# Physician Density and Location of Physician Training: The Impact on Avoidable Hospitalizations

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## ABSTRACT

**Purpose of the Study**

The purpose of the study is to understand how physician availability and the percent of foreign born and foreign trained physicians (IMGs) potentially impact on the rate of avoidable hospitalizations.

**Methods**

Using Primary Care Service Areas, rates of adult avoidable hospitalizations were compared to the rate of primary care physicians. Multiway interactions were initially used to understand the data, and ultimately the PCSAs were categorized into 4 geographic areas:

- New York City (Percent poverty and percent racial/ethnic minorities less than 20%)
- New York City (all other)
- Upstate Urban
- Upstate Rural

The study population for the research was New York State adults, ages 18 years and older, with at least one avoidable hospitalization discharge between 2009 and 2011.

**Findings**

Results indicated that the community characteristics of poverty, underrepresented minorities, and age had more of an impact on the rate of avoidable hospitalizations than physician density or the percentage of IMGs. Higher percentages of IMGs were associated with higher rates of avoidable hospitalizations in upstate rural PCSAs and in more affluent PCSAs of New York City. Only the least physician dense areas in New York City were associated with higher rates of avoidable hospitalizations.

**Conclusion**

It is evident that predisposing (race/ethnicity and age) and personal enabling (poverty) factors had a much more substantial impact on the rate of avoidable hospitalizations than enabling community (physician density and physician characteristics) factors.

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## INTRODUCTION

Poor access to primary care and/or poor quality of care may increase the number of unnecessary hospitalizations; as such, avoidable hospitalizations serve well as a proxy for poor care. These hospitalizations could be avoided if a sufficient number of primary care providers were available within a defined community or neighborhood.

The existing literature suggests a number of factors are associated with avoidable hospitalization admissions and readmissions, including:

- individual factors (age, gender, comorbidities, race/ethnicity, and socioeconomic status) and
- hospital factors (location, academic affiliation, and size).

Very little research has been conducted, however, on the impact of primary care physician density on avoidable hospital admissions and readmissions.

One model for assessing access to care is Andersen's Behavioral Model of Health Service Use. This construct considers both individual and community factors in understanding potential facilitators or impediments to utilizing health care services and is organized by predisposing, enabling, and need factors.

## METHODS

The purpose of this research was to determine if there are statistically significant associations between the rate of avoidable hospitalizations within New York State and both physician density and the location of physician training, as defined by location of medical school, taking into account selected predisposing, need, and enabling factors as identified in Andersen's Behavioral Mode of Health Services Use.

PCSAs were used as the units of geography for this analysis. Given the complexity of the data, multi-way interactions were assessed and New York City was accordingly segregated into two analyses, those with both the percentage of poverty and the percentage of racial/ethnic minorities less than 20% (n=18); and those with poverty or racial/ethnic minorities above 20% (n=63). The counties outside of New York City were divided into rural or urban counties and included 169 urban PCSAs and 150 rural PCSAs.

Avoidable hospitalizations were defined using the Agency for Healthcare Research and Quality prevention quality indicators, version 4.5. The study population was New York State adults, 18 years of age and older, for the years 2009 through 2011. Hospital inpatient discharge data were obtained from the NYSDOH Statewide Planning and Cooperative System (SPARCS).

## METHODS (cont.)

Inpatient discharges were identified as potential avoidable hospitalizations using primary and selected secondary diagnoses based on AHRQ criteria, then checked against the AHRQ exclusionary factors and discharges with out-of-state, incomplete, or missing zip codes.

| | | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| Total SPARCS Records | | 2,665,235 | 2,621,602 | 2,583,619 |
| Records with Avoidable Hospital Primary Diagnoses | | 347,675 | 327,721 | 323,720 |
| Exclusion Criteria * | Abortion Indicator | 20 | 16 | 14 |
| | Bad/Missing/Out-of-State Zip Code | 11,224 | 10,639 | 10,356 |
| | Age | 32.026 | 28.164 | 27.886 |
| | Health Facility Transfers | 16,184 | 19,319 | 20,064 |
| | Secondary Diagnoses/Procedures | 40,006 | 42,267 | 43,653 |
| Total Records for Analysis | | 264,099 | 248,985 | 251,852 |

## RESULTS

There were 158.2 unadjusted avoidable hospitalizations per 10,000 for the population 18 years of age or older statewide, including 168.9 per 10,000 population 18 years of age and older in NYC, 147.0 per 10,000 in Upstate urban areas, and 161.7 per 10,000 in Upstate rural areas.

