Local-Level Adult Influenza and Pneumococcal Vaccination Disparities: Chicago, Illinois, 2015–2016

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Objectives. To investigate local-level adult influenza and pneumococcal vaccination disparities to inform targeted interventions.

Methods. Questions on influenza and pneumococcal vaccination uptake were included in a door-to-door community-based representative survey conducted in 10 Chicago, Illinois, neighborhoods in 2015 and 2016. A total of 1543 adults completed the survey, including 172 adults aged 65 years or older. We calculated adult influenza (≥ 18 years) and pneumococcal (≥ 65 years) vaccination coverage by community area and respondent characteristics.

Results. We observed significant differences in pneumococcal vaccination coverage between community areas (range = 18%–91%). Influenza vaccination coverage differed by gender, age, insurance coverage, acculturation, and confidence or trust in physician. Non-Hispanic Blacks were more likely to be vaccinated when they had higher confidence or trust in their physician (45% vs 20%; $P < .01$). Mexicans who reported less acculturation were more likely to be vaccinated than were Mexicans who were more acculturated (41% vs 27%; $P = .02$).

Conclusions. Striking disparities between neighborhoods and racial/ethnic groups in adult influenza and pneumococcal vaccination coverage highlight the need for improved local-level immunization coverage data. (*Am J Public Health.* 2018;108:517–523. doi: 10.2105/AJPH.2017.304257)

See also Quinn, p. 427.

Influenza and pneumococcal disease are major contributors to morbidity and mortality in US adults.[1,2] Adult influenza-related hospitalizations are estimated at 126 000 to 687 000 each year, depending on the severity of the season, and annual pneumococcal disease–related hospitalizations are estimated to number 445 000.[1,3] Influenza is estimated to account for 12 000 to 54 000 deaths annually, and pneumococcal disease is associated with 22 000 deaths annually.[1,3] The majority of these deaths occur in people aged 65 years or older because of increased risk of complications, high comorbidities with other chronic illnesses, and immunosenescence leading to a suboptimal immune response to vaccination or disease.[1,2,4,5]

Vaccination is effective in preventing disease and reducing the severity of illness if one is infected.[3,6] The seasonal influenza vaccine is recommended annually for all people aged 6 months or older, and adults aged 65 years or older are recommended to receive a series of pneumococcal immunizations.[7–9] Despite the existence of these recommendations for decades,[10,11] a substantial proportion of adults remain unvaccinated. US influenza vaccination coverage in 2015 to 2016 for adults (≥ 18 years) was 42%,[12] compared with the Healthy People 2020 goal of 70%.[13] The pneumococcal vaccination rate was 61% in 2014 for adults aged 65 years or older,[14] compared with the Healthy People 2020 goal of 90%.[15]

Racial/ethnic vaccination coverage disparities persist nationally,[16,17] with Hispanic populations consistently having the lowest coverage for influenza and pneumococcal vaccines compared with non-Hispanic Whites, non-Hispanic Asians, and non-Hispanic Blacks.[13,15] The reasons for these racial/ethnic disparities are complex and involve multilayered social and health care system factors, including health literacy and vaccination refusal at the individual level and the provision of vaccination and implementation of interventions to increase vaccination at the provider level.[18–20] Interventions that address provider-level barriers have been considered a key strategy for eliminating racial/ethnic vaccination disparities.[21–25] Furthermore, national-level immunization data may mask important coverage variation at the local level and disparities within Hispanic subgroups.[26]

Data from smaller geographic regions are critical to inform programmatic decisions on which populations should be targeted for immunization interventions to improve overall vaccination coverage and reduce disparities. For example, city leaders with this type of local data could direct limited resources, such as public information campaigns, health care provider education and vaccination provision, and vaccination clinics, toward the demographic groups or geographic areas with the lowest vaccination coverage. There are currently no available city-wide estimates for Chicago, Illinois, for adult influenza or pneumococcal vaccination coverage.

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We aimed to investigate disparities at the local level by providing community-level vaccination estimates for 9 diverse Chicago community areas and to assess, by 4 racial/ethnic groups, the association of individual demographic and socioeconomic characteristics and provider–patient behavior with vaccination uptake.

