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# Eye Care in Federally Qualified Health Centers

**Maria A. Woodward, MD, MS**[1,2], **Patrice M. Hicks, PhD, MPH**[1], **Kristen Harris-Nwanyanwu, MD**[3], **Bobeck Modjtahedi, MD**[4,5,6], **R.V. Paul Chan, MD**[7], **Emily L. Vogt, BA**[1], **Ming-Chen Lu, MS**[1], **Paula Anne Newman-Casey, MD, MS**[1,2] **American Academy of Ophthalmology Taskforce on Ophthalmology and Community Health Centers***

[1]Department of Ophthalmology and Visual Sciences, University of Michigan, Ann Arbor, Michigan.

[2]Institute for Healthcare Policy and Innovation, University of Michigan, Ann Arbor, Michigan.

[3]Department of Ophthalmology and Visual Science, Yale School of Medicine, New Haven, Connecticut.

[4]Department of Research and Evaluation, Southern California Permanente Medical Group, Pasadena, California.

[5]Department of Clinical Science, Kaiser Permanente Bernard J. Tyson School of Medicine, Pasadena, California.

[6]Eye Monitoring Center, Kaiser Permanente Southern California, Baldwin Park, California.

[7]Department of Ophthalmology and Visual Sciences, Illinois Eye and Ear Infirmary, University of Illinois at Chicago, Chicago, Illinois.

## Abstract

**Purpose:** To assess changes in vision care availability at Federally Qualified Health Centers (FQHCs) between 2017 and 2021 and whether neighborhood-level demographic social risk factors (SRFs) associated with eye care services provided by FQHCs.

**Design:** Secondary data analysis of the Health Resources and Services Administration (HRSA) data and 2017–2021 American Community Survey (ACS).

**Participants:** Federally Qualified Health Centers.

**Methods:** Patient and neighborhood characteristics for SRFs were summarized. Differences in FQHCs providing and not providing vision care were compared via Wilcoxon-Mann–Whitney

Correspondence: Maria A. Woodward, MD, MSc, 1000 Wall Street, Ann Arbor, MI 48105. mariawoo@med.umich.edu.

Author Contributions:

Conception and design: Woodward, Hicks, Lu, Newman-Casey Data collection: Woodward, Hicks, Chan, Vogt, Lu, Newman-Casey Analysis and interpretation: Woodward, Hicks, Harris-Nwanyanwu, Modjtahedi, Chan, Vogt, Lu, Newman-Casey Obtained funding: N/A; Study was performed as part of the authors' regular employment duties. No additional funding was provided. Overall responsibility: Woodward, Hicks, Harris-Nwanyanwu, Modjtahedi, Chan, Vogt, Lu, Newman-Casey

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HUMAN SUBJECTS: Human subjects were included in this study. This study was reviewed by the University of Michigan Medical School Institutional Review Board and determined to be exempt. All research adhered to the tenets of the Declaration of Helsinki. Patients were not recruited for this study, so informed consent was not necessary to obtain.

No animal subjects were used in this study.

tests for continuous measures and chi-square tests for categorical measures. Logistic regression models were used to test the associations between neighborhood measures and FQHCs providing vision care, adjusted for patient characteristics.

**Main Outcome Measures:** Odds ratios (ORs) with 95% confidence intervals (CIs) for neighborhood-level predictors of FQHCs providing vision care services.

**Results:** Overall, 28.5% of FQHCs (n = 375/1318) provided vision care in 2017 versus 32% (n = 435/1362) in 2021 with some increases and decreases in both the number of FQHCs and those with and without vision services. Only 2.6% of people who accessed FQHC services received eye care in 2021. Among the 435 FQHCs that provided vision care in 2021, 27.1% (n = 118) had added vision services between 2017 and 2021, 71.5% (n = 311) had been offering vision services since at least 2017, and 1.4% (n = 6) were newly established. FQHCs providing vision care in 2021 were more likely to be in neighborhoods with a higher percentage of Hispanic/Latino individuals (OR, 1.08, 95% CI, 1.02–1.14, $P = 0.0094$), Medicaid-insured individuals (OR, 1.08, 95% CI, 1.02–1.14, $P = 0.0120$), and no car households (OR, 1.07, 95% CI, 1.01–1.13, $P = 0.0142$). However, FQHCs with vision care, compared to FQHCs without vision care, served a lower percentage of Hispanic/Latino individuals (27.2% vs. 33.9%, $P = 0.0007$), Medicaid-insured patients (42.8% vs. 46.8%, $P < 0.0001$), and patients living at or below 100% of the federal poverty line (61.3% vs. 66.3%, $P < 0.0001$).

**Conclusions:** Vision care services are available at a few FQHCs, localized to a few states. Expanding eye care access at FQHCs would meet patients where they seek care to mitigate vision loss to underserved communities.

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## Keywords

Community Health Centers; Eye care; Federally Qualified Health Centers; Health Resources and Services Administration; Vision services

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Many Community Health Centers (CHCs) have attained classification as Federally Qualified Health Centers (FQHCs). Community Health Centers include standard FQHCs and programs or community-based clinics that meet the requirements of an FQHC but do not receive federal funding, free clinics, health care centers for the homeless, public housing primary care centers, migrant health centers, and outpatient clinics associated with tribal organizations.[1,2] In the United States, FQHCs provide health care for 29.8 million patients.[3] Between 2000 and 2018, the number of individuals receiving care at FQHCs increased by 196%.[4] Federally Qualified Health Centers are important resources for low-income and medically underserved patients because the clinics are located in medically underserved areas; the clinics accept Medicaid and charge for service on a sliding scale for those without insurance.[5] Federally Qualified Health Centers represent the main source of health care for 1 in 11 people in the United States. As of 2021, there were 1373 FQHC hubs with 14 276 clinics in the United States.[6]

Patients served at FQHCs disproportionately experience social risk factors (SRFs), adverse social conditions that can impact health outcomes,[3,7] including housing instability, food insecurity, and lack of or limited health insurance.[7] Individuals with heightened SRFs are more likely to present with severe disease and have poorer health outcomes.[8,9] Patients who are housing insecure, for example, are more likely to have visual impairment compared with individuals with secure housing.[10] Additionally, patients with heightened SRFs are more likely to experience severe manifestations of chronic and acute eye conditions.[9]

The Health Resources and Services Administration (HRSA) mandates that FQHCs provide comprehensive primary care services; however, eye care is not included in the definition of "required primary health services" or "additional health services" under Section 330 of the Public Health Service Act. Although FQHCs are the medical home for 1 in 11 Americans,[11-13] vision care services are limited at FQHCs. The American Academy of Ophthalmology Task Force on Disparities in Eye Care and other researchers have shown that the rates of diabetic retinopathy and other major eye diseases are very high in populations from minority backgrounds and with low income. There are high rates of eye disease in these populations who attend medical care at FQHCs.[14-16] Patients with no insurance or Medicaid cannot receive timely care in the community;[17-19] prior research indicates that this population has high rates of eye diseases.[20-22] The purpose of this study was to explore the availability of vision care provided at FQHCs and evaluate whether patient-level or neighborhood-level disparities in the provision of vision care services exist at FQHCs to improve equitable allocation of resources.

## Methods

### Study Design

This cross-sectional study used data from HRSA's Uniform Data System (UDS) and the American Community Survey (ACS) to quantify the scope of vision care services at FQHCs and identify pertinent associations with neighborhood SRFs. The HRSA UDS data were used to identify FQHC vision service status, sociodemographic characteristics, and addresses. The ACS data were used to generate neighborhood-level associations with FQHC data. This study was reviewed by the University of Michigan Medical School Institutional Review Board and determined to be exempt. The study adhered to the Declaration of Helsinki. Patients were not recruited for this study, so informed consent was not necessary to obtain. We followed the Strengthening the Reporting of Observation Studies in Epidemiology guidelines.[23]

### Setting

The HRSA UDS data are reported annually by federally funded FQHCs under Section 330 of the Public Health Service Act since 1996.[6] We used data from 2017 and 2021 because they represent the earliest and most recent years for which the national aggregated health center data were available during the study period. Information reported includes certain patient sociodemographic characteristics at the FQHC level (e.g., age, sex, race, ethnicity, poverty level, health insurance coverage type, and English proficiency), major chronic disease prevalence (hypertension and diabetes), vision services rendered, and whether an

FQHC was in a state with Medicaid expansion. We also used FQHC address information available via the Federal Information Processing Standards (FIPS) code to geocode each FQHC for the 2017 and 2021 data. Information regarding staffing and cost was not reported, because approximately 93% of data were missing due to proprietary restrictions on individual FQHC data. The FQHC organization characteristics (e.g., Medicaid managed care contract, electronic health record use) also were not reported.

The ACS is an annual public health survey that provides information on neighborhood-level characteristics and SRFs. Neighborhood-level characteristics were obtained from the 2017–2021 ACS estimates using the University of Wisconsin's Neighborhood Atlas for the Area Deprivation Index (ADI) and PolicyMap, a well-validated cloud-based data analytics tool that contains thousands of community-level measures, for the remaining neighborhood-level data.[24,25] We then used FIPS codes, which contain census tract and census block group numbers, to link sampled FQHCs to ACS neighborhood-level characteristics. Of note, for the protection of participants, the ACS does not publish estimates if the block group estimate is too small, so some neighborhood-level data were recorded as missing. Additionally, the ACS does not gather information in the U.S. territories and in the Islands Areas. Thus, FQHCs located in American Samoa, Guam, Palau, the Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, the U.S. Virgin Islands, and the Marshall Islands were not included in the study, which accounted for 0.6% (n = 8/1326) and 0.8% (n = 11/1373) of the FQHCs for 2017 and 2021, respectively.

## Participants

Study participants included any FQHCs in the UDS database in 2017 and 2021 for the most recent data and a look-back period. Federally Qualified Health Centers with vision care were defined as those that provided >0% of vision services or reported >$0 of vision service cost.[26] The HRSA defines vision services as ophthalmologists, optometrists, and other vision care personnel who performed eye examinations for detection, care, treatment, and prevention of vision problems beyond just clinical visits and inclusive of any type of eye care. These vision services included those related to chronic diseases such as diabetes, hypertension, thyroid disease, and arthritis, or for the prescription of corrective lenses. Vision cost was reported by the HRSA as the total of accrued cost, allocation of facility costs, and nonclinical support services cost. Accrued cost included all direct costs for the provision of vision services (optometry, ophthalmology, and vision support personnel), the cost of frames and lenses, costs for retinal photography (including for diabetic patients), and any contracted costs with reading the results. We derived neighborhood-level data from the main FQHC location; however, most FQHCs had multiple delivery sites that may be in neighborhoods outside the main location.

## Variables and Measures

The primary outcome variable was whether an FQHC provides vision care. Exposure variables included FQHC-level sociodemographic variables and location, generated from the UDS, and neighborhood-level SRFs, generated by the census block group and census tract from PolicyMap using ACS data. Census block group-level variables included income per capita (in U.S. dollars), self-identifying percentage of people of color, percentage identifying

as Hispanic or Latino, percentage of renters burdened by cost (gross rents that are 30% or more of household income), percentage of owners burdened by cost (mortgages that are 30% or more of household income), percentage of households with no cars, and average number of cars per household. Census tract-level variables included the percentage of people with Medicaid, the percentage of people with no insurance, the percentage of families receiving food stamps or Supplemental Nutrition Assistance Program (SNAP) benefits, and the Gini index. The Gini index measures neighborhood income inequality, ranging from 0 to 1, where increasing values mean worse neighborhood income inequality. We also used the national ADI rank via the University of Wisconsin Madison's Neighborhood Atlas tool[27] to assess neighborhood socioeconomic conditions in 2021. The ADI is a validated metric of a neighborhood's socioeconomic conditions using a compilation of 17 indicators of neighborhood-level poverty, including income, education, housing security, and household characteristics.[28,29] The national ADI metric ranges from 1 to 100, where a higher number identifies more deprivation.

### Statistical Analysis

The FQHC and neighborhood-level characteristics were summarized with descriptive statistics (mean, standard deviation [SD], frequency, and percentage). Correlations between neighborhood-level characteristics were calculated. Differences in FQHC and neighborhood-level characteristics were tested between the (1) FQHC providing vision services and those without in 2021 (2-group comparison) and (2) 2017 and 2021 FQHC stratified by vision services (4-group comparison). The 2-group comparison used Wilcoxon Mann–Whitney tests for continuous measures and chi-square tests for categorical measures. The 4-group comparison used Kruskal–Wallis test for continuous variables and chi-square or Fisher exact test for categorical variables. Significant Kruskal–Wallis tests ($P < 0.05$) were followed by Dunn's test for post hoc pairwise comparisons. Logistic regression was used to test the independent associations of neighborhood-level characteristics with the probability of providing vision services at an FQHC. The models were developed progressively: Model 1 was unadjusted; model 2 adjusted for FQHC clinic characteristics that included the proportion of patients by age, sex, race, ethnicity, insurance, poverty, and English proficiency; and model 3 added adjustments for FQHC's location as urban or rural. Model 3 also tested an interaction between the neighborhood's percentage of household with no car and the urban or rural status of a FQHC to examine if an area's urbanization or rurality moderates the effect of car availability on the provision of vision services at an FQHC. Each neighborhood-level measure was included in a separate model to avoid multicollinearity. Model estimates were reported with odds ratios (ORs) and 95% confidence intervals (CIs). A choropleth map was used to visualize the percentage of FQHCs that provided vision services for each state. Statistical analysis was conducted using R version 4.2.3 (R Foundation for Statistical Computing).

## Results

We included 1318 and 1362 FQHCs across all 50 U.S. states, the District of Columbia, and Puerto Rico for 2017 and 2021, respectively, in the final study sample. Approximately 99.6% of FQHC's addresses matched to a FIPS code (n = 1313/1318 in 2017 and n =

1357/1362 in 2021). Neighborhood data available from the ACS by census tract and census block are reported in Figure S1 (available at www.aaojournal.org). These FQHCs served an average of 22 109 patients (SD, 27229; range, 131–247 428). Notably, 56.3% (SD, 6.1) of patients served by sampled FQHCs identified as female, 24.7% (SD, 11.8) as children, 63.3% (SD, 11.3) as 18 to 64 years old, 66.9% (SD, 28.4) as White, 23.3% (SD, 25.9) as Black or African American, 29.3% (SD, 27.9) as Hispanic or Latino, and 20.7% (SD, 22.3) as non–English speaking (Table 1). Additionally, 44.0% (SD, 17.9) of patients served were insured by Medicaid or Children's Health Insurance Program, 22.1% (SD, 16.9) were uninsured, and 62.9% (SD, 19.1) had incomes at or below 100% of the federal poverty line. There were 15.6% (SD, 5.5) of patients who had diabetes, 5% (SD, 2.2) who had diabetes with hemoglobin A1C greater than 9%, and 32.3% (SD, 10.2) who had hypertension. Analysis of neighborhood-level characteristics of the sampled FQHCs revealed that 77.5% (1055/1362) were in states with Medicaid expansion, and at that time 78.8% of states (41/52) had expanded Medicaid. A total of 796 of 1362 (58.4%) of the FQHCs were in urban areas (Table 2). Other FQHC neighborhood-level factors and their correlations with each other—including average income per capita, average ADI, and Gini index—are listed in Table 2 and Table S3 (available at www.aaojournal.org).

Overall, 32% of sampled FQHCs (435/1362) provided vision care and 2.6% of people (768 671/30 112 106) who accessed FQHC services received some form of vision care or eye care at an FQHC in 2021. In the 435 FQHCs that provided vision services, 5.7% of people (768 671/13 444 374) received some form of vision care or eye care in 2021. In comparison, 28.5% (375/1318) of sampled FQHCs provided vision or eye care in 2017. Among the 435 FQHCs that provided vision care in 2021, 27.1% (n = 118) had recently added vision services between 2017 and 2021, 71.5% (n = 311) had been offering vision services since at least 2017, and 1.4% (n = 6) were newly established FQHCs. In contrast, among the 927 FQHCs without vision care in 2021, 88.8% (n = 823) had not offered vision services since 2017, 6.9% (n = 64) had ceased offering vision services since 2017, and 4.3% (n = 40) were newly established FQHCs without vision services. In 2021, an average of 1899 patients (SD, 2797; range, 0–23 256) received vision services at an FQHC and an average of 1487 patients (SD, 2371; range, 0–18 515) received eye examinations. Figure 2 displayed the proportion of FQHCs providing vision care services in each state.

There were notable differences in patient and neighborhood-level characteristics at FQHCs providing vision care (435/1362) compared with those that did not (927/1362). At the FQHC level (Table 1), FQHCs with vision care, compared with those without vision care, served a significantly lower percentage of Medicaid-insured patients (42.8% vs. 46.8%, $P < 0.0001$), patients living at or below 100% of the federal poverty line (61.3% vs. 66.3%, $P < 0.0001$), children (24.2% vs. 25.8%, $P = 0.0017$), Asian-identifying patients (3.6% vs. 5.6%, $P = 0.0001$), and Hispanic or Latino-identifying patients (27.2% vs. 33.9%, $P = 0.0007$) (Table 1). Federally Qualified Health Centers with vision care, compared with FQHCs without vision care, served a higher percentage of older adults (12.5% vs. 11.4%, $P = 0.0191$), White-identifying patients (68.6% vs. 63.3%, $P = 0.0024$), persons with Medicare (12.4% vs. 11.0%, $P = 0.0032$), persons with other third-party insurance (23.2% vs. 19.8%, $P < 0.0001$), and persons with hypertension (32.6% vs. 31.4%, $P = 0.0287$). There were no significant differences in patient age or percentages of patients with diabetes or uncontrolled

diabetes between FQHCs that added vision services in 2021 and those that did not provide vision services in 2017 or 2021 (Holm $P > 0.05$).

At the neighborhood level (Table 2), FQHCs providing vision care, compared with FQHCs without vision care, were more likely to be in neighborhoods with higher percentages of people of color (52.8% vs. 46.0%, $P = 0.0028$), people of Hispanic/Latino ethnicity (20.9% vs. 16.7%, $P = 0.0221$), individuals with Medicaid (33.7% vs. 29.6%, $P = 0.0003$), households with no car (23.1% vs. 17.6%, $P = 0.0003$), families receiving food stamp/SNAP benefits (25.3% vs. 22.5%, $P = 0.0106$), owners' cost burden (25.6% vs. 22.7%, $P = 0.0277$), and location in an urban area (67.6% vs. 54.2%, $P = 0.0001$). Federally Qualified Health Centers that added vision care in 2021, compared with FQHCs that did not provide vision care in 2017 and 2021, were in neighborhoods that had higher percentages of Medicaid-insured individuals (33.2% vs 27.8%, Holm $P = 0.0164$).

Separate logistic regression analyses demonstrated that the neighborhood's percentage of Hispanic or Latino individuals, Medicaid-insured individuals, and households with no car were all independent predictors of vision service availability at FQHCs, after adjusting for age, sex, race, insurance, ethnicity, poverty, and English proficiency of patients seen at the FQHC (Table 4). Specifically, a 5% increase in the neighborhood's percentage of Hispanic/Latino population was associated with 8% increased odds of FQHCs providing vision care (OR, 1.08, 95% CI, 1.02–1.14, $P = 0.0094$). Likewise, a 5% increase in the neighborhood's percentage of Medicaid-insured individuals was associated with 8% increased odds of FQHCs providing vision care (OR, 1.08, 95% CI, 1.02–1.14, $P = 0.0120$). A 5% increase in the percentage of household with no car was associated with 7% increased odds of FQHCs providing vision care (OR, 1.07, 95% CI, 1.01–1.13, $P = 0.0142$). A 1% increase in the percentages of families receiving food stamp assistance or SNAP benefits was associated with 1% increased odds of FQHCs providing vision care (OR, 1.01, 95% CI, 1.00–1.02, $P = 0.0257$). Similar results were found when logistic regression models were adjusted additionally for urban or rural status of an FQHC. There was no significant interaction observed between the neighborhood's percentage of households with no car and the urban or rural status of an FQHC on FQHCs providing vision services ($P = 0.8627$).

## Discussion

In 2021, 32% of U.S. FQHCs provided vision services, and 2.6% of people who accessed FQHC services received any form of vision or eye care. Although we found that more FQHCs provided some form of vision services in 2021 compared with the HRSA reporting from 2009 (19%) or 2017 (28.5%),[30] our nation still lacks eye care services at most FQHCs. As shown in Figure 2, there is a notable variability of eye care services in certain states, namely, California, Massachusetts, and New York, offering eye care services at much higher rates than the remainder of the country. Also, although there was a net increase in vision services, 6.9% of FQHCs stopped offering vision services, potentially due to workforce gaps or changing priorities of care. Additionally, the rapidly growing proportion of individuals requiring vision services, including the elderly and those with diabetes, outpaced the modest expansion of vision services at FQHCs observed from 2017 to 2021.[31,32]

We identify notable disparities in the characteristics of patients seen at FQHCs with vision care compared with those without. The FQHCs with vision care served fewer pediatric, Asian-identifying, Hispanic/Latino identifying, Medicaid-insured, low-income, and non–English speaking patients compared with FQHCs without vision care. Federally Qualified Health Centers with vision care also served a higher percentage of White-identifying patients compared to FQHCs without vision care. Thus, although vision care does exist in some FQHC settings, there are key gaps in engaging and serving many individuals who require eye care.

Neighborhood-level analysis demonstrated that FQHCs with vision care were more likely to be in neighborhoods that had a higher percentage of people of color, people of Hispanic/Latino ethnicities, people with Medicaid, households with no car, and in urban areas. Interestingly, adjusted logistic regression analysis further demonstrated that a neighborhood's percentage of Hispanic or Latino individuals, Medicaid-insured individuals, and households with no car were all positive independent predictors of an FQHC providing vision care even though FQHCs with vision care services served a lower percentage of these patients compared with FQHCs without vision care. Perhaps these FQHCs decided to implement vision care services because they saw a greater level of poverty or perhaps their communities requested eye care services, but that information is not available in this dataset. Taken together, these findings suggest that although FQHCs exist in areas of need, paradoxically the demographic makeup of the population using FQHCs that provided vision care services did not reflect the demographic composition of the surrounding neighborhood. The data show that people using FQHCs' vision care services were more likely to be White, less likely to live at or under the poverty line, and less likely to have Medicaid insurance. This finding emphasizes that clinicians must support and advocate for the use of eye and vision resources to those systematically disadvantaged in those locations, including building trusting relationships with key partners in the communities. Additionally, it will be important to look at local factors at each FQHC that could affect use by all communities.

Matching vision services to need is critical as the health care community investigates ways to improve eye care for patients at CHCs.[33] In medically underserved areas, the presence of an FQHC site improves patients' use of health services; however,[34] the analysis performed herein demonstrates that expanding FQHCs into medically underserved areas does not ensure that patients in those specific neighborhoods will use care. For example, individuals with limited income have heightened SRFs, such as lack of transportation,[35] and competing demands outside of preventive health care, such as caregiving,[36] eldercare,[37] and less flexible work schedules that may limit their ability to use preventive eye care at a local FQHC.[38] Additionally, these results found that FQHCs with vision care were more likely to be in neighborhoods with a higher percentage of households without a car. As such, if more individuals in that neighborhood have no car, it may be difficult for them to attend medical appointments even in their neighborhood compared with those with a car coming from a different neighborhood.[39] Addressing SRFs through policy change in wages and access to quality housing, transportation, healthy food, green space, and financial resources to evaluate eye care at the local level.[7,10] Using the social work infrastructure at the FQHCs to preemptively assess and address SRFs and social needs, and integrating vision referrals into this infrastructure, may help increase eye care use at FQHCs. Community outreach has

been shown to effectively engage people of color and people with lower socioeconomic status in eye care and may be an important tool to supplement clinic-based referral for improving quality of eye health; trust-building, through various means, is critical.[40]

### Study Strengths and Limitations

Strengths of this analysis include its size and national scope. We also offer insights into FQHC-level and neighborhood-level SRFs and social determinants of health that highlight important disparities in current access to preventative eye care. There are, however, limitations to this analysis. Data are national- and FQHC-reported data that do not include granular delivery site and patient information about specific SRFs.[7] Additionally, because we used multiple national databases, certain variables are from Census tract data, whereas others are from Census block data. American Community Survey data rely on self-report measures, with a potential for social desirability bias and reporting bias, and restricts data from geographic locations with smaller populations, potentially lowering generalizability. Also, neighborhood effects were derived from the location of the FQHC, and although most patients seek care locally, they may not reside in the neighborhood of the FQHC. Also, the results reported in this analysis were statistically significant, but further research is needed to determine if ORs for some results are clinically meaningful to enact policy changes. Finally, there were some missing data for costs of personnel and cost of vision services provided, which limited analysis of these components. The data provided by the HRSA are not inclusive of vision services that patients receive outside of those centers. More granular data are available at request from the HRSA and will be a focus of future work.

## Conclusions

Although vision care services grew between 2017 and 2021 in FQHCs, two-thirds of FQHCs still do not have eye care and only a minority of patients use these services when available. Access to vision care services in FQHCs, where 1 of 11 Americans receive their medical care, is critical to preventing vision impairment among at-risk populations as highlighted by the American Public Health Association and the National Academy of Medicine.[40] These clinics provide an existing infrastructure that can be used to detect and treat eye disease, including refractive errors corrected with eyeglasses. The process of providing care for refractive error is time intensive but a highly effective means to mitigate preventable vision loss in the United States. Expanding the provision of high-quality eye care in FQHCs by using available cutting-edge technologies, partnerships between primary care and eye care clinicians, community engagement strategies, and care navigation is a logical next step for addressing the growing population burden of visual impairment and blindness.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Disclosure(s):

All authors have completed and submitted the ICMJE disclosures form. The author(s) have made the following disclosure(s):

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P.M.H.: Payment for presentations – School of Public Health, University of Michigan; Other financial or nonfinancial interests – Children's Vision Equity Alliance Prevent Blindness. P.A.N.-C.: Grant – Centers for Disease Control and Prevention (U01 DP006442), Research to Prevent Blindness Physician Scientist Award, National Eye Institute R01EY031337, NIBIB R01EB032328; Payment for Visiting Professor lectures at New York University and Western University; Participation on a Board for the National Institutes of Health; Grant - K12GM111725.

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## Abbreviations and Acronyms:

| | |
|---|---|
| **ACS** | American Community Survey |
| **ADI** | Area Deprivation Index |
| **CHC** | Community Health Center |
| **CI** | confidence interval |
| **FIPS** | Federal Information Processing Standards |
| **FQHC** | Federally Qualified Health Center |
| **HRSA** | Health Resources and Services Administration |
| **OR** | odds ratio |
| **SD** | standard deviation |
| **SNAP** | Supplemental Nutrition Assistance Program |
| **SRF** | social risk factor |
| **UDS** | Uniform Data System |

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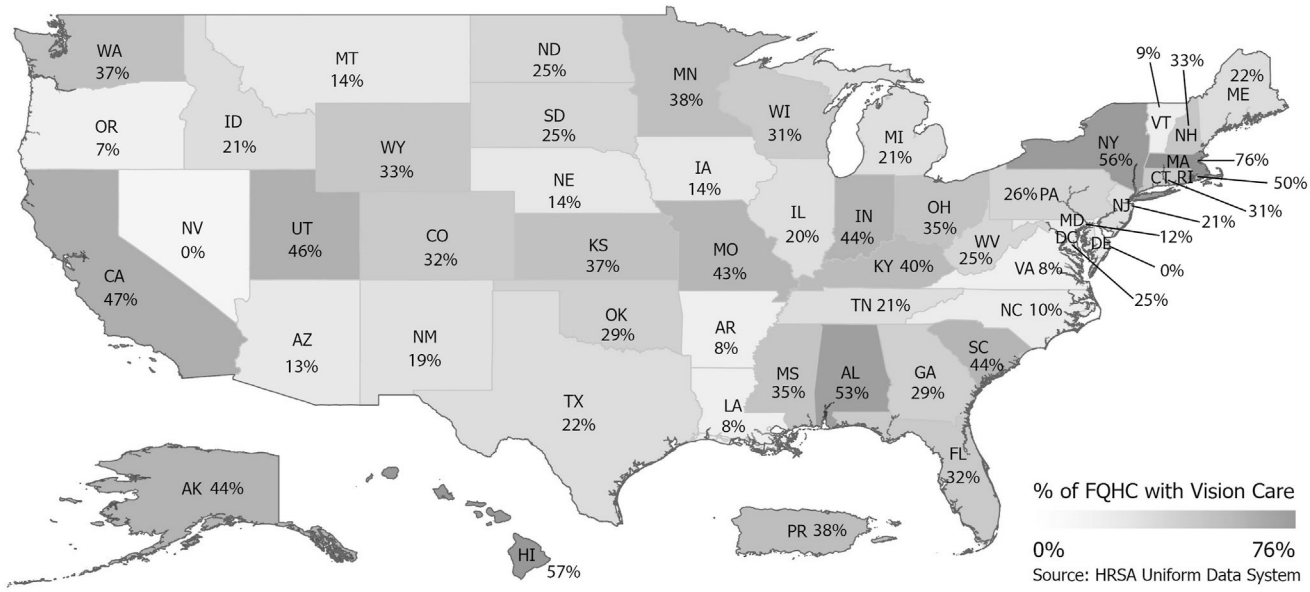


**Figure 2.**

Federally Qualified Health Centers (FQHCs) with vision care in the United States, 2021. Rates of vision and eye care services, defined as services as ophthalmologists, optometrists, and other vision care personnel who performed eye examinations for detection, care, treatment, and prevention of vision problems beyond just clinical visits and inclusive of any type of eye care at FQHCs in the country in 2021 data from the Health Resources and Services Administration's (HRSA's) Uniform Data System (UDS).

**Table 1.**

Characteristics of Federally Qualified Health Centers Overall and Stratified by Vision Care Services in 2021

| | Overall (n = 1362) | Vision Care (n = 435, 32%) | No Vision Care (n = 927, 68%) | |
|---|---|---|---|---|
| **FQHC-level Patient Characteristics** | **Mean (SD)** | **Mean (SD)** | **Mean (SD)** | ***P* Value** |
| Sex | | | | |
| Female | 56.3 (6.1) | 56.4 (6.3) | 56.1 (5.9) | 0.6195 |
| Male | 43.7 (6.1) | 43.6 (6.3) | 43.9 (5.9) | 0.6195 |
| Age | | | | |
| Children (<18 yrs) | 24.7 (11.8) | 24.2 (12.0) | 25.8 (11.1) | **0.0017** |
| Adult (18–64 yrs) | 63.3 (11.3) | 63.5 (11.6) | 63.1 (10.8) | 0.3303 |
| Older adults (65+ yrs) | 12.2 (6.7) | 12.5 (7.0) | 11.4 (6.2) | **0.0191** |
| Race | | | | |
| White | 66.9 (28.4) | 68.6 (27.7) | 63.3 (29.7) | **0.0024** |
| Black/African American | 23.3 (25.9) | 23.1 (25.8) | 23.7 (26.3) | 0.8115 |
| Asian | 4.3 (10.5) | 3.6 (8.8) | 5.6 (13.3) | **0.0001** |
| American Indian/Alaska Native | 3.3 (10.8) | 3.0 (9.3) | 4.0 (13.3) | 0.0704 |
| Native Hawaiian/Other Pacific Islander | 1.2 (4.8) | 0.9 (2.8) | 1.8 (6.9) | **0.0377** |
| >1 race | 3.7 (7.4) | 3.4 (6.5) | 4.3 (9.0) | 0.2929 |
| Hispanic/Latino Ethnicity | 29.3 (27.9) | 27.2 (26.6) | 33.9 (29.9) | **0.0007** |
| Insurance | | | | |
| Medicaid/CHIP | 44.0 (17.9) | 42.8 (18.0) | 46.8 (17.5) | **<0.0001** |
| Medicare | 12.0 (7.4) | 12.4 (7.6) | 11.0 (6.8) | **0.0032** |
| Other third party | 22.1 (12.7) | 23.2 (12.7) | 19.8 (12.3) | **<0.0001** |
| Uninsured | 22.1 (16.9) | 21.8 (16.1) | 22.9 (18.4) | 0.7067 |
| Patients at or below 100% of FPL | 62.9 (19.1) | 61.3 (19.3) | 66.3 (18.2) | **<0.0001** |
| Non–English Speaker | 20.7 (22.3) | 18.4 (20.9) | 25.4 (24.3) | **<0.0001** |
| Diabetes | 15.6 (5.5) | 15.5 (5.8) | 15.7 (4.7) | 0.2390 |
| Uncontrolled diabetes (HbA1c >9%) | 5.0 (2.2) | 5.0 (2.3) | 5.0 (2.1) | 0.5297 |
| Hypertension | 32.3 (10.2) | 32.6 (10.6) | 31.4 (9.2) | **0.0287** |

CHIP = Children's Health Insurance Program; FPL = Federal Poverty Line; FQHC = Federally Qualified Health Center; HbA1c = hemoglobin A1C; SD = standard deviation.

Boldface indicates statistical significance.

**Table 2.**

Neighborhood Characteristics of Federally Qualified Health Centers Funded in 2021 Overall and Stratified by Vision Care Services

| | