

Healthcare Staffing and Quality of Care: Evidence from Staff Absences

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The views expressed are those of the presenter and do not necessarily
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Healthcare is a labor-intensive industry

- Healthcare is the largest private employment sector (BLS, 2025)
 - Approx. 12% of the total US workforce
- Labor costs account for ~60% of hospital operating expenses (AHA, 2024)
- Healthcare sector faces severe staffing challenges
 - Projected shortage of 140,000+ physicians by 2038 (NCHWA, 2025)
 - Projected shortage of 250,000+ RNs and 80,000+ LPNs (HRSA, 2025)

How Does Staffing Affect Health Care Delivery?

- Informs returns to investments in healthcare labor market
 - Relevant for both public and private payers
- Labor input highly regulated
 - E.g., minimum staffing standards and staffing ratios
- Physicians comprise only a fraction of health care workforce (BLS, 2025)
 - Physicians: ~840K
 - Registered nurses: ~3.4M; nursing assistants/aides: ~1.4M
 - Home health and personal care aides: ~3.7M

Study focuses on *causal* effect of staffing on patient outcomes

- Three dimensions of staffing
 - **Overall staffing levels**
 - **Skill mix**
 - Experience
- Use plausibly exogenous variation in hours due to staff absences
 - Absences are common: 7% of scheduled hours are absent on the median day
 - Use these absences as an instrument for observed staffing levels



Preview of results

- Only $\sim 63\%$ of absent hours are replaced
 - Imperfect replacement used to estimate causal effects
- An additional staff hour per patient day ($\sim 25\%$ increase in staffing levels) reduces:
 - Hospitalizations by $\sim 15\%$, hospital days by $\sim 14\%$
 - Mortality by $\sim 15\%$
- Savings from reduced hospitalization offset $\sim 15\%$ of the cost of additional staffing

Nursing homes and the care of older adults

- The market for nursing home care is large
 - \$211 billion (4% of national health expenditures) in 2023 (Martin et al., 2024)
- Over a lifetime, there is a high probability of using a nursing home (HHS, 2016)
 - Of those aged 65, 46% will use a nursing home
- Central to both the post-acute and long-term care systems

Nursing home reform efforts and staffing levels

- Policies for improving nursing home quality have focused on
 - Creating better informed consumers (e.g., CMS star ratings)
 - Staffing levels, e.g., minimum staffing standards
- Labor represents 60-70% of nursing home expenses (CMS, 2021)
- Nursing home care is low-tech but labor intensive
 - Hands-on personal care; 24-hour supervision
 - 50% of residents have dementia (Mukamel et al., 2023)

The nursing home workforce

- Registered Nurses (RNs)
 - Clinical assessment, care planning, medication management, administrative
 - Initiate treatments, authorize hospital transfers
 - Supervise LPNs and CNAs
- Licensed Practical Nurses (LPNs)
 - Medication administration, wound care, vital signs
- Certified Nursing Assistants (CNAs)
 - Activities of daily living (bathing, feeding, repositioning)
 - Provide the majority of direct, hands-on resident care
 - Largest group of nursing home staff
- Other staff: therapy (PT, OT, SLP), dietary, social work, housekeeping, administration

Existing evidence on nursing home staffing and resident outcomes

- State minimum staffing standards (Park & Stearns, 2009; Bowblis, 2011; Tong, 2011; Lin, 2014; Chen & Grabowski, 2015; Hackmann, 2019)
- Medicaid wage pass-through subsidies (Foster & Lee, 2015)
- Local labor market conditions (Antwi & Bowblis, 2018; Grabowski, Gruber & McGarry, 2024)

Limited Causal Evidence on Staffing

- Current evidence base mostly relies on between-state comparisons following state policy (long-run shocks) changes
 - Facilities adjust staffing composition and resident mix over time
 - Can't identify the (short-run) marginal product of an additional hour of care
- Role of skill mix
 - Registered Nurses, Licensed Practical Nurses, Certified Nurse Aides
- Importance of experience
 - In the field (human capital)
 - At the facility (continuity of care, familiarity with patients and procedures)

Staffing data

- Payroll Based Journal (PBJ) data
 - National administrative payroll data covering all Medicare/Medicaid-certified nursing homes
 - Records daily hours worked for each employee at each facility
 - Limit to 2017–2019: PBJ reporting begins in 2017
- Job titles: CNA, LPN, RN
- Can track employees within each facility over time
 - Allows measurement of cumulative experience and detection of absences
 - Cannot track employees across facilities

Constructing staffing levels

- Daily staff hours for nursing staff (CNA, LPN, RN)
 - Aggregate employee-level hours to facility-week level
- Staffing ratio: hours per resident-day (HPRD) = total hours / average daily census
 - Census fixed at facility-level average over the study period
 - Avoids endogenous changes to census in response to staffing
- Disaggregate HPRD by
 - Staff type (CNA, LPN, RN)
 - Experience (≥ 2000 cumulative hours at facility vs. < 2000)

Data: Resident panel for each facility-date

- Minimum Data Set (MDS)
 - Requires clinical assessments for all nursing home residents
- Medicare Provider Analysis and Review (MedPAR)
 - Fee-for-service Medicare claims for hospital and SNF care
 - Diagnosis codes, length of stay, spending
- Master Beneficiary Summary File (MBSF): demographics, chronic conditions, date of death
- Combine to construct a daily panel of nursing home for 14,664 nursing homes in the US

Defining outcomes

- Hospitalizations (from MedPAR)
 - Any hospitalization, fall-related hospitalizations
 - Hospital days (length of stay)
 - Hospital spending (Medicare paid + beneficiary out-of-pocket)
- Mortality (from MBSF)
 - In-hospital death or death in the nursing home, combined
- All outcomes aggregated to facility-week percentages or averages

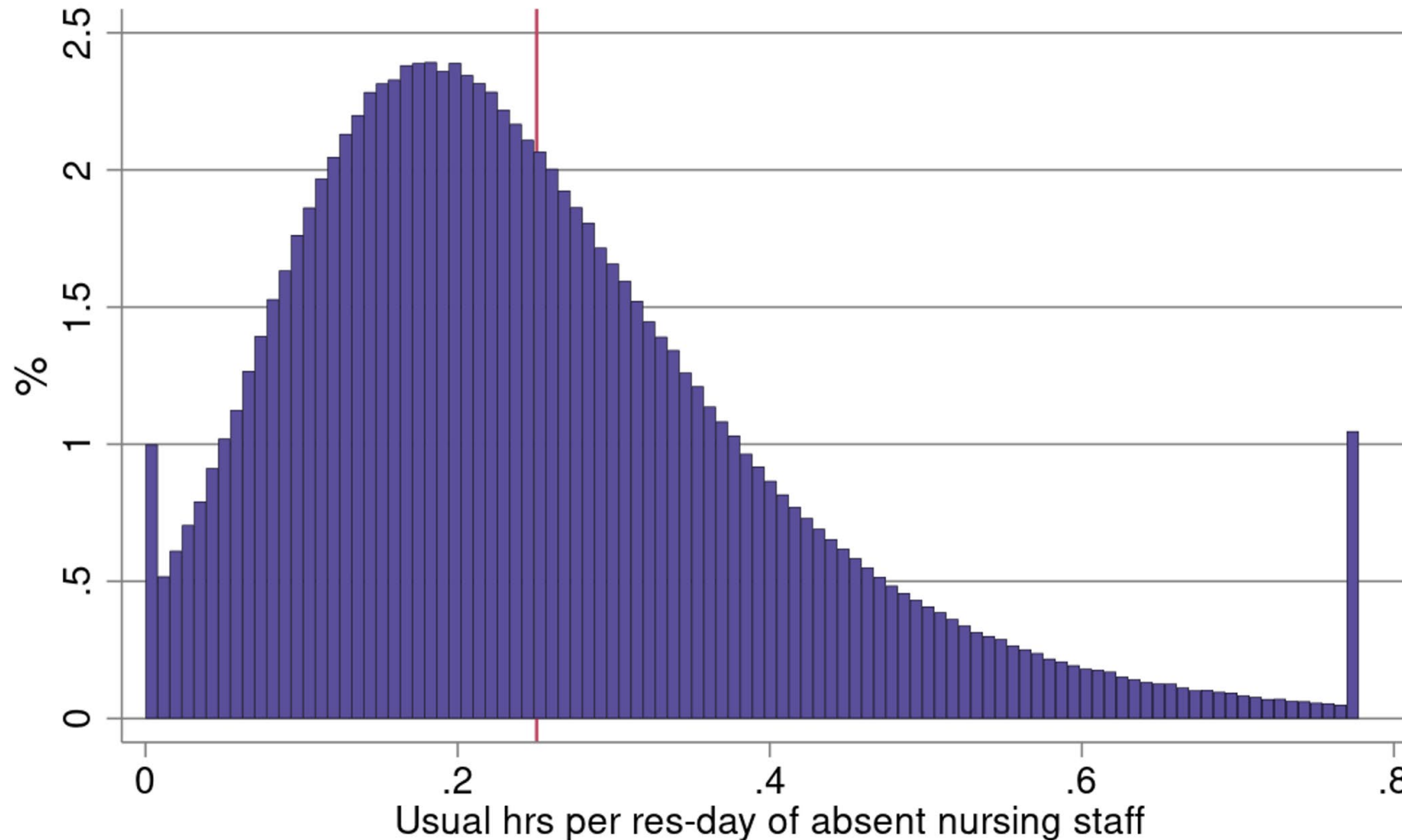
Importance of Estimating Using IV

- Facilities may endogenously set staff hours
 - E.g., even with a rich set of patient controls, if residents are unobservably sicker, the facility may add more staff hours
 - Could conclude wrongly that more staff hours worsen outcomes
- Want variation in staff hours that is exogenous to patient characteristics
 - Take advantage of the rich employee-level panel data in PBJ

Steps to defining the instrument

- For each nursing employee (unique employer-employee ID), determine absence dates
 - Baseline definition: at least 7 consecutive days of no hours worked
 - Maximum absence of 30 days to eliminate long-term leave and quits
 - Each employee can have multiple absences
- For employees with absences, determine the usual hours worked
 - Daily hours worked during the two weeks before the absence
 - Captures lost hours due to an absence
 - Aggregate to the facility-week level