METHODS

Sinai Community Health Survey 2.0 was a representative, population-based survey conducted in 10 diverse Chicago community areas from March 2015 to September 2016.[27] Communities were prioritized for inclusion if they had participated in the original Sinai Survey, were located in Chicago's West and South Sides, and had demographic characteristics to allow for racial/ethnic comparisons. The median household income, employment rate, and high-school graduation rate were lower than national levels in the surveyed communities except for 1 primarily non-Hispanic White (hereafter referred to as White) community that was used to ensure a large enough sample size of Whites for planned racial/ethnic comparisons. Table A (available as a supplement to the online version of this article at http://www.ajph.org) shows demographic characteristics of the communities included in the survey.

The final adult survey instrument contained 369 questions, which were developed in collaboration with the University of Illinois at Chicago Survey Research Laboratory and a Community Advisory Committee (CAC) composed of community organizers, leaders, and residents from each of the surveyed communities. At least 2 community members were invited to join the CAC from each of the surveyed communities. Questions used in the survey were drawn from the first Sinai Community Survey and national survey questionnaires. The CAC's role was to ensure that questions were sensitive to the cultures of the included communities and to provide input on questions' utility to health improvement efforts. The CAC helped shape questions regarding drug use, violence, incarceration, schools, and race/ethnicity. Surveys were completed by trained interviewers who were from the same community or were demographically matched when possible. The survey was administered face to face in English or Spanish with the Computer Assisted Survey Execution System. Up to 2 adults (≥ 18 years) in randomly selected households were asked to provide consent and participate in the survey. There were no additional exclusion criteria.

The primary immunization outcomes, influenza vaccination (in the past year) and pneumococcal vaccination (ever), were based on the following survey questions, which were also used in the 2013 Behavioral Risk Factor Surveillance System survey[28]: (1) "During the past 12 months, have you had either a flu shot or a flu vaccine that was sprayed in your nose?" and (2) "A pneumonia shot or pneumococcal vaccine is usually given only once or twice in a person's lifetime and is different from the flu shot. Have you ever had a pneumonia shot?" Only adults aged 65 years or older were asked about pneumococcal immunization, as this was the only population with a universal recommendation for this vaccination (beyond children for whom we did not have the sample size to estimate vaccination coverage). Individuals who did not receive a flu vaccination in the past 12 months were asked to provide a reason(s), and we coded responses as applicable in 13 predefined categories, which we collapsed into 4 groups for analysis.

We analyzed the association of various individual and provider factors with the prevalence of influenza and pneumococcal vaccination. We divided race/ethnicity into 4 categories (White, non-Hispanic Black [hereafter referred to as Black], Puerto Rican, and Mexican). We analyzed age in 3 groups (18–49, 50–64, and ≥ 65 years) for influenza vaccination only. We categorized education as less than high school, high-school graduate, and some college or more. We collapsed reported household income into 3 categories (< $20 000, ≥ $20 000–$49 999, and ≥ $50 000). We dichotomized insurance coverage into either uninsured or insured. We developed a 3-point acculturation construct, modeled after one developed by Coronado et al.,[29] for Hispanic survey respondents (original scale reliability was tested only in Hispanics of Mexican descent). We gave 1 point for each of the following characteristics: (1) born in the United States, (2) primarily speaks in English, and (3) primarily thinks in English. We gave half points for items 2 and 3 when English was identified as coprimary with another language. We used the scores to classify acculturation into low (≤ 1) and medium or high (> 1) levels. A cut-off score of 1 allowed us to compare vaccination among individuals with low acculturation scores with others and to ensure a large enough sample size in each of the groups for analysis (we conducted sensitivity analyses with 0.5 and 1.5 as the cutoff, which yielded similar results).

