

Assessing Public Health and Preventative Health Needs of Underserved Communities in Rhode Island

PHILIP A. CHAN, MD; NATALIE FENN, PhD; YELENA MALYUTA, MPH; MAXIMILLIAN ERBE, MPH; MORGAN LEONARD, MPA; DANIEL MCGUIRE; SUSSY SANTANA; KATHERINE WESTROM, BA; ALEXI ALMONTE, BS; PETER SALHANEY, MS; BRYCE PERLER, MD; AMANDA MAGUIRE-WILKERSON, DrPH; JUN TAO, PhD; AMY S. NUNN, ScD

ABSTRACT

BACKGROUND: In the United States, significant disparities exist in preventative health among underserved communities, including African American/Black (AA/B), Hispanic/Latino (H/L) and lesbian/gay/bisexual/transgender/queer (LGBTQ+) individuals. We explored the influence of social determinants of health (SDOH) on preventative health outcomes in these groups.

METHODS: We conducted a comprehensive cross-sectional needs assessment at safety-net health clinics in Providence, Rhode Island, from June to September 2022.

RESULTS: Of N=1,017 individuals, 67% identified as H/L, 16% identified as AA/B, and 19% identified as LGBTQ+. The most common diagnosed health conditions were anxiety (26%), depression (23%), hypertension (20%), and diabetes (15%). People reported most commonly needing help with food (31%), housing (25%), and utilities (22%). More social needs were associated with reductions in COVID-19 booster vaccination ($p<.01$) and higher mental health diagnoses ($p<.01$). AA/B individuals with higher health literacy were also less likely to be diagnosed with a mental health condition ($p=.02$). LGBTQ+ individuals were more likely to report a history of mental health illness, tobacco use, hazardous alcohol use, other substance use, and more sexual partners ($p<.05$).

CONCLUSIONS: Addressing health literacy and other social determinants of health is important to address disparities and achieve health equity among marginalized communities.

KEYWORDS: Social determinants of health; health disparities; mental health; sexual health; health literacy

INTRODUCTION

In the United States (US), significant health disparities exist among underserved communities, including African American/Black (AA/B), Hispanic/Latino (H/L), and lesbian, gay, bisexual, transgender, and queer (LGBTQ+) individuals.¹ The COVID-19 pandemic highlighted and exacerbated the numerous disparities experienced by these underserved populations,² including those related to infectious diseases

prevention (i.e., vaccination), substance use, mental health, and sexual health. The peak of the pandemic saw an almost 30% reduction in primary care visits.¹ Post-pandemic, the extent of these disparities is largely unknown. Approaches to address these disparities have included focusing on addressing structural inequalities.³ In addition, disparities among underserved communities are affected by social determinants of health (SDOH).⁴ SDOH are defined as conditions and environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health outcomes.⁴ Understanding and addressing SDOH is critical to improving health disparities among underserved communities in the US.

SDOH include a diverse set of factors that affect health outcomes, including income and socioeconomic status, education opportunities, access to healthcare, occupation and employment status, workplace safety, access to housing, gender inequity, racial segregation, social support, policy and laws, availability of transportation, neighborhoods, and many others.⁵ These determinants can have a significant impact on population health which disproportionately impacts underserved communities. SDOH factors, such as health behaviors, clinical care, social and economic status, and physical environment, may account for up to half of health outcomes.^{6,7} This also includes mortality.^{8,9} Studies have found that addressing SDOH can improve population-level health outcomes. As an example, states that dedicate more funding for social services compared to medical services have seen improved health outcomes compared to states that do not.¹⁰

Health literacy is also considered a SDOH,^{11,12} and is defined as the degree to which individuals can find, understand, and use information and services for health-related decisions and actions for themselves and others. National assessments of health literacy demonstrate that approximately 36% of US adults have basic or below-basic health literacy,¹³ with individuals of color and non-native English speakers more likely to have lower health literacy than White individuals and English speakers, respectively.¹⁴⁻¹⁶ Lower socioeconomic status, including lower educational attainment, is the most important determinant of health literacy.¹⁷ However, less is known about how health literacy as a SDOH affects preventative health outcomes among underserved communities.

The goal of this study was to assess the strength of relationships between SDOH, including health literacy, and preventative health outcomes at safety-net clinics in a major urban area in the US, with a focus on AA/B, H/L and LGBTQ+ communities.

METHODS

We conducted a cross-sectional needs assessment on preventative health among patients presenting to safety-net health clinics in Providence, Rhode Island (RI) from June 2022 to September 2022. Sites included four community-based clinics providing most major safety-net healthcare in the city serving AA/B, H/L and LGBTQ+ individuals. All patients attending clinics during the study period were asked to participate. If interested, a needs assessment was conducted and included questions on demographics, SDOH, infectious diseases' vaccination, substance use, mental health, sexual health, health communications, and media use habits. Vaccination outcomes included: 1) Initial vaccination against COVID-19 (yes/no); 2) Booster dose for COVID-19 (yes/no); 3) Children vaccinated against COVID-19 (yes all/no or only some children).

Substance use was assessed across three dimensions: alcohol, tobacco, other substance use. Alcohol use outcomes were based on the first two questions of the AUDIT-C, a questionnaire utilized to determine alcohol dependence.¹⁸ The questions of "How often do you have a drink containing alcohol?" and "How many standard drinks containing alcohol do you have on a typical day?" were summed to produce a total score (0-8), with higher scores representing hazardous alcohol use. A cut-off score of 3+ to dichotomize individuals into two groups was used: hazardous drinking (3+) and not engaging in hazardous drinking (two or fewer). Tobacco outcomes were based on: "Do you currently use tobacco products including cigarettes, cigars, chewing tobacco, hookah, vaping tobacco, etc.?" (No versus any use). Other substance use was based on: "In the past six months, have you used any of the following substances?" with a list of multiple substances based on National Institute of Drug Abuse screening tools (Any use compared to none).

