



Community and Nursing Home Facility Factors Associated with COVID Cases in July 2021

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Executive Summary

Following the start of resident and staff vaccination clinics as part of a public-private pharmacy partnership program at the end of December 2020, there was a steady decline in COVID cases in nursing homes. With the spread of the Delta variant (B.1.617.2), COVID cases among residents and staff started increasing again in July 2021. This rise came alongside a rise in community cases. Evidence looking at the first half of 2020 and that assessing the rise in cases later that year found that outbreaks in nursing homes were associated with the rates of COVID in the community, as well as facility size and urban location. However, the evidence on the relationship of staffing with cases has been ambiguous.

Key Takeaways

- Consistent with findings from 2020, nursing home cases in July 2021 were associated with the rates of COVID in the community and facility size.
- Despite community case rates quadrupling in July 2021, there were only 1,361 (9.6%) nursing homes with at least one resident case. When cases occurred, most outbreaks (75%) in nursing homes remained small with three or fewer cases.
- Higher resident, staff, and community vaccination rates were associated with fewer resident and staff cases.

Vaccines have been a safe and effective tool in mitigating the effect of COVID and its complications among nursing home residents and staff. While there is mounting evidence on the real-world effectiveness of the vaccines, uptake of vaccines has varied among nursing homes and communities and between nursing home residents and staff.

Given the risk COVID poses to nursing home residents and staff, we set out to identify what facility and community characteristics were associated with the rise in nursing home cases in July 2021. We hope that the findings will help operators and policy makers evaluate strategies to reduce COVID cases in nursing homes, particularly considering the possibility of new variants emerging in the future.

We found that nursing homes with at least one resident or staff case had more beds and were more often in an urban setting compared to nursing homes that had no resident or staff cases. Additionally, they had lower vaccination rates among residents, staff, and were in counties with lower general population vaccination rates. Moreover, they tended to be in counties with higher average number of cases. With regards to staffing, these facilities had higher average total nurse staffing hours per resident day (HPRD) and higher average unique staff counts.

For each independent comparison of resident or staff cases with resident, staff, and community vaccination rates, the average case rate was lowest among each high vaccination category. Stratification by the community COVID case levels revealed resident and staff case rates to be higher for all categories of vaccination rates in

counties with high community transmission. This finding highlights the importance of controlling cases in the community to reduce disease burden in nursing homes.

If COVID entered their building in July 2021, most nursing homes were able to minimize and control the spread. Approximately 75% of outbreaks were of three or fewer cases, and there were only 993 (7.0%) facilities that had both resident and staff cases. This is remarkable given the close and confined interactions that must occur between staff and residents to assist residents with daily activities of living, and aligns with our model, which found having at least one staff case was the strongest predictor (OR 6.13, 95% CI: 5.32-7.06) of having a resident case, adjusting for all other variables and accounting for state heterogeneity.

Other factors with a positive and statistically significant association were community cases per 1,000 people, low community vaccination rates, and high staff counts.

Together, these findings support the theory that staff are a vector for bringing COVID into buildings and passing the virus onto residents. Because staff interact and live in the surrounding community, controlling cases in the community and increasing community vaccination rates could help reduce the disease burden on nursing home residents. In a similar vein, family and friends visiting nursing home residents are also a possible COVID vector between the community and residents.

Our findings on the association of positive association of COVID in the community with COVID in nursing homes are consistent with prior research from 2020. However, unlike the early part of 2020, vaccines are available to reduce disease and disease burden. In our stratified analyses, we saw higher rates of resident, staff, and community vaccination associated with lower resident and staff case rates in high community case rate counties.

Nursing home operators, regulators, and policy makers should make efforts to increase staff, resident, and community vaccination rates. Additional research on the drivers and methods to achieve higher staff and community vaccination rates will be beneficial. These efforts appear to be ongoing. According to the CDC, nursing home staff vaccination rates have increased by 33% from 61.5% on July 25, 2021 to 81.6% on December 12, 2021. The general population or community vaccination rates have increased by 24% from 49.1% to 60.8% in the same time frame. Meanwhile, resident vaccination rates have remained above 80% since July 2021.

Introduction

Following the start of resident and staff vaccination clinics as part of a public-private pharmacy partnership program at the end of December 2020, there was a steady decline in COVID cases among nursing home residents.¹ At its peak in December 2020, there were over 33,000 new COVID infections among residents. The weekly infection count fell to just over 350 cases the week of June 27, 2021.²

With the spread of the Delta variant (B.1.617.2), COVID cases among residents started increasing again in July 2021. Nearly identical trends were seen for staff cases. This rise in both resident and staff cases came alongside a rise in community cases. According to CDC data, the community 7-day average COVID case rate increased steadily from approximately 14,000 on July 1 to over 75,000 on July 30.³

Evidence from the first half of 2020 found that outbreaks in nursing homes were associated with the rates of COVID in the community, as well as facility size and urban location.^{4,5} This association with community cases persisted during the surge in cases in the fall of 2020.⁶

The association of nursing home staffing to COVID cases is complex and the evidence is unclear. At times, staffing has been shown to be protective against widespread outbreaks. For instance, some early studies found higher direct care staffing levels per resident to be associated with smaller outbreaks.^{7,8} One explanation for this phenomenon is higher staffing corresponds to lower nurse to resident ratio and thus minimizes the opportunity for the virus to spread from person to person. Conversely, another study found having a larger number of unique individuals on staff to be a contributing factor to cases.⁹ The rationale behind this finding is every staff member is a possible vector of disease given that they interact with both the community outside the nursing home as well as with residents inside.

Vaccines have been a safe and effective tool in mitigating the effect of COVID and its complications among nursing home residents and staff. Due to increased risk for the disease, nursing home staff and residents were prioritized to receive the vaccine in December 2020. Several studies showed those nursing homes to first have a vaccine clinic experiences faster declines in cases relative to others.^{10,11}

While there is mounting evidence on the real-world effectiveness of the vaccines, uptake of vaccines has varied among nursing homes and communities and between nursing home residents and staff.^{12,13} As a response, some states and providers have utilized mandates aimed at increasing vaccination rates among staff.^{14,15}

Given the risk COVID poses to nursing home residents and staff, we set out to identify what facility and community characteristics were associated with the rise in nursing home cases in July 2021. We hope that the findings will help operators and policy

makers evaluate strategies to reduce COVID cases in nursing homes, particularly considering the emergence of new variants such as Omicron (B.1.1.529).

