Title

New Dimensions of Staffing Patterns in Nursing Homes and Nursing Home Quality: Comparing Staffing Instability to Staffing Turnover.

Permalink

https://escholarship.org/uc/item/0q54g5hv

Journal

Journal of the American Medical Directors Association, 24(8)

Authors

Sinha, Soham

Mukamel, Dana

Saliba, Debra

et al.

Publication Date

2023-08-01

DOI

10.1016/j.jamda.2023.04.009

Peer reviewed

New Dimensions of Staffing Patterns and Nursing Home Quality: Comparing Staffing Instability to Staffing Turnover

Soham Sinha, MS [PhD Student],

Department of Public Health Sciences, The University of Chicago Biological Sciences, 5841 S. Maryland Ave. | Room 214 | Chicago, IL 60637, Phone: 929-732-1695

Dana B. Mukamel, PhD,

Department of Medicine, Public Health and Nursing, information Technology Enhancing Quality Care (iTEQC) Research Program, University of California, Irvine, Irvine

Debra Saliba, MD MPH,

Borun Center at University of California, Los Angeles, Geriatric Research, Education, and Clinical Centers, Veterans Administration, Los Angeles, California, RAND, Santa Monica, California

Heather Ladd, MS,

Division of General Internal Medicine, Department of Medicine, iTEQC Research program, University of California, Irvine, Irvine

R. Tamara Konetzka, PhD

Department of Public Health Sciences | Department of Medicine, The University of Chicago Biological Sciences, 5841 S. Maryland Ave. | Room W255, MC2000 | Chicago, IL 60637, Phone: 347-721-0924

Abstract

Objective: This study examines how measures of staffing — turnover and instability — are associated with one another and how they independently contribute to quality of care in nursing homes.

Design: Cross-sectional analysis of 2021–2022 administrative data. Data included the Payroll-Based Journal (PBJ) for daily staffing information, merged with Nursing Home Care Compare (NHCC) data for nursing home characteristics, total staffing turnover, and nursing home quality.

Setting and Participants: A total of 11,840 nursing homes nationally reporting data on daily staffing and staffing turnover.

Methods: We explored correlations between measures of staffing and estimated facility-level regression models with robust standard errors. The dependent variables were indicators of nursing

Corresponding Author: Soham Sinha MS, PhD Student, Department of Public Health Sciences, The University of Chicago Biological Sciences, 5841 S. Maryland Ave. | Room 214 | Chicago, IL 60637, Phone: 929-732-1695, sohams@uchicago.edu.

home quality included in the NHCC 5-star ratings. The independent variables of interest were average total staffing hours per resident-day, total staffing turnover, and total staffing instability.

Results: For the 11,840 nursing homes in the study, there was a weak positive correlation between turnover and instability, with some overlap between nursing homes with high instability and high turnover. Regression analysis revealed that staffing instability and turnover contributed independently to nursing home quality, with instability having a stronger association with some measures of quality and turnover with others. Staffing instability was positively and more strongly associated with long-stay residents' decline in ADL levels and receipt of anti-psychotic drugs and short-stay residents' functioning at discharge. Turnover was positively and more strongly associated with long-stay residents' prevalence of pressure ulcers and worsening mobility, and short-stay residents' hospitalizations.

Conclusion and Implications: Instability and turnover in total nursing home staffing independently contribute to nursing home quality. This suggests that adding measures of staffing instability to the existing measures of average staffing and staff turnover in Nursing Home Care Compare may enhance the report card's value for providers engaged in quality improvement and consumers searching for high-quality nursing homes.

Introduction

Staffing is fundamental to quality of care in nursing homes.[1] Substantial evidence links staffing levels to quality of care in long-term care facilities.[2,3] Studies have found that higher staffing levels are associated with better scores on quality measures (QM) reported in the Nursing Home Care Compare (NHCC) report card, fewer hospitalizations and emergency department (ED) visits[4], and fewer citations for deviations from state and federal quality standards.[5] Higher staffing levels were also found to be helpful in containing COVID-19 outbreaks in nursing homes.[6] However, average staffing hours per resident-day (HPRD) as reported in NHCC mask substantial variation and do not fully describe the association between staffing levels and nursing home quality.[7] Nursing turnover measures have long been shown to be associated with poor quality of care in nursing homes[8–10] and recently, a new measure of staffing instability [7] has also been found to be associated with poor quality of care in nursing homes.[11]

Turnover in nursing home staffing— which includes registered nurses (RN), RN director of nursing, RN with administrative duties, licensed practical nurses (LPN) and LPN with administrative duties, certified nurse aides (CNA), aides in training, and medication aides/ technicians — is defined as the percentage of nursing staff that left the nursing home over a twelve-month period[12] and has been a longstanding concern and point of discussion in long-term care policy.[10] Studies have found that higher turnover rates in nursing homes, among other factors, were correlated with lower five-star ratings[10], higher deficiencies[13], and higher mortality[14]. Depending on the sample and method for calculation, studies have reported annual turnover rates in the range of 14–346 percent for staff in nursing homes.[8,9,15–18]

