

# COVID-19 Vaccine Coverage and Hesitancy Among New York City Parents of Children Aged 5–11 Years

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**Objectives.** To measure vaccine uptake and intentions among New York City (NYC) parents of children aged 5 to 11 years following emergency use authorization.

**Methods.** We conducted a survey of 2506 NYC parents of children aged 5 to 11 years. We used survey weights to generate prevalence estimates of vaccine uptake and intentions. Multivariable Poisson regression models generated adjusted prevalence ratios (APRs) of vaccine hesitancy, defined as parents who reported being not very likely or not at all likely to vaccinate their children, or unsure about whether to do so.

**Results.** Overall, 11.9% of NYC parents reported that their child was vaccinated; 51.0% were very or somewhat likely to vaccinate; 8.0% were not sure; 29.1% were not very likely or not at all likely to vaccinate their child. Among vaccine-hesitant parents, 89.9% reported safety concerns and 77.8% had concerns about effectiveness. In multivariable models, more vaccine hesitancy was expressed by non-Hispanic Black parents than by non-Hispanic White parents (APR = 1.41; 95% confidence interval [CI] = 1.17, 1.72) and by parents who were not themselves vaccinated than by parents who were vaccinated (APR = 1.53; 95% CI = 1.32, 1.77).

**Conclusions.** In a survey conducted after authorization of COVID-19 vaccines for children aged 5 to 11 years, significant hesitancy among parents was observed. (*Am J Public Health.* 2022;112(6):931–936. <https://doi.org/10.2105/AJPH.2022.306784>)

In October 2021, the Centers for Disease Control and Prevention (CDC) recommended use of the Pfizer BioNTech COVID-19 vaccine for children aged 5 to 11 years,<sup>1</sup> prompting concerns about parental acceptability and uptake. National polls conducted before authorization found that only one third of US parents planned to vaccinate their 5- to 11-year-old child right away, and the same proportion planned not to.<sup>2</sup>

Vaccination is critical for protecting children from SARS-CoV-2 infection, which can cause severe disease,

prolonged symptoms, and death.<sup>3,4</sup> High pediatric vaccination coverage will also help contain the COVID-19 pandemic.<sup>5</sup> New York City (NYC), the first epicenter of the pandemic in the United States, has the nation's largest public school system. High vaccination coverage among school-age children will keep students and staff safe, lead to fewer educational disruptions, and lower the risk of community spread. We measured parent-reported COVID-19 vaccination intentions for children aged 5 to 11 years following emergency use authorization.

## METHODS

We conducted this cross-sectional survey using a stratified random sample of NYC parents. NYC residents aged 18 years or older, self-identifying as a parent or legal caregiver of a child aged 5 to 11 years, were eligible. We collected data from November 10 to 18, 2021, through surveys in English, Spanish, and Mandarin. Participants were recruited through address-based random sampling. Participants contacted by cellphone completed Web-based surveys; those contacted

by landline used interactive voice response.

The study included 2506 eligible adults and had a margin of error of 1.8%.<sup>6</sup> The sample was weighted to reflect the population of parents of children aged 5 to 11 years based on US Census and other survey estimates for child age and race/ethnicity, and for adult education, within each borough of NYC.<sup>7</sup> Appendix A (available as a supplement to the online version of this article at <http://www.ajph.org>) has further information on sampling and weights.

We measured vaccination intention through parent report for the youngest child aged 5 to 11 years. Parents were asked, "Has your child received the COVID-19 vaccine?" (responses: "yes," "no," "not sure"). Those responding "no" or "not sure" were asked, "How likely are you to get your child vaccinated against COVID-19 now that it is available for 5–11 year olds?" (responses: "very likely," "somewhat likely," "not very likely," "not at all likely," and "not sure"; online Appendix B). Parents responding "not very likely," "not at all likely," or "not sure" were considered vaccine hesitant and asked to agree or disagree with reasons for hesitating, including safety, effectiveness, medical, religious or philosophical, believing children do not need the vaccine, and cost or time concerns.

