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Urban-Rural Disparities in Vaccination Service Use Among Low-Income Adolescents

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Abstract

Objective: To access urban-rural disparities in vaccination service use among Medicaid-enrolled adolescents and examine its association with residence county characteristics.

Study design: We used the 2016 Medicaid T-MSIS Analytic File to estimate adolescents' use of vaccination services, defined as the proportion of adolescents aged 11–18 years with ≥ 1 vaccination visit in a county. We used linear regression and the Oaxaca-Blinder decomposition method to examine the association between county characteristics and urban-rural disparities in vaccination service use.

Results: The analysis included 2,473 counties located in 38 states. The mean proportion of adolescents making ≥ 1 vaccination visit at the county level was low (36.09%) and was lower in rural than in urban counties (31.99% vs. 36.85%, $p < .01$). The number of primary care physicians (PCPs) was positively associated with vaccination service use in rural counties; in urban counties, % of households without a vehicle was negatively associated with vaccination service use. The decomposition results showed that 66.78% (3.24 percentage points) of the urban-rural disparities in vaccination service use could be attributed to urban-rural differences in the county characteristics included in the study. Characteristics measuring access to care (number of PCPs), social and economic factors (% adults with at least a bachelor's degree and % children in poverty), quality of care (influenza vaccination rates and preventable hospital stays), and demographics (% non-Hispanic black, % Hispanic, and % females) played a role in urban-rural disparities.

Conclusions: Differences in county characteristics could partly explain the observed urban-rural disparities in vaccination service use among low-income adolescents.

Keywords

Health care disparities; Medicaid; Adolescents; Vaccination; Rural health

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Health-related outcomes are influenced by many factors. Studies have consistently shown that health insurance coverage and individuals' demographic and socioeconomic characteristics are associated with various health outcomes [1–4]. Residence location in urban and rural areas is also well documented in the literature [5–10]. Compared to urban residents, rural residents tend to have the characteristics independently linked to worse health outcomes and lower health care utilization, including lower income, lower educational attainment, a higher probability of being uninsured, and less access to health care services due to fewer providers and health care facilities in rural compared to urban areas [6–9]. Studies examining urban-rural health disparities revealed that demographic characteristics (e.g., race/ethnicity and population age distribution) [11,12], socioeconomic status (e.g., income and educational level) [9,12,13], and systematic and public health environments (e.g., the supply of providers and health care facilities) [7–9] of the residence locations are likely to be the key factors contributing to urban-rural differences in health-related outcomes.

Although a large amount of literature examines urban-rural disparities in health outcomes, studies examining the relationship between urban-rural disparities and the characteristics of residence locations are relatively limited [6,9,14,15]. Additionally, most of these studies included a limited set of location characteristics and none of these studies focused on the health outcomes of children. This study adds to the current literature by focusing on adolescents in Medicaid and examining the relationship between their use of vaccination services and residence county characteristics. Routine childhood immunization is one of the most cost-effective disease prevention programs [16]. The Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination of four vaccines for adolescents, including meningococcal conjugate (MenACWY), tetanus diphtheria toxoid acellular pertussis (Tdap), human papillomavirus (HPV), and influenza vaccines. Many adolescents had no annual preventive visits [17], and vaccination rates for HPV (51.1%) [10] and influenza (47.4%) [18] are much lower than the Healthy People 2020 target (80.0%). Vaccination coverage in rural areas was lower than that in urban areas [7], and there have been long-standing concerns regarding access to medical care among children in Medicaid [19]. In addition to low income, Medicaid-enrolled adolescents residing in rural areas may encounter worse location characteristics than their urban counterparts (e.g., lower supply of health care providers), which may aggravate their medical access issues. Understanding the relationship between the characteristics of residence locations and urban-rural disparities in vaccination service use could provide insights into barriers to primary care access among low-income children and help efforts to prioritize interventions to address the vaccination coverage gap between urban and rural areas.