Considering this relationship between staff turnover and quality of care, the Centers for Medicare and Medicaid Services (CMS) started reporting staff turnover rates on NHCC since January 2022.[19] Staffing instability, on the other hand — a validated measure of daily variation in staffing, defined as the percent of days in which a facility's nurse staffing is at least 20 percent less than that facility's mean staffing, adjusted for daily resident census[7] — is not reported on the NHCC report card. However, like staffing turnover, higher staffing instability in daily staffing levels among the direct care workforce in nursing homes has been found to be associated with overall lower NHCC five-star ratings[7] and lower performance on quality measures included in calculation of the star ratings.[11] Weekend staffing was recently added to the NHCC report card, but sensitivity analyses on the instability measure showed substantial instability in nursing home staffing beyond weekday-weekend differences.[7]

Turnover and instability are separate but potentially related concepts with distinct possible pathways to quality. Turnover may serve as a proxy for continuity of care; facilities with lower nurse turnover may have more staff that are familiar with each resident's condition and may be better able to identify a change in condition.[19] New staff may also be unfamiliar with facility specific processes. On the other hand, available measures of turnover do not distinguish between employee-initiated (voluntary) turnover, which likely leads to poor quality, or employer-initiated (involuntary) turnover due to poor staff performance, which may actually result in quality improvement.[20] In any case, if staff who leave give short notice or the facility has difficulty replacing them, higher turnover rates may temporarily lead to inadequate levels of daily staffing or staffing instability.[21,22] Staffing instability, however, need not arise from turnover alone. Even at low levels of staff turnover, staffing instability may arise from poor management practices[23] that fail to ensure enough slack in the scheduling system, should staff call in sick, quit, or should the resident census or case-mix suddenly increase. Whether associated with turnover or poor management practices, staffing instability may impede the performance of daily tasks in nursing homes such as medication administration, monitoring, and assistance with activities of daily living, resulting in residents experiencing adverse outcomes such as falls, pressure ulcers, hospitalizations, and ED visits.[7] However, it remains unclear to what extent these two measures of nursing home staffing are empirically redundant or independently associated with quality. Therefore, the objectives of this study were to (a) directly compare staffing turnover and staffing instability and (b) explore their associations with quality of care in nursing homes. We hypothesize that the two measures will be weakly correlated and have separate associations with quality.

Methods

Data Source and Study Population

We derived data on daily staffing levels from the CMS Payroll Based Journal (PBJ) database.[24] Using the facility provider ID from the PBJ, we merged these data with two sources of facility-level data: Long-Term Care Focus (LTCfocus)[25], and Nursing Home Care Compare (NHCC). LTCfocus provided data on aggregated resident characteristics as of 2019; and NHCC provided data on nursing home characteristics and quality measures for 2021 and total staffing turnover as of the first quarter of 2022. Turnover measures reported

in the NHC archives for a given quarter are calculated based on retrospective data from the previous year. Therefore, to match data collection periods for the two measures, turnover data reported in the first quarter of 2022 were merged with daily staffing data, nursing home characteristics and quality measures for the year 2021. We restricted our analysis to facilities that reported complete data on daily staffing in the PBJ, and complete data on turnover in the NHCC. Our final analytic sample consisted of a cross-section of 11,840 nursing homes in the United States (US). See Supplementary Figure 1 for construction of analytic sample.

Variable Definitions

Dependent Variables

The dependent variables used in the analysis included long-stay and short-stay quality measures that were included in the 5-Star NHCC ratings during 2021.[12] The long-stay measures included percentage of residents receiving an antipsychotic medication, percentage of high-risk residents with pressure ulcers, percentage whose ability to move independently worsened, percentage whose need for help with daily activities has increased, number of hospitalizations per 1,000 long-stay resident days, and number of ED visits per 1,000 long-stay resident days. The short-stay measures included percentage of residents receiving an antipsychotic medication for the first time, percentage who failed to improve in their ability to move around on their own, percentage who were rehospitalized after a nursing home admission, and percentage with an ED visit.

Independent Variables

Our independent variables of interest consisted of three measures of staffing levels in nursing homes –average total staffing hours per resident-day, total staffing turnover, and total staffing instability. Average staffing levels reported as adjusted total staffing hours per resident-day were taken from NHCC for the year 2021. The total staffing turnover measure was taken from the NHCC for the first quarter of 2022. The denominator for the turnover measure included individuals who worked at least 120 hours in a 90-day period across the baseline quarter (the quarter prior to the first quarter used in the turnover calculation) and the first two quarters used in the turnover calculation. The numerator included individuals who did not work for a period of 60 consecutive days. Employees who returned to the nursing home after a gap of more than 60 days were treated as new employees when calculating turnover. [12] Using this specification, the turnover rate can be at most 100 percent. To ensure comparability between the two measures of staffing, based on methodologies described in Mukamel et al., 2023[11], we defined staffing instability as the percent of days during the year in which staffing hours per resident-day were less than the annual facility mean by more than 20 percent. Other independent variables included were ownership type of the facility, occupancy, resident census, overall 5-star ratings, and facility-level resident characteristics such as percentage of female residents, percentage of Black residents, and percentage of residents with Medicaid as primary payer.[11]

Statistical Analysis

We first explored unadjusted correlations between turnover and staffing instability. We then compared the distributions of the two measures to explore overlap and produced summary

statistics to understand organizational characteristics (for-profit status, chain ownership, share of female residents, share of Black residents, Medicaid share, five-star ratings) of facilities at the highest and lowest levels of turnover and staffing instability. Levels of staffing instability and turnover were defined using tertiles. Nursing homes in the top one-third of instability and turnover were classified as having high instability and high turnover, respectively, and nursing homes in the bottom one-third of instability and turnover were classified as having low instability and low turnover, respectively. Lastly, to understand how average staffing per resident-day, staffing turnover, and staffing instability contribute to nursing home quality, we estimated 10 separate models, one for each quality measure regressed on the three measures of staffing. In addition to the staffing measures, across all the 10 models, we controlled for overall 5-star rating of the facility, resident census, occupancy, ownership type, percentage of female residents, percentage of Black residents, and percentage of residents with Medicaid. The unit of analysis was a nursing home, and the models were estimated using ordinary least squares (OLS) models with robust standard errors.