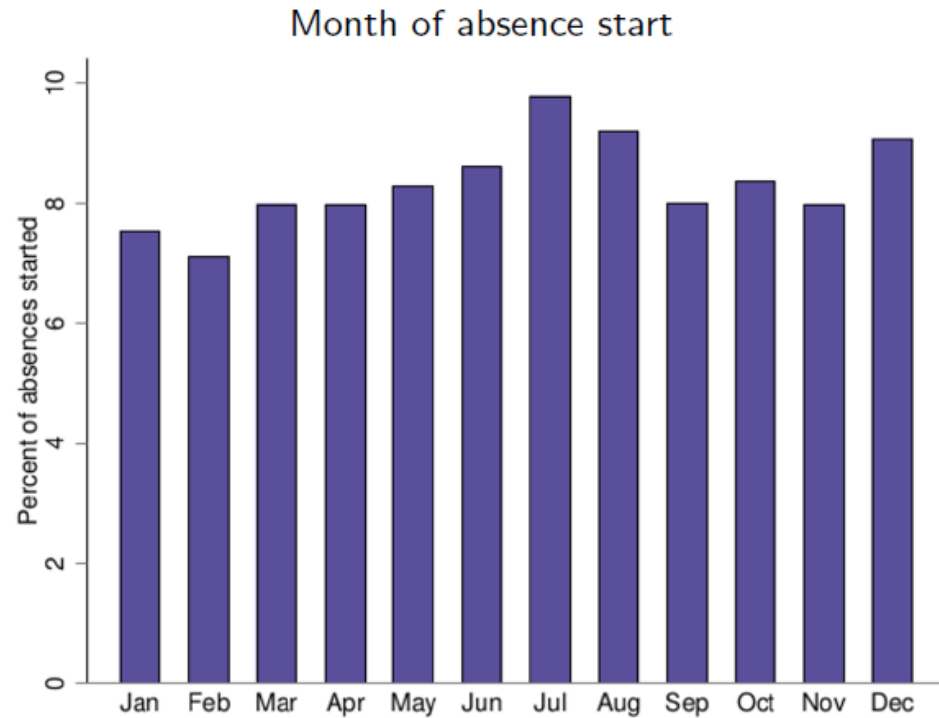
Median absent HPRD = 0.25, ~7% of the mean staffing level



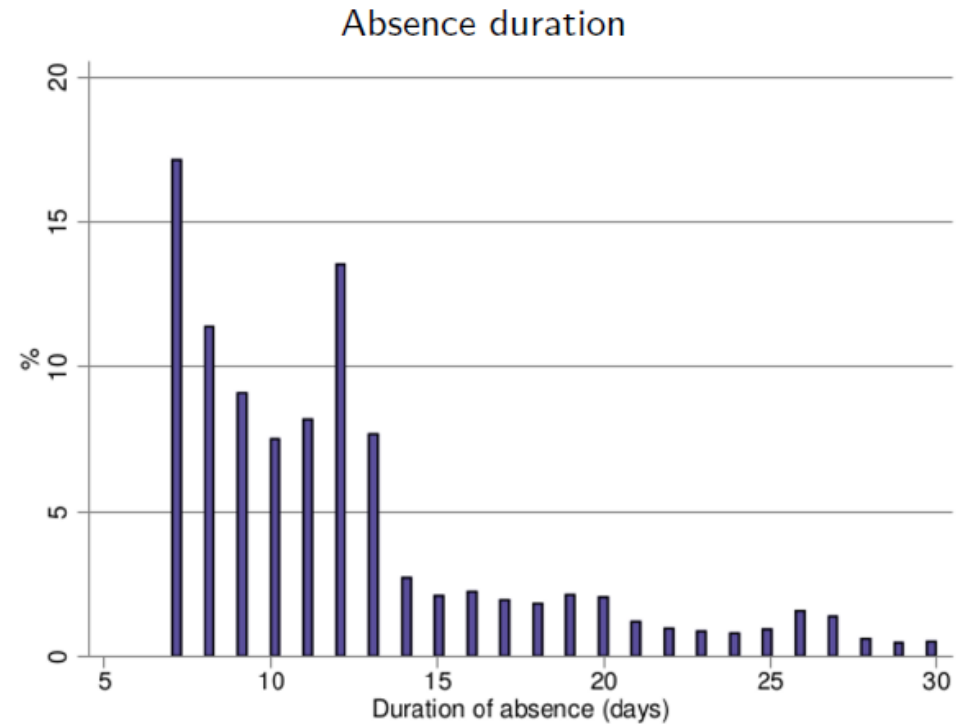
Instrument assumptions

- The usual hours worked by absent employees only impact patient outcomes through their effect on actual staff hours/composition
- Staff absences occur independently of unobservable severity of residents
 - For example, staff do not take vacations when residents are unobservably more or less complex
- Supporting evidence
 - High degree of day-to-day variation in staffing levels (Geng et al., 2019; Mukamel et al., 2023)
 - Suggests frequent absences due to vacation, family care needs, illness, transportation issues
- Persistent excess demand for nursing home labor
 - Inability of the nursing home to fully replace absent hours

Absences most likely in summer months and last 7-14 days



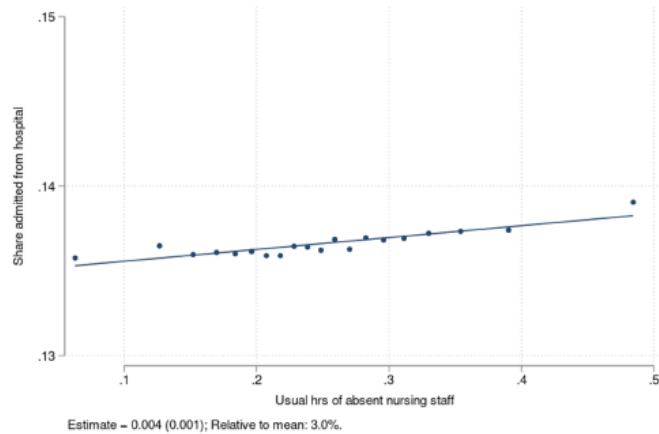
Note. Includes absences lasting between 7-30 days in 2017-2019.



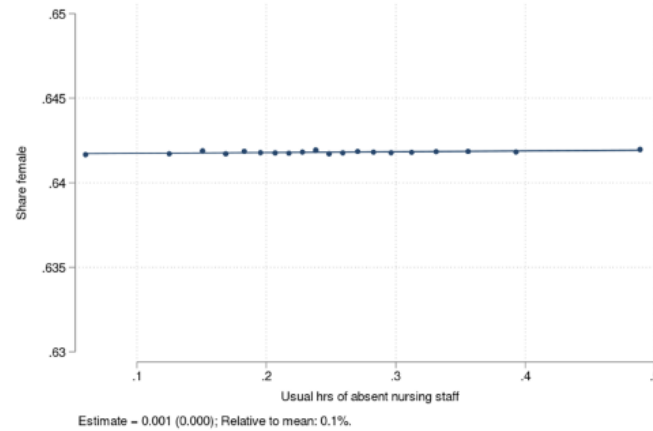
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Patient composition does not vary with absent HPRD