Methods

Data

This study used the 2016 Medicaid T-MSIS Analytic File (TAF) [20]. The Medicaid program is administered by states. The Centers for Medicare and Medicaid Services (CMS) has required states to submit eligibility data and electronic Medicaid claims since 1999. The TAF is created from the state-submitted data and contains individual enrollment information and insurance claims records for beneficiaries in the 50 states and the District of Columbia. We excluded Arkansas due to missing data in 2016. We further excluded 12 states due to low data quality concerns based on CMS data quality briefs [21]; data in eight states (Colorado, Delaware, Maine, Missouri, New Jersey, North Dakota, Rhode Island, and Washington) could not appropriately identify Medicaid beneficiaries and the outpatient claims data in four states were either incomplete (Mississippi, Nevada, and Utah) or had unusual high claims volume (Massachusetts). After the exclusion, our final sample included counties located in 38 states.

Outcome variable

We used the TAF data to estimate adolescents' use of vaccination services at the county level, which is the proportion of adolescents aged 11–18 years who made ≥ 1 vaccination visit in each county. Adolescents experiencing discontinuity in Medicaid coverage during 2016 were excluded when we estimated the proportion. A vaccination visit was defined as an outpatient visit with an insurance claim including the Current Procedural Terminology (CPT) codes indicating vaccine administration or a vaccine product (MenACWY, Tdap, HPV, or influenza). Medicaid-enrolled children under aged 19 years are eligible for the Vaccines for Children (VFC) program, which supplies VFC-enrolled providers with ACIP-recommended vaccines at no cost. Providers are reimbursed for vaccine administration fees, and thus, many states have missing information on vaccine products as providers only submit insurance claims for vaccine administration.

County characteristics

We included county characteristics relevant to health care utilization based on the existing literature [1,2,4,8,9,15,22,23]. Unless specified in the parenthesis below, we obtained the county variables from the County Health Rankings & Roadmaps program [24]. Following the program, we grouped the county characteristics into four categories: (1) access to care, including % uninsured children, number of primary care physicians (PCPs) per 100,000 population, and % households without a vehicle (2013–2017 American Community Survey, ACS) [25], (2) social and economic factors, including % adults with at least a bachelor's degree (2013–2017 ACS), unemployment rate, food insecurity (% population lacking adequate access to food), median household income, % children in poverty, and % children living in a single-parent household, (3) quality of care, including influenza vaccination rates among Medicare beneficiaries (% fee-for-service Medicare enrollees receiving an annual influenza vaccine) and preventable hospital stays among Medicare beneficiaries, and (4) demographics, including % Medicaid-enrolled children in a managed care plan (2016 Medicaid TAF data), % non-Hispanic black, % Hispanic, % females, and % population aged 65 years and older. Preventable hospital stays indicate the number of hospital stays for ambulatory-care sensitive conditions per 100,000 Medicare enrollees. Ambulatory-care sensitive conditions are conditions for which good outpatient care can potentially prevent the need for hospitalization or for which early intervention can prevent complications or more severe disease.

We determine whether a county is urban or rural based on the National Center for Health Statistics (NCHS) classification schemes [26]. The NCHS urbanization level is based on four metropolitan and two nonmetropolitan categories. We defined rural counties as counties located in the two nonmetropolitan categories and urban counties as counties in the four metropolitan categories. Because county population size was the fundamental definition of a rural county, and thus, we did not include this variable in the estimation equations. We excluded counties that had missing values for our chosen set of county characteristics (60 counties, 2.4%) and had ≤ 100 Medicaid-enrolled children (40 counties, 1.6%).

Statistical analysis

We used the Oaxaca–Blinder decomposition method to gain a deeper understanding of the correlation between county characteristics and urban-rural disparities in vaccination service use [27]. This method decomposes the mean urban-rural differences in outcomes based on linear regressions. It runs two regression equations separately for urban and rural counties. The estimation equation is as follows:

$$Y_{c,j} = X'_{c,j}\beta_j + \theta_j^S + \varepsilon_{c,j}, j = \text{ urban or rural}$$

where $Y_{c,j}$ represents the outcome in county c, $X_{c,j}$ is a vector containing variables capturing county characteristics, and θ_j^S represents state-fixed effects, accounting for observed and un-observed time-invariant state-specific factors that may affect adolescents' use of vaccination services, such as state vaccination school entry requirement and state Medicaid enrollment criteria.

