

COVID-19 Vaccination Coverage Among People Experiencing Homelessness in a Highly Vaccinated Midwest County—Dane County, Wisconsin, 2021

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People experiencing homelessness (PEH) are at increased risk for coronavirus disease 2019 (COVID-19) infection. This study assessed COVID-19 vaccination coverage among vaccine-eligible PEH (5 years and older) stratified by demographic characteristics. PEH were less likely to complete a primary vaccination series than the Dane County population (32.0%; 95% confidence interval [CI], 30.3%–33.8% vs 82.4%; 95% CI, 82.3%–82.5%) and were less likely to have received a booster when eligible (30.8%; 95% CI, 27.8%–33.9% vs 67.2%; 95% CI, 67.1%–67.4%). Vaccination rates were lowest among young PEH and PEH of color.

Keywords. COVID-19; vaccination; people experiencing homelessness.

Dane County, Wisconsin is a highly vaccinated county, with over 82% of eligible people aged 5 years and older completing an initial coronavirus disease 2019 (COVID-19) vaccination series as of 31 January 2022. However, high vaccination coverage county-wide obscures low vaccine coverage within specific populations that may be at higher risk for COVID-19 infection.

People experiencing homelessness (PEH) are at increased risk for COVID-19 infection [1–6]. The spectrum of COVID-19 illness in PEH is varied. Seroprevalence data of PEH demonstrate that many COVID-19 infections in this population are asymptomatic, which can complicate mitigation strategies in congregate shelter settings [1, 2]. Simultaneously, multiple reports show increased severity and poorer outcomes of COVID-19, including hospitalization and death [3–6]. Several factors are likely associated with vulnerability to severe COVID-19 illness among PEH, including co-occurring health conditions and living in congregate settings.

Despite widespread availability of COVID-19 vaccine in the United States, emerging evidence suggests lower vaccination coverage among PEH compared to the general population [7]. Vaccine uptake among PEH may be influenced by several factors, including less access to health care and mistrust in government and medical systems [8]. Moreover, many

unvaccinated PEH may never be offered a COVID-19 vaccine [9]. Geographic transience may complicate receipt of additional doses of vaccine, which could impact PEH being up to date with COVID-19 vaccine series [10]. Given the vulnerability to COVID-19, understanding vaccination coverage in PEH is critical for targeted vaccination efforts in this specific population. The aim of this study was to estimate vaccine coverage among vaccine-eligible PEH in Dane County, Wisconsin.

METHODS

Data Sources

People Experiencing Homelessness

PEH were identified from the Homeless Management Information System (HMIS), which includes people who received housing and other services from organizations serving the homeless population in Dane County. The HMIS data included name, date of birth, and client characteristics (gender, race, ethnicity, age). Sixteen programs that provided consent to use client-level data were included in this analysis. Data were provided in 2 installments, and not all programs consented to data sharing for each installment; 6 programs only consented to data sharing for half the year. We included data for 2778 individuals aged 5 and older served by programs 1 January 2021 through 31 December 2021 to evaluate vaccine coverage in all COVID-19 vaccine-eligible age groups. Demographic information from HMIS were used to define specific populations of PEH.

COVID-19 Vaccination Records

COVID-19 vaccination records for Dane County residents were obtained from the Wisconsin Immunization Registry

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(WIR), Wisconsin's centralized immunization management system. A 2015 assessment of WIR demonstrated that this system has good completeness and accuracy [11].

Population

The 2020 census bridged race population estimates for people aged 5 and older were used. These population estimates were obtained by the Wisconsin Department of Health Services Office of Health Informatics.

Variables and Statistical Analyses

Completion of a primary COVID-19 vaccination series was the primary outcome of interest, with booster coverage as a secondary outcome. Completed primary COVID-vaccine series was defined as people with 1 dose of Janssen or 2 doses of Pfizer or Moderna vaccine in WIR as of 31 January 2022. Being eligible for a booster included people aged 12 and older with a completed primary vaccine series. A booster was defined as an additional vaccine dose after a completed primary vaccine series, which was given on or after 13 August 2021, when the Centers for Disease Control and Prevention recommended a booster dose for immunocompromised people. Being up to date on vaccines was defined as being aged 5–11 years with a completed primary vaccine series, or aged 12 or older with either a completed primary vaccine series within the previous 2 months, a booster dose ≥ 2 months after a completed Janssen primary series, or a booster dose ≥ 5 months after a completed Pfizer or Moderna primary series [12].

To estimate vaccination and booster coverage among PEH, HMIS data were matched to the WIR using Link Plus, a probabilistic linkage tool. First name, last name, date of birth, and gender were present in both data sources and were used as matching variables. Completion of a primary series and being up to date on vaccines for PEH were calculated using the number of people aged 5 and older in HMIS for denominators. Booster coverage was calculated using the number of people eligible for a booster for denominators.

Descriptive statistics were calculated to examine vaccine coverage among specific populations of PEH compared to the general Dane County population with 95% confidence intervals (CIs) calculated using the Wilson method. Vaccination coverage was stratified by age group, gender, ethnicity, race, and homeless services program type. Programs were classified as providing services to unsheltered PEH (3 programs), sheltered PEH (8 programs), and PEH housed in permanent or transitional housing (5 programs). For county vaccination coverage, we used Dane County WIR records to identify people with a completed primary vaccine series and a booster dose. Receipt of primary COVID-19 vaccination series by vaccine manufacturer was also examined for PEH and Dane County.

χ^2 tests were conducted to assess whether vaccination rates differed for categories within demographic groups for PEH,

with P values $<.05$ indicating statistical significance. Statistical testing was not performed on vaccination coverage by program type, as some PEH participated in multiple programs within different categories. For comparisons to Dane County, estimates with nonoverlapping CIs were considered statistically different. All analyses for PEH were conducted using SAS (version 9.4; SAS Institute) and Dane County CIs were estimated using OpenEpi (version 3.01).

This project was evaluated using the University of Wisconsin-Madison Health Sciences Institution Review Board's Self-Certification Tool and was deemed to be quality improvement and exempt from Institution Review Board review.

RESULTS

PEH were less likely to complete a primary vaccination series than the Dane County population overall (32.0%; 95% CI, 30.3%–33.8% vs 82.4%; 95% CI, 82.3%–82.5%) and for all demographic groups (Table 1). Among those with a completed primary vaccine series, PEH were less likely than the Dane County population to have received the recommended booster dose (30.8%; 95% CI, 27.8%–33.9% vs 67.2%; 95% CI, 67.1%–67.4%). This disparity was observed across all demographic groups (Table 2). Among eligible individuals, only 16% of PEH were up to date on their COVID-19 vaccines compared to 61% of the Dane County population.

Among PEH, completion of a primary vaccine series was lowest among those aged 5–11 years (4.9%; 95% CI, 2.6%–9.1%), 12–17 years (16.3%; 95% CI, 10.5%–24.6%), 18–24 years (16.8%; 95% CI, 12.3%–22.7%), 25–34 (22.4%; 95% CI, 19.7%–25.9%), those who were multiracial (23.5%; 95% CI, 17.1%–31.4%) or Hispanic (25.8%; 95% CI, 20.4%–32.2%). For program type, both completion of primary series and receipt of a booster dose were highest among people receiving permanent or transitional housing services (primary series, 54.0%; 95% CI, 48.1%–59.7%; booster, 45.0%; 95% CI, 37.2%–53.0%).

About 1 in 5 PEH (22.5%) received the single-dose Janssen vaccine, 36.8% received the Moderna vaccine, and 40.7% received the Pfizer vaccine. In contrast, 10.1% of the Dane County population received the Janssen vaccine, 31.2% received Moderna vaccine, and 58.7% received Pfizer vaccine.

DISCUSSION

PEH in Dane County, Wisconsin have low COVID-19 vaccination rates across all age groups despite living in a highly vaccinated county. These findings are consistent with a recent analysis that found lower vaccination coverage among adult PEH in 6 urban public health jurisdictions [7]. Children were included in our analysis to assess overall vaccine coverage in all vaccine-eligible PEH utilizing services. Rates of COVID-19 vaccination in children experiencing homelessness (CEH)

Table 1. Completed COVID-19 Primary Vaccination Series Among People Experiencing Homelessness Compared to All Residents in Dane County, Wisconsin