We assessed perceived discrimination in health care in the previous year and in a lifetime. We based assessment of experienced discrimination in the past year on a single question modified from the 2009 California Health Interview Survey ("Within the past 12 months, how often have you been treated unfairly when getting medical care because of your race, ethnicity or color?").[30] Respondents who had no health care visits in the past year were coded as missing. The 7-item measure of lifetime personal discrimination was an adaptation of that used by Hausmann et al. and Bird et al. who report reliability of the scale in diverse populations.[31,32] One question, regarding courtesy, was dropped and a new question, ". . . had a doctor or nurse act as if he or she did not want to touch you?" was added. We dichotomized responses to both discrimination constructs as "never" versus "ever." We dichotomized physician trust on the basis of responses to the question "How much confidence and trust do you have in your doctor?" into low or moderate ("none at all," "a little," or "a moderate amount") and high ("a lot" or "a great deal") levels.

Incorporating the complex survey design, we calculated influenza and pneumococcal vaccination prevalence estimates and 95% confidence intervals (CIs) with the Taylor linearized variance estimator overall and by community area (excluding Lower West Side where recruitment was ended early and thus the sample size was too low to allow for community-area estimates). This resulted in participants from 9 community areas included in analyses by community area and participants from 10 community areas included in all other analyses in which we could include the partially sampled Lower West Side community area. For analysis of the associations of individual, socioeconomic, and provider factors with vaccination, we restricted the sample to those with nonmissing data for the specific vaccination outcome and to those in

1 of the 4 racial/ethnic groups. We also stratified by race/ethnicity and examined bivariate associations for influenza vaccination (sample size limitations prohibited stratification for pneumococcal vaccination). We provided reasons for influenza nonvaccination overall and by race/ethnicity. We suppressed estimates when there were fewer than 5 observations in any cell. We used a second-order Rao–Scott test to assess statistical differences in vaccination prevalence. We set statistical significance at a P level of less than .05. We conducted all analyses in Stata version 14.2 (StataCorp LP, College Station, TX).

RESULTS

A total of 1543 adult surveys were completed over a 19-month period. The overall response rate with the American Association of Public Opinion Research's response rate number 3 was 28.4%.[33] For our primary outcomes, we had missing data levels of 0.5% for influenza vaccination and 5.2% for pneumococcal vaccination.

Influenza Vaccination

The overall prevalence of annual influenza vaccination in surveyed communities was 39% (95% CI = 35%, 43%). We saw no statistically significant differences by community area for having received an influenza vaccination in the past year; however, we observed qualitative differences between neighborhoods (Table 1). Respondents were more likely to be vaccinated if they were female, older, insured, and had high confidence and trust in their doctor (Table 2).

When we stratified by race/ethnicity, Mexican women were more likely to be vaccinated than were Mexican men (48% vs 24%; Table 2). Insurance coverage was associated with increased vaccination for Whites and Mexicans only. For Blacks, those who had high confidence and trust in their doctor had increased vaccination coverage compared with those who had low or medium trust (45% vs 20%; $P < .01$). We saw a similar association for Whites, but it was not statistically significant. A higher level of acculturation was associated with lower vaccination rates among Mexicans, but not Puerto Ricans. We saw no statistically significant differences in influenza vaccination coverage by income category or by health care discrimination in the previous year.

TABLE 1—Weighted Proportion of Survey Respondents Who Had Received Influenza Vaccine in the Past Year and Had Ever Received Pneumococcal Vaccine by Chicago Community Area: Sinai Community Health Survey 2.0, Chicago, IL, 2015–2016

Community Area	Influenza Vaccine (n = 1503)		Pneumococcal Vaccine[a] (n = 167)	
	% (95% CI)	*P*	% (95% CI)	*P*
Norwood Park	47 (30.3, 64.7)	.72	43 (12.6, 79.3)	.013
Hermosa	40 (32.6, 48.1)		63 (25.6, 89.5)	
Humboldt Park	39 (26.9, 52.6)		26 (9.7, 52.7)	
West–West Town	43 (34.0, 52.6)		42 (17.3, 71.4)	
North Lawndale	39 (28.4, 49.7)		72 (39.2, 91.0)	
South Lawndale	44 (32.8, 55.6)		91 (69.5, 97.8)	
Gage Park	34 (21.4, 49.9)		. . .	
Chicago Lawn	32 (20.7, 45.1)		18 (6.1, 44.4)	
West Englewood	43 (30.1, 57.5)		66 (34.6, 87.6)	

Note. CI = confidence interval. Ellipses indicate suppressed data.

