

Nursing Home Staffing Studies Showing a Positive Relationship Between Nurse Staffing and Quality Outcomes		
1977	Linn, M., Gurel, L., and Linn, B.A. (1977). Patient outcomes as a measure of quality of nursing home care. <i>American J. Public Health</i> . 67 (4):337-44.	More RN hours per patient were associated with patients being alive, improved, and discharged. A higher professional staff-to-patient ratio was related to being discharged.
1990	Munroe, D. (1990). The influence of registered nurse staffing on the quality of nursing home care. <i>Research Nursing & Health</i> . 13:263-270.	A positive, significant relationship existed between nursing home quality and the ratio of RN hours to licensed vocational nurse (LVN) hours per resident day.
1991	Spector, W.D., and Takada, H.A. (1991). Characteristics of nursing facilities that affect resident outcomes. <i>Journal of Aging and Health</i> 3 (4): 427-454.	Higher staff levels and lower RN turnover were related to resident functional improvement.
1996	Johnson-Pawlson, J & Infeld, D (1996). Nurse staffing and quality of care in nursing facilities. <i>J. Gerontol Nurs</i> , 22: 36-45.	The ratio of RNs to residents is directly related to a measure of resident rights deficiencies. The ratio of total nursing staff to residents is directly related to a lower overall deficiency index and a higher quality of care score.
1996	Kayser-Jones, J. (1996). Mealtime in nursing homes. <i>J. of Gerontological Nursing</i> . 22 (3):26-31.	Educating nursing assistants on individualized care at mealtime and ensuring that an adequate number of staff are available to assist residents can improve mealtime and reduce malnutrition.
1997	Kayser-Jones, J. and Schell, E. (1997). Inadequate staffing at mealtime: implications for nursing and health policy. <i>J Gerontological Nursing</i> . 23(8):14-21.	Inadequate staffing is a major factor that contributes to weight loss. Each staff CNA should have no more than two to three residents to feed or assist during meals.
1997	Kayser-Jones, J. and Schell, E. (1997). The effect of staffing on the quality of care at mealtime. <i>Nursing Outlook</i> . 45 (2):64-72.	Inadequate staffing has serious consequences for the nutritional care of nursing home residents. CNAs should have no more than two or three residents to feed or assist at mealtime and have a minimum of 25-30 minutes to feed each person.
1998	Anderson, A., Hsieh, P. Su, H. (1998). Resource allocation and resident outcomes in nursing homes; Comparisons between the best and worst. <i>Res Nurs Health</i> . 21:297-313.	Two sets of comparison groups and showed that the group of nursing homes with the greatest percentage of improvement in resident outcomes had higher levels of registered nurse (RN) staffing and higher costs. The results suggest that, although RN staffing is more expensive, it is key to improving resident outcomes.
1998	Bliesmer, M.M., Smayling, M., Kane, R.L., and Shannon, I. (1998). The relationship between nursing staffing levels and nursing home outcomes. <i>J. of Aging and Health</i> . 10 (3):351-371.	In the year after admission, licensed (but not nonlicensed) nursing homes were significantly related to improved functional ability, increased probability of discharge home, and decreased probability of death.
1998	Castle, N. and Fogel, B. (1998). Characteristics of nursing homes that are restraint free. <i>Gerontologist</i> . 38:181-188.	Restraint free facilities were likely to utilize more full-time equivalent (FTE) registered nurses (RNs) per resident, but less FTE nurse aides and licensed practical nurses (LPNs) per resident.
1999	Anderson, R.A. and McDaniel, R.R. (1999). RN participation in organizational decision making and improvements in resident outcomes. <i>Health Care Manage Rev</i> . Winter;24(1):7-16.	Nursing homes with the most improvements in resident outcomes had greater RN participation in decision making than did homes with the least improvements.
1999	Berlowitz, D., Anderson, J., Brandeis, G., et al. (1999). Pressure ulcer development in the VA: Characteristics of nursing homes providing best care. <i>Amer J. Medical Quality</i> . 14: 39-44.	Using multivariate modeling, hospital size and low staffing were significant independent predictors of pressure ulcer development.

1999	Intrator, O., Castle, N., Mor, V. (1999). Facility characteristics association with hospitalization of nursing home residents: Results of a national study. <i>Medical Care</i> . 37: 228-237.	Controlling for other factors, more physicians and nurse practitioners or physician assistants were less likely to hospitalize their residents.
1999	Kayser-Jones, J., Schnell, E.S., Porter, C., Barbaccia, J.C., and Shaw, H. (1999). Factors contributing to dehydration in nursing homes: inadequate staffing and lack of professional supervision. <i>J. American Geriatric Society</i> . 47 (1):1187-94.	Residents with moderate to severe dysphagia, severe cognitive and functional impairment, aphasia or inability to speak English, and a lack of family or friends to assist them at mealtime are at great risk for dehydration when staffing is inadequate and supervision is poor.
1999	Ooi, W.L., Morris, J.N., Brandeis, G.H., Hossain, M., Lipsitz, L.A. (1999). Nursing home characteristics and the development of pressure sores and disruptive behaviour. <i>Age Ageing</i> . 28 (1):45-52.	Nursing homes at high-risk for pressure sores and disruptive behaviour had fewer beds and used less non-licensed nursing staff time.
2000	Harrington, C., Kovner, C., Kayser-Jones, J., Berger, S., Mohler, M., Burke R. et al. (2000). Experts recommend minimum nurse staffing standards for nursing facilities in the United States. <i>Gerontologist</i> , 40 (1):1-12.	Experts recommended total minimum staffing levels for nursing homes of 1.15 RN hours, .70 LVN/LPN hours, 2.7 CNA hours, and a total of 4.55 hours including administrative nurses.
2000	Harrington, C., Zimmerman, D., Karon, S., Robinson, J. and Beutel, P., (2000). Nursing home staffing and its relationship to deficiencies. <i>J. of Gerontology</i> . 55B: (5):S278-S287.	Few RN and nursing assistant hours were associated with more total deficiencies and more quality of care deficiencies controlling for other variables. Fewer nursing assistant hours were associated with more quality of life deficiencies.
2001	US Centers for Medicare and Medicaid Services, Prepared by Abt Associates Inc. (2001). <i>Appropriateness of minimum nurse staffing ratios in nursing homes. Report to Congress: Phase II Final</i> . Volumes I-III. Baltimore, MD: CMS.	Recommended staffing levels were 2.78 hrs/resident day for nursing assistants and 1.3 hrs/resident day for licensed staff, including .75 hrs/resident day for RNs to improve outcomes and avoid selected care problems for long stay residents.
2001	Kramer, A.M. and Fish, R. (2001). The relationship between nurse staffing levels and the quality of nursing home care. In <i>Appropriateness of minimum nurse staffing ratios in nursing homes. Report to Congress: Phase II Final</i> . Volumes I-III. Baltimore, MD: CMS.	Staffing thresholds were at 2.78 hrs/resident day for nursing assistants and 1.3 hrs/resident day for licensed staff, including .75 hrs/resident day for RNs, to improve outcomes and avoid selected care problems for long stay residents.
2001	Schnelle, J.F., Simmons, S.F., and Cretin, S. (2001). Minimum nurse aide staffing required to implement best practice care in nursing facilities. In <i>Appropriateness of minimum nurse staffing ratios in nursing homes. Report to Congress: Phase II Final</i> . Volumes I-III. Baltimore, MD: CMS, Ch 3, 1-40.	The results of this study showed that 2.8 to 3.2 nursing assistant hours per resident day, depending on the acuity level of the residents, were necessary to consistently provide all of these daily care processes.
2002	Simmons S.F., Babineau, S., Garcia, E., Schnelle, J.F. (2002). Quality assessment in nursing homes by systematic direct observation: feeding assistance. <i>J Gerontol A Biol Sci Med Sci</i> . Oct;57(10):M665-71.	Chart information is often inaccurate or incomplete for many daily care processes and food and fluid intake are significantly over-estimated. Residents with low oral food and fluid intake often receive little or no assistance from NH staff during mealtimes.
2001	Svarstad, B. L., & Mount, J. K. (2001). Chronic benzodiazepine use in nursing homes: Effects of federal guidelines, resident mix, and nurse staffing. <i>Journal of the American Geriatrics Society</i> , 49, 1673–1678. doi:10.1111/j.1532-415X.2001.49278.x.	High BZ use in nursing homes continues. A study in Wisconsin nursing homes found that nurse staffing was the only significant predictor of chronic BZ use where better staffing was associated with lower use.
2002	Zimmerman, S., Gruber-Baldini, A.L., Hebel, J.R., Sloane, P.D., Magaziner, J. (2002). Nursing home facility risk factors for infection and hospitalization: importance of registered nurse turnover, administration, and social factors. <i>J Am Geriatr Soc</i> . 50(12):1987-95.	Higher RN turnover is related to infections and hospitalization. High rates of infection were associated with high licensed practical nurse staffing and low nurses' aide staffing.