Characteristic	Dane People Experiencing Homelessness			P Value ^a	All Dane Residents		
	No. PEH	No. Completed Vaccine Series	% Completed Vaccine Series (95% CI)		No. Residents	No. Completed Vaccine Series	% Completed Vaccine Series (95% CI)
Overall	2778	889	32.0 (30.3–33.8)		523 060	430 929	82.4 (82.3–82.5)
Age, y ^b							
5–11	182	9	4.9 (2.6–9.1)	<.001	43 400	24 794	57.1 (56.7–57.6)
12–17	104	17	16.3 (10.5–24.6)		37 339	31 007	83.0 (82.7–83.4)
18–24	196	33	16.8 (12.3–22.7)		73 703	48 110	65.3 (64.9–65.6)
25–34	581	130	22.4 (19.7–25.9)		87 018	72 484	83.3 (83.1–83.5)
35–44	581	174	29.9 (26.4–33.8)		75 534	66 634	88.2 (88.0–88.5)
45–54	466	198	42.5 (38.1–47.0)		61 874	54 913	88.7 (88.5–89.0)
55–64	485	224	46.2 (41.8–50.6)		63 090	56 913	90.2 (90.0–90.4)
65+	178	104	58.4 (51.1–65.4)		81 102	76 071	93.8 (93.6–94.0)
Gender ^c				.15			
Female	1031	312	30.3 (27.5–33.1)		263 351	222 903	84.6 (84.5–84.8)
Male	1720	567	33.0 (30.8–35.2)		259 709	207 288	79.8 (79.7–80.0)
Ethnicity ^d				.045			
Hispanic/Latino	209	54	25.8 (20.4–32.2)		33 618	26 410	78.6 (78.1–79.0)
Not Hispanic/Latino	2446	801	32.8 (30.9–34.6)		489 442	379 052	77.4 (77.3–77.6)
Race ^e				<.001			
White	1257	468	37.2 (34.6–39.9)		451 456	343 128	76.0 (75.9–76.1)
Black or African American	1256	352	28.0 (25.6–30.6)		33 382	17 722	53.1 (52.6–53.6)
Multiracial	132	31	23.5 (17.1–31.4)		NA	NA	NA
Other race	59	21	35.6 (24.6–48.3)		NA	NA	NA
Program type				NA			
Unsheltered	255	79	31.0 (25.6–36.9)		NA	NA	NA
Sheltered	2418	739	30.6 (28.8–32.4)		NA	NA	NA
Permanent/transitional housing	278	150	54.0 (48.1–59.7)		NA	NA	NA

Abbreviations: CI, confidence interval; PEH, people experiencing homelessness; NA, not available.

^aχ² tests conducted to determine difference in vaccine coverage within demographic groups.

^bMissing age: PEH = 5 (0.2%); Dane County residents n = 3 (<0.1%).

^cMissing gender: PEH n = 8 (0.3%); Dane County residents n = 902 (0.2%). Nonbinary gender is not included.

^dMissing ethnicity: PEH n = 123 (4.4%); Dane County residents n = 30 427 (5.8%).

^eMissing race: PEH n = 74 (2.7%); Dane County residents n = 22 843 (4.4%).

aged 5 to 11 years have not been reported previously. While CEH had the shortest time of vaccine eligibility (approximately 3 months prior to analysis), the large disparity between CEH and their counterparts in the general population further highlight the challenges and delays in reaching all PEH with vaccine efforts. Disparities in vaccination coverage among PEH of color were observed, which is concerning due to the increased risk of severe outcomes from COVID-19 among racial and ethnic minorities [13].

Low vaccination and booster coverage among PEH in Dane County indicates that this population remains vulnerable to COVID-19 infection, particularly during periods of high COVID-19 incidence. Mobile vaccination services have been identified as an approach to improve equitable vaccine access to PEH and increase vaccination coverage in this population [14]. While several mobile vaccination teams have offered on-site vaccination clinics at several shelters and community

organizations serving PEH in Dane County, COVID-19 vaccination rates remain low, indicating barriers to vaccine uptake beyond access. As public health interventions focus on increasing COVID-19 vaccine coverage among PEH, efforts to mitigate the impact of COVID-19 including continuing shelter-specific infection control strategies such as mask use and physical distancing, and maintaining local isolation/quarantine sites, are critical to reducing COVID-19 transmission in this population [15].