In our sensitivity analysis, we tested an alternative specification for instability, defining it as total days exceeding a 20 percent band above and below the average staffing level, and repeated the regression analysis with this measure. The motivation is that sporadically high levels of staffing, while presumably less problematic than low staffing, can cause congestion and workflow disruptions, and thus may also be associated with lower quality. Also, to indirectly account for lower staffing levels and higher instability on the weekends that may be justifiable due to lower activity, we tested a more lenient specification for instability, defining it as total days exceeding a 30 percent band above and below the average staffing level.[7] All analyses were performed using Stata 17.1 (StataCorp) and statistical significance was determined as 2-sided $p < 0.05$.

Results

First, we found a weak positive correlation between staffing turnover and staffing instability, ($r = 0.55$, $p - value = 0.00$). See Figure 1. Figure 2 shows that there is some, but incomplete, overlap among facilities across measures of staffing turnover and staffing instability.

Table 1 shows how organizational and other relevant characteristics differed among nursing homes with low turnover and low instability, high turnover and low instability, low turnover and high instability, and high turnover and high instability. We found that compared to facilities with low turnover and low instability, facilities with high turnover and high instability were more likely to be for-profit, chain-based, and less likely to be hospital-based. Compared to facilities with low turnover and low instability, facilities with high turnover and high instability were on average smaller in terms of both beds and residents, had lower occupancy, a higher share of residents on Medicaid and female residents, and a lower share of Black residents. In terms of staffing, facilities with high turnover and high instability on average had lower RN staffing hours per resident-day, lower LPN staffing hours per resident-day, lower CNA staffing hours per resident-day, and lower total staffing hours per resident-day. In terms of NHCC five-star ratings, facilities with high turnover and high instability on average had lower overall ratings, lower staffing ratings, and lower QM ratings. We also

found that compared to facilities with low turnover and high instability, facilities with high turnover and low instability were less likely to be for-profit and chain-based, but more likely to be hospital-based. Compared to facilities with low turnover and high instability, facilities with high turnover and low instability were on average bigger in terms of beds and residents, had higher occupancy, a lower share of residents on Medicaid and Black residents, and a higher share of female residents. In terms of staffing, facilities with high turnover and low instability on average had higher RN staffing hours per resident-day, lower LPN staffing hours per resident-day, higher CNA staffing hours per resident-day, and higher total staffing hours per resident-day. In terms of NHCC five-star ratings, facilities with high turnover and low instability on average had higher overall rating, higher staffing rating and higher QM rating. All differences were found to be statistically significant.

Regression analysis revealed that staffing instability and turnover contributed independently to nursing home quality (see Figures 3 and 4), with instability having a stronger association with some measures of quality and turnover with others. The regression analyses revealed that, controlling for staffing turnover, average staffing hours per resident-day, facility characteristics, 5-star ratings and facility-level resident characteristics, staffing instability was positively and more strongly associated with long-stay residents' receipt of anti-psychotic drugs, decline in ADL levels and short-stay residents' functioning at discharge. Staffing instability was negatively associated with long-stay residents' hospitalizations. The regression analyses also showed that controlling for staffing instability, average staffing hours per resident-day, facility characteristics, 5-star ratings and facility-level resident characteristics, turnover was positively and more strongly associated with long-stay residents' prevalence of pressure ulcers and worsening mobility, and short-stay residents' hospitalizations. The two staffing measures showed similar associations with both long-stay and short-stay residents' ED visits, and short-stay residents' receipt of anti-psychotic drugs. Across all outcomes, average total staffing hours per resident-day was found to be negatively associated with quality measures; this is expected given a large literature connecting higher staffing levels to better quality. For the full set of regression results, see Supplementary Tables 1 and 2. All the aforementioned results were found to be in line with the regression models in our sensitivity analyses. See Supplementary Tables 3, 4, 5 and 6.

Discussion

In this cross-sectional study of 11,840 nursing homes in the US, we explored unadjusted associations between the new measures of nursing home staffing — staffing instability and staffing turnover — to examine whether or not they independently contributed to the production of quality in nursing homes. We found that the two measures were positively but weakly correlated with each other, with some but incomplete overlap between nursing homes with high instability versus high turnover. Regression analysis revealed that staffing instability and turnover contributed independently to nursing home quality, with instability having a stronger association with some measures of quality and turnover with others. Thus, our findings indicate that staffing turnover and staffing instability have different and complementary associations with quality of care in nursing homes. These findings highlight the fact that both measures are important and offer different perspectives on quality of care.