Methods

Nursing Home Resident and Staff COVID Cases and Vaccination Rates

Nursing homes are required by the Centers for Medicare and Medicaid Services (CMS) to report weekly to the Centers for Disease Control and Prevention's National Healthcare Safety Network (NHSN) on a variety of COVID-related issues, including resident and staff cases and vaccination rates.¹⁶ CMS publicly releases updated data on a weekly basis.

In our evaluation, we used the CMS NHSN public file released on August 12, 2021, containing nursing home-level data up to the week ending on August 1, 2021. We limited our analysis of incident COVID case and death data from the week ending on July 4, 2021 to the week ending on August 1, 2021, to create an analysis period that spanned from June 28, 2021 to August 1, 2021. We then defined the resident case and death rates as counts per 1,000 residents utilizing the weekly resident occupied bed count in the public data file. Similarly, the staff case and death rates were defined as counts per 1,000 staff utilizing the staff count variable, which was added to the public data file with the start of reporting of vaccination rates in June 2021.

For facility-level staff and resident COVID vaccination rates, we averaged the vaccination prevalence reported weekly in the CMS NHSN file since the week ending June 20, 2021, when this data first became publicly available. Vaccination rates of zero were excluded as outliers likely due to data entry or reporting issues.

Based on clinical estimates of effectiveness, facility-level staff vaccination rates were categorized into low (<50%), medium (50-74%), and high (\geq 75%), and resident rates were categorized into low (<50%), low-moderate (50-74%), moderate-high (75-84%), and high (\geq 85%).

Nursing Home Facility and Resident Characteristics

We used the July 28, 2021 refresh of CMS's Care Compare for nursing homes to obtain most of the latest facility characteristics.¹⁷ Specifically, physical metrics (e.g., bed size), operational characteristics (e.g., ownership, staffing) and quality metrics (e.g., survey findings, Five-Star Ratings) were pulled from Care Compare. We used the March 2021 CMS Provider of Service file for the urban - rural location classification of each facility.¹⁸

Using the CMS Long Term Care Minimum Data Set (MDS) 3.0 from 2020-Q1, we calculated the proportion of residents identifying as a racial minority or Hispanic non-white ethnicity.¹⁹ We defined racial minority defined as: Asian, African American, American Indian or Alaskan Native, Native Hawaiian or Pacific Islander

alone, or more than one race. We characterized facilities as having low, medium, medium-high, or high proportion of residents based on quartiles from the national distribution of any racial minority and for Hispanic non-white.

County Community Case and Vaccination Rates

We calculated county-level COVID rates as COVID cases for the general population per 1,000 people for the same time frame as the nursing home cases (June 28 – August 1, 2021) using data available through the Johns Hopkins Coronavirus Resource Center.²⁰

Using tertiles from the national distribution, we characterized the counties' community COVID counts per 1,000 people into three categories: low (<1.60), medium (1.60-4.17), and high (>4.17).

We pulled county-level characteristics (e.g., Social Vulnerability Index - SVI) and county-level general population COVID vaccination rates from a CDC database and used the prevalence of fully vaccinated individuals as of July 19, 2021.²¹ To supplement CDC's database, we pulled Texas county-level general population fully vaccinated prevalence data representative as of July 20, 2021 from the Texas Department of Health and Human Services website.²² Because of incomplete reporting, county-level vaccination rates in the states of Georgia, West Virginia, Virginia, and Vermont were excluded.

Using clinical estimates of effectiveness, we characterized counties' community vaccination rates in three categories: low (<30%), low-moderate (30-39%), moderate-high (40-49%), and high (>=50%).

Statistical Analyses

There were two outcomes of interest in this study. The first outcome was having a resident case, and the other was having a staff case.

First, we compared differences in facility characteristics for each outcome using chi-square or t-tests, as appropriate.

Second, we calculated the nursing home resident or staff case rates for each category of resident (i.e., low, low-moderate, moderate-high, high), staff (i.e., low, medium, high), and community (i.e., low, low-moderate, moderate-high, high) vaccination rates. We then stratified these rates by community case levels (i.e., low, medium, high) to visualize how COVID in the community possibly influences the relationship between nursing home cases and vaccination rates.

Finally, for each outcome, we assessed the multivariable relationships of the facility and community factors using generalized linear mixed models with the random intercept set as the state to account for any heterogeneity of states. All analyses were done using SAS 9.4.

Results

There were 1,361 (9.6%) nursing homes with at least one resident case between June 28 – August 1, 2021. In that same period, 3,963 (27.9%) nursing homes had at least one staff case. There were 993 (7.0%) facilities that had both resident and staff cases. Of nursing homes with cases, approximately seventy-five percent had three or fewer resident and staff cases.

Facility and Community Characteristics

Nursing homes with at least one resident case were larger (i.e., average bed size of 121 vs. 105, $p < 0.01$) and more often in an urban setting (75.0% vs 72.3%, $p = 0.03$) than those without any resident cases. Additionally, they had lower vaccination rates among residents (79.9% vs 83.3%, $p < 0.01$), staff (53.9% vs 60.5%, $p < 0.01$), and were in counties with lower general population vaccination rates (41.2% vs 44.5%, $p < 0.01$). Moreover, they tended to be in counties with higher average number of cases (7.29 vs 3.71 cases per 1,000, $p < 0.01$). They also had a higher average unique staff count (133 vs 117, $p < 0.01$) but lower average registered nurse hours per resident day (RN HPRD 0.76 vs 0.83, $p < 0.01$). There was no noteworthy difference in Five-Star ratings (3.18 vs 3.25, $p = 0.12$).

