (8.370)	30.154*** (8.421)	19.833 (10.287)
Population (100k)	22.991*** (6.091)	13.733** (4.176)	16.511*** (3.944)	20.865*** (3.759)	22.951*** (4.847)
% Over 65	34.818*** (8.585)	30.201*** (7.617)	32.122*** (5.842)	23.434*** (5.568)	22.616*** (5.711)
Unemployment	-4.138 (3.012)	-1.872 (2.398)	-2.976 (1.981)	-7.335*** (2.075)	-3.602 (2.141)
% Female	-44.740***	-43.131***	-25.900***	-36.621***	-35.390***

	(10.630)	(8.353)	(6.877)	(7.473)	(9.037)
Per Capita Income (\$10k)	-31.461*** (9.026)	-19.856** (6.439)	-7.319 (5.366)	-12.799* (5.976)	-3.368 (5.693)
Housing Price Index	-0.322 (0.184)	-0.308* (0.140)	-0.379** (0.124)	-0.388** (0.127)	-0.319* (0.142)
Quarter 2	6.949*** (0.451)	6.009*** (0.310)	5.311*** (0.273)	5.751*** (0.265)	5.445*** (0.329)
Quarter 3	10.607*** (0.583)	9.509*** (0.404)	8.817*** (0.381)	9.636*** (0.370)	8.544*** (0.451)
Quarter 4	15.814*** (0.815)	14.930*** (0.578)	14.117*** (0.532)	14.548*** (0.536)	13.572*** (0.638)
Constant	2278.044** (688.577)	2302.949*** (560.226)	1179.717* (459.494)	1910.584*** (496.636)	1731.111** (579.769)
Pre-NH Compare Inventory	258.76	242.22	225.14	225.6	211.54
Post-NH Compare Change	14.798 (7.911)	10.891 (6.436)	16.96*** (5.370)	32.603*** (5.498)	21.76*** (5.584)
% Change	5.72%	4.50%	7.53%%	14.45%	10.10%
N	14304	26285	26476	32760	21888

Table 9: Change in ALF Daily Price and Quarterly Occupancy Following NH Compare

	(1) Daily Price (2009 USD)	(2) Occupancy (%)
Year Following NH Compare		
Year 1	5.033*** (0.191)	0.154 (0.090)
Year 2	3.996*** (0.234)	0.923*** (0.106)
Year 3	3.586*** (0.284)	1.060*** (0.102)
Year 4	1.642*** (0.356)	1.362*** (0.115)
Year 5	3.103***	1.777***

	(0.438)	(0.137)
Population (100k)	-0.153 (0.102)	-0.133** (0.049)
% Over 65	-0.912*** (0.261)	-0.387*** (0.079)
Unemployment	-0.276*** (0.067)	-0.420*** (0.026)
% Female	-1.125*** (0.210)	0.941*** (0.088)
Per Capita Income (\$10k)	1.368*** (0.321)	1.129*** (0.117)
Housing Price Index	0.039*** (0.004)	-0.024*** (0.002)
Quarter 2	0.562*** (0.011)	0.003 (0.009)
Quarter 3	1.026*** (0.013)	0.148*** (0.012)
Quarter 4	1.671*** (0.022)	0.222*** (0.013)
Constant	201.904*** (14.188)	42.192*** (5.831)
Pre-NH Compare Levels	132.12	90.00
Post-NH Compare Change	4.123	0.604
% Difference	0.31%	0.67%
N	128789	129328
R ² (overall)	0.084	0.049
R ² (between)	0.081	0.051
R ² (within)	0.069	0.099

Appendix A: Backup Figures and Tables

Figure A1: Example of Nursing Home Compare Five-Star Rating System (2021 Version)

The screenshot shows the Medicare.gov website interface for finding nursing homes. At the top, there are navigation menus for 'Basics', 'Health & Drug Plans', and 'Providers & Services', along with a 'Log In' button. Below the navigation is a search bar with three main sections: 'MY LOCATION' (set to Philadelphia, PA 19104), 'PROVIDER TYPE' (set to Nursing homes), and 'NAME OF FACILITY (optional)'. There are also filters for 'Filter by: Distance: 25 mi.', 'Overall rating', and 'Other ratings'. A 'View All Filters' button is present. The search results show two nursing homes:

- 1. Pennsylvania Nursing**
0.6 mi | 1 Anytown Road
Philadelphia, PA 19104
(215) 555-0100
Overall rating: 4 stars (Average)
- 2. William Penn Care**
0.7 mi | 123 Main Street
Overall rating: 3 stars (Below average)

To the right of the list is a map of Philadelphia with numbered pins (1-14) indicating the locations of the nursing homes. A 'Feedback' button is visible on the right side of the page.

Figure A2: Theoretical Relationship Between NH Prices and ALF Quantity