This analysis has several limitations. The people included as PEH are a subset of the entire population of PEH in Dane County, as not all programs gave consent to use data, while others only consented to provide data for a partial year. Some PEH may not access services, and are not represented in HMIS, and others were not included because the programs in which they were served did not consent to providing client-level information for this analysis. Consequently, our findings may not be

Table 2. Receipt of COVID-19 Booster Dose Among People Experiencing Homelessness Compared to All Residents in Dane County, Wisconsin

Characteristic	Dane People Experiencing Homelessness			P Value ^a	All Dane Residents		
	No. Booster Eligible	No. Received Booster	% Received Booster (95% CI)		No. Booster Eligible	No. Received Booster	% Received Booster (95% CI)
Overall	880	271	30.8 (27.8–33.9)		406 132	273 055	67.2 (67.1–67.4)
Age, y ^b				<.001			
12–17	17	2	11.8 (3.3–34.3)		31 007	13 603	43.9 (43.3–44.4)
18–24	33	4	12.1 (4.8–27.3)		48 110	22 698	47.2 (46.7–47.6)
25–34	130	25	19.2 (13.4–26.9)		72 484	42 641	58.8 (58.5–59.2)
35–44	174	46	26.4 (20.4–33.5)		66 634	45 421	68.2 (67.8–68.5)
45–54	198	60	30.3 (24.3–37.0)		54 913	39 276	71.5 (71.2–71.9)
55–64	224	89	39.7 (33.6–46.3)		56 913	44 175	77.6 (77.3–78.0)
65+	104	45	43.3 (34.2–52.9)		76 071	65 241	85.8 (85.5–86.0)
Gender ^c				.03			
Female	308	109	35.4 (30.3–40.9)		210 741	147 636	70.1 (69.9–70.3)
Male	562	158	28.1 (24.6–32.0)		194 682	125 304	64.4 (64.2–64.6)
Ethnicity ^d				.12			
Hispanic/Latino	53	11	20.8 (12.0–33.5)		24 631	11 112	45.1 (44.5–45.7)
Not Hispanic/Latino	793	248	31.2 (28.1–34.6)		358 016	249 626	69.7 (69.6–69.9)
Race ^e				.1			
White	466	161	34.6 (30.4–40.0)		324 168	231 247	71.3 (71.2–71.5)
Black or African American	347	92	26.5 (22.1–31.4)		16 854	7 017	41.6 (40.9–42.4)
Multiracial	30	10	33.3 (19.2–51.2)		NA	NA	NA
Other race	21	7	33.3 (17.2–54.6)		NA	NA	NA
Program type				NA			
Unsheltered	79	15	19.0 (11.9–30.0)		NA	NA	NA
Sheltered	731	207	28.3 (25.2–31.7)		NA	NA	NA
Permanent/transitional housing	149	67	45 (37.2–53.0)		NA	NA	NA

Abbreviations: CI, confidence interval; PEH, people experiencing homelessness; NA, not available.

^aχ² tests conducted to determine difference in booster coverage within demographic groups.

^bAge: Dane County residents n = 3 (<0.1%).

^cMissing gender: PEH n = 3 (0.3%); Dane County residents n = 738 (0.2%). Nonbinary gender is not included.

^dMissing ethnicity: PEH n = 34 (3.9%); Dane County residents n = 25 468 (6.3%).

^eMissing race: PEH n = 16 (1.8%); Dane County residents n = 18 385 (4.5%).

generalizable to all PEH locally and outside of our jurisdiction. Vaccination records for PEH may have been missed during matching due to inconsistencies in name or date of birth. In addition, vaccination records were limited to people with a Dane County residence, which may be problematic for populations such as PEH who may change their geographic location. PEH vaccinated outside of Dane County and those who provided an out-of-county residential address are not represented in the vaccination records used for this analysis. This highlights the need for better data sharing between local and state health departments monitoring health outcomes, particularly for special populations that may be represented in multiple jurisdictions, as well as the need for rigorous data sharing agreements to safeguard the privacy of individuals and prevent harm among populations such as PEH. This is particularly relevant for local health departments without epidemiological capacity to conduct analyses that require specialized methods such as probabilistic matching. Furthermore,

this analysis does not explore potential drivers of the disparity in vaccination coverage among the general population compared to PEH, such as employer vaccination policies. Additional research to identify successful vaccination policies and strategies to reduce the disparity is needed. Despite these limitations, these findings highlight an urgent need for better understanding of barriers to vaccine uptake to improve vaccination coverage among all PEH as well as targeted interventions to improve vaccine equity among specific populations within PEH.

Notes

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