**NYC: Poverty and Underrepresented Minorities < 20%**

The percentage of IMGs was associated with the rate of avoidable hospitalizations in NYC in PCSAs where both poverty and underrepresented minorities were less than 20%, with the rate of avoidable hospitalizations 62% higher in PCSAs where IMGs were less than 20% of total physicians, compared to PCSAs were IMGs were 20% of higher of total physicians.

| Variable | Category | Adjusted Rate Ratio |
|---|---|---|
| Population 65 Plus | < 10% | 1 |
| | 10% - 19% | 1.62** |
| | 20% and Higher | 2.55*** |
| International Medical Graduates | < 20% | 1 |
| | 20% and Higher | 1.62*** |
| Physician Density | Less than 1,500:1 | 1 |
| | 1,500:1 to 1,999:1 | 0.92 |
| | 2,000:1 to 2,999:1 | 0.99 |
| | 3,000:1 and Higher | 1.30*** (1) |

\* p < .05
\*\* p < .01
\*\*\* p < .001
(1) 1 PCSA

**NYC: Poverty Or Underrepresented Minorities ≥ 20%**

The association between percentage of IMGs and avoidable hospitalizations was not significant for the majority of NYC PCSAs. Avoidable hospitalization rates were not elevated among PCSAs with lower provider access compared to areas with good provider coverage. The association between physician density, and poverty, race/ethnicity, and age were all significantly associated with avoidable hospitalization rates.

| Variable | Category | Adjusted Rate Ratio |
|---|---|---|
| Federal Poverty Level | < 10% | 1 |
| | 10% - 19% | 1.03 |
| | 20% - 39% | 1.15 |
| | 40% and Higher | 1.66** |
| Underrepresented Minorities | < 20% | 1 |
| | 20% - 49% | 1.05 |
| | 50% - 69% | 1.27** |
| | 70% and Higher | 1.55*** |
| Population 65 Plus | < 10% | 1 |
| | 10% - 19% | 0.98 |
| | 20% and Higher | 1.32** |
| International Medical Graduates | <20% | 1 |
| | 20% -59% | 1.04 |
| | 60% and Higher | 1.09 |
| Physician Density | Less than 1,500:1 | 1 |
| | 1,500:1 to 1,999:1 | 0.91 |
| | 2,000:1 to 2,999:1 | 0.88 |
| | 3,000:1 and Higher | 0.89* |

\* p < .05
\*\* p < .01
\*\*\* p < .001

## RESULTS (cont.)

**Upstate Urban**

The association between the percentage of IMGs and the rate of avoidable hospitalizations was not statistically significant for urban PCSAs outside of NYC, once adjusted for community factors. The rate of avoidable hospitalizations in upstate urban PCSAs with poverty levels of 10% or higher was 12% higher than the rate of avoidable hospitalizations for PCSAs with a population where less than 10% meet federal poverty levels.

| Variable | Category | Adjusted Rate Ratio |
|---|---|---|
| Federal Poverty Level | < 10% | 1 |
| | 10% and Higher | 1.12 ** |
| Underrepresented Minorities | < 20% | 1 |
| | 20% - 49% | 1.03 |
| | 50% and Higher | 1.20** |
| International Medical Graduates | < 20% | 1 |
| | 20% and Higher | 1.1 |
| Physician Density | Less than 1,500:1 | 1 |
| | 1,500:1 to 1,999:1 | 1.1 |
| | 2,000:1 to 2,999:1 | 1.05 |
| | 3,000:1 and Higher | 1.08 |

\* p < .05
\*\* p < .01
\*\*\* p < .001

**Upstate Rural**

The association between the percentage of IMGs and the rate of avoidable hospitalizations in rural PCSAs was significant. The rate of avoidable hospitalizations was 18% higher for PCSAs with 20% or more of IMGs to total physicians, compared to PCSAs with less than 20% of IMGs to total physicians. In rural areas of NYS, areas with greater poverty had higher rates of avoidable hospitalizations.

| Variable | Category | Adjusted Rate Ratio |
|---|---|---|
| Federal Poverty Level | < 10% | 1 |
| | 10% - 19% | 1.35*** |
| | 20% - 29% | 1.02 |
| | 30% and Higher | 1.94*** |
| Population 65 Plus | < 12% | 1 |
| | 12% - 24% | 1.33*** |
| | 25% and Higher | 2.18** |
| International Medical Graduates | <20% | 1 |
| | 20% and Higher | 1.18** |
| Physician Density | Less than 1,500:1 | 1 |
| | 1,500:1 to 1,999:1 | 1.07 |
| | 2,000:1 to 2,999:1 | 1.05 |
| | 3,000:1 and Higher | 0.97 |

\* p < .05
\*\* p < .01
\*\*\* p < .001

## DISCUSSION

If social determinants of health truly are the major contributor to the rate of avoidable hospitalizations, then any response to addressing avoidable hospitalizations must address those social determinants. Appropriate levels of social programs must be available within each community, targeting the most vulnerable populations, and within reach of those populations.

Effective delivery of primary care must also consider the people and their community. To close gaps in coverage, interventions to improve health care delivery should include the coordination of care both within, across, and outside traditional health care settings, such as with social service organizations. Finally, while IMGs are an integral part of the health care system in New York State and are placed in many underserved areas, through various federal and state programs, to increase access to care, their presence may have unintended consequences with respect to hospitalizations.