Our study had several limitations. First, this was a cross-sectional study, and therefore we could neither explore longitudinal trends in either instability or turnover, nor make causal inferences connecting these dimensions of staffing and quality of care in nursing homes. This should be explored in future research. Second, our study period overlaps with (a) periods of COVID-19 outbreaks in nursing homes, and (b) time periods when states had varying COVID-19 vaccine mandates, both of which may have led to irregularities in staffing levels in nursing homes, due to which turnover and instability may have been higher than usual. Third, PBJ collects data only on paid hours, suggesting it might inaccurately reflect when salaried staff work more or less than is nominally specified by their employment agreement.[10] However, prior research suggests this issue is fairly minor and this type of measurement error should have a minimal impact on our findings.[10,26] Lastly, given the data reported in national datasets, we are not able to distinguish whether turnover in facilities was voluntary or involuntary. Future research should look into this, as it would provide a more nuanced perspective on the staffing-outcomes relationship in nursing homes. Notwithstanding these limitations, our study provides a broad view of how the new measures of staffing in nursing homes are related to quality of care in nursing homes.

Federal guidelines dictate that facilities must "have sufficient staff to assure the safety of residents and attain or maintain the highest feasible level of physical, mental, and psychosocial well-being of each resident."[27] However, despite the guidelines, nursing homes have historically struggled with workforce shortages and high rates of turnover, both of which have been exacerbated by the COVID-19 pandemic.[2] Our study, highlights the fact that policymakers have to look beyond average staffing ratios to ensure adequate staffing in nursing homes. Attempts to manage and improve quality by influencing only the average staffing level or only the daily staffing instability or only staffing turnover may be associated with only partial success.[11] Therefore, to ensure its commitment towards improving transparency and helping families and caregivers find the best quality of nursing home care for their loved ones, CMS should consider adding measures of staffing instability to the existing measures of average staffing and staff turnover in the NHCC, as each of these dimensions of staffing exhibits independent associations with quality. Optimal policy to improve nursing home quality will require a more complete understanding and consideration of multiple dimensions of staffing.

Conclusion and Implications

Our study found that instability in total nursing home staffing is only weakly correlated with total staffing turnover, and that the two measures are independently associated with nursing home quality. These findings demonstrate that two key measures of nursing home staffing — staffing instability and turnover — conceptually and empirically measure different things, over and above average staffing levels. Therefore, adding measures of staffing instability to the existing measures of average staffing and staff turnover in NHCC may enhance the report card's value for providers engaged in quality improvement and consumers searching for high-quality nursing homes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

References

1. Donabedian A The Quality of Care: How Can It Be Assessed? JAMA 1988;260(12):1743. doi:10.1001/jama.1988.03410120089033 [PubMed: 3045356]

2. Committee on the Quality of Care in Nursing Homes, Board on Health Care Services, Health and Medicine Division, National Academies of Sciences, Engineering, and Medicine. The National Imperative to Improve Nursing Home Quality: Honoring Our Commitment to Residents, Families, and Staff National Academies Press; 2022:26526. doi:10.17226/26526

3. Konetzka RT, Stearns SC, Park J. The Staffing-Outcomes Relationship in Nursing Homes: The Staffing-Outcomes Relationship. Health Services Research 2007;43(3):1025–1042. doi:10.1111/j.1475-6773.2007.00803.x

4. Mukamel DB, Saliba D, Ladd H, Konetzka RT. Associations Between Daily Nurse Staffing Levels and Daily Hospitalizations and ED Visits in Nursing Homes. Journal of the American Medical Directors Association 2022;23(11):1793–1799.e3. doi:10.1016/j.jamda.2022.06.030 [PubMed: 35948066]

5. Centers for Medicare & Medicaid Services. State Operations Manual: Chapter 7—Survey and Enforcement Process for Skilled Nursing Facilities and Nursing Facilities; 2011.

6. Gorges RJ, Konetzka RT. Staffing Levels and COVID ‐19 Cases and Outbreaks in U.S. Nursing Homes. J Am Geriatr Soc 2020;68(11):2462–2466. doi:10.1111/jgs.16787 [PubMed: 32770832]

7. Mukamel DB, Saliba D, Ladd H, Konetzka RT. Daily Variation in Nursing Home Staffing and Its Association With Quality Measures. JAMA Netw Open 2022;5(3):e222051. doi:10.1001/jamanetworkopen.2022.2051 [PubMed: 35285921]

8. Castle NG, Engberg J. Staff Turnover and Quality of Care in Nursing Homes. Medical Care 2005;43(6):616–626. doi:10.1097/01.mlr.0000163661.67170.b9 [PubMed: 15908857]

9. Castle NG, Engberg J, Men A. Nursing Home Staff Turnover: Impact on Nursing Home Compare Quality Measures. The Gerontologist 2007;47(5):650–661. doi:10.1093/geront/47.5.650 [PubMed: 17989407]

10. Gandhi A, Yu H, Grabowski DC. High Nursing Staff Turnover In Nursing Homes Offers Important Quality Information: Study examines high turnover of nursing staff at US nursing homes. Health Affairs 2021;40(3):384–391. doi:10.1377/hlthaff.2020.00957 [PubMed: 33646872]

11. Mukamel DB, Saliba D, Ladd H, Konetzka RT. Association of Staffing Instability With Quality of Nursing Home Care. JAMA Netw Open 2023;6(1):e2250389. doi:10.1001/jamanetworkopen.2022.50389 [PubMed: 36626170]

12. Centers for Medicare & Medicaid Services (CMS). Nursing Home Five-Star Quality Rating System:Technical Users' Guide Published online October 2022. Accessed August 10, 2022. https://www.cms.gov/medicare/provider-enrollment-and-certification/certificationandcomplianc/downloads/usersguide.pdf

