Connecticut Epidemiologist

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Differences by Neighborhood Poverty Decrease for Influenza-Associated Hospitalizations in Connecticut

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In this issue...

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Background

The United States has experienced high rates of influenza over the past few years, a trend reflected in Connecticut (CT). With this increase in influenza has come an increase in influenza-associated hospitalizations. The CT Emerging Infections Program (EIP) has conducted population-level surveillance for hospitalizations with influenza in children since 2003 and adults since 2005. Having a data-driven understanding of the populations most impacted by influenza hospitalizations can help direct enhanced vaccination efforts to reduce future hospitalizations.

Previous studies of New Haven County residents have revealed a relationship between influenza-associated hospitalizations and census tract-level poverty.[1] Past surveillance has shown a strong association between increasing incidence of hospitalizations and increasing census tract-level poverty (CTP), a measure of socioeconomic status (SES), nationally as well as in CT.[2,3] An analysis of trends in hospitalizations in CT by census tract poverty in 2019 showed little change in the magnitude of the relative risk of hospitalization with influenza between the highest and lowest poverty census tracts when comparing the initial years of surveillance with aggregate influenza hospitalization data from 2013–2018.[1]

The objective of this analysis is to examine whether and the extent to which this SES difference persisted in CT in the most recent years since the COVID-19 pandemic, 2022–2025. During the initial COVID-19 pandemic period (2020–2021), influenza rates fell sharply before returning to previous rates and then exceeding them in 2024-2025. At the same time, the primary location of vaccine delivery outside the public health system shifted from physician offices to retail pharmacies, which would theoretically increase access to the annual influenza vaccine.[4] The post-COVID-19 pandemic era has seen public trust and uptake of vaccines decrease. To combat this decrease, there have been renewed efforts by public health organizations to encourage vaccination and access to vaccines. The purpose of this study was to determine if the difference in influenza-associated hospitalizations across levels of poverty had changed in the wake of the changes in and efforts towards vaccine access spurred by the COVID-19 pandemic.

Methods

The CT EIP Respiratory Virus Hospitalization Surveillance Network team at the Yale School of Public Health collected influenza hospitalization data for New Haven and Middlesex County residents for the 2022–2023 influenza season and for Naugatuck Valley, South Central, and Lower CT River Valley planning region residents for the 2023–2024 and 2024–2025 influenza seasons when CT transitioned from historic counties to county equivalent planning regions. Both of these larger surveillance areas include the towns that made up New Haven County, the surveillance area used for this analysis. A case was defined as a resident of New Haven County who tested positive for influenza via an approved laboratory test ordered by a healthcare provider within 14 days before or during their hospitalization or who was under observation at the hospital for at least 24 hours. Cases who met these criteria had their addresses geocoded and matched with U.S. Census Bureau data. The 2020 U.S. Census was used for population data and geocoding and the 2020–2024 5-year American Community Survey for CTP level. Census tracts were categorized into four poverty levels based on the proportion of residents living below the federal poverty limit: <5% (Low), 5-<10% (Medium-Low), 10-<20% (Medium-High), and ≥20% (High).

The 2022–2025 data from New Haven County were compared to 2003–2011 and 2013–2018 data to provide insight into how differences have changed over time. Age-specific incidences for the three influenza seasons separately and combined (2022–2023 through 2024–2025) were determined for each CTP level. Trends in incidence by increasing CTP category were measured using chi-square for trend. Incidence rate ratios (IRR) of the ≥20% to <5% CTP groups were used to measure the magnitude of trend associations found. Age-specific IRRs from the aggregated 2022–2025 data were compared with those found in the 2013–2018 data and 2003–2010 (children) and 2007–2011 (adult) studies. This project was exempt from Human Investigations Committee review.