2003	Harrington, C. and Swan, J.H. (2003). Nurse home staffing, turnover, and casemix. <i>Medical Care Research and Review</i> , 60 (2):366-392.	Higher total nurse and RN staffing hours were associated with lower staff turnover rates.
2004	Bates-Jensen, B.M., Schnelle, J.F., Alessi, C.A., Al-Samarrai, N.R., and Levy-Storrs, L. (2004). The effects of staffing on in-bed times of nursing home residents. <i>J. of the American Geriatric Society</i> . 52 (6): 931-8.	In multivariate analyses, staffing level remained the strongest predictor of time observed in bed after controlling for resident functional measures.
2004	Bostick, J. Relationship of nursing personnel and nursing home care quality. <i>J. Nursing Care Quality</i> . 19:130-136.	An increase of RN time can result in lower pressure ulcer rates.
2004	Schnelle, J.F., Simmons, S.F., Harrington, C., Cadogan, M., Garcia, E., & Bates-Jensen, B. (2004). Relationship of nursing home staffing to quality of care? <i>Health Services Research</i> , 39 (2):225-250.	Based on an observational study in 21 nursing homes, the highest nursing assistant staffed nursing homes (above 2.8 hours per patient day) performed significantly better on 13 of 16 care processes compared to lower staffed homes.
2004	Horn, S.D., Bender S.A., Ferguson, M.L., Smout, R.J. et al (2004). The national pressure ulcer long-term care study: Pressure ulcer development in long-term care residents. <i>J. American Geriatrics Society</i> , 52: 359-367.	A retrospective cohort study found a decreased likelihood of developing a Stage I to IV pressure ulcer included new resident, nutritional intervention, antidepressant use, use of disposable briefs, RN hours of 0.25 hours per resident per day or more, nurses' aide hours of 2 hours per resident per day or more, and licensed practical nurse turnover rate of less than 25%.
2004	Simmons, S.F., Schnelle, J.F. (2004). Individualized feeding assistance care for nursing home residents: staffing requirements to implement two interventions. <i>J Gerontol A Biol Sci Med Sci</i> . 59(9):M966-73.	46% significantly increased their oral intake with 1 on 1 mealtime feeding assistance (time required was 35 minutes/meal per resident compared with usual NH care (6 minutes). 44% significantly increased their oral intake with between-meal snack intervention (12 minutes).
2004	Weech-Maldonado, R., Meret-Hanke, L., Neff, M.C., and Mor, V. (2004). Nursing staffing patterns and quality of care in nursing homes. <i>Health Care Management Review</i> . 29 (2):107-116.	RN staffing levels were found to affect quality of patient care both directly and indirectly through their positive effect on the processes of care.
2004	Zhang, X., & Grabowski, D. C. (2004). Nursing home staffing and quality under the nursing home reform act. <i>The Gerontologist</i> , 44, 13–23. doi:10.1093/geront/44.1.13	After controlling for many factors, there was a significant decrease in the proportion of residents with pressure ulcers, physical restraints, and urinary catheters following the implementation of the NHRA. A positive relationship between RN, total licensed hours, and total nurse staffing hours and overall quality of care was found.
2005	Akinci, F., & Krolikowski, D. (2005). Nurse staffing levels and quality of care in Northeastern Pennsylvania nursing homes. <i>Applied Nursing Research</i> , 18, 130–137. doi:10.1016/j.apnr.2004.08.004	90 licensed nursing homes in Northeastern PA were examined and found a positive association between RN and CNA staffing and quality of patient care provided to nursing home residents.
2005	Dorr, D.A., Horn, S.D., & Smout, R.J. (2005). Cost analysis of nursing home registered nurse staffing times. <i>J. of Amer Geriatrics Society</i> , 53: 840-845.	A retrospective cost study of adverse outcome rates of pressure ulcers, urinary tract infections, and hospitalizations showed an annual net benefit per resident per year in a high-risk, long-stay nursing home unit that employed sufficient nurses to achieve 30-40 minutes of RN nurse direct care time per resident per day versus nursing homes that have nursing time of less than 10 minutes.
2005	Hickey, E.C., Young, G.J., Parker, V.A. et al. (2005). The effects of changes in nursing home staffing on pressure ulcer rates. <i>J. Am Med Dir Assoc</i> , 6:50-53.	Ten nursing homes that reduced staffing levels from their baseline levels at the beginning of the study and/or changed their staffing mix by replacing licensed personnel with nursing