All parents reported demographic information about their child and themselves, including their own COVID-19 vaccination status, whether the child was up-to-date with routine vaccines and influenza vaccination, and concerns about the child becoming infected or infecting others with COVID-19. Descriptive statistics (unweighted counts and percentages using survey weights to generate

prevalence estimates) are reported along with characteristics of children vaccinated at the time of the survey. To assess the relationship between characteristics and vaccination intentions, we divided the sample into 4 groups: (1) child already vaccinated, (2) parent very or somewhat likely to vaccinate, (3) parent unsure, and (4) parent not very likely or not at all likely to vaccinate. We compared prevalence estimates for groups by characteristics using the Rao adjusted Pearson  $\chi^2$  test. We fitted Poisson regression models (incorporating survey weights) with robust standard errors to estimate prevalence ratios of parental vaccine hesitancy, comparing vaccine-hesitant parents to parents of vaccinated children and parents very or somewhat likely to vaccinate children. We adjusted models for demographic and household characteristics to yield the adjusted prevalence ratio (APR).

## RESULTS

Among all participants, 90% of children were reported to be up-to-date with routine vaccines, 44.0% had received the flu vaccine, and 84.6% of parents were vaccinated. Overall, 11.9% of NYC parents reported that their child had been vaccinated; 51.0% were very or somewhat likely to vaccinate their child; 8.0% were not sure; 29.1% were not very or not at all likely to do so (Table 1). Characteristics of children who had received COVID-19 vaccination at the time of the survey are shown in online Table A.

In univariable analysis, prevalence of vaccine hesitancy differed by characteristics including child and parent race/ethnicity, child's routine vaccination and flu vaccine status, parent's gender and vaccination status, parental concerns about COVID-19, and borough of

residence. Among vaccine-hesitant parents, 89.9% reported safety concerns, 77.8% had concerns about effectiveness, 56.7% believed children do not need vaccination, 35.6% reported medical reasons, 29.2% cited philosophical or religious beliefs, and 11.0% reported time or cost concerns.

In multivariable models, compared with parents of children vaccinated for flu, parents not planning to vaccinate their child for flu (APR = 2.09; 95% confidence interval [CI] = 1.67, 2.62) and those unsure (APR = 2.16; 95% CI = 1.62, 2.88) were more vaccine hesitant (Table 1). Non-Hispanic Black parents compared with non-Hispanic White parents (APR = 1.41; 95% CI = 1.17, 1.72), parents who were not vaccinated themselves compared with vaccinated parents (APR = 1.53; 95% CI = 1.32, 1.77), and parents with some college compared with those with an undergraduate college degree or more (APR = 1.22; 95% CI = 1.02, 1.44) were also more vaccine hesitant. Parents reporting little or no worry about children infecting household members were more vaccine hesitant than very or somewhat worried parents (APR = 1.50; 95% CI = 1.18, 1.91). NYC parents who did not vote in the 2021 mayoral election (APR = 1.41; 95% CI = 1.13, 1.76) and those who voted for the Republican candidate (APR = 1.27; 95% CI = 1.03, 1.57) were more vaccine hesitant than those voting for the Democratic candidate. Compared with parents in Manhattan, those from Staten Island were more vaccine hesitant (APR = 1.44; 95% CI = 1.05, 1.98).

## DISCUSSION

In this representative sample of NYC parents surveyed 2 weeks after emergency use authorization of COVID-19

**TABLE 1—** Characteristics of Children Aged 5–11 Years and Their Parents or Caregivers, Estimated Prevalence of Intention to Have Children Vaccinated for COVID-19, and Prevalence Ratios for Vaccine Hesitancy: New York City (NYC), November 10–18, 2021