Differences by Neighborhood Poverty Decrease for Influenza-Associated Hospitalizations in Connecticut *(continued)*

Results

The highest age-specific incidence was in the 50–64 and 65+ year age groups. By CTP level, for every age except those in the 0–4 years and 5–17 years age groups, age-specific incidence was the highest among residents of high poverty census tracts (Figure 1). The 0–4 and 5–17 years age groups had similar incidence in high and medium-high CTP groups. For each age group there was a statistically significant association of increasing incidence with increasing CTP ($p<0.05$, chi-square for trend, Figure 1).

When comparing the magnitude of the association over time, there has been a consistent decrease in the magnitude of the IRR difference between the highest and lowest poverty groups for persons in the three youngest age groups, 0–4, 5–17 and 18-–49 years (Figure 2). The reduction in IRR in these age groups from highs in 2003–2011 to lows in 2022–2025 ranged from a 54% reduction in the 0–4 year age group to a 46% reduction in the 5–17 year age group, and a 33% reduction in the 18–49 year age group. The older two age groups showed no consistent trend.

Discussion

There are two major findings from this analysis. First, the association between higher rates of hospitalization with influenza with higher CTP level in New Haven County for all age groups continues, twenty years after first being described. Second, there appears to be a sizable decrease ranging from 33–54 percent in the magnitude of the association since the last analysis covering 2013–2018 for age groups <50 years.

One possible hypothesis for the decreases in the difference by CTP is a relative increase in influenza vaccination rates among younger residents of higher poverty areas. While there are no specific New Haven County data to critically examine this hypothesis, there are several factors which could lead to an increase in vaccination of those living in high CTP areas. In 2011, an influenza vaccination requirement for children 6 months and older in licensed daycare was implemented. The combination of increasing Medicaid enrollment due to the expanded eligibility from the Affordable Care Act and increasing availability of influenza vaccines from pharmacies also made influenza vaccine increasingly accessible at little to no cost to more low-income persons. As COVID-19 vaccines were licensed and made available, there was strong encouragement to vaccinate children in daycare and schools against not just COVID-19, but also influenza. In addition, similar differences in COVID-19 associated hospitalization and death lead to public health efforts to make COVID-19 vaccine readily available in publicly funded clinics in all neighborhoods.

The CDC collects information annually on influenza vaccination levels by age group in each state using telephone surveys.[5] Compared to aggregated data from 2016–2018, aggregated vaccination rates from 2022–2024 increased in all age groups except 5–17 year olds: from 85.0% to 86.4% in 6 month-4 year olds, from 41.0% to 45.7% in 18–64 year olds and from 68.3% to 72.5% in >65 year olds. In 5–17 year olds it decreased slightly from 68.0% to 66.8%. However, over the 3 influenza seasons from 2022 to 2024, rates steadily dropped each year from highs of 90.1%, 68.2%, 53.4% and 76.3% in the 4 age groups in ascending order for the influenza season beginning in 2022 to lows of 79.6%, 63.4%, 39.7% and 67.8% respectively for the season beginning in 2024. While it appears that influenza immunization may have initially gotten a boost across the age spectrum after the worst of COVID-19, in 2024–25, levels decreased below those nearly 10 years ago. Limitations of these immunization rate data to help interpret the decrease in differences by CTP in New Haven County are that the data are statewide and cannot be parsed by CTP levels. Limitations of the surveillance data are that a small percentage (<5%) of cases could not be geocoded and included in this analysis and some persons admitted with influenza may not have been tested. To the extent that these limitations varied by CTP, the magnitude of the differences observed could be affected.

The overall implication of the findings of this analysis for future influenza prevention efforts are several. First, despite the encouraging trends in lessening of differences by CTP in influenza hospitalizations, knowing that SES directly affects health, enhanced vaccination efforts should continue to be targeted towards regions that have 10% or more of the residents living below the federal poverty limit. Second, given the trend toward decreasing vaccination levels against influenza statewide in all age groups, more general efforts are needed to reverse this trend and thus reduce the risk of hospitalization amongst all groups.