		assistants had a 2.1% higher rate of pressure ulcer development. Staff stability is associated with better outcomes.
2005	Horn, S.D., Buerhaus, P., Bergstrom, N., Smout, R.J. (2005). RN staffing time and outcomes of long-stay nursing home residents: pressure ulcers and other adverse outcomes are less likely as RNs spend more time on direct patient care. <i>Am J Nurs.</i> 105(11):58-70	More RN direct care time per resident per day was associated with fewer pressure ulcers, hospitalizations, and UTIs; less weight loss, catheterization, and deterioration in the ability to perform ADLs; and greater use of oral standard medical nutritional supplements. More CNA and LPN time was associated with fewer pressure ulcers but did not improve other outcomes.
2006	Castle, N. G., & Myers, S. (2006). Mental health care deficiency citations in nursing homes and caregiver staffing. <i>Administration and Policy in Mental Health</i> , 33 , 215–225. doi:10.1007/ s10488-006-0038-2	Greater RN staffing was associated with a lower likelihood of being cited for deficiencies in mental health care. Greater LPN and NA staffing were associated with a higher likelihood.
2006	Decker, F.H. 2006. Nursing staff and the outcomes of nursing stays. <i>Medical Care</i> . 44 (9):812-21.	For stays less than 60 days, but not among longer stays, the probability of leaving the nursing home in recovered or stabilized condition increased, and that of dying decreased, with an increasing staffing ratio for registered nurses.
2006	Dellefield, M.E. (2006). Organizational correlates of the risk-adjusted pressure ulcer prevalence and subsequent survey deficiency citation in California nursing homes. <i>Research in Nursing & Health</i> , 29:345-358.	A study of California nursing homes found higher pressure ulcer prevalence was associated with lower licensed nurse centralization and Medicaid only facilities. Lower deficiencies were in facilities having a higher total nurse staffing level, more licensed nurses, and 160 beds or more.
2006	Kim, H., & Whall, A. L. (2006). Factors associated with psychotropic drug usage among nursing home residents with dementia. <i>Nursing Research</i> , 55 , 252–258. doi:10.1097/00006199-200607000-00005	Low levels of RN staffing lead to increased psychotropic drug use.
2006	Mueller, C., Arling, G., Kane, R., Bershadsky, J., Holland, D., & Joy, A. (2006). Nursing home staffing standards: Their relationship to nurse staffing levels. <i>The Gerontologist</i> , 46 (1):74-80.	Facilities in states with high staffing standards had somewhat higher staffing than states with no standards or low standards.
2006	Wan, T.T.H., Zhang, N.J. & Unruh, L. (2006). Predictors of resident outcome improvement in nursing homes. <i>Western J. Of Nursing Research</i> . 28 (8):974-993.	Controlling for other factors, nursing homes having a high level of nurse staffing had an overall quality improvement of resident outcomes, measured by a weighted index in incidents of pressure ulcers, physical restraints, and catheter use.
2007	Castle, N. & Engberg, J. (2007). The influence of staffing characteristics on quality of care in nursing homes. <i>Health Services Research</i> , 42: 1822-1847.	Achieving higher quality was dependent on having more than one favorable staffing characteristic such as turnover, staffing levels, worker stability, and agency staff.
2007	Dyck, M.J. (2007). Nursing staffing and resident outcomes in nursing homes: weight loss and dehydration. <i>J. Nursing Care Quality</i> . 22 (1):59-65.	Residents receiving at least 3 hours per day of nursing assistant care had a 17% decreased likelihood of weight loss.
2007	Konetzka, R.T., Spector, W. & Limcangco, M.R. (2007). Reducing hospitalizations from long-term care settings. <i>Medical Care Research & Review</i> , 65:40-66.	Evidence from 55 peer-reviewed articles on interventions that potentially reduce hospitalizations are those that increase skilled staffing, especially through physician assistants and nurse practitioners.

2007	Spector, W., Shaffer, T., Potter, D.E., Correa-de-Araujo, R., Rhona Limcangco, M. (2007). Risk factors associated with the occurrence of fractures in U.S. nursing homes: resident and facility characteristics and prescription medications. <i>J Am Geriatr Soc.</i> 55(3):327-33.	A high certified nurse aide ratio was associated with fewer fractures.
2007	Zhang, N.J., & Wan, T.T. (2007). Effects of institutional mechanisms on nursing home quality. <i>J. of Health & Human Services Administration</i> , 29:380-408.	Structural equation modeling found that the potential demand for care, Medicaid reimbursement rate, and occupancy rate are positively associated with nursing home quality. An interaction effect between the regulatory mechanism and nurse staffing is statistically significant.
2008	Alexander, G.L. (2008). An analysis of nursing home quality measures and staffing. <i>Quality Management in Health Care.</i> 17 (3):242-51.	The percentage of CNA/LPN/RN staffing-level mix is associated with fewer residents that are incontinent, improvements in activities of daily living, fewer residents with moderate to severe pain, and fewer pressure ulcers.
2008	Castle, N., & Engberg, J. (2008). The influence of agency staffing on quality of care in nursing homes. <i>J. of Aging and Social Policy</i> , 20 (4): 437-53.	More agency nurse aides resulted in a smaller increase in quality, compared to the use of an equivalent number of regular nurse aides.
2008	Castle, N., & Engberg, J. (2008). Further examination of the influence of caregiver staffing levels on nursing home quality. <i>Gerontologist</i> , 48: 464-76.	When regression models include agency staff, stability, and professional staff mix), staffing levels were generally associated with the quality measures (i.e., 15 of the 18 staffing measures were significant).
2008	Castle, N.G., Engberg, J. & Men, A. (2008). Nurse aide agency staffing and quality of care in nursing homes. <i>Medical Care Research and Review</i> , 65 (2):232-52.	Higher nurse aide agency levels were associated with low quality.
2008	Decker, F.H. (2008). The relationship of nursing staff to the hospitalization of nursing home residents. <i>Research, Nursing and Health</i> , 31 (3):238-51.	For patients with longer stays (>30 days), higher RN staffing levels in nursing homes reduced hospitalizations. Higher RN levels reduced hospitalizations more than higher licensed nurse levels or skill mix.
2008	Grabowski, D.C., Stewart, K.A., Broderick, S.M. & Coots, L.A. (2008). Predictors of nursing home hospitalization: A review of the literature. <i>Medical Care Research and Review</i> , 65 (1):3-39.	Factors associated with hospitalization included low nurse staffing among others.
2008	Hutt, E., Radcliff, T.A., Liebrecht, D., Fish, R., McNulty, M., Kramer, A.M. (2008). Associations among nurse and certified nursing assistant hours per resident per day and adherence to guidelines for treating nursing home-acquired pneumonia. <i>J Gerontol A Biol Sci Med Sci.</i> 63(10):1105-11.	CNA hours per resident day were significantly associated with better pneumococcal and influenza vaccination rates. More than 1.2 licensed nurse hours per resident day was significantly associated with appropriate hospitalization and guideline-recommended antibiotics.
2008	Konetzka, R.T., Stearns, S.C., Park, J. (2008). The staffing-outcomes relationship in nursing homes. <i>Health Serv Res.</i> 43(3):1025-42.	Controlling for endogeneity of staffing increases the estimated positive impact of staffing on outcomes in nursing homes. Greater RN staffing significantly decreases the likelihood of adverse outcomes. Increasing skill mix reduces the incidence of urinary tract infections.
2008	Simmons, S.F., Keeler, E., Zhuo, X., Hickey, K.A., Sato, H.W., Schnelle, J.F. (2008). Prevention of unintentional weight loss in nursing home residents: a controlled trial of feeding assistance. <i>J Am Geriatr Soc.</i> Aug;56(8):1466-73.	Increasing staff feeding assistance time from 10 minutes to 35 minutes per resident per meal and for snacks from 1 minute to 12 minutes resulted in significant gains in resident food and fluid intake.
2009	Hyer, K., Temple, A., and Johnson, C.D. (2009) Florida's efforts to improve quality of nursing home care through nurse	Florida's state Medicaid reimbursement incentives was not effective in increasing

