Characterizing socioeconomic disparities in the burden of influenza and RSV using surveillance data

John S. Brownstein, Ph.D. [1], Barbara Garcia Pena, M.D.[2], and Kenneth D. Mandl, M.D. [1]

[1]Children's Hospital Boston Informatics Program, Harvard Medical School

[2] Division of Emergency Medicine, Miami Children's Hospital

OBJECTIVE

To measure the impact, within administrative geographic areas, of household income on rates of visits due influenza and RSV among children using real-time syndromic surveillance.

BACKGROUND

Though there is some empirical confirmation of a relationship between geography and respiratory infection risk at large scale,(*1*) there very little evidence to suggest how population-level demographics, including socioeconomic disparities, influence influenza and RSV risk. Children of lower socioeconomic status are thought to be at a higher risk for many communicable diseases, including respiratory infections,(*2*) however, the impact of socioeconomic disparities on the burden of influenza and RSV among children has not been quantified. Documenting empirical small-scale spatial patterns of influenza and RSV and their relationship to population-level demographic characteristics represents a first step towards defining this relationship. Given the mounting concern over an influenza pandemic disaster, the question of whether socioeconomic disparities will be further exacerbated in such a public disaster would provide critical information of preparedness planning.

METHODS

Using the Massachusetts Department of Public Health AEGIS surveillance system, we tracked influenza activity from 2001-2006 using respiratory infection chief complaint data from emergency department visits at Miami Children's Hospital in Miami, FL. We performed cross-sectional ecological analysis of 298,956 patients presenting to the emergency department of a large tertiary care pediatric hospital in Miami, Florida from 2001-2005. We measure the rate of patients presenting to emergency departments with influenza and RSV syndromes aggregated by home address ZIP code.

RESULTS

We identified 63,616 visits attributed to influenza and RSV infection with rates of 173.7 to 259.9 per 1,000 visits. Average income by ZIP ranged from $11,873 to $62,019. Rate of visits due to influenza and RSV was significantly predicted by median household income with a $10,000 decrease in income linked to an increase in the number of visits due to influenza and RSV of 14.4 per 1,000 visits (95% confidence interval [CI], 17.3-11.6 per 1,000). There is no evidence of confounding by race/ethnicity, population density, average household size and median number of rooms per household.

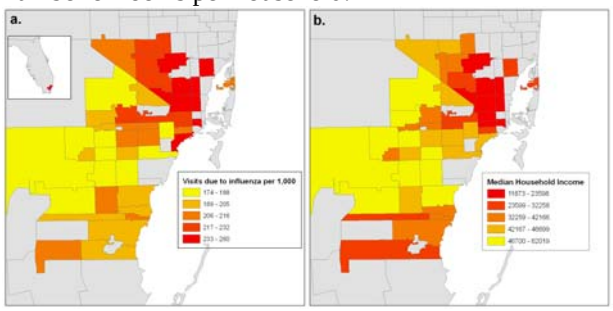

Figure 1. Spatial patterns of pediatric influenza and respiratory syncytial virus illness and poverty, Miami, FL. a) Rate of pediatric visits to a large metropolitan children's hospital due to influenza and RSV infection by ZIP code. b) Median household income per ZIP code as defined by the 2000 US Census.

CONCLUSIONS

We find that socioeconomic factors have a critical influence on influenza and RSV risk in a major metropolitan area. While many studies have reported the barriers to low-income populations receiving influenza vaccination,(*3*) this is the first study to report a direct linear association of socioeconomic status with respiratory viral infection.

The Hurricane Katrina experience threw into greater relief the interplay among poverty and disease in a public health context. Strategies that account for disparities under normal and disaster conditions are in critical need. In a pandemic, local health departments will be forced to decide how to best limit spread and reduce impact to the most vulnerable populations using available resources, including limited vaccine and anti-viral supply. The recognition that poverty plays a role in defining risk should be an important component of national and local preparedness strategies.

REFERENCES

1.C. Viboud *et al.*, *Science* (Mar 30, 2006).
2.L. Egbuonu, Starfield, *Pediatrics* **69**, 550 (May, 1982).
3.K. Armstrong, M. Berlin, J. S. Schwartz, K. Propert, P. A. Ubel, *American Journal of Preventive Medicine* **20**, 21 (Jan, 2001).

Further Information: contact John Brownstein, john_brownstein@harvard.edu www.chip.org