13. Lerner NB, Johantgen M, Trinkoff AM, Storr CL, Han K. Are Nursing Home Survey Deficiencies Higher in Facilities With Greater Staff Turnover. Journal of the American Medical Directors Association 2014;15(2):102–107. doi:10.1016/j.jamda.2013.09.003 [PubMed: 24139163]

14. Antwi YA, Bowblis JR. The Impact of Nurse Turnover on Quality of Care and Mortality in Nursing Homes: Evidence from the Great Recession. American Journal of Health Economics 2018;4(2):131–163. doi:10.1162/ajhe_a_00096

15. Harrington C, Swan JH. Nursing Home Staffing, Turnover, and Case Mix. Med Care Res Rev 2003;60(3):366–392. doi:10.1177/1077558703254692 [PubMed: 12971234]

16. Fitzpatrick PG. Turnover of Certified Nursing Assistants: A Major Problem for Long-term Care Facilities. Hospital Topics 2002;80(2):21–25. doi:10.1080/00185860209597991

17. Zimmerman S, Gruber-Baldini AL, Hebel JR, Sloane PD, Magaziner J. Nursing Home Facility Risk Factors for Infection and Hospitalization: Importance of Registered Nurse Turnover, Administration, and Social Factors. J Am Geriatr Soc 2002;50(12):1987–1995. doi:10.1046/j.1532-5415.2002.50610.x [PubMed: 12473010]

18. Castle NG. Measuring Staff Turnover in Nursing Homes. The Gerontologist 2006;46(2):210–219. doi:10.1093/geront/46.2.210 [PubMed: 16581885]

19. Centers for Medicare & Medicaid Services. To Advance Information on Quality of Care, CMS Makes Nursing Home Staffing Data Available Published online January 26, 2022. Accessed August 17, 2022. https://www.cms.gov/newsroom/press-releases/advance-information-quality-care-cms-makes-nursing-home-staffing-data-available

20. Abelson MA, Baysinger BD. Optimal and Dysfunctional Turnover: Toward an Organizational Level Model. The Academy of Management Review 1984;9(2):331. doi:10.2307/258446 [PubMed: 10266031]

21. Collier E, Harrington C. Staffing Characteristics, Turnover Rates, and Quality of Resident Care in Nursing Facilities. Research in Gerontological Nursing 2008;1(3):157–170. doi:10.3928/19404921-20080701-02 [PubMed: 20077960]

22. Shen K, McGarry BE, Grabowski DC, Gruber J, Gandhi AD. Staffing Patterns in US Nursing Homes During COVID-19 Outbreaks. JAMA Health Forum 2022;3(7):e222151. doi:10.1001/jamahealthforum.2022.2151 [PubMed: 35977215]

23. Leveck ML, Jones CB. The nursing practice environment, staff retention, and quality of care. Res Nurs Health 1996;19(4):331–343. doi:10.1002/(SICI)1098-240X(199608)19:4<331::AID-NUR7>3.0.CO;2-J [PubMed: 8773556]

24. Payroll Based Journal https://data.cms.gov/quality-of-care/payroll-based-journal-daily-nurse-staffing

25. LTCFocus Public Use Data sponsored by the National Institute on Aging (P01 AG027296) through a cooperative agreement with the Brown University School of Public Health Accessed November 9, 2022. www.ltcfocus.org. 10.26300/h9a2-2c26

26. Geng F, Stevenson DG, Grabowski DC. Daily Nursing Home Staffing Levels Highly Variable, Often Below CMS Expectations. Health Affairs 2019;38(7):1095–1100. doi:10.1377/hlthaff.2018.05322 [PubMed: 31260368]