We observed a similar trend for all these factors when the outcome of interest was staff cases. See Table 2 for details. Differences between the two outcomes were found in three variables: non-profit ownership, total HPRD, and having an immediate jeopardy (IJ) infection control (F-880) citation. Nursing homes with a resident case were significantly less likely to have non-profit ownership (26.5% vs 29.8%, $p = 0.01$). However, those with a staff case were more likely to be non-profit at a non-statistically significant rate (30.7% vs 29.0%, $p = 0.06$). Average total HPRD was higher for both nursing homes with a staff (4.23 vs 4.07, $p < 0.01$) or resident (4.16 vs 4.11, $p = 0.07$) case, but it was statistically significant only for having a staff case. Nursing homes with a resident case were less likely to have an F-880 IJ citation in the past year (2.3% vs 3.9%, $p < 0.01$), but nursing homes with a staff case were just as likely to have an F-880 IJ citation (3.8% vs 3.8%, $p = 0.94$).

COVID Cases and Vaccination Rates Stratified by Community Case Level

For each independent comparison of nursing home resident cases with resident, staff, and community vaccination rates, the average case rate was lowest among each “high” vaccination category.

When we stratified these comparisons by community COVID case levels, we had two observations. First, at the high stratum of COVID cases in the community the relationship between cases and vaccination rates remained. In other words, the highest vaccination group had lower rates than the lowest vaccination group.

Second, at the low and medium stratum of COVID cases in the community, the relationship between cases and vaccination rates was less pronounced. In other words, there were instances when the highest vaccination group had the same or higher rates than the lowest vaccination group.

As an example of the first observation, nursing homes with greater than or equal to 75% of staff vaccinated had an average of 2.9 resident cases per 1,000 residents in the observation period. This rate was lower than that of facilities with less than 50% staff vaccinated (i.e., 8.0 cases per 1,000 residents), and that of facilities with 50-74% of staff vaccinated (i.e., 4.6 cases per 1,000). (See Figure 1a.i)

This relative pattern for resident case rates remained at the “high” community case rate stratum. Among nursing homes located in a “high” community case rate, those with greater than or equal to 75% of staff vaccinated had 4.5 resident cases per 1,000. While those with less than 50% of staff vaccinated had 15.1 resident cases per 1,000, and those with staff vaccination rates of 50-74% had 11.7 resident cases per 1,000. (See Figure 1a.ii)

This pattern did not hold in the middle tertile of community case rates and is an example of the second observation described earlier. Among nursing homes located in a “medium” community case rate area, those with greater than or equal to 75% of staff vaccinated had the highest resident case rate (3.5 cases per 1,000); followed by a resident case rate of 2.7 cases per 1,000 for nursing homes with a staff vaccination rate of less than 50% and a 2.5 resident cases per 1,000 for nursing homes with 50-74% staff vaccination rate. (See Figure 1a.ii)

Similar patterns were seen for resident (Figures 1a-1c) and staff (Figures 2a-2c) cases across resident, staff, and community vaccination rates when stratifying by community cases.

Multivariable Modeling

We observed several similarities between the resident and staff cases multivariable, multi-level models. When looking at the outcome of having at least one resident case, having at least one staff case was the strongest predictor, adjusting for all other variables. Specifically, having at least one staff case, as opposed to not having any staff cases, was associated with 6.13 (95% CI: 5.32-7.06) times the odds of having a resident case. Similarly, having at least one resident case, as opposed to not having any resident cases, was associated with 5.96 (95% CI: 5.17-6.88) times the odds of having a staff case, adjusting for all factors and accounting for state heterogeneity.

Other factors with a positive and statistically significant association in for both outcomes were community cases per 1,000 people (Outcome: Resident Case [OR 1.06, 95% CI 1.05-1.08] Outcome: Staff Case [OR 1.15, 95% CI 1.13-1.16]), low community vaccination rates (Outcome: Resident Case [OR 1.40, 95% CI 1.05-1.86] Outcome: Staff Case [OR 1.60, 95% CI 1.30-1.98]), and high staff count (Outcome: Resident Case

[OR 1.21, 95% CI 1.03-1.42] Outcome: Staff Case [OR 1.53, 95% CI 1.36-1.71]), For example, a nursing home in a community with a general population vaccination rate less than 30% was associated with 1.40 times the odds of having a resident case than a nursing home in a community with greater than or equal to 50% of the general population vaccinated, adjusting for all factors and accounting for state heterogeneity.

There was no factor with a statistically significant protective effect in both models, but each model had their own unique factors. In the model for having a resident case, being a smaller bed facility (OR 0.67, 95% CI 0.52-0.88) and having an immediate jeopardy (IJ) infection control citation (F-880) in the prior year (OR 0.57, 95% CI 0.38-0.85) were associated with lower odds of having a resident case. In the model for having a staff case, having a low staff count (OR 0.64, 95% CI 0.57-0.72) was associated with lower odds of having a staff case.

Some factors had opposite effects between the two models. For example, having an immediate jeopardy citation for infection control (F-880) in the prior year was associated with statistically significant lower odds of having a resident case (OR 0.57, 95% CI: 0.38-0.85) but non-significant higher odds of having a staff case (OR 1.21, 95% CI: 0.97-1.51).

Adjusted odds ratios for both models are shown in Figures 3 & 4.

Discussion

Based on our analyses, the rate of COVID cases in the community is still significantly associated with having cases within the nursing home. Prior research found this to be the case in 2020 and it held true in our analysis of July 2021 outbreaks.^{4,5}

Unlike the early part of 2020, vaccines are available in 2021 to reduce disease burden. No facility reported a rate of zero vaccinations for the entire study period, and we were not aware of any reports where all residents or staff within a nursing home refused a vaccine since they became available. In our stratified analyses, we saw higher rates of resident, staff, and community vaccination associated with lower resident and staff case rates in high community case rate counties.

This study has a few limitations. First, the county general population vaccination rates for Georgia, West Virginia, Virginia, and Vermont were not complete and as such nursing homes from these states were excluded from the analyses.

Further, the Delta variant was not uniformly spreading among various communities during the study period. For instance, in July reports showed that Delta was concentrated in Missouri, Arkansas, and Louisiana.²³ We were not able to ascertain whether the COVID cases reported in our analysis were the Delta strain as this data was not available.

While an increase in cases and deaths in nursing homes during the summer of 2021 has been previously reported,²⁴ this report is among the first to look at the relationship of summer 2021 cases with facility and community characteristics and vaccination rates.