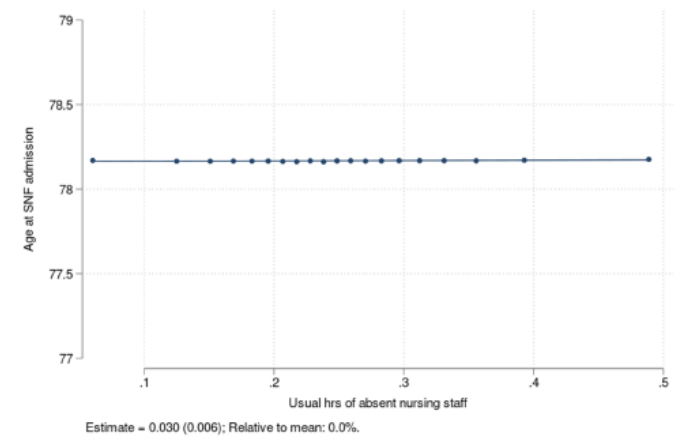
Share admitted from hospital



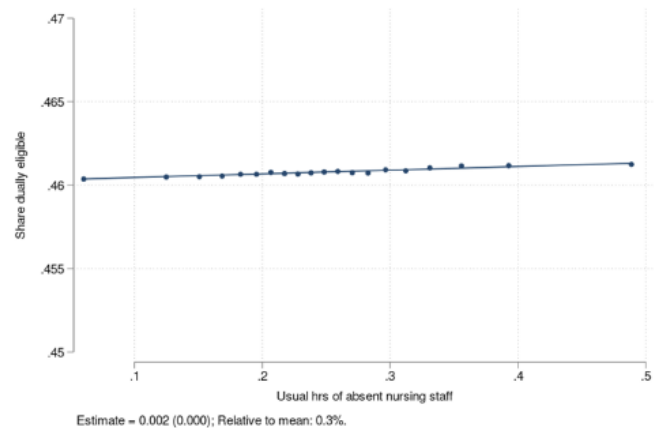
Share female



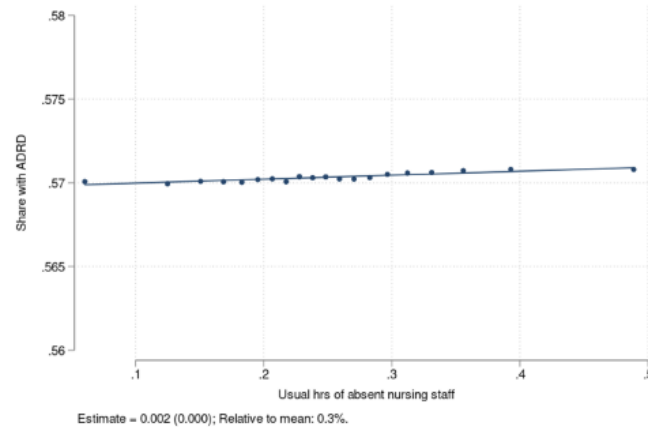
Age at SNF admission



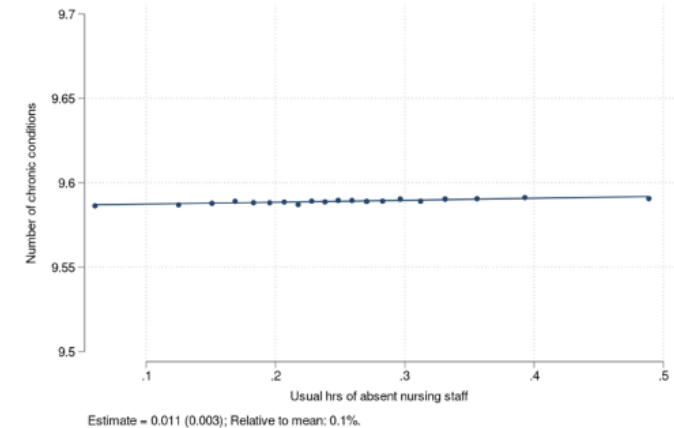
Share dually eligible



Share with ADRD



Num. chronic conditions



Estimation

$$S_{ft} = \pi Z_{ft} + \theta_t + \delta_{fq} + \nu_{ft}$$

$$Y_{ft} = \beta \hat{S}_{ft} + \theta_t + \delta_{fq} + \varepsilon_{ft}$$

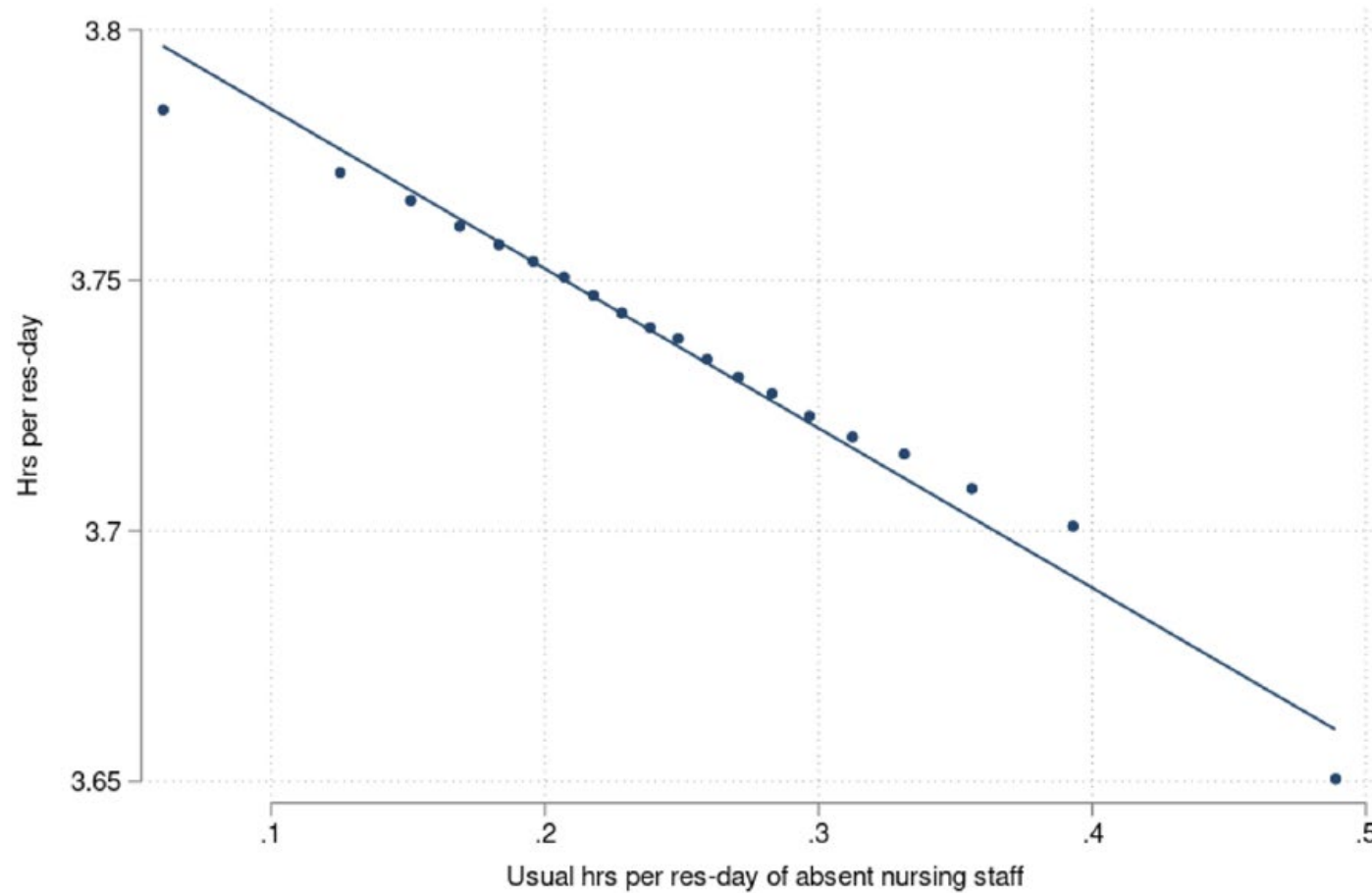
- Z_{ft} : usual HPRD of absent nursing staff for facility f and week t (instrument)
- S_{ft} : total nursing HPRD (endogenous); $\hat{S}_{ft}$: predicted from first stage
- Y_{ft} : weekly outcomes
- θ_t : week fixed effects; δ_{fq} : facility $\times$ quarter fixed effects
- Standard errors clustered at the facility level

Estimation by staff type

$$S_{jft} = \sum_k \pi_{jk} Z_{kft} + \theta_t + \delta_{fq} + \nu_{jft}$$
$$Y_{ft} = \sum_j \beta_j \hat{S}_{jft} + \theta_t + \delta_{fq} + \varepsilon_{ft}$$

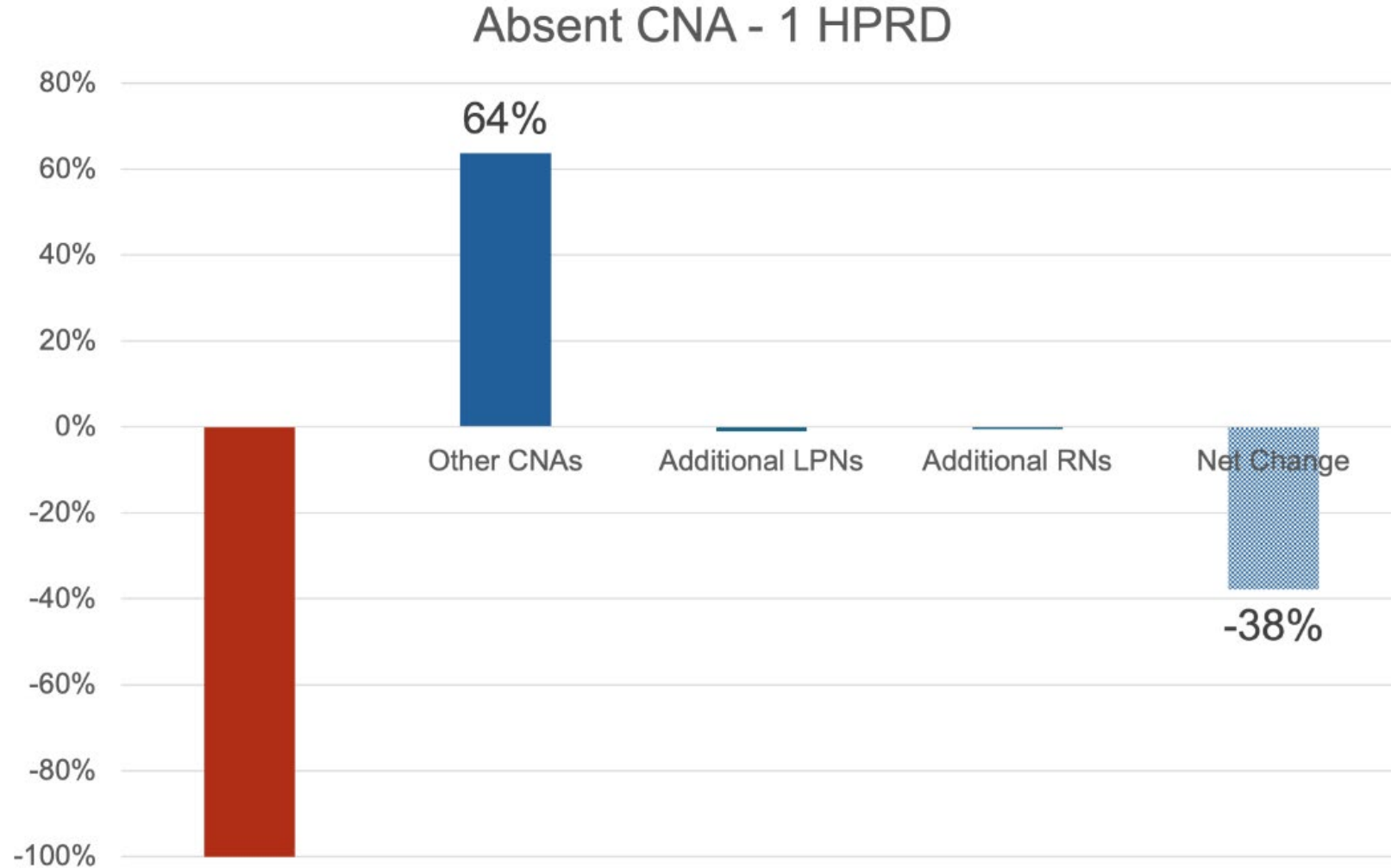
- Z_{kft} : type-specific absent HPRD (instruments)
- S_{jft} : type-specific nursing HPRD (endogenous); $\hat{S}_{jft}$: predicted from first stage
- Y_{ft} : weekly outcomes
- θ_t : week fixed effects; δ_{fq} : facility $\times$ quarter fixed effects
- j, k index staff type (CNA, LPN, RN) or experience level (≥ 2000 hrs vs. < 2000 hrs)