[a]Respondents who were aged 65 years or older were asked if they had ever received pneumococcal vaccine.

The grouped reasons for no influenza immunization in the past year were similar by race/ethnicity (Table 3). The most common reasons for nonvaccination were related to lack of awareness regarding vaccination recommendations, concerns about vaccination safety, and perceptions of personal disease susceptibility and severity. Mexicans were less likely to report reasons related to low susceptibility and severity of influenza illness than were other groups. Puerto Ricans were least likely to mention reasons related to lack of awareness of influenza vaccination.

Pneumococcal Vaccination

The overall prevalence of ever having the pneumococcal vaccination among adults aged 65 years or older in surveyed communities was 53% (95% CI = 39%, 66%). Chicago Lawn and Humboldt Park had the lowest pneumococcal vaccination coverage of the surveyed communities with only 18% (95% CI = 6%, 44%) of Chicago Lawn residents reporting ever receiving pneumococcal vaccination (Table 1). We found no statistically significant differences in vaccination prevalence by race/ethnicity, education, household income, experience of health care discrimination, and trust in doctor (Table 4). However, Mexicans and Puerto Ricans had the lowest absolute pneumococcal vaccination coverage. We excluded insurance coverage and level of acculturation from analyses of pneumococcal vaccination uptake because of sample size limitations.

DISCUSSION

This study provides, to our knowledge, the first population-based community-level vaccination coverage estimates within Chicago. We found striking disparities between close geographic areas and between racial/ethnic groups. Overall, our survey provides important data that can support policy and program decision-making in Chicago. Healthy Chicago 2.0, which aims to improve health equity in Chicago, was launched in 2016 and relies on citywide estimates of disease burden.[34] Our community-level immunization data, which is not available from any other source, will help Chicago public health leaders identify neighborhoods that need targeted outreach to reduce disparities in immunization. The disparities we found warrant more studies examining local-level data, given that city-level estimates, if available, continue to mask geographic disparities, preventing public health organizations from directing limited resources to communities that most need them. Evidence shows the effectiveness of tailored and targeted interventions for specific communities in improving vaccination coverage in vulnerable populations.[35–37]

Geographic Disparities

We found substantial differences in vaccination coverage between community areas. The geographic differences in vaccination

TABLE 2—Weighted Proportion of Survey Respondents Who Received an Influenza Vaccine in the Past 12 Months by Risk Factors and Race/Ethnicity: Sinai Community Health Survey 2.0, Chicago, IL, 2015–2016

	Overall (n = 1420)		Non-Hispanic White (n = 218)		Non-Hispanic Black (n = 531)		Mexican (n = 521)		Puerto Rican (n = 150)	
Characteristic	% (95% CI)	*P*	% (95% CI)	*P*	% (95% CI)	*P*	% (95% CI)	*P*	% (95% CI)	*P*
All	38 (34, 43)		45 (32, 58)		38 (31, 46)		35 (29, 41)		51 (37, 64)	
Gender		< .001		.08		.06		< .001		.10
Male	32 (26, 38)		51 (35, 66)		31 (22, 42)		24 (17, 33)		40 (26, 56)	
Female	46 (40, 51)		37 (24, 52)		44 (34, 54)		48 (40, 56)		61 (39, 79)	
Age, y		< .001		.007		.07		< .001		.016
18–49	31 (27, 36)		29 (19, 42)		34 (26, 43)		29 (24, 35)		44 (28, 61)	
50–64	49 (40, 58)		57 (29, 82)		42 (32, 54)		45 (31, 59)		79 (60, 90)	
≥ 65	62 (47, 76)		71 (53, 84)		52 (34, 69)		78 (39, 95)		33 (10, 68)	
Education		.24		.81		.69		.05		.16
< high school	43 (36, 50)		. . .		41 (27, 56)		43 (35, 51)		54 (23, 82)	
High-school graduate	35 (28, 42)		48 (20, 78)		40 (29, 52)		27 (19, 37)		30 (17, 48)	
≥ some college	39 (32, 45)		44 (34, 34)		34 (25, 45)		33 (24, 44)		64 (43, 80)	
Household income, $		.32		.79		.20		.55		.23
< 20 000	41 (33, 49)		39 (17, 66)		42 (31, 55)		38 (28, 50)		52 (29, 75)	
20 000–49 999	34 (28, 41)		46 (29, 65)		27 (20, 35)		34 (26, 43)		37 (19, 59)	
≥ 50 000	42 (32, 52)		49 (32, 67)		39 (18, 64)		29 (18, 43)		73 (41, 91)	
Insurance		< .001		< .001		.57		< .001		.56
Uninsured	22 (16, 31)		5 (1, 19)		31 (14, 56)		21 (14, 31)		40 (14, 74)	
Insured	43 (37, 48)		48 (35, 60)		38 (30, 48)		42 (35, 50)		52 (37, 66)	
Acculturation[a]		.013						.021		.14
Low	43 (36, 50)		. . .		. . .		41 (34, 48)		63 (37, 83)	
Medium or high	29 (22, 38)		. . .		. . .		27 (19, 37)		42 (28, 57)	
Health care discrimination (previous y)		.58				.95		.47		.34
No	40 (35, 46)		. . .		39 (31, 48)		37 (31, 91)		48 (33, 64)	
Yes	44 (34, 54)		. . .		40 (28, 53)		44 (29, 60)		67 (31, 91)	
Confidence and trust in doctor		.013		.06		< .001		.66		.30
Low or medium	29 (21, 38)		25 (10, 49)		20 (11, 34)		33 (22, 47)		65 (37, 85)	
High	43 (37, 48)		49 (36, 63)		45 (37, 54)		37 (30, 44)		48 (34, 64)	