	staffing standards, regulation, and Medicaid reimbursement. <i>J. of Aging Social Policy</i> . 21 (4):318-37.	nursing home staffing. Only after the legislation mandated minimum nursing home staffing did nursing homes improve staffing levels. Unfortunately, the state established a minimum for CNAs and licensed nursing but not for RN staffing. Nursing homes reduced RN staffing by substituting less expensive LVNs for RNs.
2009	Park, J. and Stearns S.C. (2009). Effects of state minimum staffing standards on nursing home staffing and quality of care. <i>Health Serv Res</i> . 44(1):56-78.	Increased standards resulted in small staffing increases for facilities with staffing initially below or close to new standards. The standards were associated with reductions in restraint use and the number of total deficiencies at all types of facilities.
2009	Castle, N. (2009). Use of agency staff in nursing homes. <i>Research in Gerontological Nursing</i> , 2 (3): 192-201.	A strong association was found between better quality and lower agency use for both nurse aides and RNs.
2009	Kim, H., Harrington, C. & Greene, W. (2009). Registered nurse staffing mix and quality of care in nursing homes: A longitudinal analysis. <i>Gerontologist</i> , 49 (1):81-90.	Higher RN to total nurse staffing ratios and higher RN to licensed staffing ratios was associated with lower total deficiencies and less serious deficiencies.
2009	Kim, H., Kovner, Harrington, C., Greene, W. & Mezey, M. (2009). A panel data analysis of the relationships of nursing home staffing levels and standards to regulatory deficiencies. <i>J. of Gerontology: Social Sciences</i> , 64B (2):269-278.	Higher total nursing staffing and RN staffing levels were related to lower total deficiencies, quality of care deficiencies, and serious deficiencies. Nursing homes that met the state staffing standard received fewer total deficiencies and quality of care deficiencies.
2010	Horn, S.D., Sharkey, S.S., Hudak, S., Smout, R.J., Quinn, C.C., Yody, B. and Fleshner, I (2010). Beyond CMS Quality Measure Adjustments: Identifying Key Resident and Nursing Home Facility Factors Associated with Quality Measures. <i>J. American Medical Directors Association</i> . 11 (7):500-5.	Resident activities of daily living decline showed significant associations with licensed nurse turnover.
2011	Bowblis, J.R. (2011). Staffing ratios and quality: An analysis of minimum direct care staffing requirements for nursing homes. <i>Health Services Research</i> , 46(5): 1495-516.	Higher minimum direct care staffing requirements increased nurse staffing levels and were generally associated with improved resident outcomes and meeting regulatory standards.
2011	Castle, N.G. & Anderson, R.A. (2011). Caregiver staffing in nursing homes and their influence on quality of care: using dynamic panel estimation methods. <i>Medical Care</i> , 49:545-522.	Generalized method of moments estimation examined changes in 4 quality measures (physical restraint use, catheter use, pain management, and pressure sores). A robust positive association between RN, LPN, and CNA staffing and quality indicators. A change to more favorable staffing is generally associated with a change to better quality.
2011	Castle, N.G., Wagner, L.M., Ferguson, J.C. & Handler, S.M.. (2011). Nursing home deficiency citations for safety. <i>J. Aging and Social Policy</i> , 23 (1):34-57.	Low staffing levels are associated with the likelihood of receiving deficiency citations for safety violations.
2011	Castle, N.G., Wagner, L.M., Ferguson-Rome, J.C., Men, A, & Handler, S.M.. (2011). Nursing home deficiency citations for infection control. <i>Am. J. Infection Control</i> , 39 (1):263-9-57.	For all 3 types of caregiver examined (i.e, nurse aides, Licensed Practical Nurses, and Registered Nurses), low staffing levels were associated with receipt of a deficiency citation for infection control.
2011	Hyer, K., Thomas, K.S., Branch, L.G., Harman, J.S., Johnson, C.E., and Weech-Maldonado, R. (2011). The influence of nurse	Using a generalized estimating equation approach and controlling for facility characteristics, higher CNA and licensed

	staffing levels on quality of care in nursing homes. <i>The Gerontologist</i> . 51:610-616.	nursing staff were predictors of facilities' total deficiency score and quality of care deficiency scores using the CMS Nursing Home Compare Five-Star Rating System, adjusting for the complexity of the scope and severity of the citations.
2011	Kalisch, B.J., Tschannen, D, and Hee, K. (2011). Do staffing levels predict missed nursing care? <i>Intern. J. for Quality in Health Care</i> . 23 (3):302-308.	Ten hospitals in the Midwest were studied by surveying RNs with direct care responsibilities. RN hours per patient day were a significant predictor of missed nursing care.
2011	Tong PK. (2011). The effects of California minimum nurse staffing laws on nurse labor and patient mortality in skilled nursing facilities. <i>Health Econ</i> . 20(7):802-16.	After the 2000 state staffing regulation change to 2.8 hours per resident day, increases in nurse staffing reduced on-site SNF patient mortality.
2011	Zhao M, Haley DR. (2011). Nursing home quality, staffing, and malpractice paid-losses. <i>J Health Care Finance</i> . 38(1):1-10.	Nursing homes with higher registered nurse to resident ratios are less likely to experience malpractice paid-losses.
2012	Harrington, C., Olney, B, Carrillo, H., & Kang, T. 2012. Nurse staffing and deficiencies in the largest for-profit chains and chains owned by private equity companies. <i>Health Services Research</i> , 47 (1), Part I: 106-128.	The top 10 for-profit chains had lower registered nurse and total nurse staffing hours than government facilities, controlling for other factors. The top 10 chains received 36 percent higher deficiencies and 41 percent higher serious deficiencies than government facilities.
2012	Leland NE, Gozalo P, Teno J, Mor V. (2012). Falls in newly admitted nursing home residents: a national study. <i>J Am Geriatr Soc</i> . 60(5):939-45.	NHs with higher certified nursing assistant (CNA) staffing had significantly lower rates of falls.
2012	Trivedi, T.K., DeSalvo, T., Lee, L., Palumbo, A., Moll, M., Curns, A., Hall, A.J., Patel, M., Parashar, U.D., Lopman, B.A. (2012). Hospitalizations and mortality associated with norovirus outbreaks in nursing homes, 2009-2010. <i>JAMA</i> . Oct 24;308(16):1668-75.	Homes with lower daily registered nurse (RN) hours per resident (<0.75) had increased mortality rates during norovirus outbreaks compared with baseline
2013	Lerner, N.B. (2013). The relationship between nursing staff levels, skill mix, and deficiencies in Maryland nursing homes. <i>The Health Care Manager</i> , 32:123-128.	A study of Maryland nursing homes found that number of deficiencies were associated with the number of nursing home beds, nursing assistant hours per patient-day, and the location of the nursing home. The only factor influencing the severity of the deficiencies was RN hours per patient-day.
2013	Simmons, S.F., Durkin, D.W., Rahman, A.N., Choi, L., Beuscher, L., Schnelle, J.F. (2013). Resident characteristics related to the lack of morning care provision in long-term care. <i>Gerontologist</i> . 53(1):151-61.	40% of the observations showed a lack of morning care provision, including any staff-resident communication about care. Residents more physically dependent and requiring 2 staff for transfer were more likely to not receive morning care.
2013	Spector, W.D., Limcangco, R., Williams, C., Rhodes, W., Hurd, D. (2013). Potentially avoidable hospitalizations for elderly long-stay residents in nursing homes. <i>Med Care</i> . 2013 Aug; 51(8):673-81.	Three fifths of hospitalizations were potentially avoidable and the majority was for infections, injuries, and congestive heart failure. Clinical risk factors include renal disease, diabetes, and a high number of medications among others. Staffing, quality, and reimbursement affect avoidable, but not unavoidable hospitalizations.
2013	Trinkoff, A. M., Han, K., Storr, C. L., Lerner, N., Johantgen, M., & Gartrell, K. (2013). Turnover, staffing, skill mix, and resident outcomes in a national sample of US nursing homes.	LN turnover was associated with two times the incidence of pressure ulcers. CNA turnover was associated with increased quality issues (PUs, pain and UTIs).