Policy Implications

Nursing home operators, regulators, and policy makers should make efforts to increase staff, resident, and community vaccination rates. Incentives or enforcement actions that focus solely on vaccinating one group may not achieve the desired outcome of fewer cases in nursing homes.

Additional research on the drivers and methods to achieve higher staff and community vaccination rates will be beneficial particularly with the rise of new variants such as Omicron.

Efforts to increase vaccination rates appear to be ongoing. According to the CDC, nursing home staff vaccination rates have increased by 33% from 61.5% on July 25, 2021 to 81.6% on December 12, 2021.² The general population or community vaccination rates have increased by 24% from 49.1% to 60.8% in the same timeframe.²¹ Meanwhile, resident vaccination rates have remained above 80% since July 2021.²

Table 1 Characteristics of Nursing Homes with Resident Case(s)

		Resident Case(s)?				P-value
		Yes		No		
		#	%	#	%	
Total Nursing Homes		1,361	9.6	12,845	90.4	
Facility Characteristics						
Bed Size	Average	121		105		<0.01
	<=50 Beds	84	6.2	1,899	14.8	
	50-120 Beds	801	58.9	7,289	56.8	
	>120 Beds	476	35.0	3,657	28.5	<0.01
Government or Not-For-Profit	No	1,001	73.6	9,013	70.2	
	Yes	360	26.5	3,832	29.8	0.01
Rural/Urban	Rural	338	25.0	3,546	27.7	
	Urban	1,016	75.0	9,258	72.3	0.03
Overall 5-Star Rating	Average	3.18		3.25		0.12
	1	210	15.7	1,837	14.5	
	2	257	19.2	2,464	19.5	
	3	259	19.4	2,319	18.3	
	4	299	22.4	2,843	22.5	
	5	312	23.3	3,203	25.3	0.43
Staffing						
Total Nursing HPRD (Adjusted)	Average	4.16		4.11		0.07
RN HPRD (Adjusted)	Average	0.76		0.83		<0.01
Staff Count	Average	133		117		<0.01
Infection Control Citations						
Any F-880 in Past Year	No	576	42.3	5,274	41.1	
	Yes	785	57.7	7,571	58.9	0.37

		Yes		No		P-value
		#	%	#	%	
Immediate Jeopardy F-880 in Past Year	No	1,330	97.7	12,339	96.1	
	Yes	31	2.3	506	3.9	<0.01
Staff Data						
Staff Vaccination Rate	Average	53.9		60.5		<0.01
Any Staff Case?	No	368	27.0	9,875	76.9	
	Yes	993	73.0	2,970	23.1	<0.01
Staff Case Rate (per 1k)	Average	25.7		3.8		<0.01
Resident Data						
Resident Vaccination Rate	Average	79.9		83.3		<0.01
Race (% Minority)	Average	14.8		14.4		0.39
Ethnicity (% Hispanic)	Average	4.8		4.8		0.88
County Community Data						
County Vaccination (All)	Average	41.2		44.5		<0.01
	<35%	412	30.3	2,696	21.1	
	>=35%	948	69.7	10,099	78.9	<0.01
County Vaccination (Age 18+)	Average	50.5		54.3		<0.01
County Case Rate (per 1k)	Average	7.29		3.71		<0.01
Social Vulnerability Index	Low	165	13.7	2,617	22.1	
	Low-Moderate	300	24.9	3,362	28.4	
	Moderate-High	446	37.0	3,583	30.3	
	High	295	24.5	2,261	19.1	<0.01

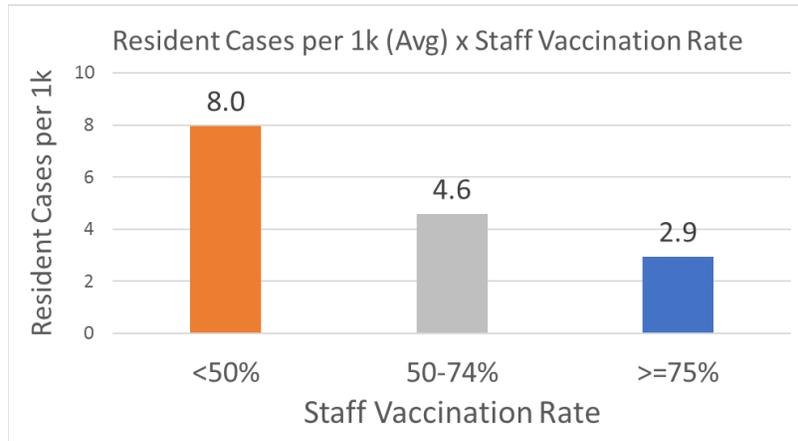
Table 2 Characteristics of Nursing Homes with Staff Case(s)

		Staff Case(s)?				P-value
		Yes		No		
		#	%	#	%	
Total Nursing Homes		3,963	27.9	10,243	72.1	
Facility Characteristics						
Bed Size	Average	118		103		<0.01
	<=50 Beds	337	8.5	1,646	16.1	
	50-120 Beds	2,266	57.2	5,824	56.9	
	>120 Beds	1,360	34.3	2,773	27.1	<0.01
Government or Not-For-Profit	No	2,747	69.3	7,267	71.0	
	Yes	1,216	30.7	2,976	29.0	0.06
Rural/Urban	Rural	1,031	26.1	2,853	27.9	
	Urban	2,920	73.9	7,354	72.1	0.03
Overall 5-Star Rating	Average	3.23		3.24		0.50
	1	568	14.6	1,479	14.6	
	2	784	20.1	1,937	19.2	
	3	696	17.9	1,882	18.6	
	4	895	23.0	2,247	22.2	
	5	955	24.5	2,560	25.3	0.46
Staffing						
Total Nursing HPRD (Adjusted)	Average	4.23		4.07		<0.01
RN HPRD (Adjusted)	Average	0.78		0.84		<0.01
Staff Count	Average	132		113		<0.01
Infection Control Citations						
Any F-880 in Past Year	No	1,650	41.6	4,200	41.0	
	Yes	2,313	58.4	6,043	59.0	0.49