Mental health was assessed using the CDC's Healthy Days core question: "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 was your mental health not good?"¹⁹ Given the non-normal distribution of count data, data were recoded into quintiles with 0 days representing no days of poor mental health, 1-5 representing minimal poor mental health, 6-10 representing moderately poor mental health, 11-20 representing frequently poor mental health, and 21-30 representing severely poor mental health. Participants were asked to endorse conditions that a health professional had ever stated they had. Anxiety, depression, or other mood disorders were classified as "Yes"

to having a history of a mental health condition, while those who did not select these conditions were classified as "No".

Sexual health was assessed with: "How many partners have you had sex with in the past three months? Including oral, vaginal, or anal sex." (0 or 1 partner compared to 2+). Participants were asked: "Not including blood donations, when was your last HIV test?" Participants were coded as never (0), within the past year (1), more than one year ago (2).

SDOH were evaluated including income, education, employment, housing, public assistance, preferred language, insurance, health literacy, and social needs. Social needs were determined by: "What do you need help with?" Options included: food, housing, clothing, utilities, education/tuition, employment/job training, transportation, immigration, substance use treatment, legal assistance, childcare, smoking cessation, mental health, other, or no assistance needed. Social needs scores were categorized as 0 needs, 1 need, 2 needs, 3 or more needs. Health literacy as a SDOH was assessed using previously validated screening questions^{20,21}: "How often do you need help reading materials from your healthcare provider?" (Never=1, Occasionally=2, Sometimes=3, Often=4, Always=5); "How often do you have problems learning due to difficulty understanding written information?" (Never=1, Occasionally=2, Sometimes=3, Often=4, Always=5); "How often do you have problems understanding what is told to you about your medical condition?" (Never=1, Occasionally=2, Sometimes=3, Often=4, Always=5); "What is your level of confidence filling out medical forms alone?" (Extremely=1, Quite a bit=2, Somewhat=3, A little bit=4, Not at all=5). Total scores were produced on a scale of 4-20. Participants were categorized into three groupings of health literacy: limited (4-12), marginal (13-16), adequate (17-20), in accordance with previous validation.

Baseline characteristics and associations with all health outcomes (COVID-19 vaccination, substance use, mental health, and sexual health) were examined using chi-square and Fisher's exact tests. Multinomial and binary logistic regression models evaluated relationships between SDOH and each preventative health outcome. Interaction terms were included for binary regressions to explore the moderating role of race and ethnicity on the relationship between health literacy and outcomes. Given prior research documenting disparities in health literacy particularly among Black/AA and Hispanic/Latino communities, we chose to incorporate an interaction term in the regression models to specifically examine relationships between race (non-Black/AA vs. Black/AA individuals) and the three levels of health literacy (limited vs. marginal, limited vs. adequate), and then ethnicity (non-Hispanic/Latino vs. Hispanic/Latino individuals) and the three levels of health literacy (limited vs. marginal, limited vs. adequate). Analyses were conducted in Stata 17.0 and SPSS 29.0. De-identified data collected for the needs assessment was approved by the Brown University Institutional Review Board for publication.

RESULTS

A total of N=1,223 individuals were offered enrollment and N=1,017 individuals completed the survey (86%). Average age was 42 years, 67% identified as H/L, 16% as AA/B, 60% were born outside the US, and 25% reported household incomes of <\$10,000 annually [Table 1]. A total of 6% identified as transgender or gender diverse, 12% as bisexual+ (we use bisexual+ as an umbrella term for people who feel sexual and emotional attraction to more than one gender (bisexual, pansexual, fluid, queer, asexual, and other free identifiers)), and 7% as gay or lesbian. People reported needing the most help with food (31%), housing (25%), and utilities (22%). Common health conditions people reported included anxiety (26%), depression (23%), hypertension (20%), diabetes (15%), obesity (14%), and asthma (14%). Common sources of health information included trusted healthcare providers (56%), the internet (36%), family (19%), friends (13%), and social media (10%). Roughly half reported limited or marginal proficiency reading, understanding written, and understanding verbal medical information, and confidence completing medical forms alone. Associations between SDOH and preventative health outcomes appear in Tables 2–4.

In terms of COVID-19 vaccination, SDOH including socioeconomic status and education were significantly associated with receiving vaccination. A household income >\$25k was associated with approximately 3x greater odds of having received at least one dose of the vaccine ($p=.004$) compared to individuals with household incomes <\$10k. Compared to those with less than a high school degree, having some college or greater was associated with an approximately 2-4x greater odds of having received a COVID-19 booster ($p=.003$). Compared to reporting no social needs to having 1+ social needs was associated with reduced odds of receiving a COVID-19 booster (ORs 0.3–0.5; $p=.003$). There were no differences in age, gender, race, ethnicity, sexual orientation, education, or preferred language and receiving at least one dose of the vaccine. Limited or marginal degrees of health literacy was not associated with receiving any vaccination including a COVID-19 booster, compared to those with adequate health literacy. Compared to those with incomes <\$10k/year, having incomes between \$25,001–\$75k was associated with 4x greater odds of having all children vaccinated (95% CI 1.76–8.98). Interestingly, compared to those with less than a high school degree, receiving at least some college was associated with reduced odds of having all children vaccinated against COVID-19 (OR 0.37, 95% CI 0.16–0.86).