Note. CI = confidence interval. Ellipses indicate suppressed data.

[a]Acculturation analyses were limited to Mexican and Puerto Rican subpopulations (n = 667).

coverage were greater for pneumococcal vaccination than for influenza vaccination. One potential explanation for this is that pneumococcal vaccination is more dependent on provider-level variables such as going to a physician and a physician recommending the vaccination compared with influenza vaccination, which is more widely promoted and known about by the public and is available in a range of settings beyond the provider office such as workplaces or pharmacies.[22,38] Unmeasured geographic community area differences in access to providers and the quality of providers' immunization support may have led to the observed pneumococcal vaccination coverage differences, as none of the examined risk factors showed a strong association with pneumococcal vaccination.

We observed the largest disparity between South Lawndale (predominantly Mexican) and Chicago Lawn (approximately equally Mexican and Black). These communities differ in the availability and quality of health care with 2 prominent federally qualified health centers and several hospitals located near South Lawndale and a dearth of hospitals and federally qualified health centers near Chicago Lawn. More proximate access to providers may influence pneumococcal vaccination as research shows the importance of provider-level factors on pneumococcal vaccination rates.[22,39] Provider-level interventions such as immunization standing orders, provider reminders, and provider assessment feedback have been shown to be effective in increasing vaccination uptake in high-risk adults.[37,40]

Racial/Ethnic Disparities and Provider Influences

We assessed the effect of trust or confidence on immunization uptake and found striking differences by race/ethnicity. For our

TABLE 3—Reasons Why Respondents Did Not Receive the Influenza Vaccine in the Past 12 Months, Weighted Percentages (n = 831): Sinai Community Health Survey 2.0, Chicago, IL, 2015–2016

Reasons	Overall Survey, %	Non-Hispanic White, %	Non-Hispanic Black, %	Mexican, %	Puerto Rican, %
Recommendation awareness[a]	43	38	44	46	29
Vaccine safety[b]	39	37	42	37	40
Disease susceptibility or severity[c]	34	49	38	26	39
Financial or logistical barriers[d]	6	9	4	7	. . .
No reason provided	3	2	2	4	. . .

Note. Ellipses indicate suppressed data. Respondents who did not receive the flu vaccine in the past 12 months were asked why not. Respondents could select 0, 1, or more of 13 possible reasons. The 13 reasons were condensed into the 4 categories as described in the footnotes that follow.

[a]"Didn't think about it/Forgot/Missed it"; "Didn't know it was needed"; "Doctor did not recommend a flu shot."