27. Code of Federal Regulations. CMS Requirements for Long-Term Care Facilities—Administration, 42 CFR § 483.70(e) (2016) Published online 2016. Accessed January 15, 2023. https://www.ecfr.gov/current/title-42/chapter-IV/subchapter-G/part-483
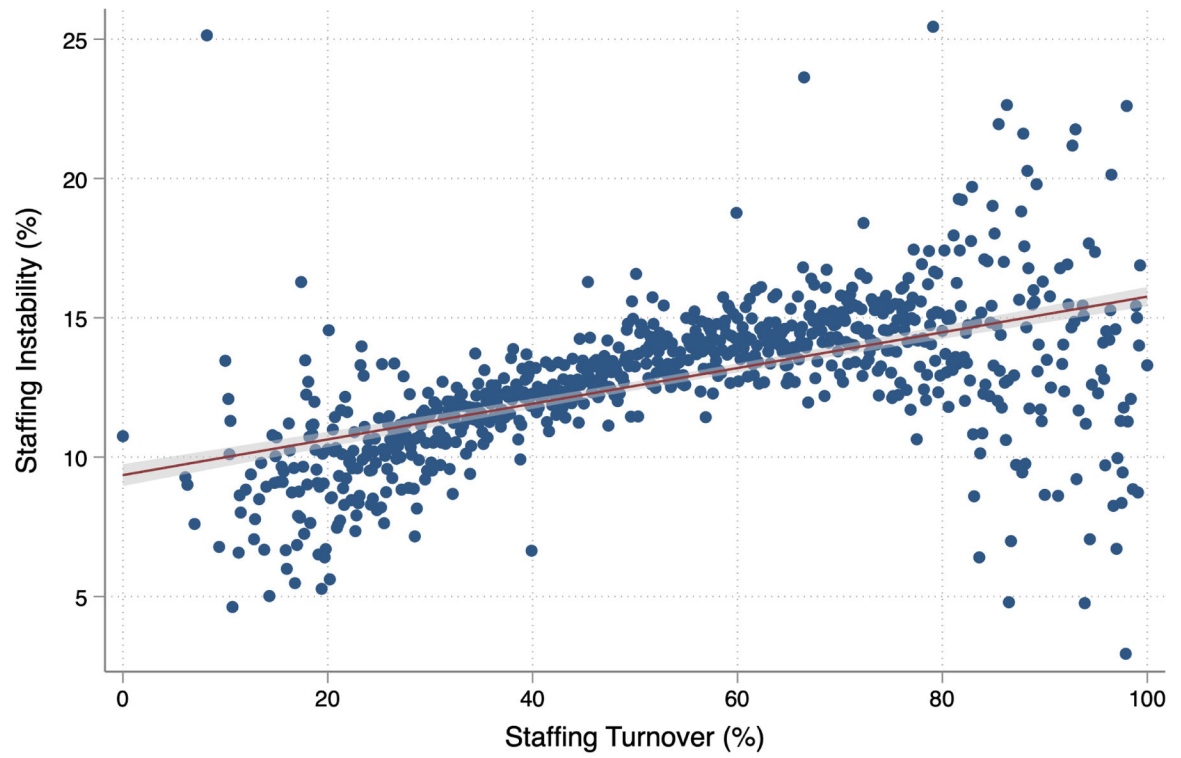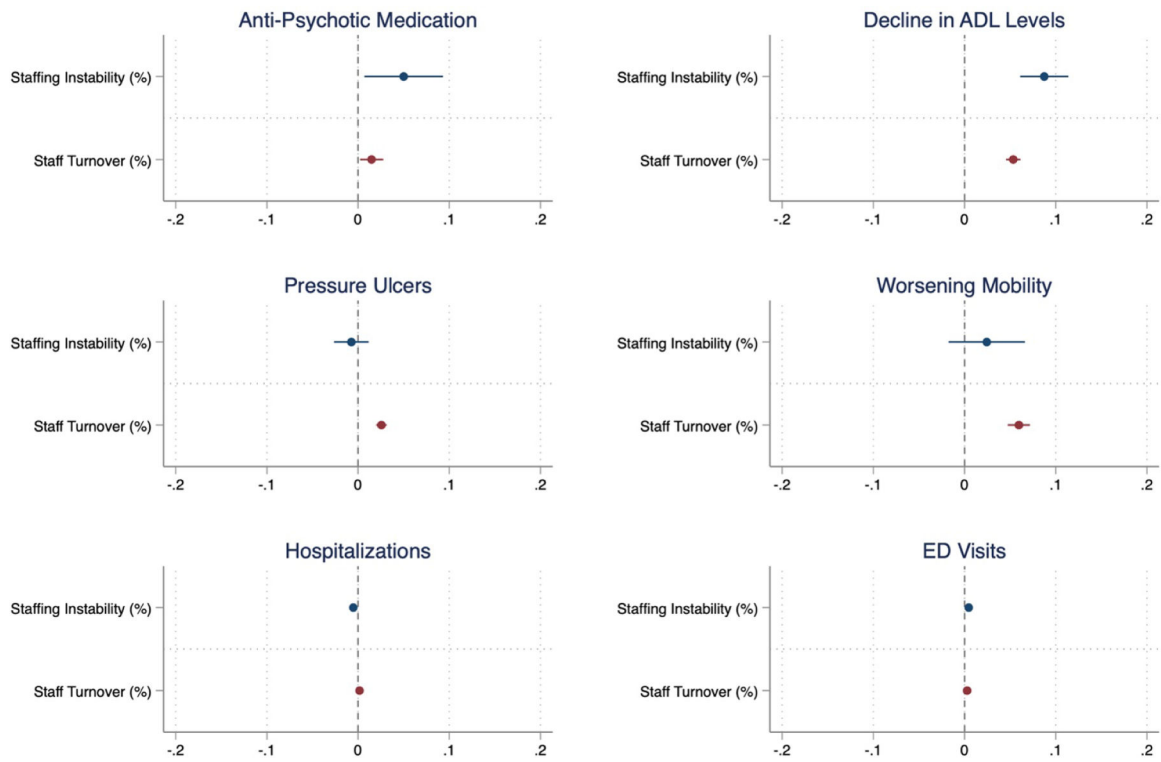
Figure 1:
Unadjusted Association between Staffing Instability and Staffing Turnover
(a) Staffing instability is measured as the percentage of days when average staffing levels at a facility was 20 percent below its mean
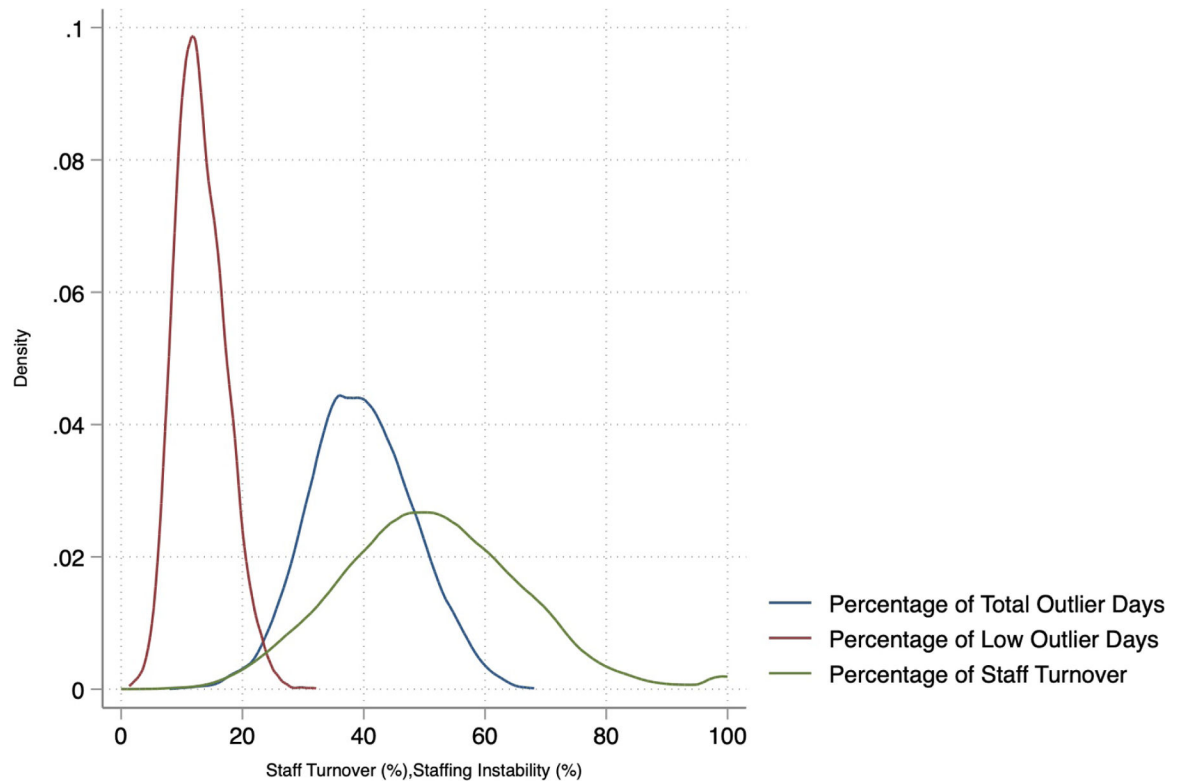
Figure 2:
Distribution of Staffing Instability and Turnover Measures in Total Staffing
(a) Percentage of low outlier days is measured as the percentage of days when average staffing levels at a facility was 20 percent below its mean (b) Percentage of total outlier days is measured as the percentage of days when average staffing levels at a facility was 20 percent above or below its mean