Gender and sexual orientation were associated with tobacco and alcohol use [Table 3]. Identifying as bisexual+ was associated with approximately 3x increased odds of tobacco use (95% CI 1.30–5.23) and 7x increased odds of hazardous drinking (95% CI 3.33–14.66) compared to identifying as straight. There was no difference in race, ethnicity, or degree of health literacy and tobacco use or hazardous

Table 1. Social Determinants in a Sample of 1017 Patients Across Rhode Island

Characteristics		N	%
Age	18–29	237	23
	30–39	239	24
	40–49	174	17
	50–59	158	16
	60+	135	13
	Missing	74	7
Gender	Cisgender Man	292	29
	Cisgender Woman	663	65
	Transgender/Gender Diverse	58	6
	Missing	4	0.4
Race	White	330	32
	Black or African American	163	16
	American Indian/Alaska Native	28	3
	Asian	20	2
	Native Hawaiian/Pacific Islander	10	1
	Not Listed	293	29
	Decline to Answer	200	20
Ethnicity	Hispanic/Latino	683	67
	Non-Hispanic/Latino	318	31
	Decline to Answer	15	2
	Missing	1	0.1
Sexual Orientation	Heterosexual	742	73
	Bisexual+	119	12
	Lesbian/Gay	70	7
	Missing	86	9
Income	<\$10,000	256	25
	\$10,000–\$25,000	270	27
	\$25,001–\$75,000	276	27
	>\$75,000	78	8
	Missing	137	14
Education	< High School Degree	238	23
	High School Graduate	262	26
	Some College	235	23
	College Graduate+	270	27
	Missing	12	1
Preferred Language	Other Language	501	49
	English	516	51
Health Literacy	Limited	245	24
	Marginal	234	23
	Adequate	506	50
	Missing	32	3
Social Needs	0 Needs	393	39
	1 Need	243	24
	2 Needs	153	15
	3+ Needs	228	22

Table 2. Logistic Regression Results of Factors Associated with Covid-19 Outcomes

Characteristics		Received One Vaccine Dose	Received Covid Booster	Children Received Vaccine
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Age	18–29	ref	ref*	ref*
	30–39	0.84 (.46–1.53)	1.13 (.63–2.03)	2.33 (.96–5.67)
	40–49	1.29 (.61–2.77)	1.71 (.84–3.50)	7.32 (2.76–19.38)*
	50–59	1.09 (.52–2.26)	2.75 (1.22–6.22)*	5.13 (1.64–16.08)*
	60+	2.26 (.95–5.42)	3.65 (1.50–8.86)*	15.50 (1.39–172.61)*
Gender	Cisgender Men	ref	ref	ref
	Cisgender Women	0.98 (.59–1.64)	0.67 (.40–1.14)	0.86 (.45–1.66)
	Trans/Gender Diverse	4.84 (.93–25.30)	2.63 (.62–11.17)	0.16 (.01–3.99)
Race	non-Black/AA	ref	ref	ref
	Black/AA	1.40 (.25–7.85)	0.33 (.07–1.58)	0.49 (.04–6.86)
Ethnicity	non-Hispanic/Latino	ref	ref	ref
	Hispanic/Latino	0.89 (.24–3.34)	1.02 (.24–4.30)	0.16 (.02–1.68)
Sex Orientation	Heterosexual	ref	ref*	ref
	Bisexual+	0.83 (.39–1.78)	2.62 (1.14–6.04)*	1.39 (.41–4.69)
	Lesbian/Gay	3.82 (.83–17.62)	3.11 (1.10–8.81)*	1.66 (.10–26.49)
Income	<\$10,000	ref*	ref	ref*
	\$10,000–\$25,000	1.64 (.98–2.77)	0.98 (.53–1.80)	1.57 (.73–3.37)
	\$25,001–\$75,000	3.11 (1.65–5.89)*	0.64 (.34–1.20)	3.98 (1.76–8.98)*
	>\$75,000	3.23 (1.02–10.23)*	0.89 (.31–2.54)	2.31 (.57–9.47)
Education	<High School Degree	ref	ref*	ref*
	High School Graduate	0.85 (.46–1.54)	1.28 (.65–2.51)	0.45 (.20–1.01)
	Some College	1.68 (.83–3.40)	2.35 (1.13–4.87)*	0.37 (.16–.86)*
	College Graduate+	1.75 (.83–3.69)	3.76 (1.71–8.29)*	0.88 (.38–2.07)
Language	Other Language	ref	ref	ref
	English	0.58 (.31–1.08)	0.35 (.18–.66)*	0.55 (.26–1.17)
Health Literacy	Limited	ref	ref	ref
	Marginal	0.9 (.19–4.15)	0.38 (.08–1.93)	0.14 (.01–1.98)
	Adequate	0.8 (.21–3.14)	0.34 (.08–1.47)	0.62 (.05–7.06)
Social Needs	0 Needs	ref	ref*	ref
	1 Need	0.79 (.43–1.45)	0.45 (.24–.82)*	1.06 (.51–2.20)
	2 Needs	0.47 (.24–.91)	0.29 (.14–.61)*	0.88 (.37–2.09)
	3+ Needs	0.87 (.46–1.65)	0.38 (.20–.71)*	1 (.44–2.25)
Literacy x Race^a	Limited x non-Black/AA	ref	ref	ref
	Marginal x Black/AA	2.88 (.18–45.83)	4.77 (.64–35.59)	3.79 (.13–114.04)
	Adequate x Black/AA	0.62 (.09–4.08)	1.83 (.32–10.36)	0.61 (.03–10.79)
Literacy x Ethnicity^a	Limited x non-H/L	ref	ref	ref
	Marginal x H/L	1.37 (.26–7.26)	1.57 (.28–8.79)	10.83 (.70–167.46)
	Adequate x H/L	1.29 (.31–5.45)	2.43 (.52–11.45)	2.24 (.18–27.22)