		Yes		No		P-value
		#	%	#	%	
Immediate Jeopardy F-880 in Past Year	No	3,814	96.2	9,855	96.2	
	Yes	149	3.8	388	3.8	0.94
Staff Vaccination Rate	Average	55.8		61.5		<0.01
Resident Data						
Resident Vaccination Rate	Average	81.5		83.5		<0.01
Any Resident Case?	No	2,970	74.9	9,875	96.4	
	Yes	993	25.1	368	3.6	<0.01
Resident Case Rate (per 1k)	Average	16.2		1.0		<0.01
Race (% Minority)	Average	15.8		14.0		<0.01
Ethnicity (% Hispanic)	Average	5.2		4.6		<0.01
County Community Data						
County Vaccination (All)	Average	41.8		45.1		<0.01
	<35%	1,135	28.7	1,973	19.4	
	>=35%	2,823	71.3	8,224	80.6	<0.01
County Vaccination (Age 18+)	Average	51.3		55.0		<0.01
County Case Rate (per 1k)	Average	6.46		3.12		<0.01
Social Vulnerability Index	Low	506	14.2	2,276	24.1	
	Low-Moderate	929	26.0	2,733	28.9	
	Moderate-High	1,256	35.1	2,773	29.3	
	High	885	24.8	1,671	17.7	<0.01

Figure 1a – Resident Cases by Staff Vaccination

(1a.i) Resident Cases per 1,000



(1a.ii) Stratified by Community Case Rate

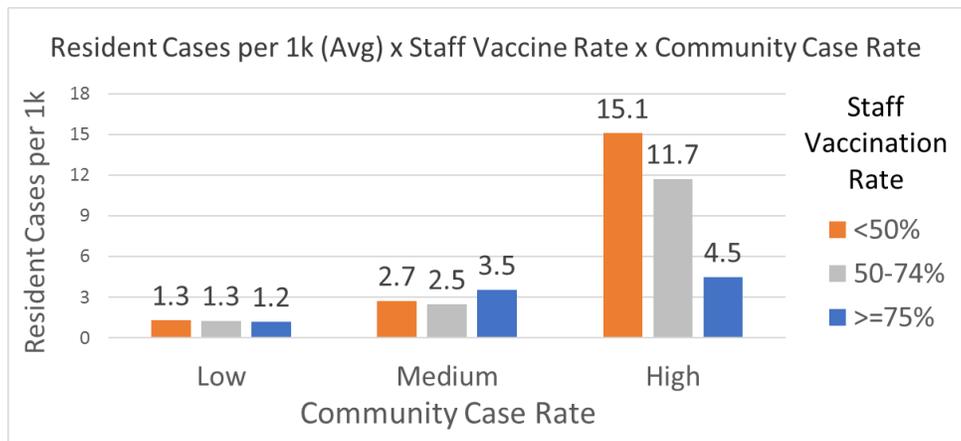
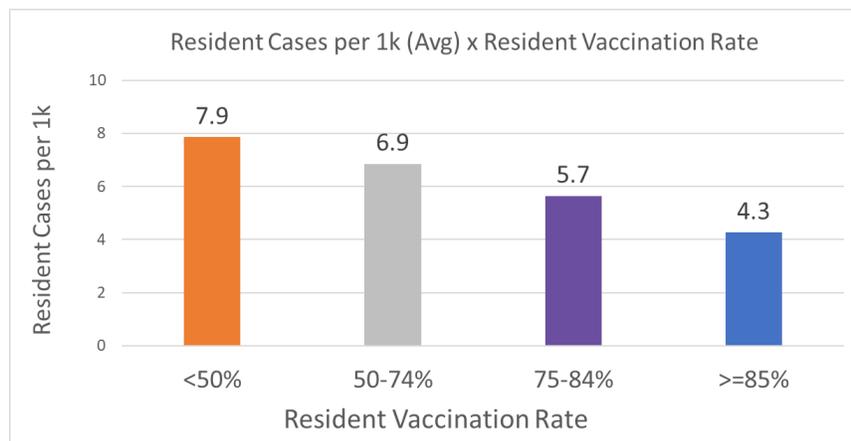


Figure 1b – Resident Cases by Resident Vaccination

(1b.i) Resident Cases per 1,000



(1b.ii) Stratified by Community Case Rate

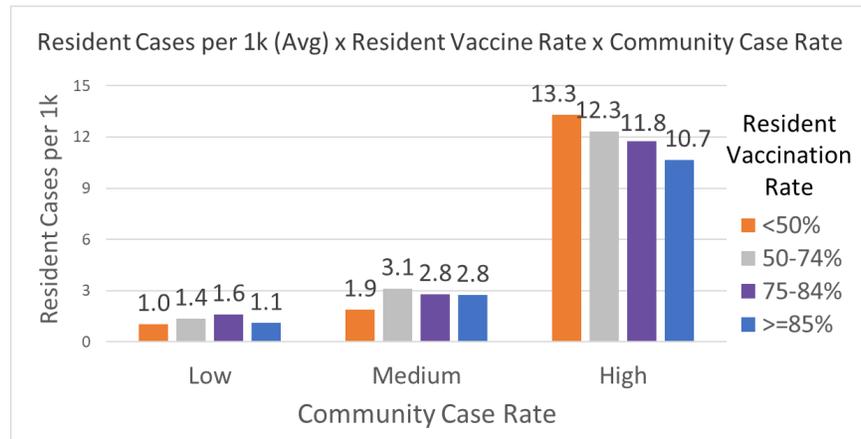
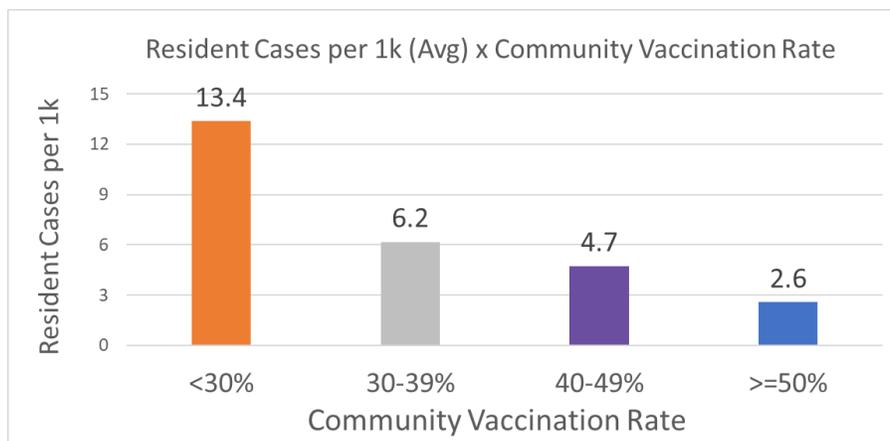