Only ~63% of lost hours are replaced

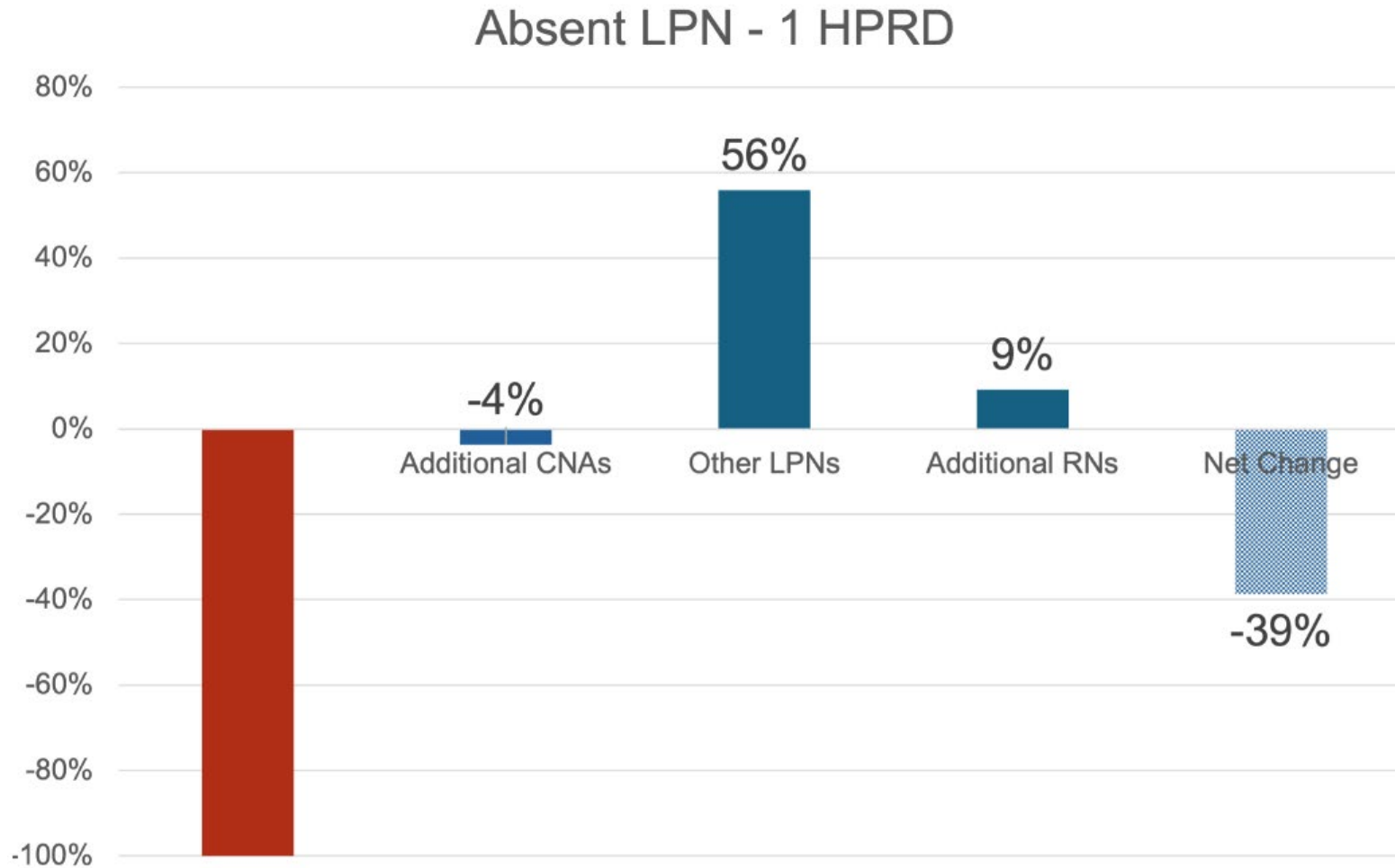


Note. Unit of observation: facility-week. Includes sample facility-weeks in 2017-2019. Hours were winsorized at the 99th percentile. Includes facility-quarter fixed effects.

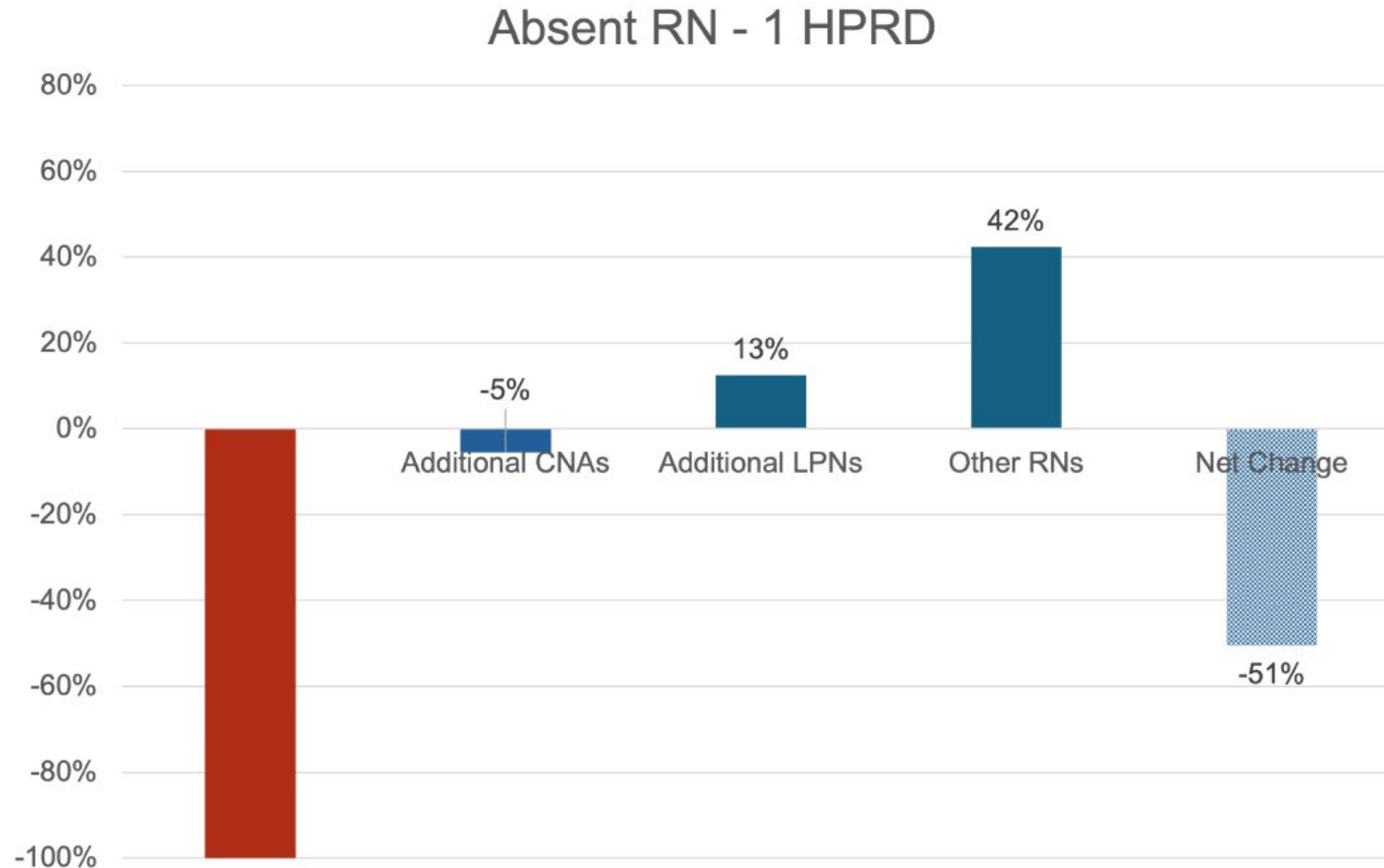
Facilities partially replace absent CNAs with other CNAs



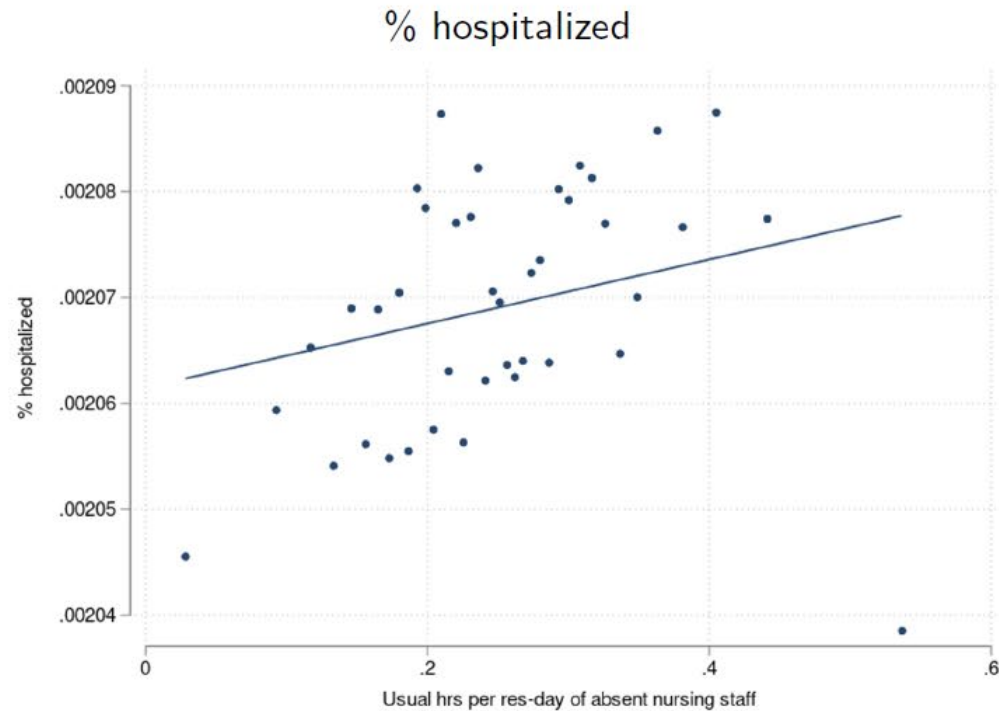
Facilities partially replace absent LPNs with other LPNs and RNs



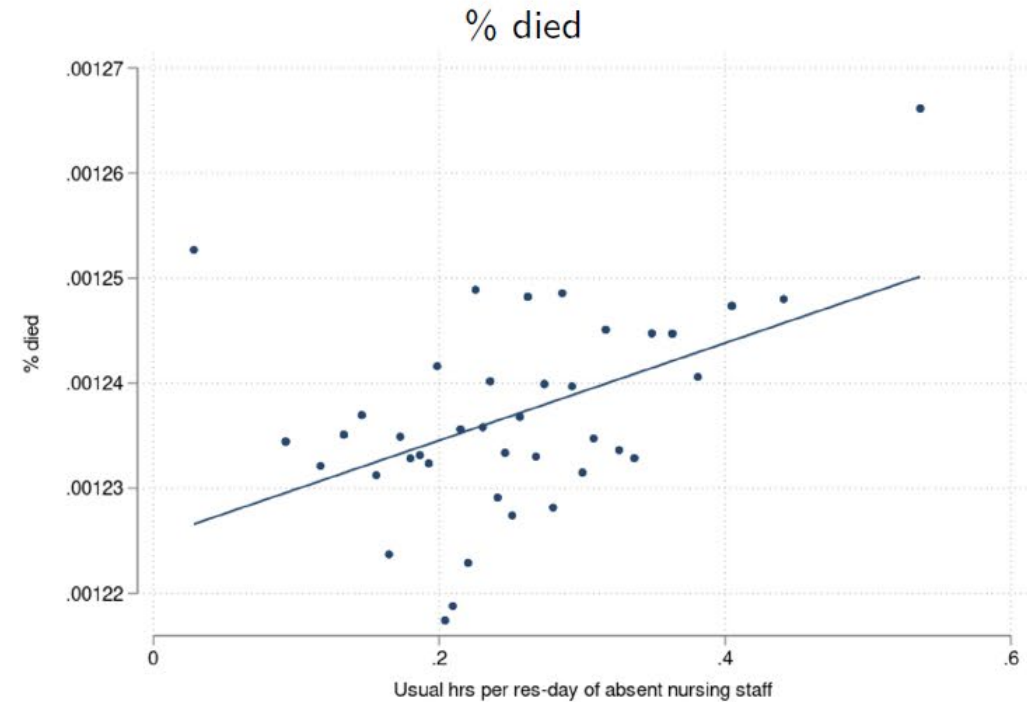
Facilities partially replace absent RNs with other RNs and LPNs



Reduced form: relationship between absences and claims-based outcomes

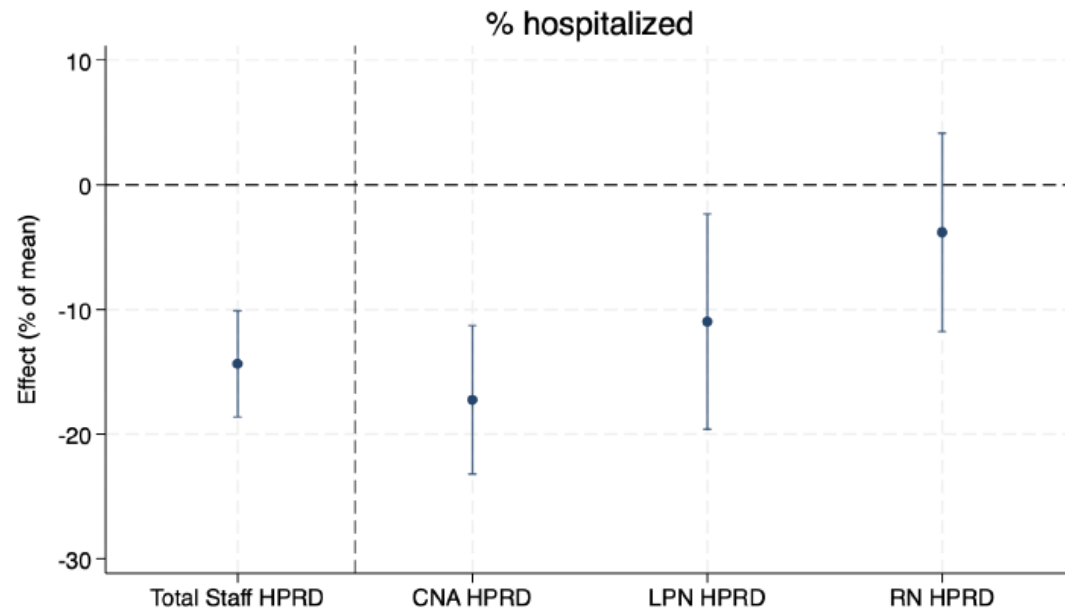


Note. Unit of observation: facility-week. Includes sample facility-weeks in 2017-2019. Hours were winsorized at the 99th percentile. Includes facility-quarter fixed effects.

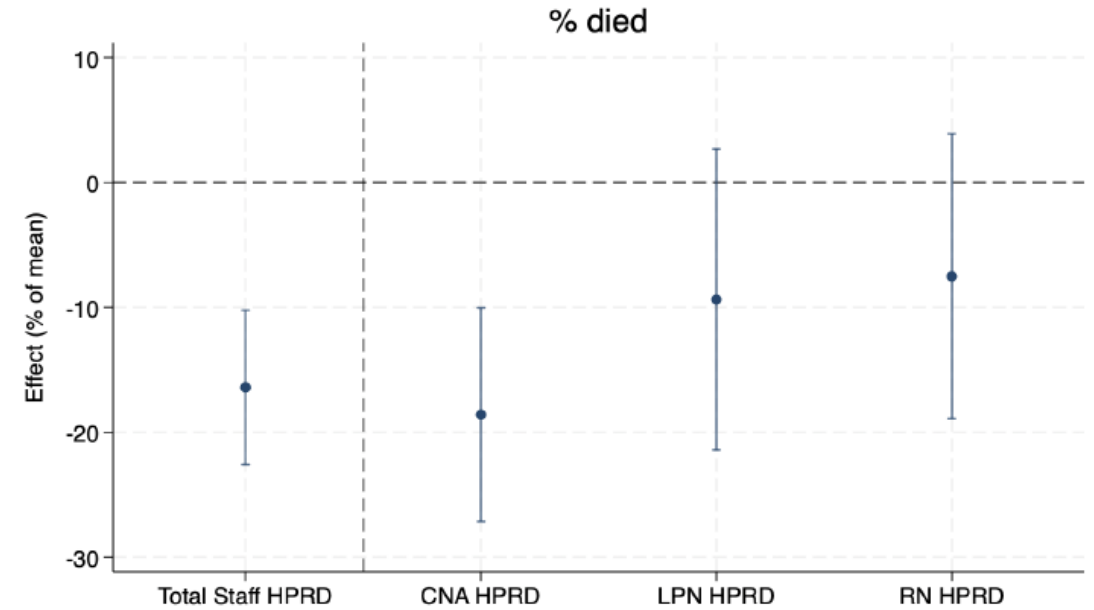


Note. Unit of observation: facility-week. Includes sample facility-weeks in 2017-2019. Hours were winsorized at the 99th percentile. Includes facility-quarter fixed effects.

A 25% increase in staffing reduces hospitalizations and mortality by ~15%

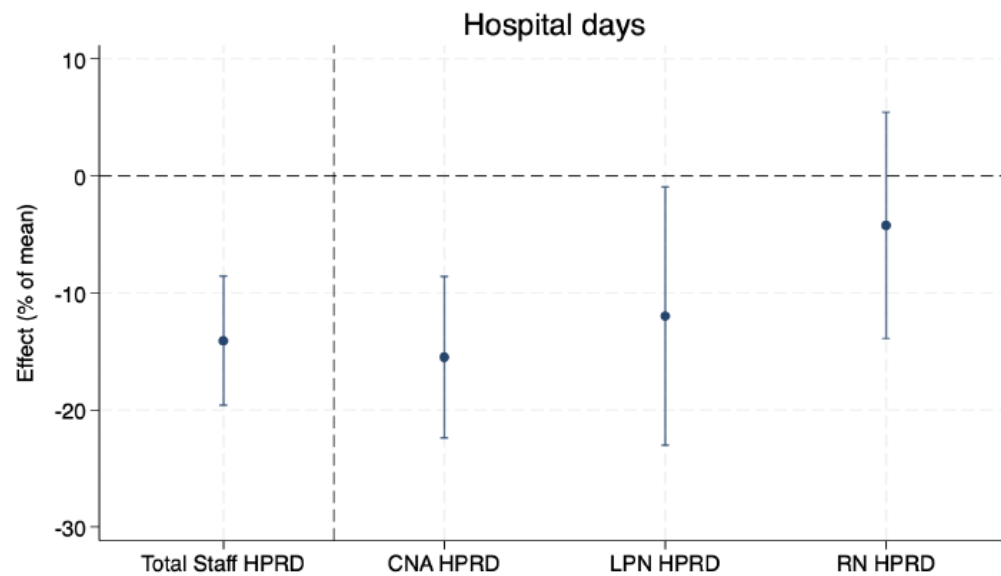


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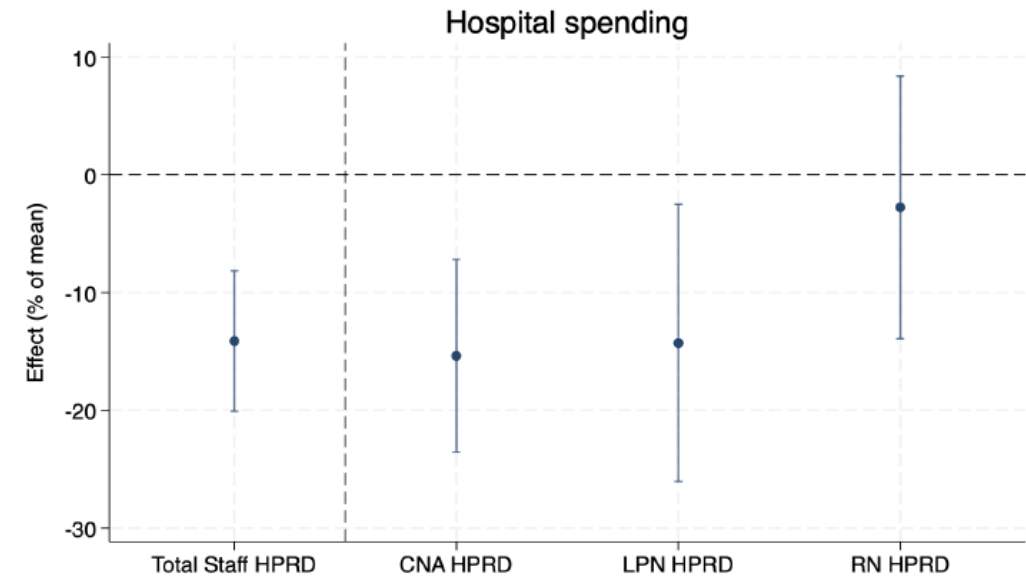


Note. Includes sample facility-weeks in 2017-2019. Hours were winsorized at the 99th percentile. Includes facility-quarter and week fixed effects.

A 25% increase in staffing reduces hospital days and spending by $\sim 14\%$

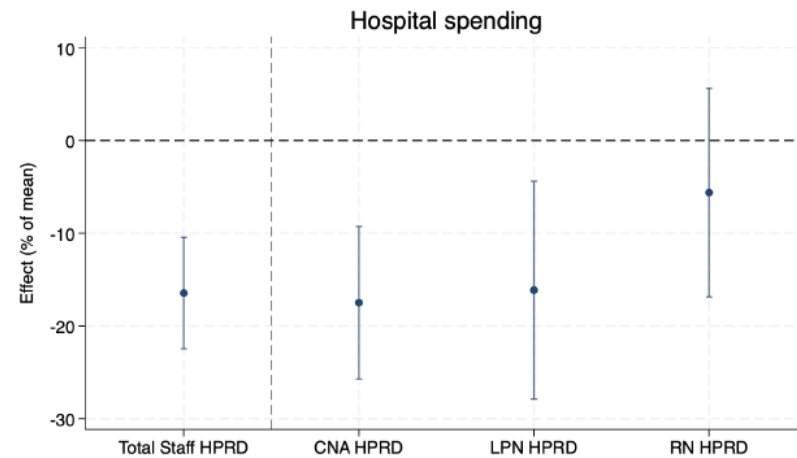
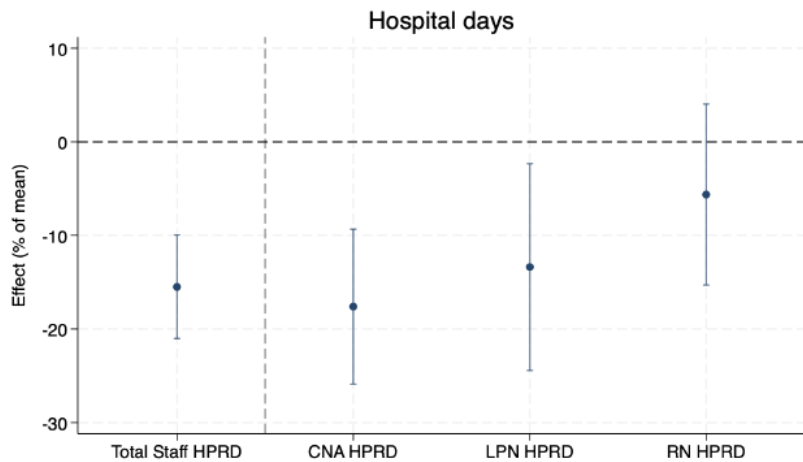
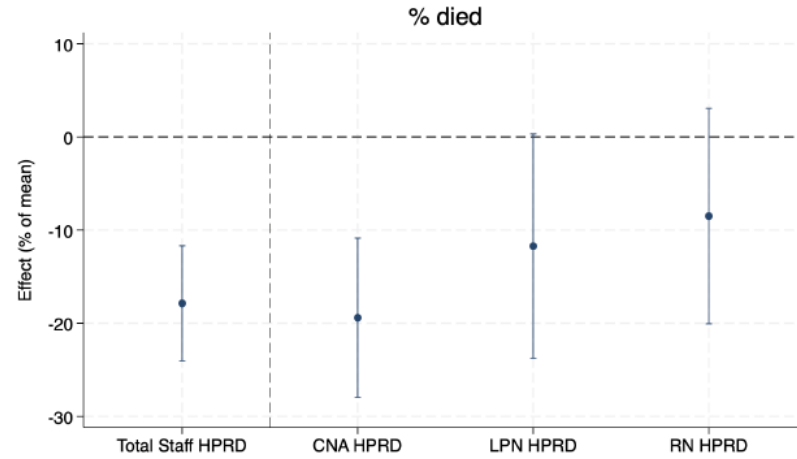
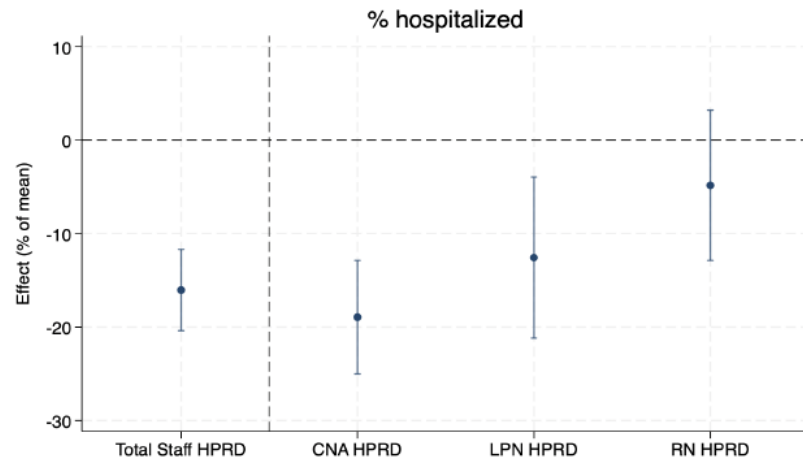


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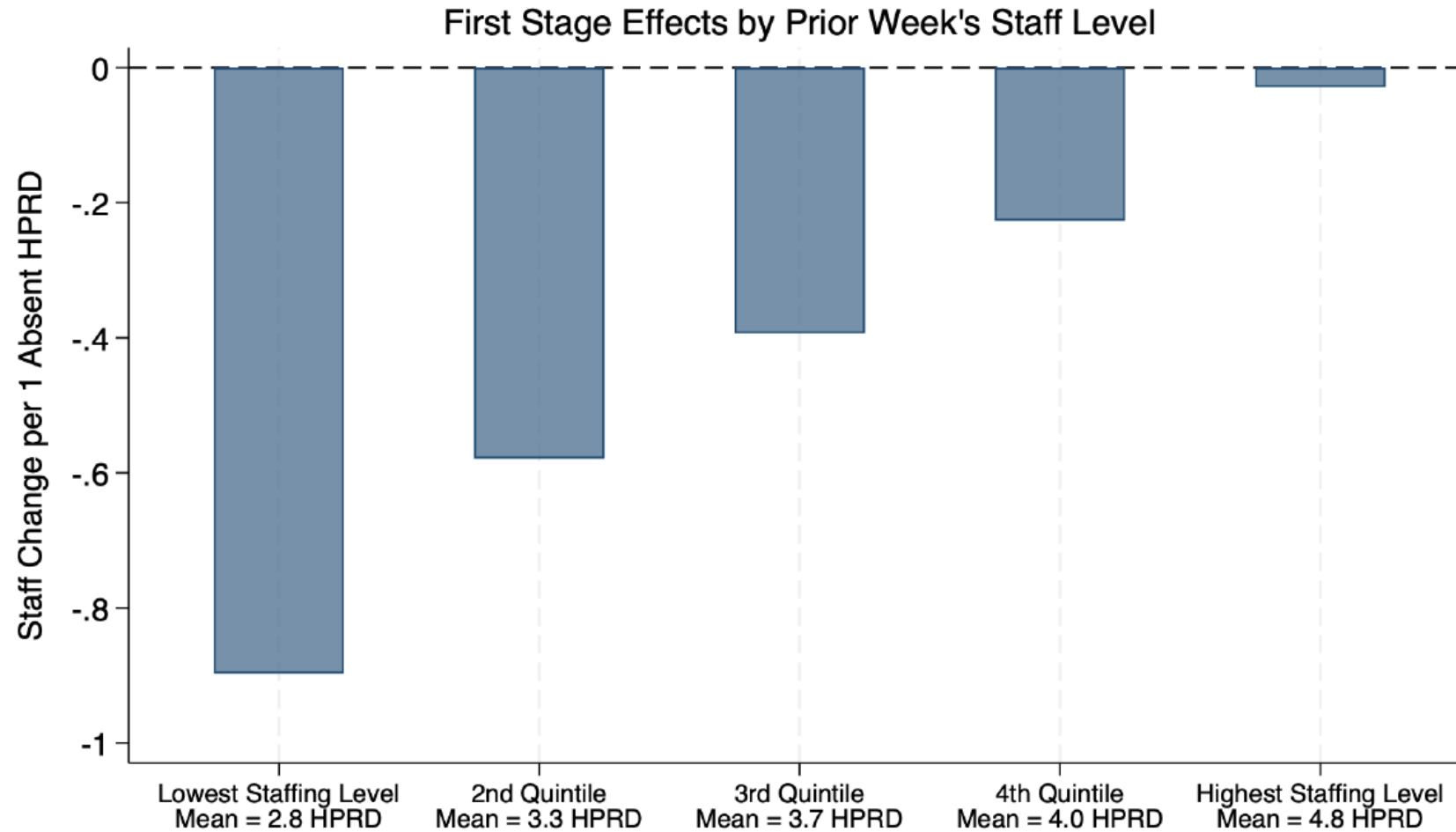
Health effects persist when excluding new admissions



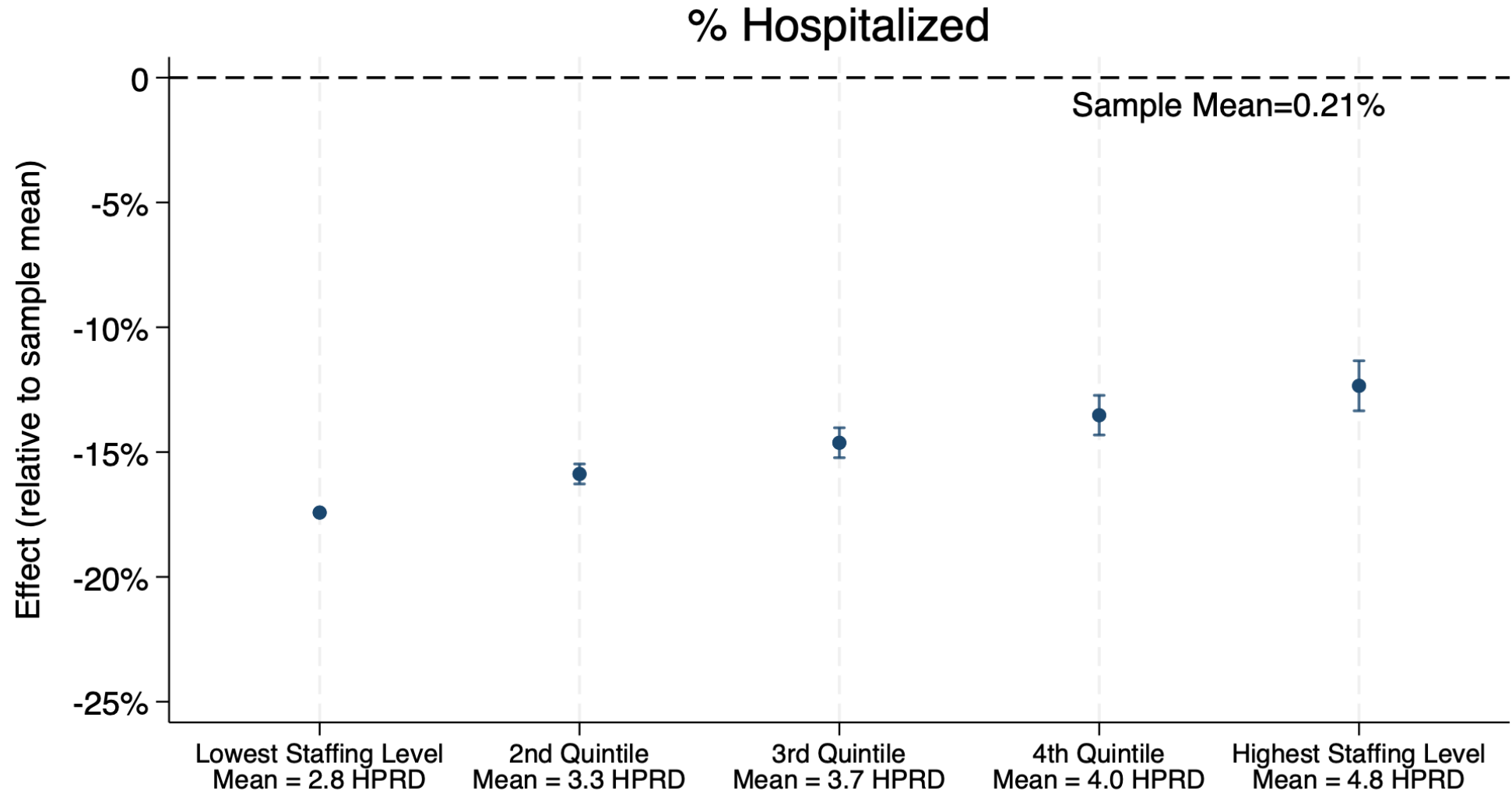
Cost implications

- If increase CNA hours of care for each resident by 1 hour per day
 - \$140 per patient-week (at average CNA wage of \$20/hr $\times$ 7 days)
 - \$11,200 per facility-week (at typical facility with $\sim$ 80 residents)
- Reduce weekly (FFS) hospital spending by \$21 per resident
 - \$1,670 less hospital spending per facility per week
 - Savings larger if including MA-covered hospitalizations
- Hospital savings offset $\sim$ 15% of staffing cost (\$1,670 / \$11,200)

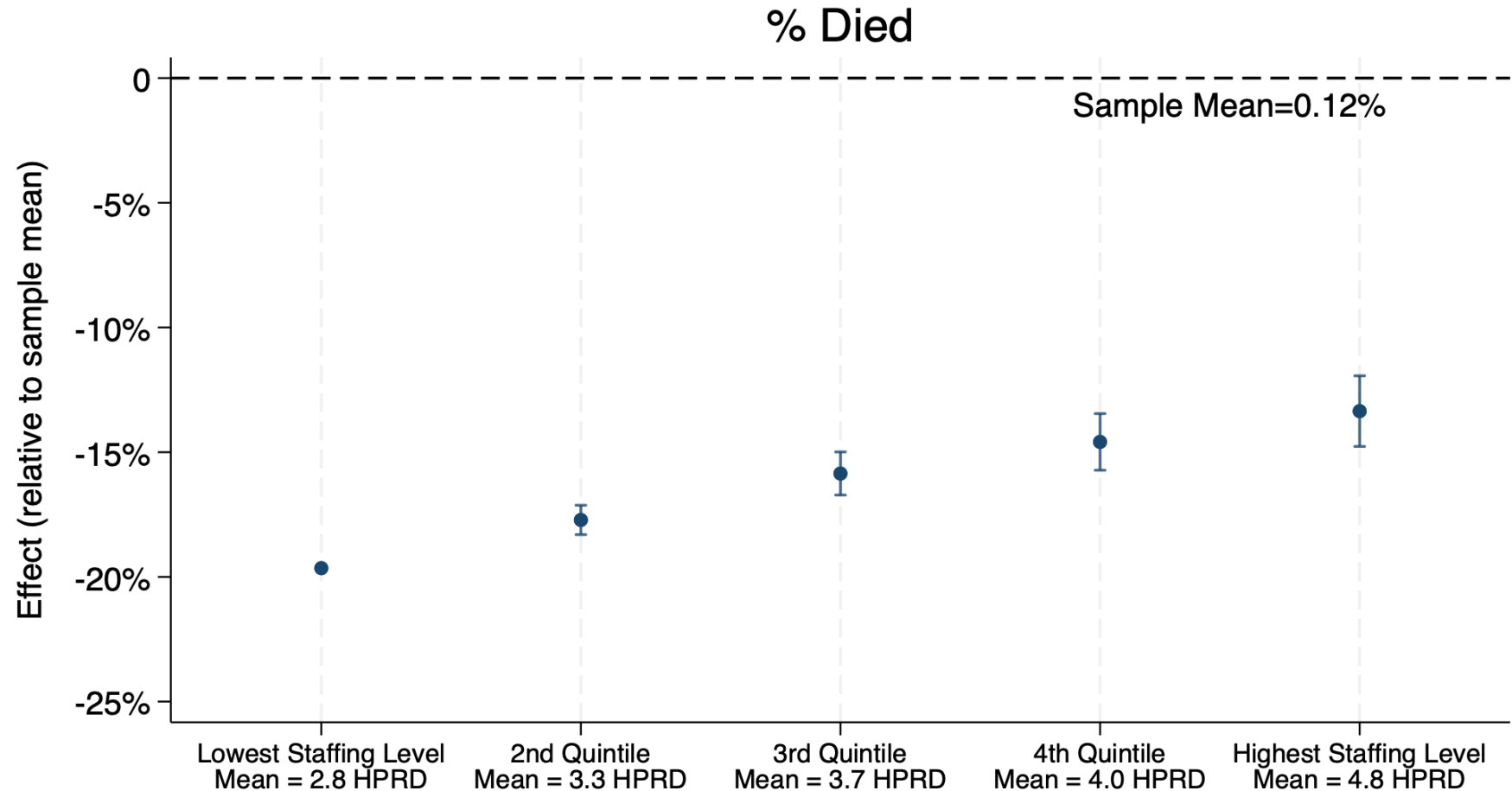
Facilities with higher baseline staffing levels are better able to fill staff absences



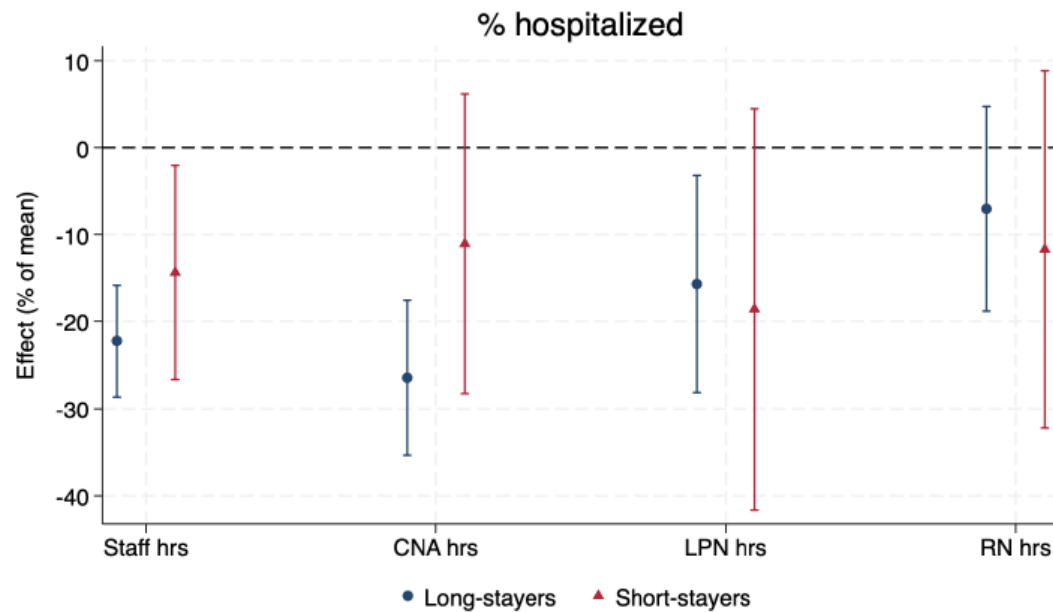
Protective effects of additional staffing are larger among low-staffed facilities



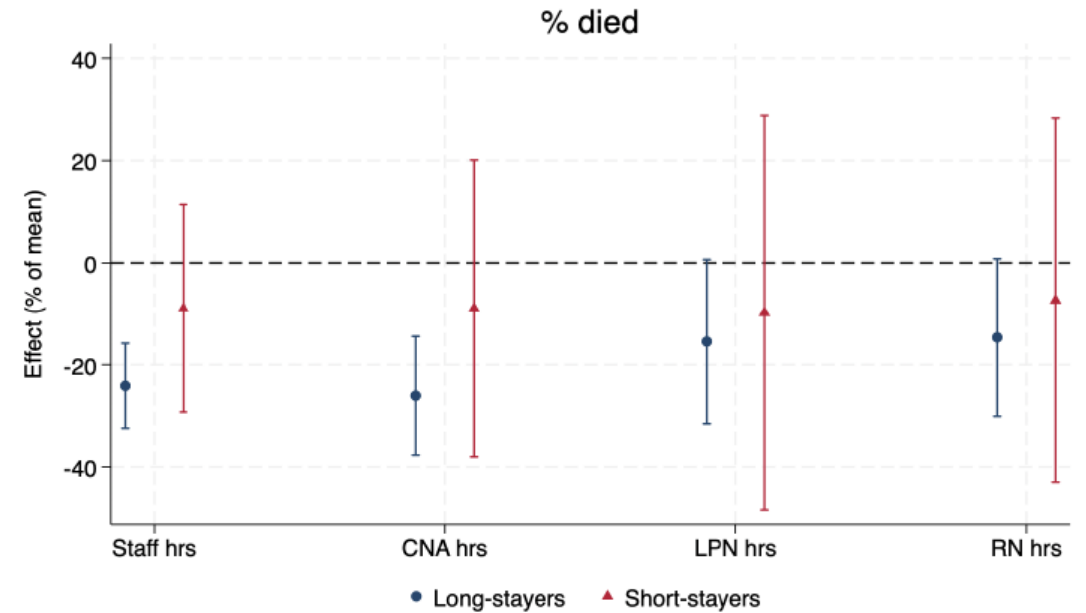
Protective effects of additional staffing are larger among low-staffed facilities



Increases in staffing prevent hospitalizations for all residents and decrease mortality for long-stayers



Note. Includes sample facility-weeks in 2017-2019. Hours were winsorized at the 99th percentile. Includes facility-quarter and week fixed effects.



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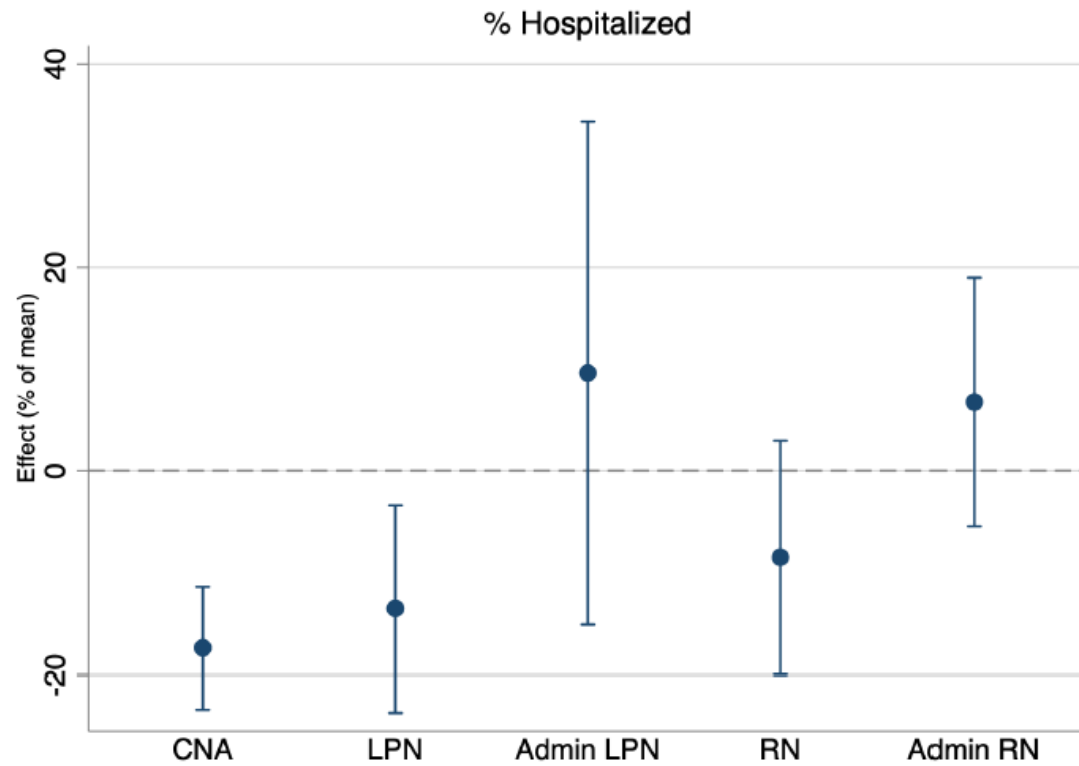
Effect sizes

- Prior studies have generally found smaller effects (e.g., Lin, 2014; Chen & Grabowski, 2015; Foster & Lee, 2015; Hackmann, 2019)
- Identifying variation comes from short-term and, likely unexpected, losses of staffing
- If nursing homes operate with limited “slack” in their typical staffing levels, unexpected losses due to absences may drop staffing below the minimum threshold needed to ensure patient safety, resulting in larger reductions in quality
- Consistent with larger protective effects at lower baseline levels of staffing

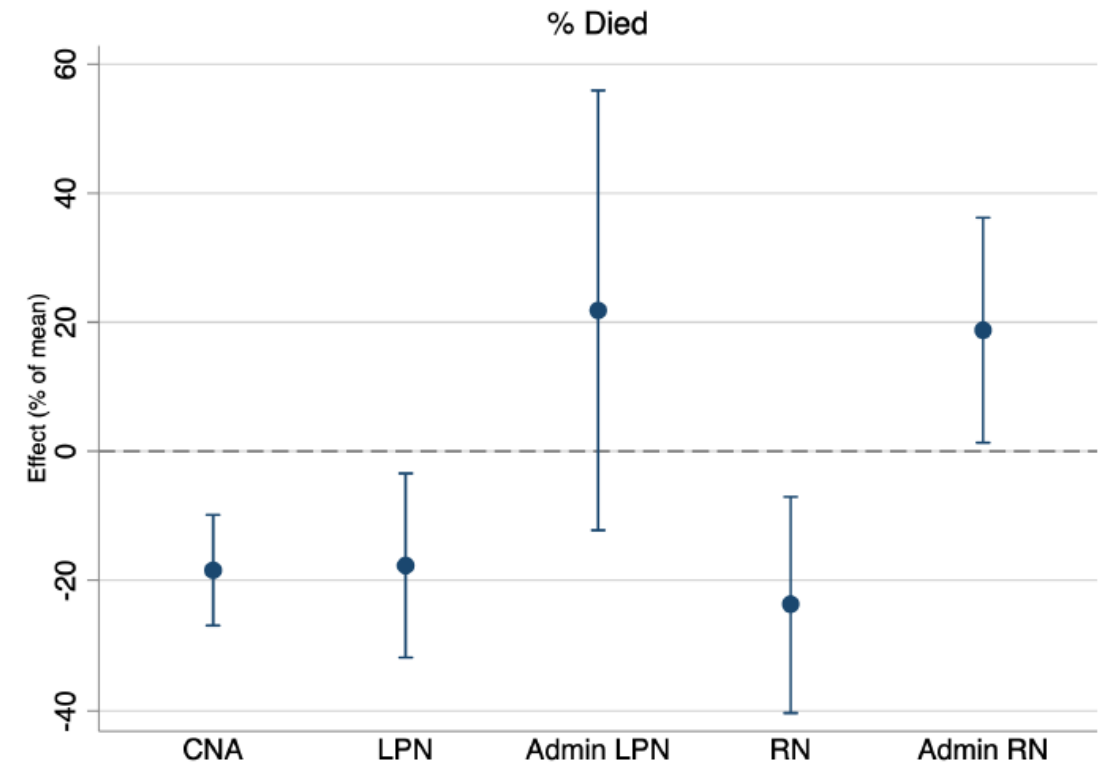
Absence of effects from RNs

- Prior research on minimum staffing standards has found RNs and LPNs usually more important than CNAs for outcomes (e.g., Chen & Grabowski, 2015; Foster & Lee, 2015; Hackmann, 2019; Lin, 2014)
 - Use annual policy shocks
- Because CNAs are the primary staff type delivering hands-on care & direct monitoring of patients, CNA losses may be particularly detrimental to residents in the near term
- RN absences may have limited short-term impact because their responsibilities are primarily to develop & oversee the implementation of patient plans of care

No effects for admin RNs and LPNs



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Conclusion

- Staff absences provide a novel source of exogenous variation in staffing levels
- A 25% increase in staffing reduces hospitalizations and mortality by $\sim 15\%$
 - Effects driven by CNAs and experienced staff
 - Larger effects at low-staffed facilities
- Policy implications
 - Supports minimum staffing standards, especially targeting low-staffed facilities
 - Policies should prioritize staff retention (e.g., Medicaid payment boosts for longer-tenured staff)
- Hospital savings offset $\sim 15\%$ of staffing costs, but misaligned incentives limit investment

Questions/Comments For Authors

What does the “naïve” model tell us?

- Authors (plausibly) assert that non-causal approach likely to be biased
 - Potential bias: Even controlling for severity, if residents are (unobservably) sicker, the facility may add more staff hours
 - Could conclude wrongly that more staff hours worsen outcomes
- What are OLS estimates?
 - We know that they'll be biased, but would be relevant to know in which direction
 - Will help to establish baseline for comparing to other work, understand the importance of the IV strategy

Test of IV Exclusion Restriction

- Results require that staff absences occur independently of the *unobservable* severity of residents
- While we (clearly) can't get information on the *unobservable* severity of residents, can the authors test whether the observable components of the new admissions to the nursing homes are related to absences?
 - If no relationship, this could strengthen the validity of the instrument

Persistence of Protective Effects of Staffing

- Key measures include simultaneous mortality, hospitalization (i.e. during the week)
- Are the effects persistent?
 - Staffing-based care provision can have lagged effects (Propper and Van Reenen, 2010; Gruber and Kleiner, 2012)
- Study determines that decreased hospital savings offsets cost of increased staffing by 15%
 - If effects persist, this is likely an underestimate!

Potential Heterogeneity Across Homes

- Estimated Effect Size is average across all homes
 - Includes facility-level fixed effects (good!)
- Current results show heterogeneous effects by baseline staffing level
 - Protective effects most prominent in lowest staffing quintile
- Are higher “quality” homes better able to manage staffing irregularities
 - Better homes may be better at effectively utilizing inputs in ways that improve both overall quality *and* skilled at staffing allocation

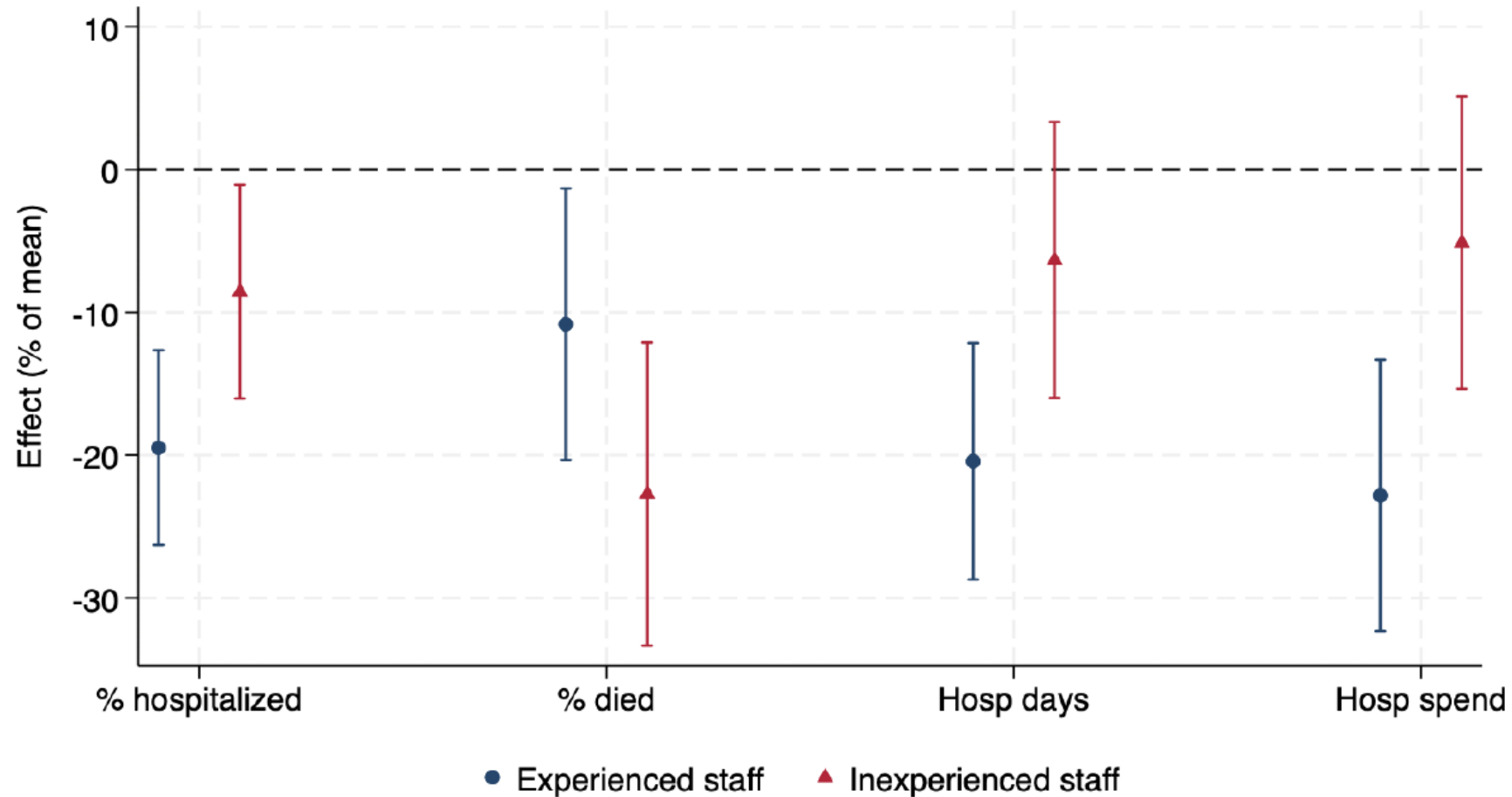
Measurement of Absenteeism

- Current results define as “no work” as an employee who has no hours for 7-30 days versus hours worked for the 2 week period prior to this
 - Employees who anticipate vacation/leave may work significantly more hours immediately prior to their leave
 - Might *overstate* the absenteeism measure
- The “absentee” measure appears to be calculated at the *facility* level
 - Nursing home chains/system may allocate staff across multiple homes
 - Could the “absent” measure pick up these allocations?
 - Could “systems” be better at allocating staff, due to a larger staffing pool?

Contributions

- Provides an important contribution examining causal effects of nursing home staffing on patient outcomes
- Very thorough detailed exposition of the methods, data, modeling assumptions
 - Model allows for examining staffing across different staffing types, homes, outcomes, patient population
- Thoughtful, clearly written paper!

Larger effects from experienced staff as compared to inexperienced



Note. Includes sample facility-weeks in 2017-2019. Hours were winsorized at the 99th percentile. Includes facility-quarter and week fixed effects.