AA= African American; H/L= Hispanic/Latino; *=significant at $p<.05$; a= For interaction terms, the first line represents the reference group, where non-Black/AA individuals are compared to Black/AA individuals across limited, marginal, and adequate levels of literacy. For ethnicity, non-H/L individuals are compared to H/L individuals across limited, marginal, and adequate levels of literacy.

drinking. Regarding other substance use, identifying as bisexual+ was associated with a 5x greater odds (95% CI 2.60–9.76) and gay/lesbian with 3x greater odds of use (95% CI 1.46–6.47), compared to those identifying as straight. Preference for English was associated with an approximately 7x increased odds, compared to preferring other languages (95% CI 3.51–13.15). Endorsing social needs was associated with substance use. Compared to those with no needs, those with one need had 2.5x greater odds of substance use

(95% CI 1.46–4.44), and those with 3+ needs had 2.3x greater odds (95% CI 1.28–4.30). There was no difference in race, ethnicity, or degree of health literacy and substance use.

Gender was significantly associated with ever being diagnosed with a mental health condition. Compared to men, women had 1.6x greater odds of ever being diagnosed (95% CI 1.04–2.50), and transgender/gender diverse individuals had 6x greater odds (95% CI 2.11–16.89). Compared to straight individuals, those identifying as bisexual+ had

Table 3. Logistic Regression Results of Factors Associated with Substance Use Outcomes

Characteristics		Tobacco Use	Hazardous Drinking	Other Substance Use Past 6mo
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Age	18–29	ref	ref	ref
	30–39	1.08 (.57–2.02)	0.65 (.33–1.30)	0.79 (.45–1.37)
	40–49	1.75 (.88–3.49)	0.71 (.33–1.55)	0.76 (.40–1.45)
	50–59	2.19 (1.08–4.42)	0.83 (.37–1.90)	1.18 (.59–2.38)
	60+	1.05 (.45–2.46)	0.59 (.21–1.61)	0.65 (.29–1.46)
Gender	Cisgender Men	ref*	ref*	ref*
	Cisgender Women	0.56 (.34–.90)*	0.23 (.13–.41)*	0.5 (.31–.79)*
	Trans/Gender Diverse	0.35 (.11–1.05)	0.04 (.01–.14)*	0.47 (.18–1.23)
Race	non-Black/AA	ref	ref	ref
	Black/AA	0.7 (.16–3.13)	0	1.06 (.25–4.39)
Ethnicity	non-Hispanic/Latino	ref	ref	ref
	Hispanic/Latino	0.83 (.26–2.63)	0.48 (.10–2.43)	1.47 (.45–4.80)
Sex Orientation	Heterosexual	ref*	ref*	ref*
	Bisexual+	2.61 (1.30–5.23)*	6.99 (3.33–14.66)*	5.04 (2.60–9.76)*
	Lesbian/Gay	1.05 (.42–2.61)	3.07 (1.40–6.75)*	3.07 (1.46–6.47)*
Income	<\$10,000	ref	ref	ref
	\$10,000–\$25,000	0.96 (.56–1.63)	1.33 (.61–2.92)	1.02 (.57–1.82)
	\$25,001–\$75,000	0.53 (.29–.99)	1.74 (.80–3.81)	0.75 (.41–1.37)
	>\$75,000	0.37 (.13–1.06)	3.78 (1.42–10.08)	0.74 (.32–1.72)
Education	<High School Degree	ref	ref	ref
	High School Graduate	1.54 (.82–2.92)	0.8 (.34–1.92)	1.13 (.56–2.27)
	Some College	1.24 (.62–2.48)	0.77 (.31–1.95)	1.06 (.52–2.19)
	College Graduate+	0.6 (.28–1.30)	1 (.41–2.44)	1.09 (.52–2.31)
Language	Other Language	ref	ref	ref
	English	2.98 (1.56–5.71)*	1.56 (.74–3.30)	6.79 (3.51–13.15)*
Health Literacy	Limited	ref	ref	ref
	Marginal	0.82 (.23–2.86)	0.65 (.13–3.30)	2.48 (.73–8.44)
	Adequate	0.76 (.25–2.33)	0.92 (.22–3.85)	2.67 (.88–8.08)
Social Needs	0 Needs	ref	ref	ref*
	1 Need	0.99 (.54–1.79)	1.32 (.69–2.51)	2.54 (1.46–4.44)*
	2 Needs	1.11 (.57–2.16)	0.99 (.44–2.22)	1.6 (.83–3.10)
	3+ Needs	1.35 (.75–2.43)	0.87 (.41–1.86)	2.34 (1.28–4.30)*
Literacy x Race ^a	Limited x non-Black/AA	ref	ref	ref
	Marginal x Black/AA	0.83 (.11–6.54)	0	0.49 (.08–3.19)
	Adequate x Black/AA	1.99 (.37–10.57)	0	0.92 (.19–4.45)
Literacy x Ethnicity ^a	Limited x non-H/L	ref	ref	ref
	Marginal x H/L	0.8 (.19–3.36)	3.09 (.47–20.46)	0.27 (.06–1.17)
	Adequate x H/L	0.93 (.27–3.27)	2.15 (.39–11.72)	0.37 (.11–1.32)

AA= African American; H/L= Hispanic/Latino; *=significant at $p<.05$; *= For interaction terms, the first line represents the reference group, where non-Black/AA individuals are compared to Black/AA individuals across limited, marginal, and adequate levels of literacy. For ethnicity, non-H/L individuals are compared to H/L individuals across limited, marginal, and adequate levels of literacy.

4.5x greater odds (95% CI 2.37–8.52). Regarding household income, individuals earning \$10k–\$25k had reduced odds, compared to those making <\$10k (OR 0.45, 95% CI 0.28–0.74). Social needs were significantly associated with mental health. Compared to those without social needs, those with 1+ needs had 2.3–3.7x greater odds of ever being diagnosed ($p<.001$). There was no difference in race and ethnicity and having a mental health condition. However, there was an interaction effect between race and health literacy. Black/

AA individuals with marginal or adequate health literacy had reduced odds of ever being diagnosed with a mental health condition compared to non-Black/AA individuals with limited health literacy (ORs 0.07–0.18; $p=.013$). [See **Table 5**.]

Several social identity variables were associated with sexual health. Identifying as a cisgender woman or as transgender/gender diverse was associated with reduced odds of having 2+ sexual partners (ORs 0.08–0.20; $p<.001$).

Table 4. Logistic Regression Results of Factors Associated with Sexual Health Outcomes

Characteristics		HIV Test Within the Past Year	HIV Test More Than A Year Ago	Number of Sexual Partners
		OR (95% CI)	OR (95% CI)	OR (95% CI)
Age	18–29	4.64 (2.03–10.59)*	1.42 (.63–3.19)	ref
	30–39	10.35 (4.64–23.11)*	2.89 (1.35–6.19)*	0.91 (.41–1.99)
	40–49	9.76 (4.08–23.34)*	4.9 (2.17–11.05)*	0.9 (.36–2.28)
	50–59	4.37 (1.90–10.04)*	3.4 (1.60–7.19)*	0.2 (.05–.77)
	60+	ref*	ref*	0.18 (.03–1.05)
Gender	Cisgender Men	2.22 (.68–7.27)	1.82 (.47–7.12)	ref*
	Cisgender Women	3.17 (1.00–10.04)	3.84 (1.02–14.40)*	0.2 (.10–.44)*
	Trans/Gender Diverse	ref	ref*	0.08 (.02–.27)*
Race	non-Black/African American	0.66 (.32–1.34)	0.59 (.28–1.25)	ref
	Black/African American	ref	ref	1.42 (.11–19.26)
Ethnicity	non-Hispanic/Latino	0.88 (.46–1.70)	0.47 (.23–.96)*	ref
	Hispanic/Latino	ref	ref*	1 (.13–7.77)
Sex Orientation	Heterosexual	0.12 (.04–.40)*	0.36 (.09–1.35)	ref*
	Bisexual+	0.64 (.15–2.66)	1.46 (.30–7.00)	10.3 (4.26–24.91)*
	Lesbian/Gay	ref*	ref	11.01 (4.44–27.29)*
Income	<\$10,000	2.64 (.95–7.31)	1 (.34–2.97)	ref
	\$10,000–\$25,000	2.94 (1.07–8.03)*	2 (.69–5.77)	0.85 (.33–2.20)
	\$25,001–\$75,000	1.72 (.67–4.40)	1.83 (.67–4.95)	0.92 (.26–2.39)
	>\$75,000	ref*	ref	1.0 (.30–3.37)
Education	<High School Degree	0.6 (.28–1.30)	0.41 (.19–.87)	ref
	High School Graduate	0.7 (.34–1.42)	0.65 (.32–1.33)	0.61 (.18–2.08)
	Some College	0.81 (.39–1.68)	0.49 (.23–1.04)	0.52 (.15–1.86)
	College Graduate+	ref	ref	1 (.29–3.45)
Language	Other Language	0.66 (.34–1.26)	1.17 (.59–2.31)	ref
	English	ref	ref	4.09 (1.18–14.15)*
Health Literacy	Limited	1.25 (.65–2.40)	0.85 (.44–1.65)	ref
	Marginal	0.75 (.42–1.34)	0.84 (.46–1.54)	3.6 (.59–21.88)
	Adequate	ref	ref	2.11 (.41–10.94)
Social Needs	0 Needs	1.94 (1.01–3.71)	1.10 (.57–2.11)	ref
	1 Need	1.56 (.80–3.05)	1.21 (.63–2.34)	1.32 (.54–3.24)
	2 Needs	1.78 (.83–3.85)	1.08 (.49–2.36)	1.07 (.38–2.99)
	3+ Needs	ref	ref	3.18 (1.28–7.94)
Literacy x Race ^a	Limited x non-Black/AA			ref
	Marginal x Black/AA			0.20 (.01–5.94)
	Adequate x Black/AA			0.55 (.03–9.16)
Literacy x Ethnicity ^a	Limited x non-H/L			ref
	Marginal x H/L			0.63 (.06–6.33)
	Adequate x H/L			0.61 (.06–5.02)

AA= African American; H/L= Hispanic/Latino; *=significant at $p<.05$; a= For interaction terms, the first line represents the reference group, where non-Black/AA individuals are compared to Black/AA individuals across limited, marginal, and adequate levels of literacy. For ethnicity, non-H/L individuals are compared to H/L individuals across limited, marginal, and adequate levels of literacy.

Compared to straight individuals, those identifying as bisexual+ had 10.3x increased odds of having multiple sexual partners (95% CI 4.26–24.91), and gay/lesbian individuals had 11x increased odds (95% CI 4.44–27.29). Preference for English was associated with 4.1x increased odds of sex with multiple partners (95% CI 1.18–14.15). Compared to those with incomes >\$75k, household incomes of \$10k–25k was associated with 3x increased odds of testing for HIV within the past year compared to never testing (95% CI 1.07–8.12).

Compared to H/L individuals, being non-H/L was associated with reduced odds of testing for HIV over a year ago, compared to never testing for HIV (OR 0.47, 95% CI 0.23–0.96).

DISCUSSION

This is among the first studies post-pandemic to evaluate preventative health among underserved populations. Major strengths were the systematic sampling and high response

Table 5. Logistic Regression Results of Factors Associated with Mental Health History

Characteristics		History of Mental Health Condition
		OR (95% CI)
Age	18–29	ref
	30–39	1.05 (.63–1.76)
	40–49	0.92 (.50–1.67)
	50–59	0.77 (.41–1.44)
	60+	0.49 (.24–.99)
Gender	Cisgender Men	ref*
	Cisgender Women	1.61 (1.04–2.50)*
	Trans/Gender Diverse	5.97 (2.11–16.80)*
Race	non-Black/African American	ref
	Black/African American	2.05 (.59–7.12)
Ethnicity	non-Hispanic/Latino	ref
	Hispanic/Latino	0.93 (.32–2.69)
Sex Orientation	Heterosexual	ref*
	Bisexual+	4.49 (2.37–8.52)*
	Lesbian/Gay	1.30 (.64–2.65)
Income	<\$10,000	ref*
	\$10,000–\$25,000	0.45 (.28–.74)*
	\$25,001–\$75,000	0.90 (.54–1.49)
	>\$75,000	0.65 (.29–1.47)
Education	<High School Degree	ref
	High School Graduate	0.62 (.36–1.09)
	Some College	0.64 (.36–1.16)
	College Graduate+	0.75 (.41–1.36)
Language	Other Language	ref
	English	1.54 (.90–2.64)
Health Literacy	Limited	ref
	Marginal	2.34 (.69–7.93)
	Adequate	1.78 (.61–5.23)
Social Needs	0 Needs	ref*
	1 Need	2.29 (1.38–3.79)*
	2 Needs	2.09 (1.15–3.80)*
	3+ Needs	3.68 (2.16–6.25)*
Literacy x Race ^a	Limited x non-Black/AA	ref*
	Marginal x Black/AA	0.07 (.01–.45)*
	Adequate x Black/AA	0.18 (.04–.77)*
Literacy x Ethnicity ^a	Limited x non-H/L	ref
	Marginal x H/L	0.28 (.07–1.06)
	Adequate x H/L	0.45 (.14–1.43)

AA= African American; H/L= Hispanic/Latino; *=significant at $p<.05$; a= For interaction terms, the first line represents the reference group, where non-Black/AA individuals are compared to Black/AA individuals across limited, marginal, and adequate levels of literacy. For ethnicity, non-H/L individuals are compared to H/L individuals across limited, marginal, and adequate levels of literacy.

rate (i.e., 86%). The results of the study demonstrate and quantify the complex nature and needs of diverse communities. We found that individuals reported high rates of mental health problems (i.e., anxiety and/or depression), and other chronic medical conditions (i.e., hypertension, diabetes, and/or obesity). Mental health needs were higher than national estimates²¹ and may reflect the underserved communities surveyed. Gender was significantly associated

with ever being diagnosed with mental health conditions. Transgender/gender diverse individuals had almost 6x greater odds being diagnosed compared to cisgender men. Those identifying as bisexual+ had almost 5x greater odds of ever being diagnosed. There was no difference in race and ethnicity and having a mental health condition. Results highlight significant disparities that the LGBTQ+ community faces with mental health.²² Efforts to expand access to mental health care are urgently needed.

In addition to the aforementioned social identities, this assessment identified several other important SDOH reported by individuals that may influence health. The most common SDOH reported was needing help with food (31%) and housing (25%). These trends are higher than national averages that find 13.5% of American households report food insecurity.²⁴ Food insecurity increased 50% during the pandemic in our state, partly because of economic crises and inflationary prices on food. There is significant need for housing in this population, an important SDOH.²⁵ Recent studies have highlighted that our state ranks last nationally in new housing production.²⁶ Efforts should focus on food and housing to address health disparities in underserved communities.

Health literacy is important for optimal health outcomes. Roughly half of patients reported limited or marginal proficiency understanding medical information and confidence completing medical forms. AA/B individuals with marginal or adequate health literacy had reduced odds of ever being diagnosed with mental health conditions compared to non-AA/B individuals with limited health literacy, suggesting that the protective effect of higher health literacy against having mental health conditions appears to be more pronounced among AA/B individuals. Adequate health literacy may be more beneficial in reducing likelihood of mental health conditions. This highlights the need for improvement with health literacy among individuals, and especially those who may identify as AA/B to mitigate mental health challenges.

This study offers insights into which SDOH are strongly associated with COVID-19 vaccination outcomes. Higher income and education were associated with 2–3x greater odds of receiving at least one dose of the vaccine or a booster. Having limited or marginal degrees of health literacy was also not associated with receiving initial vaccination, which likely reflects comprehensive statewide efforts to reach underserved communities. Compared to those with no

social needs, having 1+ social needs was associated with a reduced odds of receiving a booster. Having at least some college education was also associated with a reduced odds of having all children vaccinated. There was no difference in race, ethnicity, or degree of health literacy and likelihood of vaccinating children, suggesting that enhancing campaign efforts among lower socioeconomic communities may improve vaccination rates, regardless of race or ethnicity.