As part of broader statewide strategies to reduce influenza-associated morbidity, the Connecticut Department of Public Health has initiated the Adult Influenza Vaccine Pilot, established by Public Act 26-3, to improve access to seasonal influenza vaccine for uninsured and underinsured adults aged 19 years and older. While separate from the data analyzed in this report, this pilot reflects ongoing efforts to strengthen adult immunization access across Connecticut and address the SES differences described in this report.

Differences by Neighborhood Poverty Decrease for Influenza-Associated Hospitalizations in Connecticut *(continued)*

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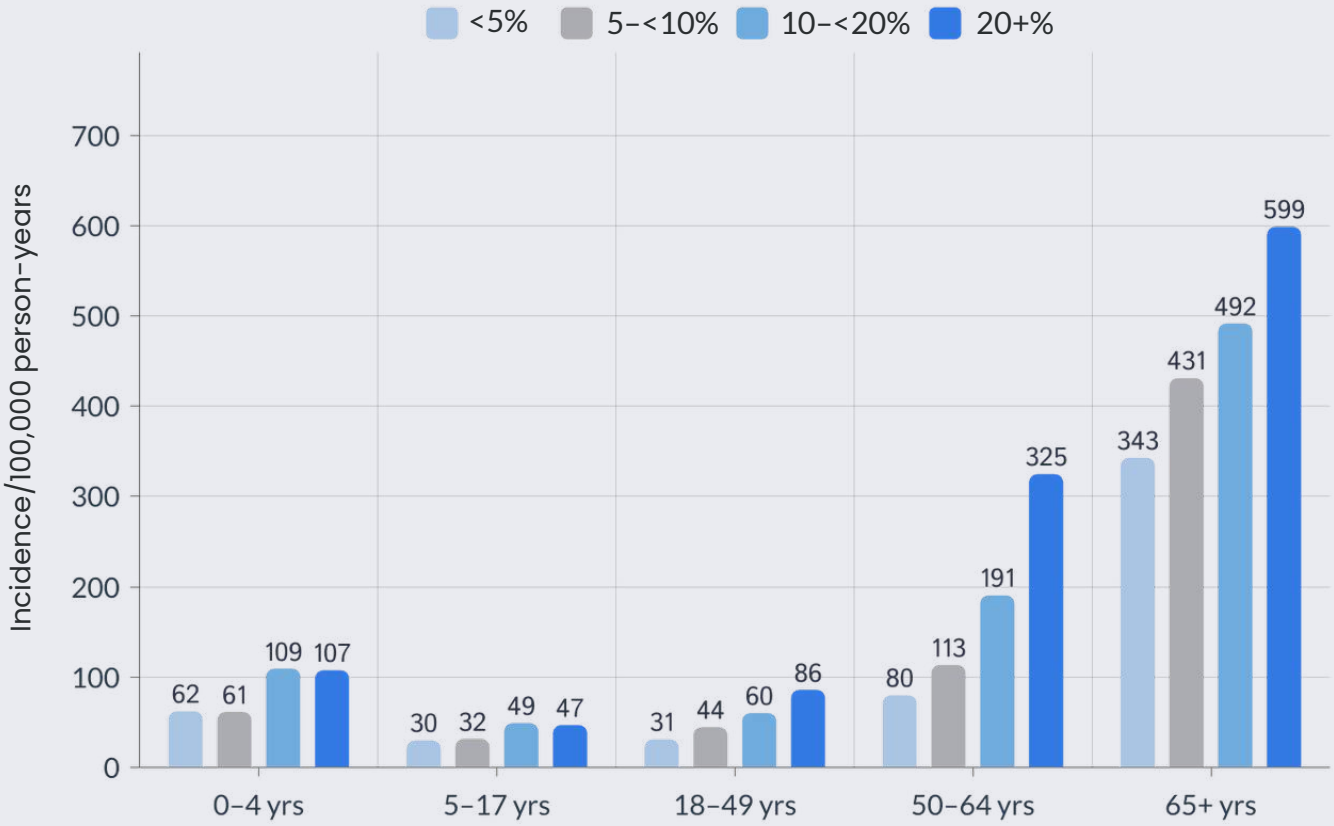
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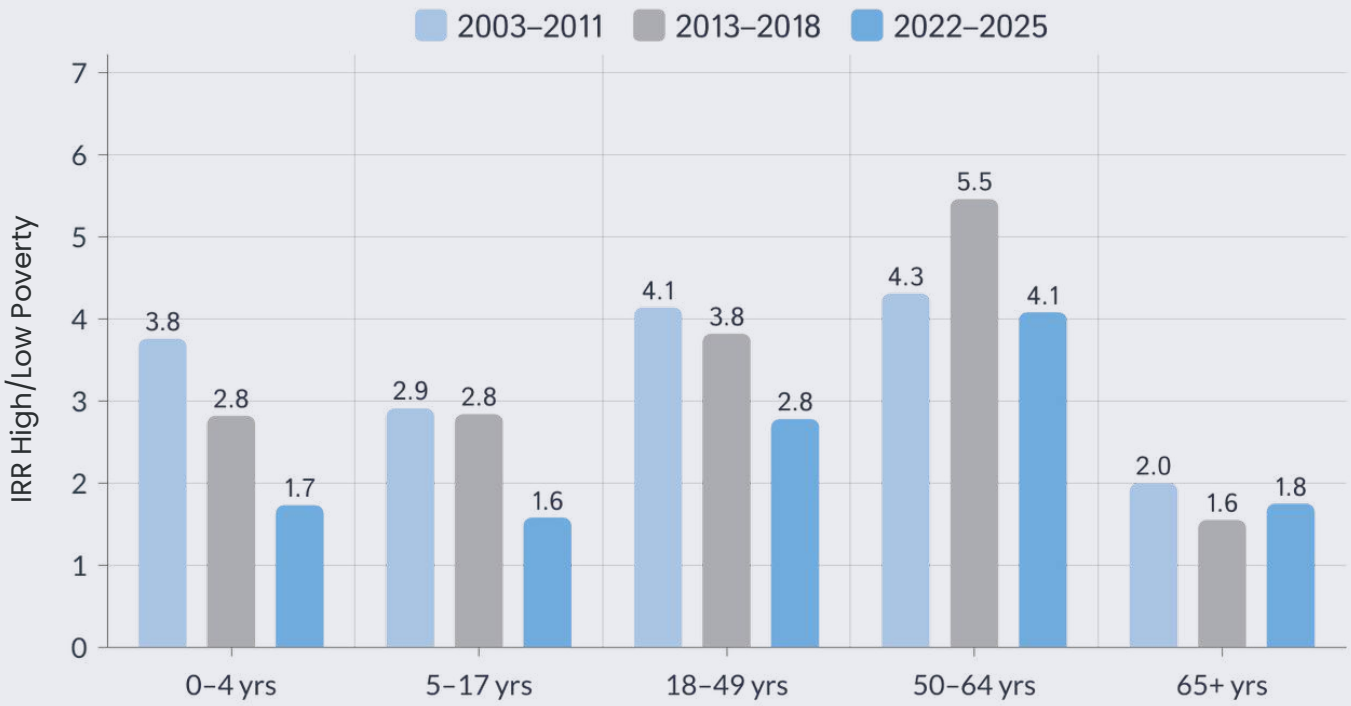
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Figure 1: Incidence of Influenza-Associated Hospitalization by Age Group and Census Tract Poverty Level in New Haven County, 2022–2025



Differences by Neighborhood Poverty Decrease for Influenza-Associated Hospitalizations in Connecticut *(continued)*

Figure 2: Incidence Rate Ratio (IRR) High/Low Census Tract Poverty by Age Group and Time Period, New Haven County, 2003–2025



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