Figure 1c – Resident Cases by Community Vaccination

(1c.i) Resident Cases per 1,000



(1c.ii) Stratified by Community Case Rate

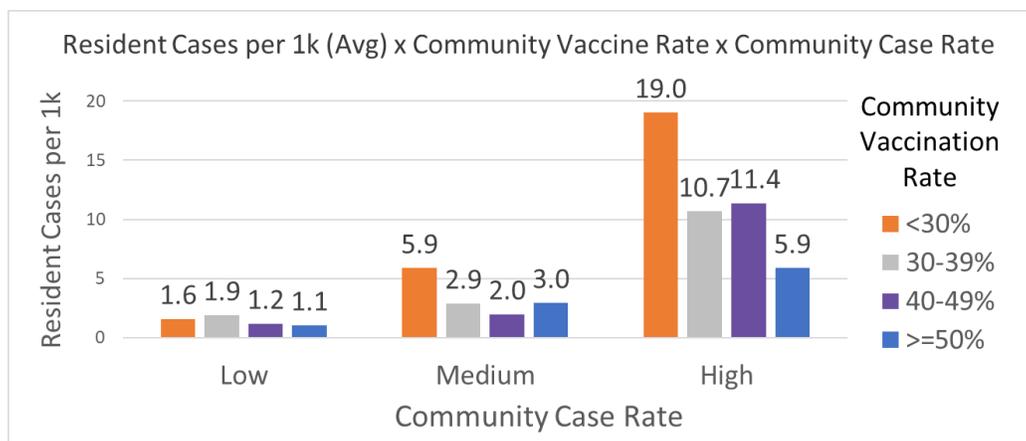
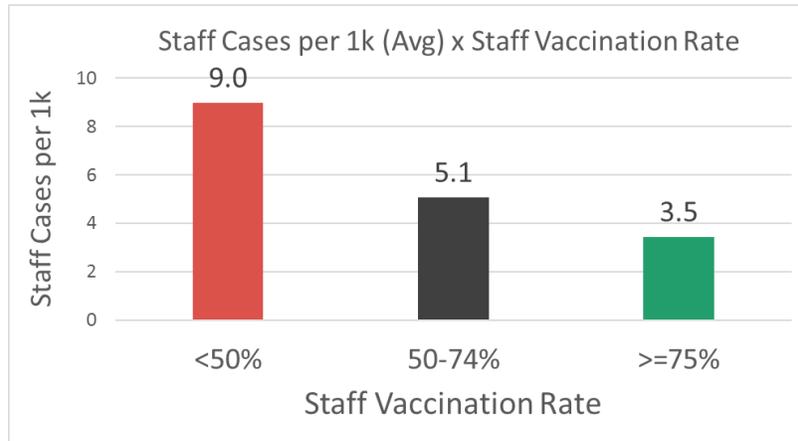


Figure 2a – Staff Cases by Staff Vaccination

(2a.i) Staff Cases per 1,000



(2a.ii) Stratified by Community Case Rate

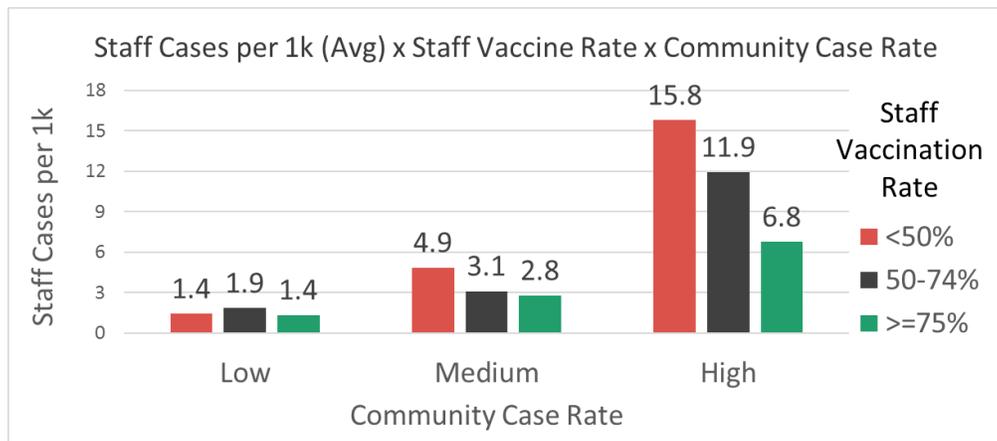
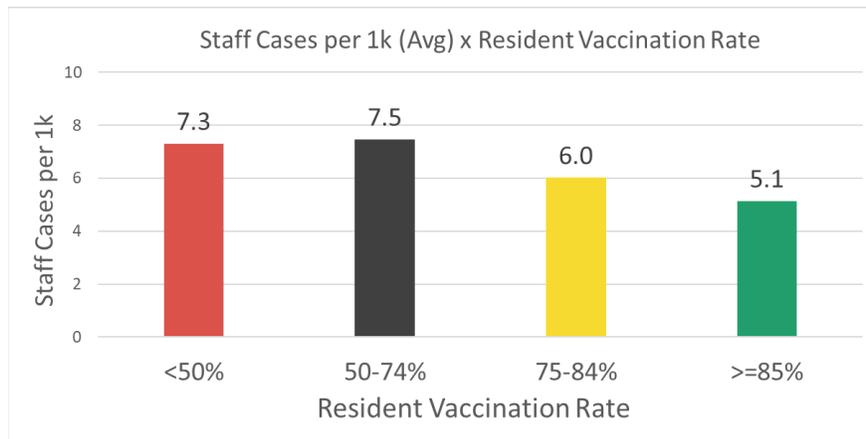