The study highlights significant disparities that LGBTQ+ individuals experience related to tobacco, alcohol, substance use, and sexual health. Sexual minorities and transgender/gender diverse individuals reported higher levels of substance use and sexual partners compared to straight individuals and cisgender men. Prior literature demonstrates high rates of substance use and sexual partners within LGBTQ+ populations.^{27,28} Importantly, having increased sexual partners is not inherently problematic and can be an important aspect of sexual health.²⁹ Nor is occasional substance use always problematic if use does not create dysfunction within someone's life.³⁰ Promoting condoms and frequent testing to ensure low transmission rates of HIV and other STIs is important. As substance use has been shown to increase condomless sex,³¹ interventions should continue education on how to use substances safely within sexual contexts, while promoting harm reduction to ensure individuals do not experience negative sequelae associated with substance use.

Limitations of the study included potential generalizability and self-reported data. The assessment also asked limited questions about broader topics that could be nuanced in nature (i.e., sexual health). The analysis determined associations and not causality. However, systematic sampling and high response rate were a major strength. Although the study was conducted in one geographic location which may not be representative of the state or country, demographics of the study reflect diverse populations constituting major groups in other major urban settings across the United States. Although self-reported data can be a limitation of surveys, high rates of mental health conditions, substance use, and sexual partners suggest that patients felt comfortable reporting behaviors to staff conducting the needs assessment. We also note that this study examined social identities (e.g., race, sexual orientation, gender, etc.) as proxies for experiences of social health determinants such as racism, sexism, and genderism. Future studies might utilize survey instruments that measure inequity as opposed to proxies for inequity.

In conclusion, this study highlights the significant and diverse needs of specific undeserved communities in the US. In this urban population, food and housing continue to be significant SDOH that warrant further intervention. AA/B, H/L, and LGBTQ+ individuals face significant disparities with mental and sexual health, substance use, hazardous drinking, and tobacco use. Health literacy continues to be

a challenge and may impact health outcomes. Future programming should prioritize reducing stigma in communities regarding sexual health, substance use and mental health conditions more commonly experienced among LGBTQ+ individuals; improving access to housing and food sources among those exhibiting these needs; and increasing screening, referrals, and treatment retention specifically for mental health and substance use. To achieve equity, focusing on these SDOH and underserved communities are warranted to improve public health outcomes across the United States.

References

1. Morgan Z, Bazemore A, Dai M, Peterson L. Racial and ethnic disparities in access to primary care during COVID-19. *Ann Fam Med*. 2022;20(20 Suppl 1):2790. doi:10.1370/afm.20.s1.2790
2. Andraska EA, Alabi O, Dorsey C, et al. Health care disparities during the COVID-19 pandemic. *Semin Vasc Surg*. 2021;34(3):82-88. doi:10.1053/j.semvascsurg.2021.08.002
3. Faghy M, Arena R, Hills AP, et al. The response to the COVID-19 pandemic: With hindsight what lessons can we learn? *Prog Cardiovasc Dis*. 2023;76:76-83. doi:10.1016/j.pcad.2022.11.019
4. Social Determinants of Health at the Centers for Disease Control and Prevention. Accessed October 1, 2023. www.cdc.gov/about/sdoh/index.html
5. Chelak K, Chakole S. The Role of Social Determinants of Health in Promoting Health Equality: A Narrative Review. *Cureus*. 15(1):e33425. doi:10.7759/cureus.33425
6. Marmot M, Friel S, Bell R, Houweling TAJ, Taylor S, Commission on Social Determinants of Health. Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet*. 2008;372(9650):1661-1669. doi:10.1016/S0140-6736(08)61690-6
7. Vo A, Tao Y, Li Y, Albarrak A. The Association Between Social Determinants of Health and Population Health Outcomes: Ecological Analysis. *JMIR Public Health and Surveillance*. 2023;9(1):e44070. doi:10.2196/44070
8. Chan KS, Roberts E, McCleary R, Buttorff C, Gaskin DJ. Community characteristics and mortality: the relative strength of association of different community characteristics. *Am J Public Health*. 2014;104(9):1751-1758. doi:10.2105/AJPH.2014.301944
9. Gerend MA, Pai M. Social determinants of Black-White disparities in breast cancer mortality: a review. *Cancer Epidemiol Biomarkers Prev*. 2008;17(11):2913-2923. doi:10.1158/1055-9965.EPI-07-0633
10. Bradley EH, Canavan M, Rogan E, et al. Variation In Health Outcomes: The Role Of Spending On Social Services, Public Health, And Health Care, 2000-09. *Health Aff (Millwood)*. 2016;35(5):760-768. doi:10.1377/hlthaff.2015.0814
11. Coughlin SS, Vernon M, Hatzigeorgiou C, George V. Health Literacy, Social Determinants of Health, and Disease Prevention and Control. *J Environ Health Sci*. 2020;6(1):3061.
12. Schillinger D. The Intersections Between Social Determinants of Health, Health Literacy, and Health Disparities. *Stud Health Technol Inform*. 2020;269:22-41. doi:10.3233/SHTI200020
13. National Center for Education Statistics. The health literacy of America's adults: results from the 2003 National Assessment of Adult Literacy. September 2006. Accessed May 1, 2024. nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2006483
14. Mantwill S, Monestel-Umaña S, Schulz PJ. The Relationship between Health Literacy and Health Disparities: A Systematic Review. *PLoS One*. 2015;10(12):e0145455. doi:10.1371/journal.pone.0145455

15. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Ann Intern Med.* 2011;155(2):97-107. doi:10.7326/0003-4819-155-2-201107190-00005
16. Fleary SA, Ettienne R. Social Disparities in Health Literacy in the United States. *Health Lit Res Pract.* 2019;3(1):e47-e52. doi:10.3928/24748307-20190131-01
17. Stormacq C, Van den Broucke S, Wosinski J. Does health literacy mediate the relationship between socioeconomic status and health disparities? Integrative review. *Health Promot Int.* 2019;34(5):e1-e17. doi:10.1093/heapro/day062
18. Instrument: AUDIT-C Questionnaire | NIDA CTN Common Data Elements. Accessed March 2, 2025. <https://cde.nida.nih.gov/instrument/f229c68a-67ce-9a58-e040-bb89ad432be4>
19. archive.cdc.gov/www_cdc_gov/hrqol/hrqol14_measure.htm.
20. Chew LD, Bradley KA, Boyko EJ. Brief questions to identify patients with inadequate health literacy. *Fam Med.* 2004;36(8):588-594.
21. Chew LD, Griffin JM, Partin MR, et al. Validation of screening questions for limited health literacy in a large VA outpatient population. *J Gen Intern Med.* 2008;23(5):561-566. doi:10.1007/s11606-008-0520-5
22. Lee B, Wang Y, Carlson SA, et al. National, State-Level, and County-Level Prevalence Estimates of Adults Aged ≥18 Years Self-Reporting a Lifetime Diagnosis of Depression - United States, 2020. *MMWR Morb Mortal Wkly Rep.* 2023;72(24):644-650. doi:10.15585/mmwr.mm7224a1
23. King M, Semlyen J, Tai SS, et al. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC Psychiatry.* 2008;8:70. doi:10.1186/1471-244X-8-70
24. USDA ERS - Key Statistics & Graphics. Accessed December 19, 2024. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/key-statistics-graphics>
25. Lebrun-Harris LA, Sandel M, Sheward R, Poblacion A, Ettinger de Cuba S. Prevalence and Correlates of Unstable Housing Among US Children. *JAMA Pediatr.* 2024;178(7):707-717. doi:10.1001/jamapediatrics.2024.1159
26. April 24 NDSI, 2023. Housing Supply and Homelessness in Rhode Island. RI Foundation. Accessed December 19, 2024. <https://rifoundation.org/news/housing-supply-and-homelessness-in-rhode-island>
27. Chapin-Bardales J, Rosenberg ES, Sullivan PS, Jenness SM, Paz-Bailey G, NHBS Study Group. Trends in Number and Composition of Sex Partners Among Men Who Have Sex With Men in the United States, National HIV Behavioral Surveillance, 2008-2014. *J Acquir Immune Defic Syndr.* 2019;81(3):257-265. doi:10.1097/QAI.0000000000002025
28. Compton WM, Jones CM. Substance Use among Men Who Have Sex with Men. *N Engl J Med.* 2021;385(4):352-356. doi:10.1056/NEJMra2033007
29. Ueda P, Mercer CH, Ghaznavi C, Herbenick D. Trends in Frequency of Sexual Activity and Number of Sexual Partners Among Adults Aged 18 to 44 Years in the US, 2000-2018. *JAMA Netw Open.* 2020;3(6):e203833. doi:10.1001/jamanetworkopen.2020.3833
30. McLellan AT. Substance Misuse and Substance use Disorders: Why do they Matter in Healthcare? *Trans Am Clin Climatol Assoc.* 2017;128:112-130.
31. Tucker JS, Ryan GW, Golinelli D, et al. Substance Use and Other Risk Factors for Unprotected Sex: Results From An Event-Based Study of Homeless Youth. *AIDS Behav.* 2012;16(6):1699-1707. doi:10.1007/s10461-011-0017-9

Authors

- Philip A. Chan, MD, Brown University, Open Door Health, Rhode Island Public Health Institute, Providence, Rhode Island.
- Natalie Fenn, PhD, Brown University, Providence, Rhode Island.
- Yelena Malyuta, MPH, Brown University, Open Door Health, Rhode Island Public Health Institute, Providence, Rhode Island.
- Maximillian Erbe, MPH, Brown University, Open Door Health, Rhode Island Public Health Institute, Providence, Rhode Island.
- Morgan Leonard, MPA, Clínica Esperanza/Hope Clinic (CEHC), Providence, Rhode Island.
- Daniel McGuire, Providence Community Health Centers, Providence, Rhode Island.
- Sussy Santana, City of Providence, Providence, Rhode Island.
- Katherine Westrom, BA, Open Door Health, Rhode Island Public Health Institute, Providence, Rhode Island.
- Alexi Almonte, BS, Brown University, Providence, Rhode Island.
- Peter Salhaney, MS, Brown University, Open Door Health, Rhode Island Public Health Institute, Providence, Rhode Island.
- Bryce Perler, MD, Brown University, Providence, Rhode Island.
- Amanda Maguire-Wilkerson, DrPH, Brown University, Providence, Rhode Island.
- Jun Tao, PhD, Brown University, Providence, Rhode Island.
- Amy S. Nunn, ScD, Brown University, Open Door Health, Rhode Island Public Health Institute, Providence, Rhode Island.

Disclosures

Financial Disclosure Statement: This study was funded by United States Department of Health and Human Services (#7CPIMP221328). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflicts of Interest: The authors have no conflicts of interest to disclose.

Author Contribution Statement: All authors helped to write, review, and edit the manuscript.

Data Availability: All data generated or analyzed during this study are included in this published article (and its Supplementary Information files).

Ethics Approval: This evaluation did not require ethical approval by the Brown University Health Institutional Review Board, as this was an evaluation and not a human subjects research study. The study was conducted as part of a public health quality assessment on behalf of HHS during peak COVID-19 transmission rates.

Consent: This evaluation did not require consent, as this was an evaluation and not a human subjects research study.

Correspondence

Philip A. Chan, MD, MS
Professor of Medicine, Brown University
7 Central Street, Providence, RI 02907
401-644-2876
Philip.Chan@brown.edu