Characteristic	No. (%) <sup>a</sup>	Child Already Vaccinated, % (95% CI) <sup>b</sup>	Parent Very Likely or Somewhat Likely to Vaccinate Child, % (95% CI) <sup>b</sup>	Parent Not Sure Whether to Vaccinate Child, % (95% CI) <sup>b</sup>	Parent Not Very Likely or Not at All Likely to Vaccinate Child, % (95% CI) <sup>b</sup>	APR for Vaccine Hesitancy <sup>c</sup> (95% CI)
Total sample	2506 (100.0)	11.9 (10.6, 13.2)	51.0 (47.7, 54.3)	8.0 (6.0, 9.9)	29.1 (26.2, 32.0)	
<b>Child characteristics</b>						
Age, y						
5–8	1528 (56.8)	12.5 (10.7, 14.3)	50.4 (46.1, 54.6)	7.7 (5.3, 10.2)	29.4 (25.5, 33.3)	1.12 (0.75, 1.32)
9–11	978 (43.2)	11.1 (9.2, 13.0)	51.9 (46.8, 57.1)	8.3 (5.1, 11.4)	28.7 (24.3, 33.1)	1 (Ref)
Gender						
Female	1230 (46.4)	13.4 (11.4, 15.4)	49.0 (44.5, 53.5)	7.8 (5.5, 10.1)	29.8 (25.8, 33.9)	1.00 (0.86, 1.17)
Male	1276 (53.6)	10.6 (8.9, 12.3)	52.8 (48.0, 57.6)	8.1 (5.1, 11.2)	28.5 (24.4, 32.6)	1 (Ref)
Race/ethnicity <sup>e,f</sup>						
Non-Hispanic Black	366 (23.2)	7.5 (5.2, 9.8)	46.2 (39.0, 53.5)	13.0 (8.1, 17.8)	33.3 (26.4, 40.2)**	
Asian	196 (14.5)	18.2 (12.6, 23.7)	61.6 (52.8, 70.5)	6.5 (1.7, 11.3)	13.7 (7.5, 20.0)	
Hispanic	450 (28.9)	8.0 (5.9, 10.1)	60.3 (53.4, 67.1)	7.9 (3.7, 12.1)	23.8 (17.9, 29.7)	
Non-Hispanic White	1243 (23.5)	19.1 (16.8, 21.3)	44.8 (40.3, 49.3)	4.0 (1.9, 6.2)	32.1 (28.0, 36.2)	
Other non-Hispanic	98 (4.3)	5.4 (1.8, 8.9)	27.5 (15.5, 39.4)	5.5 (0.0, 11.0)	61.7 (48.8, 74.6)	
Multiple	153 (5.6)	8.9 (3.9, 13.8)	40.1 (29.3, 50.8)	9.4 (0.8, 18.0)	41.7 (31.2, 52.2)	
Child up-to-date with routine vaccines						
Yes	2254 (90.0)	12.8 (11.3, 14.2)	51.6 (48.1, 55.1)	7.6 (5.6, 9.6)	28.0 (24.9, 31.0)*	1 (Ref)
No	190 (8.0)	2.9 (1.0, 4.7)	48.0 (37.2, 58.9)	9.1 (1.3, 16.8)	40.0 (29.2, 50.8)	1.18 (0.91, 1.54)
Not sure <sup>d</sup>	62 (2.0)					
Child influenza vaccine status						
Received	1255 (44.0)	20.7 (17.9, 23.4)	55.3 (50.4, 60.3)	6.2 (3.3, 9.1)	17.8 (13.7, 22.0)**	1 (Ref)
Will get	685 (28.6)	8.4 (6.4, 10.5)	70.3 (65.0, 75.5)	5.5 (2.4, 8.6)	15.8 (11.7, 19.9)	0.87 (0.66, 1.16)
Will not get	465 (22.3)	1.6 (0.7, 2.6)	22.0 (15.7, 28.3)	8.2 (4.3, 12.1)	68.2 (61.5, 74.8)	2.09 (1.67, 2.62)
Not sure	101 (5.1)	0.8 (0.1, 1.6)	33.2 (19.6, 46.8)	35.6 (22.2, 49.0)	30.4 (18.9, 41.8)	2.16 (1.62, 2.88)
<b>Parent characteristics</b>						
Age, y						
18–29	230 (13.1)	10.3 (6.7, 13.9)	48.6 (38.9, 58.2)	7.1 (2.3, 11.8)	34.0 (24.4, 43.7)	1.19 (0.91, 1.57)
30–39	1155 (42.3)	12.7 (10.6, 14.7)	54.5 (49.6, 59.5)	7.2 (4.1, 10.3)	25.6 (21.5, 29.7)	1 (Ref)
≥ 40	1121 (44.6)	11.6 (9.7, 13.6)	48.4 (43.4, 53.4)	9.0 (6.0, 11.9)	31.0 (26.7, 35.4)	1.07 (0.89, 1.29)
Gender						
Male	1204 (36.1)	18.6 (15.9, 21.3)	48.1 (42.9, 53.3)	6.4 (3.2, 9.5)	26.9 (22.3, 31.6)**	1 (Ref)
Female	1252 (61.6)	8.4 (6.9, 9.8)	53.3 (49.0, 57.6)	9.1 (6.5, 11.7)	29.2 (25.5, 33.0)	1.08 (0.89, 1.30)
Transgender/other <sup>d</sup>	50 (2.3)					
Race/ethnicity <sup>f</sup>						
Non-Hispanic Black	361 (22.8)	7.2 (5.0, 9.4)	47.0 (39.7, 54.3)	12.9 (7.9, 17.9)	32.9 (26.1, 39.7)**	1.41 (1.17, 1.72)
Asian	204 (15.3)	17.6 (12.3, 22.9)	58.7 (49.7, 67.6)	5.0 (0.9, 9.0)	18.7 (11.5, 26.0)	0.97 (0.69, 1.35)
Hispanic	462 (29.6)	8.3 (6.2, 10.5)	60.8 (54.1, 67.5)	8.3 (4.1, 12.5)	22.6 (16.9, 28.2)	0.96 (0.76, 1.21)

Continued

**TABLE 1— Continued**

Characteristic	No. (%) <sup>a</sup>	Child Already Vaccinated, % (95% CI) <sup>b</sup>	Parent Very Likely or Somewhat Likely to Vaccinate Child, % (95% CI) <sup>b</sup>	Parent Not Sure Whether to Vaccinate Child, % (95% CI) <sup>b</sup>	Parent Not Very Likely or Not at All Likely to Vaccinate Child, % (95% CI) <sup>b</sup>	APR for Vaccine Hesitancy <sup>c</sup> (95% CI)
Non-Hispanic White	1317 (26.3)	18.1 (16.0, 20.2)	43.9 (39.5, 48.3)	5.8 (3.1, 8.5)	32.2 (28.2, 36.4)	1 (Ref)
Other non-Hispanic	102 (3.7)	5.3 (1.7, 8.8)	26.9 (14.9, 38.9)	6.4 (0.0, 12.8)	61.4 (48.4, 74.5)	1.03 (0.84, 1.27)
Multiple <sup>d</sup>	60 (2.3)					
Education (highest completed)						
High school or less	353 (39.2)	9.4 (6.8, 12.0)	51.5 (44.7, 58.3)	10.6 (6.4, 14.8)	28.5 (22.6, 35.0)**	1.06 (0.87, 1.29)
Some college or tech school	387 (20.7)	5.2 (3.6, 6.8)	50.9 (44.4, 57.4)	8.1 (4.7, 11.6)	35.8 (29.7, 41.8)	1.22 (1.02, 1.44)
Completed college or more	1734 (38.6)	18.5 (16.6, 20.4)	50.2 (46.6, 53.8)	5.0 (3.1, 6.8)	26.3 (23.2, 29.5)	1 (Ref)
Missing <sup>d</sup>	32 (1.5)					
Household income, US\$						
< 50 000	527 (40.1)	7.2 (5.4, 9.1)	56.2 (50.1, 62.3)	11.5 (7.5, 15.5)	25.1 (19.9, 30.2)**	0.85 (0.68, 1.06)
50 000–99 999	558 (21.5)	11.6 (8.8, 14.5)	54.8 (48.7, 60.8)	7.2 (3.4, 10.9)	26.4 (21.1, 31.5)	0.84 (0.68, 1.02)
≥ 100 000	1256 (28.3)	20.0 (17.5, 22.5)	42.8 (38.3, 47.3)	2.8 (1.2, 4.4)	34.4 (29.7, 39.0)	1 (Ref)
Not sure/missing	165 (10.1)	8.1 (3.9, 12.3)	45.7 (34.3, 57.1)	9.9 (3.8, 16.0)	36.3 (26.2, 46.3)	0.85 (0.64, 1.11)
Parent COVID-19 vaccination status						
Vaccinated	1899 (84.5)	13.5 (12.0, 15.1)	58.3 (54.7, 61.9)	7.3 (5.1, 9.4)	20.9 (17.9, 24.0)**	1 (Ref)
Not vaccinated	518 (11.6)	2.2 (1.4, 3.1)	11.6 (7.9, 15.2)	9.7 (5.3, 14.1)	76.5 (71.0, 82.0)	1.53 (1.32, 1.77)
Prefer not to answer <sup>d</sup>	89 (3.9)					
Parent concerned child will become sick from COVID-19						
Very or somewhat worried	1578 (63.6)	13.4 (11.7, 15.1)	60.4 (56.4, 64.4)	7.8 (5.4, 10.2)	18.4 (15.0, 21.8)**	1 (Ref)
A little or not at all worried	905 (34.9)	9.3 (7.2, 11.4)	34.9 (29.5, 40.3)	6.8 (4.1, 9.5)	49.0 (43.7, 54.2)	1.13 (0.91, 1.42)
Not sure <sup>d</sup>	23 (1.5)					
Parent concerned child will infect others family members						
Very or somewhat worried	1586 (64.1)	13.8 (12.0, 15.6)	61.7 (57.8, 65.7)	7.8 (5.4, 10.1)	16.7 (13.5, 19.9)**	1 (Ref)
A little or not at all worried	898 (34.2)	8.5 (6.6, 10.4)	31.1 (25.6, 36.6)	6.9 (4.1, 9.7)	53.5 (48.1, 58.9)	1.50 (1.18, 1.91)
Not sure <sup>d</sup>	35 (1.7)					
Vote in 2021 mayoral election						
Did not vote	786 (51.7)	7.6 (5.8, 9.3)	51.4 (46.4, 56.4)	10.3 (7.1, 13.6)	30.7 (26.2, 35.1)**	1.41 (1.13, 1.76)
Eric Adams (Democrat)	1112 (32.1)	19.9 (17.2, 22.6)	55.8 (50.9, 60.7)	6.4 (3.6, 9.2)	17.9 (13.8, 22.0)	1 (Ref)
Curtis Sliwa (Republican)	397 (14.0)	9.4 (6.6, 12.3)	39.0 (29.2, 48.7)	1.8 (0.1, 3.4)	49.8 (40.9, 58.7)	1.27 (1.03, 1.57)
Other	211 (2.2)	12.8 (8.4, 17.2)	50.2 (39.1, 61.4)	12.6 (4.6, 20.4)	24.4 (15.9, 32.9)	1.29 (0.96, 1.72)
NYC borough						
Bronx	396 (21.0)	6.8 (4.6, 8.9)	56.7 (49.3, 64.1)	8.1 (4.1, 12.1)	28.4 (21.7, 35.2)**	1.07 (0.78, 1.47)
Brooklyn	743 (33.5)	10.8 (8.7, 12.9)	49.3 (43.7, 54.8)	8.6 (5.1, 12.2)	31.3 (26.3, 36.2)	1.09 (0.82, 1.46)

Continued

**TABLE 1— Continued**

Characteristic	No. (%) <sup>a</sup>	Child Already Vaccinated, % (95% CI) <sup>b</sup>	Parent Very Likely or Somewhat Likely to Vaccinate Child, % (95% CI) <sup>b</sup>	Parent Not Sure Whether to Vaccinate Child, % (95% CI) <sup>b</sup>	Parent Not Very Likely or Not at All Likely to Vaccinate Child, % (95% CI) <sup>b</sup>	APR for Vaccine Hesitancy <sup>c</sup> (95% CI)
Manhattan	671 (13.5)	28.4 (23.1, 33.7)	45.1 (37.5, 52.7)	5.8 (2.1, 9.6)	20.7 (12.8, 28.6)	1 (Ref)
Queens	482 (26.1)	10.2 (7.5, 12.9)	56.5 (49.6, 63.5)	7.7 (3.4, 11.9)	25.6 (19.9, 31.3)	1.01 (0.74, 1.38)
Staten Island	214 (5.9)	5.9 (3.1, 8.7)	30.4 (20.9, 39.8)	9.8 (2.5, 17.1)	53.9 (43.8, 64.0)	1.44 (1.05, 1.98)

Note. APR = adjusted prevalence ratio; CI = confidence interval.

<sup>a</sup>Survey weights applied to sample to represent NYC population of parents by race, ethnicity, education, and borough.

<sup>b</sup>Weighted percentages are prevalence estimates of NYC parents reporting vaccination plans for their youngest child aged 5 to 11 years.

<sup>c</sup>Adjusted models compare parents who were unsure, not very likely, and not at all likely to vaccinate children with parents of vaccinated children and parents very or somewhat likely to vaccinate children; models include all variables shown in the table except child race/ethnicity (see footnote e).

<sup>d</sup>Categories are not presented in the table as they yielded unreliable standard error estimates.

<sup>e</sup>Child's race/ethnicity excluded from adjusted models because of collinearity with parent's race/ethnicity.

<sup>f</sup>Survey respondents could indicate 1 option for race/ethnicity from the following options: African American or Black, Asian, Hispanic or Latino/a, Caucasian/White, multiple, and other.

\* $P < .05$ ; \*\* $P < .001$ .

vaccines for children aged 5 to 11 years, almost 40% were vaccine hesitant. This is consistent with a March 2021 survey of NYC parents<sup>8</sup> and suggests that many parents may not vaccinate their children. Also consistent with previous studies, the main reasons for vaccine hesitancy included safety and effectiveness.<sup>8,9</sup> These findings are concerning; however, our data provide information that can inform efforts to increase vaccine acceptability.

Similar to previous studies, non-Hispanic Black parents expressed more vaccine hesitancy compared with non-Hispanic White parents.<sup>8</sup> Racial disparities in vaccine hesitancy are driven by multiple factors—including mistrust and misinformation as well as structural racism—that may require interventions that not only target individuals but also reduce structural barriers.<sup>10</sup> More than half of vaccine-hesitant parents do not believe children need COVID-19 vaccination, suggesting that greater awareness is needed about the risk of COVID-19 infection in children

and their role in transmission. Finally, we observed that poor uptake of routine pediatric vaccinations was not associated with COVID-19 vaccine hesitancy, likely because of school-based vaccine mandates<sup>11</sup>; however, lack of flu vaccination in children was. Previous studies have shown higher parental hesitancy for flu compared with routine vaccines.<sup>12</sup> Our data provide evidence of this effect with regard to COVID-19, underscoring the importance of vaccine mandates and suggesting that uptake of COVID-19 vaccines will likely be lower in children than mandated immunizations.

Limitations of our study include combined race/ethnicity—which may mask heterogeneity within groups—and lack of information about the specific vaccine-related safety concerns of parents.

## PUBLIC HEALTH IMPLICATIONS

In a survey conducted after emergency use authorization of COVID-19 vaccines

for children aged 5 to 11 years, we found that many parents were vaccine hesitant. Greater efforts are needed to increase parental awareness about the safety and efficacy of COVID-19 vaccination to foster vaccine confidence, acceptance, and uptake. *AJPH*

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## PUBLICATION INFORMATION

Full Citation: Teasdale CA, Ratzan S, Rauh L, Lathan HS, Kimball S, El-Mohandes A. COVID-19 vaccine coverage and hesitancy among New York

City parents of children aged 5–11 years. *Am J Public Health*. 2022;112(6):931–936.

Acceptance Date: February 7, 2022.

DOI: <https://doi.org/10.2105/AJPH.2022.306784>

## CONTRIBUTORS

C. A. Teasdale helped design the study and develop the survey instrument, and conducted the analyses and drafted the initial manuscript. S. Ratzan and A. El-Mohandes designed the study, including the sampling strategy, and oversaw development of the survey instrument, reviewed data, and drafted, reviewed, and revised the manuscript. S. Kimball assisted in the design of the sampling strategy, oversaw data procurement and cleaning, and reviewed the manuscript. H. S. Lanthan and L. Rauh contributed to the design of the data collection instrument and to data procurement, reviewed findings, developed figures, and revised manuscript drafts. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

## ACKNOWLEDGMENTS

We thank the survey participants.

## CONFLICTS OF INTEREST

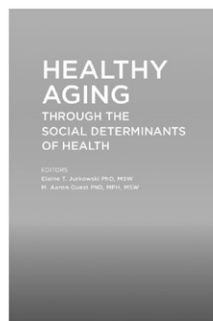
The authors have no conflicts of interest to declare.

## HUMAN PARTICIPANT PROTECTION

The CUNY School of Public Health and Health Policy institutional review board approved the protocol.

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2021, SOFTCOVER,  
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## Healthy Aging Through The Social Determinants of Health

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