Figure 2b – Staff Cases by Resident Vaccination

(2b.i) Staff Cases per 1,000



(2b.ii)- Stratified by Community Cases

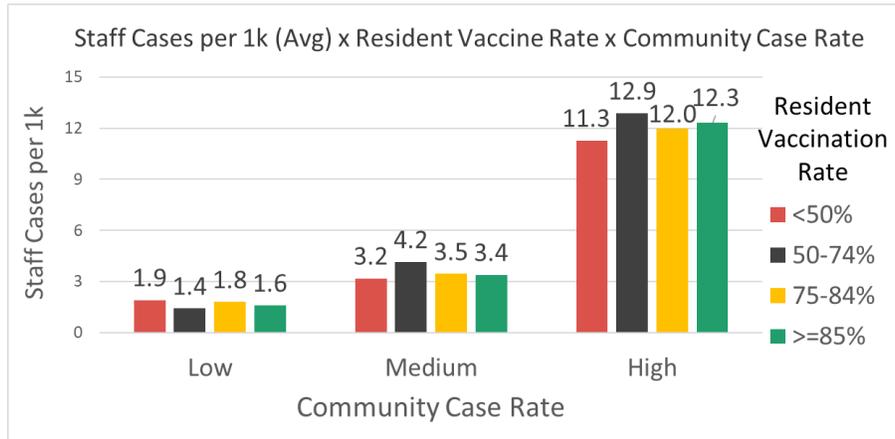
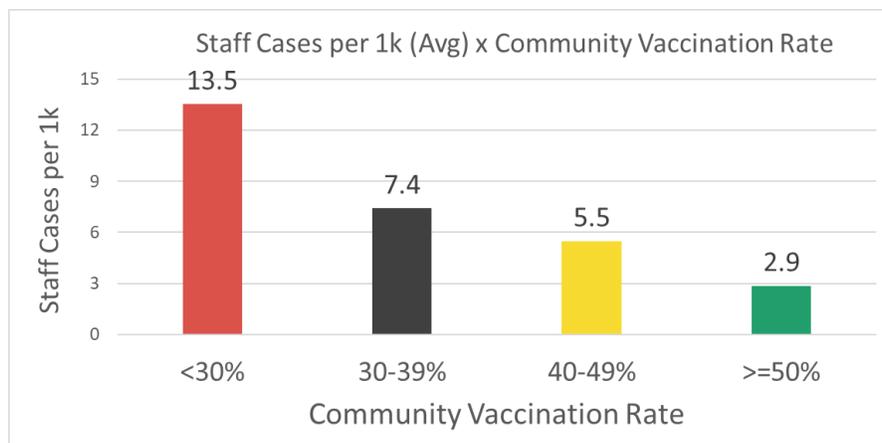


Figure 2c- Staff Cases by Community Vaccination

2c.i- Staff Cases per 1,000



2.c.ii- Stratified by Community Cases

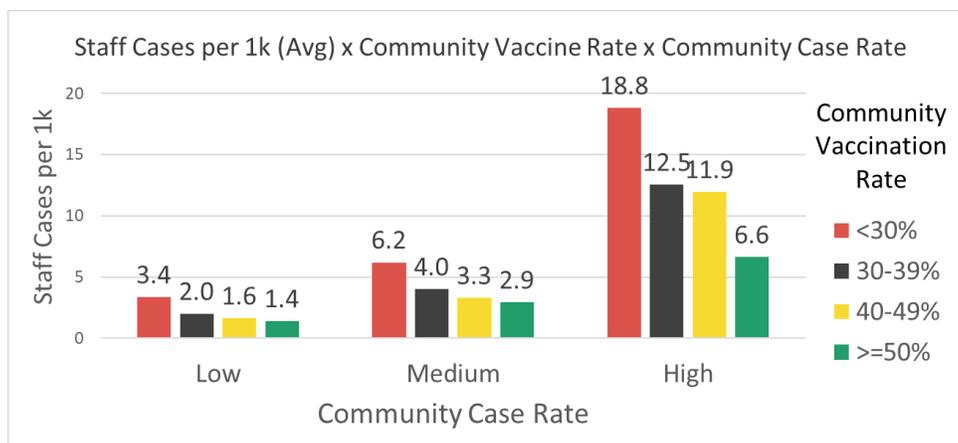


Figure 3 – Multivariable Modeling for Having a Resident Case

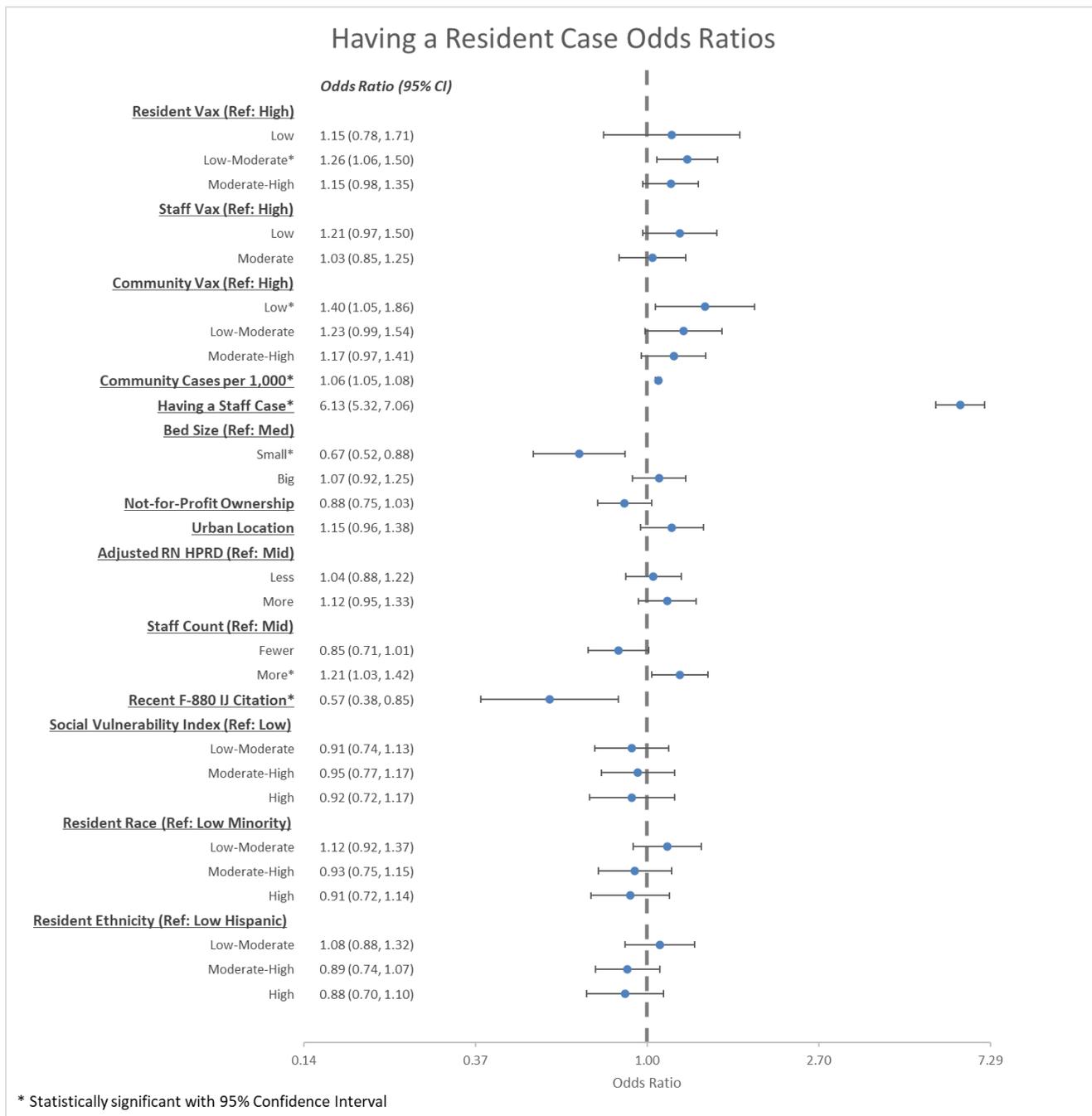
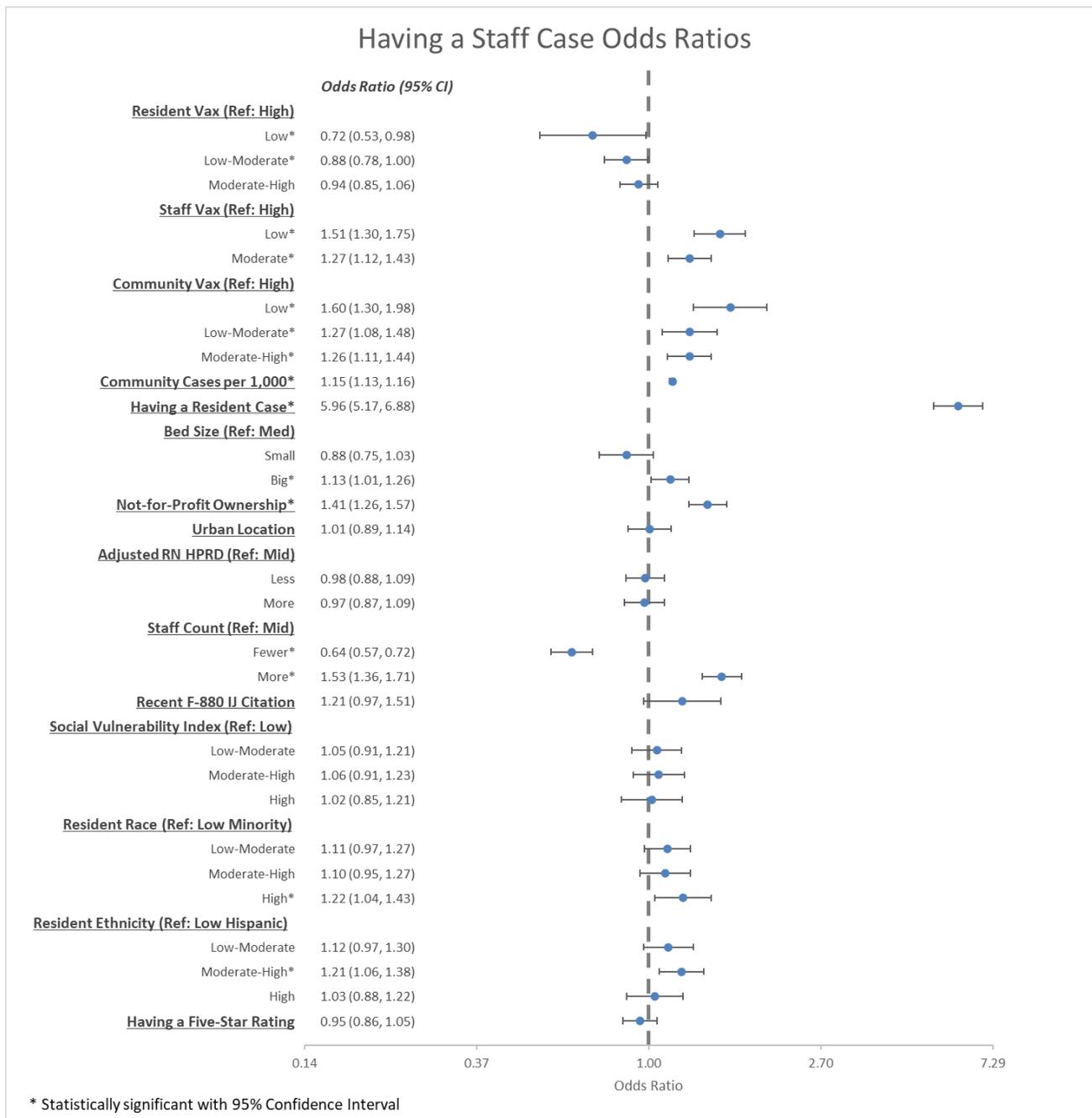


Figure 4 – Multivariable Modeling for Having a Staff Case



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