[b]"Shot could have side effects or cause disease"; "Shot could cause flu"; "Don't like shots or needles/Concerns about soreness"; "Doctor recommended against getting shot/Allergic to shot/Medical reason."

[c]"Didn't think it would prevent the flu/Could get the flu anyway"; "Getting flu isn't serious/Would not get flu anyway"; "Already had a flu shot and didn't need it again."

[d]"Cost of shot/Not worth the money"; "Inconvenient to get shot/Unable to get to location"; "Vaccine unavailable/Vaccine shortage."

Hispanic subgroups, trust or confidence had no effect on influenza vaccination although provider trust has been shown to be lower in Hispanic groups for other health care treatment.[41] The strongest impact of provider confidence or trust was for Blacks, such that those who had high trust had 25% increased likelihood of vaccination compared with those with low or medium trust. The Black community has a history of distrust in the US medical establishment because of lingering effects from past medical abuses such as the Tuskegee syphilis study.[42] Trust remained a significant issue for Blacks in our study and is likely a barrier for adult vaccination. Outreach to trusted leaders such as aldermen and faith leaders may be helpful in slowly building up trust and confidence in doctors and in the benefits of vaccination.[23,42]

Interestingly, we saw no effect for provider trust on pneumococcal vaccination. Other researchers have found trust in one's provider to be a significant predictor of pneumococcal vaccination uptake among Blacks but have also highlighted the importance of vaccination awareness, knowledge, and provider recommendation on uptake.[22] Understanding reasons for pneumococcal nonvaccination, which were not collected in this survey, is important to understanding the key barriers to vaccination. Given generally lower public awareness and safety concerns regarding pneumococcal vaccination compared with other vaccinations, and that the pneumococcal vaccination was given only once, not annually, it is possible that other unmeasured factors were more important determinants of vaccination uptake in our study.[38]

We found no association of provider discrimination with influenza or pneumococcal vaccination. One study found provider discrimination mediated 16% of unadjusted influenza vaccination disparities among Whites, Blacks, and Hispanics.[21] Other studies examining perceived discrimination and general health found perceived discrimination had a statistically significant impact on use of health services and was a strong predictor for poor health status.[43] Although it does not contradict previous research, our study does not provide evidence supporting this conclusion. One potential reason for finding no association is that those who had no provider visits in the past year and were thus not eligible to answer the discrimination question may not have had a recent visit that was directly related to previously experienced provider discrimination.

We found no statistically significant differences in pneumococcal vaccination coverage between racial/ethnic groups although there was considerably more variability in pneumococcal vaccination coverage by race/ethnicity than with influenza vaccination coverage. This is likely attributable to our restriction of analysis of pneumococcal vaccination to older adults. For influenza vaccination, when analysis was restricted to those aged 65 years and older, we saw qualitatively similar racial/ethnic disparities to pneumococcal vaccination. Greater vaccination disparities in older adults might be linked to differences in risk perception, chronic disease prevalence, or other measures that were not accounted for in this study.[17,21,44]

Differences Within Hispanic Subgroups

Our study also provided a population-based comparison in adult influenza vaccination coverage between Mexican and

TABLE 4—Weighted Proportion of Survey Respondents Aged 65 Years and Older Who Ever Received the Pneumococcal Vaccine by Risk Factors: Sinai Community Health Survey 2.0, Chicago, IL, 2015–2016

	Pneumococcal Vaccine (n = 161)	
Risk Factors	% (95% CI)	*P*
Gender		.70
Male	51 (32, 70)	
Female	55 (41, 69)	
Race/ethnicity		.28
Non-Hispanic White	67 (39, 86)	
Non-Hispanic Black	56 (38, 72)	
Puerto Rican	33 (9, 70)	
Mexican	40 (22, 60)	
Education		.40
< high school	42 (26, 59)	
High-school graduate	63 (37, 83)	
≥ some college	56 (35, 75)	
Household income, $		.16
< 20 000	62 (37, 82)	
20 000–49 999	55 (38, 71)	
≥ 50 000	29 (12, 54)	
Health care discrimination (lifetime)		.84
No	53 (38, 67)	
Yes	55 (34, 74)	
Confidence and trust in doctor		.56
Low or medium	47 (20, 76)	
High	56 (43, 68)	

Note. CI = confidence interval.