	<i>The Journal of Nursing Administration</i> , 43 , 630–636. doi:10.1097/ NNA.0000000000000004	
2013	Wagner, L.M., McDonald, S.M., Castle, N.G. (2013). Nursing home deficiency citations for physical restraints and restrictive side rails. <i>West J Nurs Res</i> . 35(5):546-65.	Restraint/side rail deficiency citations were negatively associated with higher staffing levels of registered nurses and licensed practical nurses.
2013	Xing, J., Mukamel, D. B., & Temkin-Greener, H. (2013). Hospitalizations of nursing home residents in the last year of life: Nursing home characteristics and variation in potentially avoidable hospitalizations. <i>Journal of the American Geriatrics Society</i> , 61 , 1900–1908. doi:10.1111/jgs.12517	Almost 50% of hospital admissions for NH residents in their last year of life were for potentially avoidable conditions. Facilities with higher nursing staffing were more likely to have better performance, as were facilities with higher skilled staff ratio, those with nurse practitioners or physician assistants, and those with on-site X-ray service.
2014	Castle, N., Wagner, L., Ferguson, J., Handler, S. (2014). Hand hygiene deficiency citations in nursing homes. <i>J Appl Gerontol</i> . 33(1):24-50.	In the multivariate analyses, low staffing for nurse aides, Licensed Practical Nurses, and Registered Nurses were associated with receiving a deficiency citation for hand hygiene.
2014	Lerner, N.B., Johantgen, M., Trinkoff, A.M., Storr, C.L., and Han, K. (2013). Are nursing home survey deficiencies higher in facilities with great staff turnover. <i>J. American Medical Directors Association</i> . 15 (2):102-107.	High CNA and licensed nurse turnover is associated with quality problems measured by deficiencies.
2014	Lin, H. (2014). Revisiting the relationship between nurse staffing and quality of care in nursing homes: An instrumental variables approach. <i>J. of Health Economics</i> , 37: 13-24.	Registered nurse staffing has a large and significant impact on reducing quality of care and deficiencies. A one-standard-deviation increase in RN staffing is associated with a 17% decrease in the fraction of residents with pressure sores and with a 10% decrease in the fraction of residents with contractures
2014	Thomas, K.S., Rahman, M., Mor, V., Intrator, O. (2014). Influence of hospital and nursing home quality on hospital readmissions. <i>Am J Management Care</i> . Nov 1;20 (11):e523-31.	Patients who received care in higher-quality NHs (as indicated by high nurse staffing levels and lower deficiency scores) were less likely to be rehospitalized within 30 days.
2015	Chen M.M. and Grabowski, D C. (2015) Intended and unintended consequences of minimum staffing standards for nursing homes. <i>Health Econ</i> . 24: 822-839.	Adopting minimum staffing standards in California and Ohio resulted in a 5 percent increase in total nursing hours per resident day and reduced severe deficiencies. The regulation changes had the unintended consequence of lowering the direct care professional nursing and the absolute level of indirect care.
2015	Castle, N.G., Ferguson-Rome, J.C. (2015). Influence of nurse aide absenteeism on nursing home quality. <i>Gerontologist</i> . Aug; 55(4):605-15.	High levels of staff absenteeism are associated with poor performance on all four quality indicators examined (physical restraint use, catheter use, pain management, and pressure sores).
2015	Dabney, B.W. and Kalisch, B.J. Nurse staffing levels and patient-reported missed nursing care. <i>J. Nurs Care Quality</i> , 30 (4):306-312.	A study of 729 inpatient hospital patients were surveyed. Missed timeliness in receiving nursing care from staff was associated with total nursing staff hours of care per resident day, RN hour hours per patient day, and RN skill mix.
2015	Shippee, T.P., Hong, H., Henning-Smith, C., Kane, R.L. (2015). Longitudinal changes in nursing home resident-reported quality of life: the role of facility characteristics. <i>Res Aging</i> . Aug;37(6):555-80.	Size, staffing levels (especially activities staff), and resident case mix are some of the most salient predictors of Quality of Life.
2015	Uchida-Nakakoji, M., Stone, P. W., Schmitt, S. K., & Phibbs, C. S. (2015). Nurse workforce characteristics and infection risk in VA Community Living Centers: A longitudinal analysis.	In a 6-year longitudinal panel multivariate analyses, RN and LPN tenure in VA nursing

	<i>Medical Care</i> , 53 , 261–267. doi:10.1097/MLR.0000000000000316	homes were associated with decreased infections by 3.8% and 2% respectively.
2016	Harrington, C., Schnelle, J.F., McGregor, M. and Simmons, S.F. (2016). The need for higher minimum staffing standards. <i>Health Services Insights</i> . 9: 13-19.	Multiple research studies show a positive relationship between nursing home quality and staffing and the benefits of implementing higher minimum staffing standards. Many U.S. facilities have dangerously low staffing.
2016	Paek, SC., Zhang NJ, Wan, TTH, Unruh, LY, and Meemon, N. (2016). The impact of state nursing home staffing standards on nurse staffing levels. <i>Medical Care Research & Review</i> , 73(1):41-61	The study findings indicated that state staffing standards for the categories of registered nurse, licensed nurse, or total nurse are positively related to registered nurse, licensed nurse, or total nurse staffing levels, respectively. Nursing homes more actively responded to licensed staffing requirements than total staffing requirements.
2016	Schnelle, J.F., Schroyer, L.D., Saraf, A.A., and Simmons, S.F. (2016). Determining nurse aide staffing requirements to provide care based on resident workload: A discrete event simulation model. <i>J. American Medical Directors Association</i> . 17:970-977.	Based on a simulation model, the nurse aide staffing required for ADL care that would result in a rate of care omissions below 10% ranged from 2.8 hours/resident/ day for nursing homes with a low workload to 3.6 hours/resident/day for nursing homes with a high workload.
2016	Uchida-Nakakoji, M., Stone, P. W., Schmitt, S. K., & Phibbs, C.S., Wang, C. (2016). Economic evaluation of registered nurse tenure on nursing home resident outcomes. <i>Applied Nursing Research</i> , 29:89-95	The economic costs of high tenure RNs was greater than low tenure RNs across 3 outcomes: dollars per hospitalization; dollars per hospitalization and mortality rates; and morality rates (less costly and more effective) for a substantial savings to the VA healthcare system.
2018	Boscart VM, Sidani S, Poss J, et al. The associations between staffing hours and quality of care indicators in long-term care. <i>BMC Health Serv Res</i> . 2018;18(1):750. Published 2018 Oct 3. doi:10.1186/s12913-018-3552-5	The delivery of nursing assistant care hprd was significantly associated with higher quality of resident care.
2018	Phillips LJ, Birtley NM, Petroski GF, Siem C, Rantz M (2018). An observational study of antipsychotic medication use among long-stay residents without qualifying diagnoses. <i>J. Psych Mental Health Nurs</i> . 25(8):463-474.	One additional registered nurse hour per resident day could reduce the odds of antipsychotic use by 52% and 56% for residents with and without a dementia diagnosis respectively.
2019	Geng, F., Stevenson, D.G., Grabowski, D.C. (2019). Daily nursing home staffing levels highly variable, often below CMS expectations. <i>Health Affairs</i> . 38 (7) 1095-1100.	New payroll-based data reveal large daily staffing fluctuations, low weekend staffing, and daily staffing levels often below the expectations of the Centers for Medicare and Medicaid Services (CMS).
2019	Min, A. and Hong, H.C. (2019). Effect of nurse staffing on rehospitalizations and emergency department visits among short-stay nursing home residents: A cross-sectional study using the US nursing home compare database. <i>Geriatr Nurs</i> ., 40 (2):160-165.	Using data for US nursing homes from the 2016 Nursing Home Compare, the Five-Star Quality Rating System's staffing rating is a significant predictor for the rates of rehospitalization and emergency department visit among short-stay nursing home residents. The results also showed the importance of registered nurse staffing in nursing home caring for short-stay residents.
2019	Weech-Maldonado, R., Pradhan, R., Dayama, N., Lord, J., Gupta, S. (2019). Nursing home quality and financial performance: Is there a business case for quality? <i>Inquiry</i> , Jan-Dec:56. DOI: 10.1177/0046958018825191	Using data for all free-standing nongovernment nursing homes for 2000-2014, the operating margin was lower in nursing homes that reported higher LPN hours per resident day and higher RN skill mix; higher use of catheters, lower pressure ulcer prevention, and lower restorative ambulation; and more residents with

		contractures, pressure ulcers, hospitalizations and health deficiencies. Nursing homes that have better processes and outcomes of care perform better financially.
2019	White, E.M., Aiken, L.H., and McHugh, M.D. (2019) Registered nurse burnout, job dissatisfaction, and missed care in nursing homes. <i>J. Am Geriatric Society</i> , 67 (1):2065-2071.	A survey of 687 RNs in 540 certified nursing homes in California, Florida, New Jersey, and Pennsylvania found that 30% exhibited high levels of burnout, 31% were dissatisfied with their job, and 72% reported missing one or more necessary care tasks on their last shift due to lack of time or resources. One in five RNs reported frequently being unable to complete necessary patient care. Controlling for RN and nursing home characteristics, RNs with burnout were five times more likely to leave necessary care undone than RNs without burnout. Tasks most often left undone were comforting/talking with patients, providing adequate patient surveillance, patient/family teaching, and care planning.
2020	Figueroa J.F., Wadhera R.K., Papanicolas I., Riley K., Zheng J., Orav E.J., Jha, A.K. (2020). Association of nursing home ratings on health inspections, quality of care, and nurse staffing with COVID-19 cases. <i>J. Amer Medical Association (JAMA)</i> , online August 10, 2020. doi: 10.1001/jama.2020.14709	Of the 4254 NHs across the 8 states, high performing NHs were less likely to have had more than 30 COVID-19 cases than were low-performing facilities on health inspections, quality measures, and nurse staffing. High performing NHs had a lower median number of certified beds. After adjustment, NHs with high ratings on nurse staffing were significantly less likely to have more than 30 COVID-19 than were low-performing NHs, but there was no difference on health inspections and quality measures.
2020	Gorges R. J., Konetzka R. T., (2020). Staffing levels and COVID-19 cases and outbreaks in US nursing homes. <i>Journal of the American Geriatrics Society</i> , online August 08, 2020. https://doi.org/10.1111/jgs.16787	71% of the 13,167 nursing homes that reported COVID-19 data as of June 14 had at least one case among residents and/or staff. Of those, 27% experienced an outbreak. Higher RN hours are associated with a higher probability of experiencing any cases. However, among facilities with at least one case, higher nurse aide and total nursing hours are associated with a lower probability of experiencing an outbreak and with fewer deaths. The strongest predictor of cases and outbreaks in nursing homes is per capita cases in the county.
2020	Harrington, C., Ross, L., Chapman, S., Halifax, E., Spurlock, B, and Bakerjian, D. (2020). Nursing staffing and coronavirus infections in California nursing homes. <i>Policy, Politics, & Nursing Practice</i> . 21(3):174-186. DOI: 10.1177/1527154420938707.	In a study of California nursing homes through May 4, 2020, 819 did not report residents with COVID-19 and 272 reported one or more COVID-19 residents. Nursing homes with total RN staffing levels under the recommended minimum standard (0.75 hours per resident day) had a two times greater probability of having COVID-19 resident infections. Nursing homes with lower Medicare five-star ratings on total nurse and RN staffing levels (adjusted for acuity), higher total health deficiencies, and more beds had a higher probability of having COVID-19 residents.

2020	Li, Y., Temkin-Greener, H., Shan, G., and Cai, X. (2020). COVID-19 Infections and Deaths among Connecticut Nursing Home Residents: Facility Correlates. <i>J. Am Geriatric Society</i> , Jun 18; doi: 10.1111/jgs.16689.	In a study of 215 CT nursing homes, average confirmed COVID-19 cases was eight per and confirmed deaths was 1.7 per home. Among facilities with at least one confirmed case, every 20-minute increase in RN staffing (per resident day) was associated with 22% fewer confirmed cases. Four- or five-star facilities had 13% fewer confirmed cases. Facilities with high concentration of Medicaid residents or racial/ethnic minority residents had 16% and 15% more confirmed cases. Among facilities with at least one death, every 20-minute increase in RN staffing significantly predicted 26% fewer COVID-19 deaths.
2020	Stall, N.M., Jones, A., Brown, K.A., Rochon, P.A., Costa, A.P. (2020) For-profit long-term care homes and the risk of COVID-19 outbreaks and resident deaths. <i>CMAJ</i> ,. doi: 10.1503/cmaj.201197; early-released July 22, 2020.	In a study of 623 Ontario nursing homes, the odds of an outbreak was associated with COVID in the region, the number of residents and older design standards. The extent of the outbreak and deaths was associated with for-profit status, large size, low nursing staff FTEs, and older design standards.
2020	Ogletree, A.M, Mangrum, R., Harris, Y., Gifford, D.R. et al. (2020). Omissions of care in nursing home settings: A narrative review. <i>JAMDA</i> . 21:604-614.	Review article finds definitions of omissions of care for nursing homes vary in scope and level of detail. Substantial evidence connects omissions of care with an array of adverse events in nursing home populations.
2020	Bowblis, J.R. and Roberts, A.R. (2020) Cost-effective adjustments to nursing home staffing to improve quality. <i>Med Care Res and Review</i> . 77 (3):274-284.	Using CASPER data for 1999-2015, the study found that higher staffing was consistently related to better quality (based on deficiencies and deficiency scores), the largest improvements resulted from increasing administrative RNs and social service staffing.
2020	Dean, A., Venkataramani, A. and Kimmel, S. (2020). Mortality rates from COVID-19 are lower in unionized nursing homes. <i>Health Affairs</i> . 39 (11): 1993-2001.	Health care worker unions were associated with a 1.29 percentage reduction in COVID-19 resident mortality rates in 355 New York state nursing homes compared to facilities without unions.
2020	Yang, B.K, Carter, M.W., Trinkoff, A.M., & Nelson, H.W. (2020). Nurse staffing and skill mix patterns in relation to resident care outcomes in US nursing homes. <i>JAMDA</i> .	Controlling for regional and organizational characteristics, residents in NHs in the high-RN cluster had significantly lower rehospitalization and ED use compared with those in the high-LPN cluster. NHs in the high-LPN cluster had proportionally fewer hours of care by both CNAs and RNs. NHs that emphasize LPN care in place of either RN or CNA care appears to exhibit higher rates of unplanned rehospitalization and ED visits among residents.
2021	Williams, C.S., Zheng, Q, White, A.J. et al (2021). The association of nursing home quality ratings and spread of COVID-19. <i>Journal of the American Geriatric Society</i> . DOI: 10.1111/jgs.17309.	Nursing homes receiving five-star ratings for overall quality as well as for RN staffing and total staffing, had lower COVID-19 resident infection rates and deaths.
2021	Gupta, A., Howell, S.T., Yannelis, C., and Gupta, A. (2021). Does private equity investment in healthcare benefit patients? Evidence from nursing homes. Working Paper. 2021-20. Chicago: Becker Friedman Institute and NBER.	PE ownership increases the short-term mortality of Medicare patients by 10%, implying 20,150 lives lost due to PE ownership over our twelve-year sample period. This is accompanied by declines in other measures of patient well-being,

		such as lower mobility, while taxpayer spending per patient episode increases by 11%. Operational changes that help to explain these effects, included declines in nursing staffing and compliance with standards.
2022	Loomer, L, Grabowski, D.C., Yu, H., Gandhi, A. (2022) Association between nursing home staff turnover and infection control citations. <i>HSR</i> . 57:322-332.	Nurse staff turnover was associated with an increased likelihood of infection control citation control.
2022	Mukamel, D.B., Saliba, D., Ladd, H., and Konetzka, R.T. (2022). Daily variation in nursing home staffing and its association with quality measures. <i>JAMA Network Open</i> . March 14. 5 (3): e222051. doi:10.1001/jamanetworkopen.2022.2051	Three measures of daily staffing variations for RNs and CNAs were found to be significantly associated with the CMS 5-star survey and quality rankings of US nursing homes.
2022	Dean, A., McCallum, J., Kimmel, S.D., Venkataramani, A. (2022). Resident mortality and worker infection rates from COVID-19 lower in union than nonunion US nursing homes, 2020-21. nursing homes. <i>Health Affairs</i> . 41 (5):751-759.	Unions were associated with 10.8 percent lower resident COVID-19 mortality rates and a 6.8 percent lower worker COVID-19 infection rates in US nursing homes compared to nonunion homes in 2020-21.
2022	Zheng, Q., Williams, C.S., Shulman, E.T., White, A.J. (2022). Association between staff turnover and nursing home quality – evidence from payroll-based journal data. <i>JAGS</i> . 2022:1-9. DOI: 10.1111/jgs.17843	This study found average turnover rates of 44% for RNs and 46% for total nursing in US nursing homes with higher turnover in for-profit and large nursing homes in 2018-19. Higher turnover was consistently associated with poorer quality based on CMS 5-star ratings for quality.
2022	Moreno-Martin, P, Jerez-Roig, J., Rierol-Fochs, S et al., (2022). Incidence and predictive factors of functional decline in older people living in nursing homes: A systematic review. <i>JAMDA</i> . https://doi.org/10.1016/j.jamda.2022.05.001	Predictive factors of functional decline that were significant in at least 2 of the included studies were cognitive impairment, functional status at baseline, urinary incontinence, length of institutionalization, age, depression, being married, being male, and stroke disease. Protective factors were licensed nursing hours and presence of a geriatrician within the NH staff.
2022	Vogelsmeier, A., Popejoy, L., Fritz, E., Canada, K., Ge, B, Brandt, L., and Rantz, M. (2022). Repeat hospital transfers among long stay nursing home residents: a mixed methods analysis of age, race, code status and clinical complexity. <i>BMC Health Services Research</i> . 22:626 https://doi.org/10.1186/s12913-022-08036-9	Most transfers occurred without APRN involvement prior to transfer thus resulting in transfers that might have been avoided. Missed nursing care was an underlying factor associated with many potentially avoidable transfers. Concerns about lack of staff experience and/or comfort with complex residents were also factors in transfers.
2022	Shen, K., McGarry, B.E., Grabowski, D.C., Gruber, J., Gandi, A.D. (2022). Staffing patterns in US nursing homes during COVID-19 outbreaks. <i>JAMA Health Forum</i> . 3 (7): e222151. doi:10.1001/jamahealthforum.2022.2151	In this cohort study of 2967 nursing homes in 2020, owing to increased absences and departures, there were statistically significant declines in staffing levels during a severe COVID-19 outbreak that remained statistically significantly reduced 16 weeks after the outbreak's start. Facilities temporarily increased hiring, contract staff, and overtime to bolster staffing during outbreaks, but these measures did not fully replace lost staff, particularly certified nursing assistants. Policy action is needed to ensure facilities' abilities to maintain adequate staffing levels during and after infectious disease outbreaks.
2022	Chappell, V., Kirkham, J., Seitz, DP. (2022). Association between long-term care facility staffing levels and	There was a 0.75% decrease in inappropriate antipsychotic prescribing per unit increase in overall staff-to-patient ratio, a 3.09% decrease

	antipsychotic use in US long-term care facilities. JAMDA. 2022 Nov;23(11):1787-1792.e1. doi: 10.1016/j.jamda.2022.06.029.	per unit increase in licensed staff hours, and a 2.25% decrease per unit increase in RN staffing hours, a 1.83% decrease per unit increase in LPN staffing hours. CNA staffing hours were not associated with antipsychotic use.
2022	Ruffini, K. (2022). Worker earning, service quality and firm profitability: Evidence from nursing homes and minimum wage reforms. Review of Economics and Statistics. Doi.org/10.1162/rest_a_1271	Higher minimum wages increase income and retention among low age employees and improve consumer outcomes measured by fewer inspection violations, lower rates of adverse preventable health conditions, and lower resident mortality.
2023	Shen, K, McGarry, BE, and Gandhi, AD. Health care staff turnover and quality of care at nursing homes. JAMA Internal Medicine. doi:10.1001/jamainternmed.2023.5225. Published online October 9, 2023.	New hires were 15% for nursing and 11.6% for an average facility week due to turnover from 2017-2019. Turnover in the 2 weeks before a survey resulted in additional deficiencies. An additional 10 percentage points in nursing staff turnover was associated with a mean decrease of 0.035 in assessment-based quality measures and 0.020 in claims-based quality measures, with the strongest associations found for measures related to patient functioning.
2023	Joshi, S. (2023). Staffing shortages, staffing hours, and resident deaths in US nursing homes during the COVID-19 pandemic. J Am Med Dir Assoc. Aug;24(8):1114-1119. doi: 10.1016/j.jamda.2023.04.020. Epub 2023 May 8.	18-33 percent of nursing homes reported severe shortages, associated with lower staffing hours during Covid, which were associated with resident deaths.
2023	Yang, B.K., Idzik, S., Nelson, H.W., and McSweeney-Feld, M.H. (2023). Nurse practitioner employment in relation to nursing staff turnover and resident care outcomes in US nursing homes. J Am Med Dir Assoc. Nov;24(11):1767-1772. doi: 10.1016/j.jamda.2023.07.019. Epub 2023 Aug 24.	Nursing homes that employed NPs had significantly lower RN and CNA turnover rates and fewer long-stay resident hospitalizations, infection control citations, and substantiated complaints.
2023	Evers, J., and Geraedts, M. Impact of nursing home characteristics on COVID-19 infections among residents and staff. Amer. J. of Infection Control. 2023; Doi.org/10.1016/j.ajic.2023/08.011	Study of 687 nursing homes in Germany showed that the presence of a higher ratio of RNs was a protective factor against resident infections, resident mortality, and safeguarded staff. More single rooms were protective of infections, while more beds and infected staff increased resident infections.
2023	Evers, J., and Geraedts, COVID-19 risks in private equity nursing homes in Hesse, Germany – a retrospective cohort study. BMC Geriatrics (2023) 23:648 https://doi.org/10.1186/s12877-023-04361-8	Private equity NHs had substantially fewer outbreaks in number, but longer and larger outbreaks among nursing home residents, as well as a markedly increased proportion of deceased residents. The odds of the outcome "infections & deaths" were 5.38 times higher among PE NH compared to non-PE NH.
2023	Mukamel, D.B., Ladd, H., Saliba, D., and Konetzka R.T. Dementia, nurse staffing, and health outcomes in nursing homes. HSR. Doi:10.1111/1475-6773.14270.	RN and CNA hours were improved resident outcomes in both high and low-census dementia facilities. Antipsychotic use and activities of daily living were worse in higher dementia facilities while ER use and pressure sores were worse in lower dementia facilities.

2023	Mukamel, D.B., Ladd, H., Saliba, D., and Konetzka R.T. Association of staffing instability with quality of nursing home care. JAMA Network Open. 2023: 6(1):e2250389.doi.10.1001/jama/jamanetworkopen.2022.50389	A study of US nursing homes 2017-2018 shows that higher percentage of below-average staffing days was associated with worse quality for LPNs in 10 of 12 models with the worse for a decline in ADLs for long-stay residents. More below-average staffing days was associated with worse quality for CNAs in 9 or 12 models. Holding staffing constant is a marker of better quality.
2023	Abt Associates. (2023). Nursing Home Staffing Study Comprehensive report. Report prepared for the Centers for Medicare & Medicaid Services. June 2023. https://edit.cms.gov/files/document/nursinghomestaffing-study-final-report-appendix-june-2023.pdf	Multivariate models show that quality and safety, measured using claims, resident assessments, and health inspection data, increase with RN staffing levels, with no obvious plateau at which quality and safety are maximized or “cliff” below which quality and safety steeply decline. The highest CNA staffing levels are associated with quality and safety but LPN staffing levels do not have consistent effects. A simulation model for 5 basic care tasks that RNs and LPNs provide showed that 1.4 to 1.7 hprd are needed to reduce the level of delayed or omitted care below 5 percent.
2024	Travers, J.L, Hade, E.M., Friedman, S., Raval, A., Hadson, K., and Falvey, J.R. Staffing and antipsychotic medication use in nursing homes and neighborhood deprivation. JAMA Open Network. April 24, 2024:1-8.	Cross-sectional study of US nursing homes in 2019. NHs in severely deprived neighborhoods (17% of facilities) had higher inappropriate antipsychotic medication use and this use was greatest in NHs with less than 3 hours per resident day of nurse staffing.
2024	Mukamel, D.B., Saliba, D, Ladd, H/. and Konetzka. The relationship between nursing home staffing and health outcomes revisited. JAMDA. 2024; June 25.	Using a 2-stage model to account for endogeneity, for all us nursing homes from 2017-19, NHs antipsychotic use increased with higher RN staffing and decreased with higher CNAs. Hospitalization decreased with higher RNs and LPNs and increased with higher CNAs, ER visits decreased with higher RNs and increased with CNAs. Long-stay activities of daily living and short stay function improved only with higher CNAs and pressures sores improved only with higher RN staffing.
2024	Pradhan, R, Ghiasi, A., Davlyatov, G, Gupta, S, Weech-Maldonado, R. Threads of Care: Unraveling the impact of agency nursing staff on nursing home quality. <i>Med. Care. In Press.</i>	Logistic regression with two-way fixed effects examined the effect of agency nurse staffing hours per resident day on the quality of US NHs. A 10% increase in agency RN, LPN, and CNA staffing was associated with a decrease in the odds of achieving a higher star rating by 4-5%.
2025	See, I., et al Characteristics of nursing homes with high rates of invasive methicillin-resistant staphylococcus aureus infections. JAGS, 2025, 1-10.	A study of CDC 626 nursing home infection data from 7 states from 2011-2015 found 2,824 invasive MRSA cases. 20% of facilities had at 50% of the onset cases. Regression analysis showed facilities with high rates were more likely to have a resident with multidrug-resistant organism, the residents were more likely to be male, short-stay, and other factors. Higher RN staffing hprd were associated with lower rates.

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