Using regression expressions, the decomposition method disaggregates the mean urban-rural disparities in vaccination service use into "explained" and "unexplained" components:

$$\overline{Y}_{urban} - \overline{Y}_{rural} = \overline{\beta}_{urban}\overline{X}_{urban} - \overline{\beta}_{rural}\overline{X}_{rural} = \left(\overline{X}_{urban} - \overline{X}_{rural}\right)\overline{\beta}_{rural} + \left(\overline{\beta}_{urban} - \overline{\beta}_{rural}\right)\overline{X}_{urban} = E + UE$$

where E represents the explained and UE represents the unexplained component. Multiplying mean urban-rural differences in county characteristics by the regression coefficients estimated using only the rural counties, the explained component shows how much of the disparities in service use is attributable to the mean differences in a set of observed characteristics between urban and rural counties. The unexplained component measures urban-rural disparities that cannot be accounted for by observed county characteristics. All estimation equations used robust standard errors clustered at the state level to account for the nonindependence of counties within the same state, and all analyses presented were weighted by the number of Medicaid-enrolled children in the county (2013–2017 ACS).

We performed two sensitivity analyses. First, recent studies suggested that estimates generated from a small number of groups (here, the number of states) may lead to underestimation of standard errors, and the typical cluster-robust approach may not be enough to correct this bias [28]. To account for this potential issue, we calculated standard errors using the bootstrap method with 1,000 iterations [28]. Second, we included additional county characteristics measuring the general health of the adult population: % of insufficient sleep (% adults reporting < 7 hours of sleep on average, 2016 Behavioral Risk Factor Surveillance System, BRFSS), % frequent physical stress (% adults reporting ≥ 14 days of poor physical health per month, 2016 BRFSS), and % frequent mental stress (% adults reporting ≥ 14 days of poor mental health per month, 2016 BRFSS). Statistical analyses were performed using Stata software, version 15 (Stata Corporation, College Station, TX).

As a secondary analysis of data without identifiers, this study is exempted from the review by the institutional review board of the Centers for Disease Control and Prevention.

Results

The analysis included 2,473 counties; among them, 39.14% (969) were urban, and 60.82% (1,504) were rural. On average, 36.09% of adolescents made ≥ 1 vaccination visit in the year, and the proportion was significantly lower in rural than in urban counties (31.99% vs. 36.85%, $p < .01$) (Table 1). Urban and rural counties were different in many characteristics; a significantly higher proportion of blacks and Hispanics residing in urban than in rural counties. In general, disadvantaged characteristics, such as % uninsured children, unemployment rate, food insecurity, % children in poverty, and preventable hospital stays, were significantly higher in rural than urban counties. In contrast, urban counties had a higher number of PCPs, higher % adults with at least a bachelor's degree, higher median household income, and higher influenza vaccination rates (all differences were statistically significant at $p < .01$).

Regression and decomposition results

Higher influenza vaccination rates, higher % females, or lower % households without a vehicle was associated with higher use of vaccination services. However, only influenza vaccination rates were positively associated with vaccination service use, regardless of urban/rural county classification (Table 2). There were urban-rural differences in the association between county characteristics and vaccination service use among adolescents; number of PCPs ($p < .01$) was positively associated with vaccination service use only in rural counties; in urban counties, lower % households without a vehicle ($p < .01$) was associated with higher use of vaccination services.

The urban-rural disparity in vaccination service use was 4.86 percentage points (PPs), and 66.78% (3.24 PPs) of the disparity can be attributed to urban-rural differences in the county characteristics included in the analysis (the explained differences, which equals the sum of the contributions of all control variables) (Table 3). For example, number of PCPs per 100,000 population contributed .85 PP (26.23%) to the explained differences ($\frac{0.85}{3.24} * 100 \approx 26.23$). The estimate indicated that increasing the mean number of PCPs per 100,000 population from the level in rural counties (51.51) to the level in urban counties (71.15) was associated with a .85 PP increase in adolescents' use of vaccination services in rural counties. This means that the proportion of adolescents using vaccination services in the rural county would increase from 31.99% to 32.84%, all other things equal. Similarly, the coefficient on % children in poverty was −.27, indicating that lowering the mean number of % children in poverty in rural counties (25.70%) to the mean number in urban counties

(21.49%) was associated with a .27 PP decrease in vaccination service use in rural counties (the proportion of adolescents using vaccination services in rural counties would drop from 31.99% to 31.72%, all other things equal). Other key county characteristics included % adults with at least a bachelor's degree (.73 PP, 22.46%), influenza vaccination rates (.73 PP, 22.60%), preventable hospital stays (.19 PP, 5.73%), % non-Hispanic black (.48 PP, 14.80%), % Hispanic (1.59 PP, 49.18%), and % females (.14 PP, 4.22%) (numbers in parentheses indicated percentage point and percent contribution to the explained differences in vaccination service use, respectively). Figure 1 showed the percent contribution of each county characteristic.

