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Jeffery C. Talbert

University of Kentucky, jeff.talbert@uky.edu

Aric Schadler

University of Kentucky, schadler@uky.edu

Patricia R. Freeman

University of Kentucky, trfree1@email.uky.edu

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## Rural/Urban Disparities in Pneumococcal Vaccine Service Delivery Among the Fee-for-Service Medicare Population

Jeffery Talbert, PhD; Aric Schadler, MS; and Patricia Freeman, RPh, PhD

### Overview of Key Findings

- In 2014, the overall mean vaccination rate in urban areas was 4.66 compared to a mean vaccination rate of 2.81 in rural areas, indicating a 40% lower mean vaccination rate in rural communities.
- The majority of pneumococcal vaccine services delivered to fee-for-service Medicare beneficiaries were provided by primary care providers, although pharmacy providers delivered close to one-fourth (22.2%) of these services.
- The proportion of pneumococcal vaccine services delivered by pharmacy providers was significantly greater in rural versus urban counties (29.4% vs. 21.1%).
- Consistent with previous literature, county characteristics positively associated with pneumococcal vaccine service delivery include increasing age of residents, more female residents, and availability of inpatient hospital services, while rurality, poverty, and greater overall health status were negatively associated with delivery of pneumococcal vaccine services.

### Introduction

Community-acquired pneumonia (CAP) poses a considerable threat to the health of older adults, with the incidence of CAP increasing dramatically among those age 65 years and older.<sup>1</sup> *Streptococcus pneumoniae* (pneumococcus) is a leading infectious cause of CAP although the organism also commonly causes other invasive diseases such as bacteremia and meningitis. Mortality for invasive pneumococcal disease also increases with age, doubling from age 65 (20%) to age 85 (40%).<sup>1</sup> Estimates suggest that pneumococci cause 36% of adult CAP and 50% of all cases of bacterial meningitis in the US.<sup>1,2</sup>

The morbidity and mortality associated with pneumococcal disease has led to recommendations that all persons age 65 and older be vaccinated. Since 1997, CDC recommendations have called for all individuals in this age group to receive a single dose of the 23-valent pneumococcal polysaccharide vaccine (PPS23). However, in August 2014, the Advisory Committee on Immunization Practices (ACIP) updated its recommendations to include routine use of 13-valent pneumococcal conjugate vaccine (PCV13), in addition to PPS23, in adults age 65 years and older. The ACIP recommendations were subsequently adopted by the CDC in September 2014. Even with the available vaccines and CDC guidelines supporting vaccination, there remains a significant portion of the population who qualify for these immunizations that have not been vaccinated. Studies suggest that less than two-thirds of adults age 65 years and older have been vaccinated against pneumococcal disease,<sup>3,4</sup>

well short of the Department of Health and Human Services' *Healthy People 2020* national health target of 90% for pneumococcal immunization coverage in this population.<sup>5</sup>

Several factors can contribute to poor pneumococcal vaccine uptake in adults including inadequate knowledge and understanding of the need for vaccines, concerns over vaccine adverse effects, lack of provider recommendation, and negative provider attitudes towards the vaccine.<sup>6</sup>

Geographic location can also factor into whether people are likely to get vaccinated. Prior research has shown that people who live in rural areas generally have poorer health than people who live in urban areas.<sup>7</sup> In addition, reduced access to clinic-based health care providers means rural residents may be less likely to receive adequate medical consultation and vaccination.<sup>8,9</sup> To improve vaccine coverage overall, use of alternate sites for vaccine delivery has been recommended.<sup>9</sup> Considering that currently all 50 states and D.C. authorize pharmacists to provide pneumococcal vaccines,<sup>10</sup> and 93% of Americans live within 5 miles of a community pharmacy,<sup>11</sup> vaccine administration in this alternate site may play a significant role in vaccine access, especially in rural communities.

The objective of this study was to identify rural versus urban disparities in pneumococcal vaccine provision in the elderly (age 65 or older) adult population and assess the impact of pharmacy as an alternate site provider in rural communities.

## Methods

The Medicare Physician and Other Supplier Public Use File (PUF) provides information on services and procedures provided to fee-for-service Medicare beneficiaries by physicians and other health care providers (including pharmacies and nurse practitioners).<sup>12</sup> The PUF data contain information on utilization, payment, and charges by National Provider Identifier (NPI), Healthcare Common Procedure Coding System (HCPCS) code, and provider type for all providers delivering services to fee-for-service (FFS) Medicare beneficiaries. The 2014 Medicare provider data were extracted and merged with additional data on Medicare eligibility and characteristics for each county in the U.S. Descriptive statistics were calculated and regression models were used to identify county-level factors associated with receipt of immunization. To identify pneumococcal vaccination, HCPCS code G0009 was used for each provider billing Medicare. We grouped providers into three categories: 1) primary care providers (e.g., family practice, internal medicine, and advanced practice registered nurses, regardless of practice location), 2) pharmacy providers, and 3) all other providers (physician specialties other than those listed as primary care providers). The Rural-Urban Continuum Codes (RUCCs) were used to assign counties to rural versus urban designations, with codes 1-3 designated as urban and codes 4-9 designated as rural.<sup>13</sup> All provider services were aggregated at the county level and merged with additional data about the county (i.e., demographic characteristics, Medicare member characteristics).