Puerto Rican Americans. Acculturation, although well studied for other health outcomes,[45] has been less fully examined for its effect on vaccination coverage in adult Hispanic subgroups.[46] We found that acculturation was associated with a statistically significant decrease in influenza vaccination for our Mexican population. This is consistent with Mexicans adopting more-American or less-healthy behaviors the more acculturated they become.[45] There were strong differences in vaccination coverage by age group between Mexicans and Puerto Ricans, with Puerto Rican respondents aged 18 to 64 years reporting much higher influenza vaccination than did Mexicans of the same age, but Puerto Ricans aged 65 years or older reporting less than half the influenza vaccination coverage of Mexicans aged 65 years or older. Insurance coverage, which may be related to citizenship status, had a significant positive association with influenza vaccination among Mexicans but not Puerto Ricans. These differences between Puerto Rican and Mexican vaccination by various risk factors highlight the need for more research to understand the mechanisms of these differences and to develop tailored interventions for these groups.[35] For instance, interventions in the Mexican community might focus more on younger, more-acculturated individuals whereas interventions in the Puerto Rican community might target older adults.

Strengths and Limitations

Our study had several limitations. First, measurement of vaccination coverage was gathered from self-report, which may be subject to recall bias. This bias is likely greater for pneumococcal vaccination, which may have been provided several years before survey administration; influenza immunization was asked about only regarding the previous year. However, the questions used mirror those in national surveys, which are the basis of national vaccination prevalence estimates. Since 2014, 2 doses of pneumococcal vaccination have been recommended in older adults, but our survey only asked about any pneumococcal vaccination. The observed disparities may have differed had we asked about number of doses received. Next, the acculturation and perceived discrimination in health care measures used were modified from those validated in previous studies, which may limit comparability.

The overall response rate of 28% was low, similar to participation rates in recent US surveys.[47] If those who did not respond are substantially different than those who responded, this might lead to biased estimates, especially as respondents are generally healthier than nonrespondents in survey research.[48] Because of our response rate, our sample size was smaller than anticipated, preventing multivariable regression analyses and stratified analyses for pneumococcal vaccination and suppressing some results in stratified influenza vaccination analyses.

Furthermore, we did not include enough community areas in our sample to conduct analyses on community-level factors associated with community area vaccination coverage. The questions we included in the acculturation and perceived discrimination in health care scales were slightly different from the questions that have been used in other studies. Lastly, our results cannot be generalized to the entire city of Chicago; they are only representative of the surveyed communities. However, they may be generalizable to communities with similar characteristics as those included in our study sample.

Strengths of our study include providing the first population-based estimates of adult influenza and pneumococcal vaccination at the community level for the city of Chicago. We conducted our study in a less-well-studied predominately minority and underserved population. We also examined differences within Hispanic subgroups, providing data on the important differences between Mexicans and Puerto Ricans, who are usually combined in vaccination coverage estimates. Third, we reported on less-examined factors that may have an impact on vaccination including perceived provider discrimination and acculturation and their differential associations within racial/ethnic groups.

Conclusions

We found striking disparities between geographically close communities in adult influenza and pneumococcal vaccination coverage. Improved local-level immunization coverage data are needed to better understand secular trends and intervene in populations most at risk for being undervaccinated. Targeted interventions to increase immunization coverage should be focused on those communities and racial/ethnic groups with the lowest vaccination rates. With limited resources, more focused interventions could have a greater impact in decreasing disparities and improving overall coverage than could citywide efforts. AJPH

CONTRIBUTORS

M. M. Hughes and N. S. Saiyed contributed to the study design, analysis of data, interpretation of data, and drafting of the article. T. S. Chen contributed to the interpretation of data and drafting of the article. All authors contributed to the preparation of this article and approved the final version.

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HUMAN PARTICIPANT PROTECTION

This study was approved by the institutional review boards of Mount Sinai Hospital (FWA00005088) and the University of Illinois at Chicago (FWA00000083). Written informed consent was obtained from all study participants.

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