Sensitivity analyses showed that bootstrapping standard errors did not change our findings. When adding additional county characteristics in the estimation equations, the included county characteristics explained 78.37% of the urban-rural disparities in adolescents' use of vaccination services. Although the quantitative results changed as 12 percentage points more of the urban-rural disparities were explained after including more county characteristics, the key county characteristics contributing to the urban-rural disparity that we had identified in the main analysis remained the same.

Discussion

Despite zero patients' cost sharing for vaccination visits, our findings showed that the average rate of making at least a vaccination visit among Medicaid-enrolled adolescents at the county level was low, and the rate was even lower in rural counties. This finding is consistent with existing studies that vaccination coverage in rural areas is lower than that in urban areas [5,10]. The characteristics of residence locations likely play a role in urban-rural disparities in adolescents' use of vaccination services as the state Medicaid agency operates the program uniformly in urban and rural counties. In 2016, approximately 14 million adolescents enrolled in Medicaid in the 38 selected states. The 4.86 PP urban-rural disparities in vaccination service use translated to an average of 690,000 fewer adolescents who had made a vaccination visit in rural than in urban counties.

Our findings showed that 66.78% of the urban-rural disparities in adolescents' use of vaccination services could be explained by the included county characteristics and the key county characteristics were variables measuring access to care (number of PCPs), social and economic factors (% adults with at least a bachelor's degree and % children in poverty), quality of care (influenza vaccination rates and preventable hospital stays), and demographics (% non-Hispanic black, % Hispanic, and % females).

Physician shortages are a barrier to access care, particularly in rural communities [29]. The Health Resources and Services Administration designates areas that encounter provider shortages in primary care as Health Professional Shortage Areas (HPSAs) [30]. Federal and state governments have taken steps to improve recruitment and retention of providers in HPSAs, and the CMS also provided 10% physician bonuses when providers furnish Medicare-covered services to beneficiaries living in HPSAs [30]. Our finding showed that differences in the number of PCPs between urban and rural counties were associated with the urban-rural gap in vaccination service use. This result justifies the recruitment and retention efforts made by policymakers and suggests that these efforts could reduce urban-rural disparities in vaccination coverage.

The mechanisms linking education and health have been discussed extensively in the literature [31]. One mechanism relevant to our content is associated with information and cognitive skills. Studies have shown that education is a strong predictor of health literacy (the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions) [32]. Low health literacy is associated with poor health and low primary care use [33]. Our finding that differences in residents' educational attainment explained a significant part of the urban-rural disparities suggests that there might be differences in how residents obtain health information and/or how they perceive the importance of vaccination between urban and rural counties. Additionally, low-educated workers tend to have lower-skilled jobs, which might limit parents' availability to bring their children to care.

In contrast to the abundant literature documenting a positive association between income and health care utilization [3], our findings showed a positive relationship between % of children in poverty and vaccination service use. The decomposition results also showed that if % of children in poverty in rural counties (25.70%) decreased to the level of the urban counties (21.49%), service use would decrease rather than increase. The difference between this study and previous studies might be due to our focus on the Medicaid population, and this finding was likely due to Medicaid eligibility criteria. Children's poverty status is determined by family income, which is also a key determinant of the size of the Medicaid population as children with family income below a state-specified threshold are eligible for the Medicaid program. Accordingly, a higher % of children in poverty in the county suggested a larger Medicaid population, which could increase vaccination service use among Medicaid-enrolled adolescents as our data showed a statistically significant positive correlation between adolescents' vaccination service use and the number of Medicaid-enrolled adolescents in each county. This mechanism could also apply to the finding that increasing the minority population (non-Hispanic black and Hispanic) in rural counties was associated with increasing vaccination service use in rural counties. Race/ethnicity is another key factor linked to the size of the Medicaid population. Minority children are disproportionately represented among Medicaid beneficiaries because they are more likely to be economically disadvantaged. When the minority population increased, vaccination service use might increase as the enrollment population increases. One thing worth mentioning was that our result showed increasing the Hispanic population in rural counties could reduce the urban-rural disparities in vaccination service use among low-income adolescents. We suspected that cultural factors might play a role. The "Hispanic paradox" is an epidemiological phenomenon that has puzzled researchers [34,35]. Despite their lower average socioeconomic status and lower health insurance coverage, Hispanics in the United States tend to live longer and be healthier than their non-Hispanic white counterparts. One hypothesis to explain the paradox is cultural factors, which form individuals' preferences for healthy habits and equip individuals with strategies for understanding health information and making healthy decisions. Studies show that Hispanics are less likely to exhibit risky behaviors than their non-Hispanic white counterparts and Hispanic ethnicity was the strongest predictor of parental intent to vaccinate against HPV [36–38]. Because an unevenly larger Hispanic population resides in urban counties, it is as expected that the Hispanic population could influence urban-rural disparities in vaccination service use among Medicaid-enrolled adolescents.

Our findings showed that county-level influenza vaccination among Medicare beneficiaries was positively associated with adolescents' use of vaccination services and was a key factor associated with urban-rural disparities in vaccination service use among adolescents. This result could be due to the fact that our outcome variable included influenza vaccination, and among the four vaccines considered, the influenza vaccine is the only vaccine recommended for adolescents annually. Accordingly, our outcome variable, defined as having had ≥ 1 vaccination visit per year, might mostly capture influenza vaccination uptake, and thus, it might be linked to the overall county-level influenza vaccination uptake. The county-level influenza vaccination uptake could be affected by vaccine acceptance in the community, which could be formulated from vaccine recommendations from family/friends and the common belief on susceptibility and severity of the disease and on vaccine efficacy and safety in the communities [39].

This study was subject to some limitations. First, as mentioned above, although we considered four types of vaccines recommended for adolescents, our outcome variable likely captured influenza vaccination uptake for the most part. Second, the analyses were based on counties located in 38 states, so results might not generalize to all US counties. Additionally, our data was generated from the 2016 Medicaid claims. Although the data is currently four years old and 12 states were excluded from this study, our data is still the largest and the most recent claims data currently available to analyze health care utilization among the Medicaid population. Third, we selected a large set of county characteristics based on the existing literature, and these characteristics explained 66.78% of the urban-rural disparities in vaccination service use. We believe that there might be other relevant county characteristics that we did not consider. Never-theless, our findings on the key county characteristics are consistent with previous studies [9,12,15], and we suspect that adding more county characteristics would increase the percentage of the explaining component, but the conclusions regarding our current included county characteristics should remain unchanged as shown in our sensitivity analysis. Finally, one issue of the Oaxaca–Blinder method is that the decomposition results are sensitive to the choice of the reference group [40]. Although in some cases there is no reason to choose one reference group over another, it makes sense in our analysis to use rural counties as the reference group, as it is policymakers' interest to improve health care utilization and health service quality in rural counties.

Conclusion

Our findings suggest that urban-rural disparities in vaccination service use among low-income adolescents are associated with the characteristics of residence locations. Policymakers and public health officials generally acknowledge that provider shortage is one important barrier to health services access in rural communities and many federal and state programs are in place to address this issue. Our findings on county-level education and the Hispanic population highlighted the importance of effective communications about health information to rural residents. These findings suggested that in addition to addressing provider shortage issues in rural areas, addressing the wider social determinates of health in relation to vaccination in rural communities may also be effective in reducing urban-rural disparities in vaccination uptake.

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IMPLICATIONS AND CONTRIBUTION

This study showed a large proportion of Medicaid-enrolled adolescents did not make a vaccination visit during 2016, and the proportion was lower in rural than urban counties. Findings suggest that in addition to addressing provider shortage, effective communications about the health information in rural communities may help in reducing urban-rural disparities in vaccination coverage.

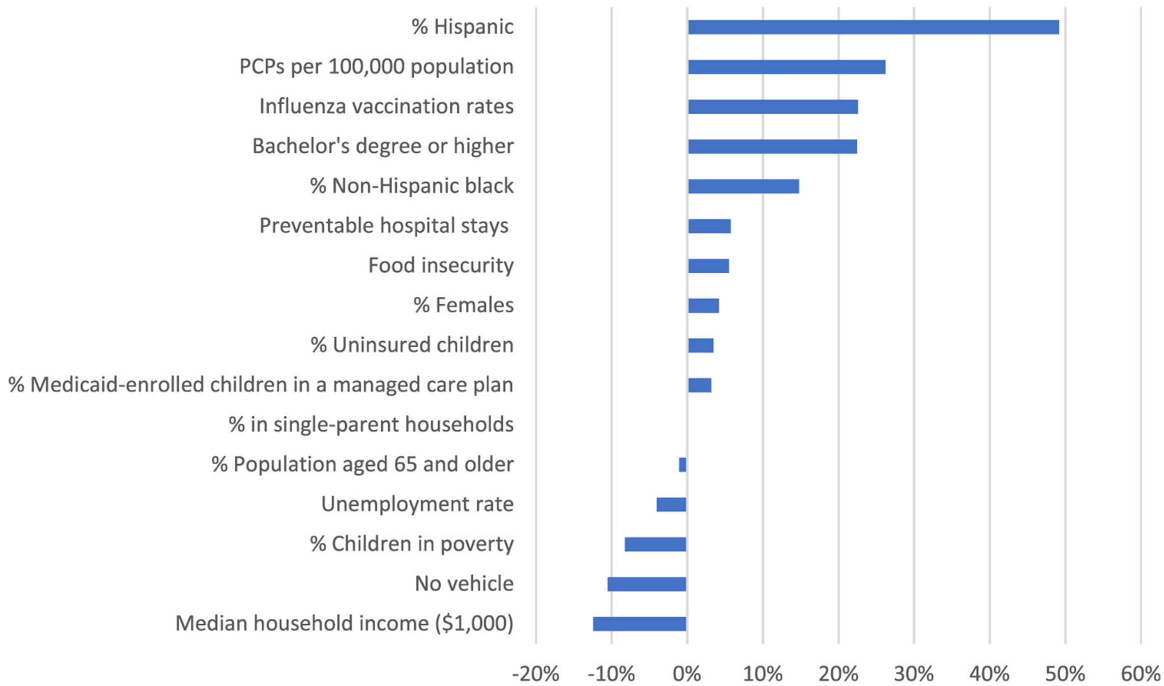

Figure 1.

Percentage contribution of the explained differences in vaccination service uses, PCPs: Primary care physicians. State-fixed effects were included in the estimation equations as control variables. The contribution of state-fixed effects was not shown in the figure.

Table 1

Vaccination service use and county characteristics by urban and rural status[a]

	All	Urban	Rural	Sources and descriptions
Number of counties	2,473	969	1,504	
% Making ≥ 1 vaccination visit	36.09	36.85***	31.99	2016 Medicaid TAF data
County characteristics				
Access to care				
% Uninsured children	4.88	4.74***	5.59	2016 U.S. Census Bureau's Small Area Health Insurance Estimates: % Children < age 19 years without health insurance
Number of PCPs	71.31	75.15***	50.51	2016 Area Health Resource File/American Medical Association: Number of PCPs per 100,000 population
No vehicle	9.57	10.02***	7.14	2013–2017 ACS: % Households without a vehicle
Social & economic factors				
Bachelor's degree or higher	28.43	30.38***	17.90	2013–2017 ACS: % Adults aged ≥ 25 years with at least a bachelor's degree
Unemployment rate	5.32	5.21***	5.88	2016 Bureau of Labor Statistics
Food insecurity	13.75	13.57***	14.73	2016 Map the Meal Gap: % Population who lack adequate access to food
Median household income ($1,000)	56.00	58.16***	44.27	2016 U. S. Census Bureau Small Area Income and Poverty Estimates
% Children in poverty	22.15	21.49***	25.70	2016 U.S. Census Bureau Small Area Income and Poverty Estimates: % Children < age 18 years in poverty
% in single-parent households	35.59	35.6	35.55	2013–2017 ACS: % Children living in a single-parent household
Quality of care				
Influenza vaccination rates	43.58	44.09***	40.82	2016 Mapping Medicare Disparities Tool. % Fee-for-service Medicare enrollees that received an annual influenza vaccine
Preventable hospital stays (1,000)	4.69	4.62***	5.13	2016 Mapping Medicare Disparities Tool. Rate of hospital stays for ambulatory-care sensitive conditions per 100,000 Medicare enrollees
Demographics				
% Medicaid-enrolled children in a managed care plan	92.37	92.65**	90.85	2016 Medicaid TAF data
% Non-Hispanic black	14.00	14.92***	8.98	2016 Census Population Estimates
% Hispanic	21.18	23.20***	10.24	2016 Census Population Estimates
% Females	50.85	51.00***	50.04	2016 Census Population Estimates
% Population aged 65 and older	15.09	14.48***	18.39	2016 Census Population Estimates

[a] TAF: T-MSIS Analytic File; ACS: American Community Survey; PCPs: Primary care physicians. Estimates were weighted by the number of Medicaid-enrolled children in the county.

*** Differences between urban and rural counties are statistically significant at $p < .01$.

** Differences between urban and rural counties are statistically significant at $p < .05$.

Table 2

Regression results for vaccination service use among Medicaid-enrolled adolescents by urban and rural status

	All[a]	Urban	Rural
Number of counties	2,473	969	1,504
	Percentage points		
Access to care			
% Uninsured children	−.30	−.18	−.13
Number of PCPs	.00	.00	.0003***
No vehicle	−.15**	−.17**	−.12
Social & economic factors			
Bachelor’s degree or higher	.05	.03	.06
Unemployment rate	−.49	−.68	.20
Food insecurity	−.12	.01	−.16
Median household income ($1,000)	.00	.00	.00
% Children in poverty	.21	.24	.06
% in single-parent households	−.01	−.05	.02
Quality of care			
Influenza vaccination rates	.24***	.21***	.22***
Preventable hospital stays (thousands)	.00	.00	.00
Demographics			
% Medicaid-enrolled children in a managed care plan	.12	.11	.06
% Non-Hispanic black	.03	.00	.08
% Hispanic	.10	.10	.12
% Females	.42**	.68	.14
% Population aged 65 and older	−.07	−.07	.01

PCPs: Primary care physicians. Estimates were weighted by the number of Medicaid-enrolled children in the county. State-fixed effects were included in all regression equations as control variables; coefficients on the state-fixed variables were not shown in the table.

*** $p < .01$,

** $p < 0.05$.

Table 3

Decomposition results for urban-rural disparities in vaccination service use[a]

	Urban	Rural
Number of counties	969	1,504
Vaccination service use (%)	36.85	31.99

	PPs	% contribution to the urban-rural disparities[b]
Urban-rural disparities	4.86***	
Explained differences	3.24***	66.78%
Unexplained differences	1.61	33.22%

	PP contribution to the explained differences[c]	% contribution to the explained differences[d]
Access to care		
% Uninsured children	.11	3.47%
Number of PCPs	.85***	26.23%
No vehicle	−.34	−10.51%
Social & economic factors		
Bachelor’s degree or higher	.73***	22.46%
Unemployment rate	−.13	−4.02%
Food insecurity	.18	5.55%
Median household income ($1,000)	−.40	−12.42%
% Children in poverty	−.27**	−8.22%
% in single-parent households	.00	.04%
Quality of care		
Influenza vaccination rates	73***	22.60%
Preventable hospital stays (thousands)	.19**	5.73%
Demographics		
% Medicaid-enrolled children in a managed care plan	.10	3.18%
% Non-Hispanic black	.48**	14.80%
% Hispanic	1.59***	49.18%

	PP contribution to the explained differences[c]	% contribution to the explained differences[d]
% Females	.14***	4.22%
% Population aged 65 and older	.00	−1.03%

[a]PP: Percentage point; PCPs: Primary care physicians. State-fixed effects were included in the estimation equations as control variables. Estimates of state-fixed effects were not shown in the table. Estimates were weighted by the number of Medicaid-enrolled children in the county

*** $p < .01$,

** $p < .05$.

[b]Percent contribution to the urban-rural disparities in service use ($\frac{3.24}{4.86} * 100 \approx 66.78$ and $\frac{1.61}{4.86} * 100 \approx 33.22$).

[c]Urban-rural disparities that could be explained by the included county characteristics (e.g., of the 3.24 percentage point explained differences, % uninsured children contributed .11 percentage point).

[d]Percent contribution to the explained differences in urban-rural disparities in service use (e.g., % contribution of the number of PCPs was equal to $\frac{0.85}{3.24} * 100 \approx 26.23$).

The Oaxaca-Blinder decomposition method ensures that the sum of the contributions of all control variables in the estimation equation equals the explained differences. The contribution of state-fixed effects was not shown in the table.