## Findings

In 2014, FFS Medicare providers delivered pneumococcal vaccine services to 1,444,829 Medicare recipients, for a mean vaccination rate nationwide of 4.26. Pneumococcal vaccination services were delivered by

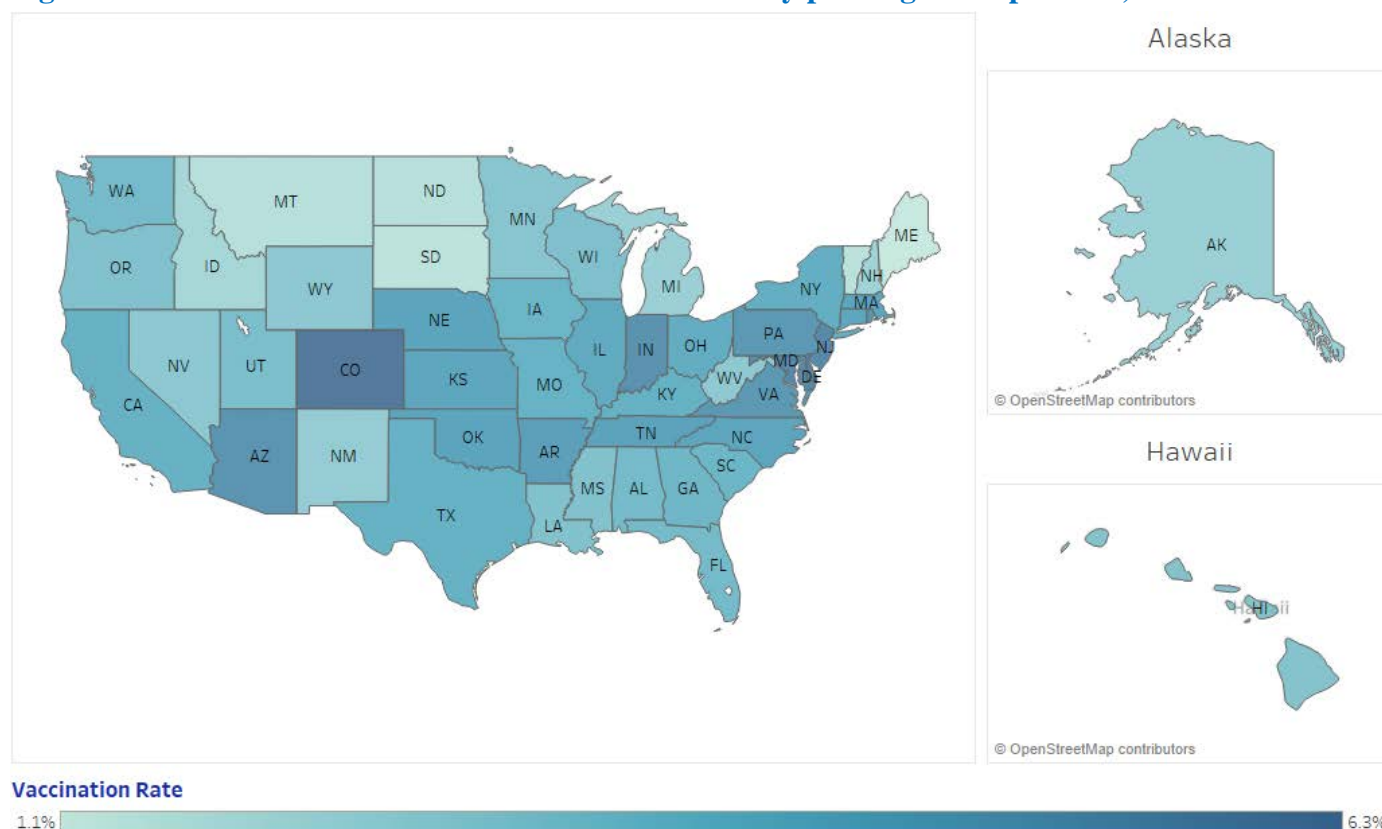
**Table 1. Pneumococcal Vaccine Services by FFS Medicare Provider Type and Rural-Urban Designation, 2014**

Provider Type	Rural Frequency (%)	Urban Frequency (%)	Total
Pharmacy	61,006 (29.4%)	260,809 (21.1%)	321,815 (22.2%)
Primary Care	138,004 (66.4%)	908,991 (73.5%)	1,046,995 (72.5%)
Other	8,693 (4.2%)	67,326 (5.4%)	76,019 (5.3%)
Total	207,703 (14.4%)	1,237,126 (85.6%)	1,444,829

providers in 2,290 (72.9%) of 3,142 U.S. counties, although vaccines were available in 2,805 (89.3%) U.S. counties based on claims documenting the delivery of annual influenza vaccination services in those counties. Table 1 presents information on the number of pneumococcal vaccine services delivered by provider type in rural and urban counties. A significant disparity is noted between rural and urban vaccine service delivery with fewer vaccines administered in rural areas. Of the 1,444,829 vaccination services provided in 2014, 207,703 (14.4%) were delivered in rural areas compared to 1,237,126 (85.6%) delivered in urban areas. The overall mean vaccination rate in urban areas was 4.66 compared to a mean vaccination rate of 2.81 in rural areas, indicating a 40% lower mean vaccination rate in rural communities. While these rates are low, we expect the cumulative rate to increase over the next few years as the recommendations for PCV13 administration, which were released in late 2014, are added to the standard of care.

State-level rates of pneumococcal vaccine service delivery in the FFS Medicare population are depicted in Figure 1. Considerable variation in rates is observed from a high of 6.3% in Colorado to a low of 1.1% in Maine. Visualization maps depicting pneumococcal vaccine service delivery rates at the county level, along with proportion of pneumococcal vaccine services delivered by provider type in rural and urban areas, are accessible on our website at <https://ruhrc.uky.edu/infographics/>.

**Figure 1. Rate of Pneumococcal Vaccine Service Delivery per Eligible Population, 2014**



One important consideration in understanding and addressing vaccine service delivery disparities is the provider type associated with vaccine delivery in rural and urban areas. In 2014, over two-thirds (72.5%) of pneumococcal vaccine services were delivered to Medicare recipients by primary care providers, while pharmacy providers accounted for almost one-fourth (22.2%) of all pneumococcal vaccine services provided. A significantly greater proportion of pneumococcal vaccine services were delivered by pharmacy providers in

rural versus urban counties (29.4% vs. 21.1%), suggesting a possible role for pharmacy providers in minimizing vaccine service disparities between rural and urban areas.

In addition to the descriptive results, we calculated multivariate regression models to identify county-level characteristics associated with receipt of pneumococcal vaccine. Results indicate that increasing age of residents, greater proportion of female residents, and availability of inpatient hospital services were positively associated with pneumococcal vaccine services, while rurality, poverty, and greater overall health status were negatively associated with delivery of pneumococcal vaccine services. Importantly, when we examined the relationships between provider types and rural vs. urban locations, we found that rural pharmacies play a key role in increasing access to vaccinations for FFS Medicare patients. At the national level, 29.4% of pneumococcal vaccines are performed in pharmacies in rural counties, compared to only 21.1% in urban counties. In states with greater rural designations, significantly higher proportions of vaccines are provided in pharmacies compared to primary care settings. For example, in rural counties in Idaho, almost three-fourths (74.3%) of pneumococcal vaccine services are provided in pharmacies compared to 40.4% of pneumococcal vaccines provided in pharmacies in urban counties.

## Conclusion/Discussion

In 2014, a significant disparity in pneumococcal vaccine service delivery was noted between rural and urban areas across the nation, with a 60% lower vaccination rate observed in rural communities. Primary care providers delivered the majority of pneumococcal vaccine services to elderly adults in the FFS Medicare population, with pharmacy providers delivering almost a quarter of pneumococcal vaccine services. This finding is consistent with a recent study, which showed that almost a quarter of U.S. adults who reported receiving an annual influenza vaccine indicated they received those services from a pharmacy-based store.<sup>14</sup> A significantly greater proportion of pneumococcal vaccine services are delivered by pharmacy providers in rural areas compared to urban areas, and regression models indicate that pharmacy providers have a significant impact on pneumococcal vaccine delivery in rural areas. Given that over 50% of the nation's primary care health professional shortage is in rural areas, access to primary care providers may limit delivery of pneumococcal vaccination services in that setting, resulting in a shift to service delivery in pharmacies as shown in this study. Rural pharmacies play a key role in access to pneumococcal vaccinations for Medicare patients. Engaging community pharmacists who are already embedded in rural communities may help address the need for increasing rural populations' access to health care and improving vaccination rates across all demographic sectors.

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## Contact Information

Jeff Talbert, Deputy Director, Rural and Underserved Health Research Center  
email: [jeff.talbert@uky.edu](mailto:jeff.talbert@uky.edu) website: <http://ruhrc.uky.edu>

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