Figure 3:
Association between Turnover, Instability and Long-Stay Residents' Quality Measures
(a) Across all models, outcomes are regressed on average staffing hours per resident-day, staffing instability and staffing turnover, resident census, occupancy, ownership type, overall rating, percent female, percent black and percent Medicaid. (b) Staffing instability is measured as percentage of days when a facility's average staffing level was 20 percent below its annual mean. (c) Across all models use robust standard errors. (d) The horizontal bars indicate 95% confidence intervals (e) Positive associations imply poor quality of care in nursing homes.
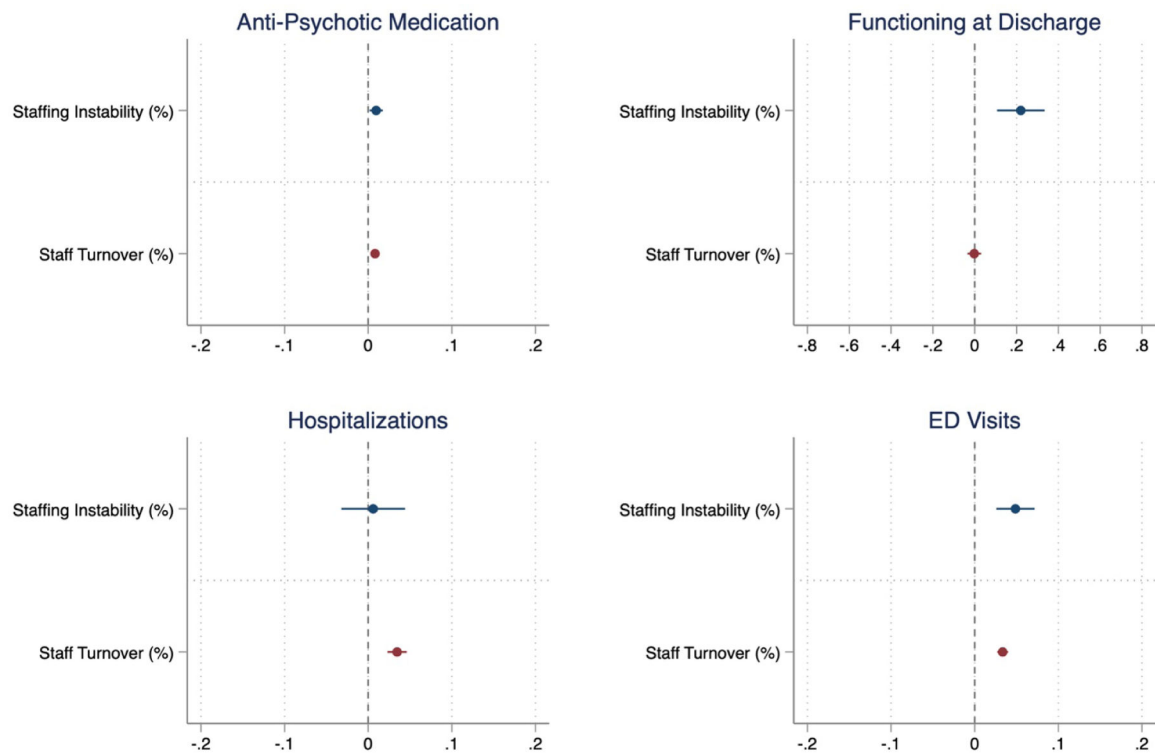
Figure 4:
Association between Turnover, Instability and Short-Stay Residents' Quality Measures
(a) Across all models, outcomes are regressed on average staffing hours per resident-day, staffing instability and staffing turnover, resident census, occupancy, ownership type, overall rating, percent female, percent black and percent Medicaid. (b) Staffing instability is measured as percentage of days when a facility's average staffing level was 20 percent below its annual mean. (c) Across all models use robust standard errors. (d) The horizontal bars indicate 95% confidence intervals (e) Positive associations imply poor quality of care in nursing homes.

Table 1:

Characteristics of Nursing Homes across Measures of Staffing Turnover and Staffing Instability

	Full Sample	Low Turnover, Low Instability	High Turnover, High Instability	P-Value	Low Turnover, High Instability	High Turnover, Low Instability	P-Value
	N=11,840	N=1,933	N=1,718		N=795	N=854	
For Profit, N (%)	8373 (70.7)	1239 (64.3)	1341 (78.7)	0.000	695 (80.2)	476 (58.8)	0.000
Hospital-Based, N (%)	410 (3.5)	111 (5.8)	16 (0.9)	0.000	20 (2.3)	42 (5.2)	0.000
Chain Ownership, N (%)	7174 (60.6)	890 (46.2)	1224 (71.8)	0.000	562 (64.8)	457 (56.4)	0.002
Number of Beds, Mean (SD)	109.31 (60.41)	125.95 (83.17)	108.14 (44.36)	0.000	99.08 (44.44)	105.25 (59.02)	0.005
Occupancy, % Mean (SD)	80.80 (14.27)	85.16 (11.98)	77.42 (14.91)	0.000	77.61 (15.65)	81.57 (13.85)	0.000
Resident Characteristics							
Daily Residents Census, Mean (SD)	76.94 (44.94)	93.99 (64.60)	72.18 (31.73)	0.000	66.06 (33.74)	76.23 (44.92)	0.000
Percent Medicaid, % Mean (SD)	60.29 (22.30)	59.18 (24.58)	62.61 (19.55)	0.000	64.51 (21.12)	56.38 (24.12)	0.000
Percent Black, % Mean (SD)	9.77 (18.62)	11.79 (19.69)	9.92 (19.11)	0.006	12.63 (21.03)	6.77 (16.13)	0.000
Percent Female, % Mean (SD)	64.33 (14.79)	62.97 (17.40)	64.74 (12.54)	0.001	63.09 (14.49)	65.46 (15.22)	0.000
Average Staffing Hours							
Registered Nurse (RN) Staffing HPRD, Mean (SD)	0.78 (0.49)	0.85 (0.57)	0.67 (0.36)	0.000	0.59 (0.38)	0.93 (0.57)	0.000
Licensed Practical Nurse (LPN) Staffing HPRD, Mean (SD)	0.93 (0.36)	0.98 (0.42)	0.89 (0.31)	0.000	1.01 (0.32)	0.90 (0.36)	0.000
Certified Nurse Aide (CNA) Staffing HPRD, Mean (SD)	2.33 (0.56)	2.43 (0.57)	2.28 (0.53)	0.000	2.19 (0.51)	2.48 (0.64)	0.000
Total Staffing HPRD, Mean (SD)	4.00 (0.89)	4.20 (0.97)	3.82 (0.76)	0.000	3.76 (0.76)	4.27 (1.04)	0.000
Quality Measures							
Overall 5-star Rating, Mean (SD)	3.25 (1.31)	3.67 (1.21)	2.76 (1.28)	0.000	2.67 (1.29)	3.83 (1.18)	0.000
Staffing 5-star Rating, Mean (SD)	3.16 (1.12)	3.38 (1.12)	2.89 (1.03)	0.000	2.58 (1.05)	3.56 (1.06)	0.000
QM Rating 5-star, Mean (SD)	3.73 (1.11)	4.08 (1.01)	3.41 (1.15)	0.000	3.39 (1.21)	3.97 (1.02)	0.000

Notes:

[a] Instability is measured as percentage of days when a facility's average staffing level was 20 percent below its annual mean.

[b] High instability and High turnover, refers to nursing homes at the top one-third of staffing instability and turnover respectively

*(c)*Low instability and low turnover, refers to nursing homes at the bottom one-third of staffing instability and turnover respectively.

*(d)*Because high/low instability and turnover were defined based on the top/bottom one-third of the distributions, with the middle range omitted, the sample sizes for subgroup comparisons do not add to the full sample size.

*(d)*5-star ratings range from 1–5, with higher ratings indicating better quality.

*(e)*At a significance level of 0.05, the study has 80 percent power to detect an effect size of 0.09.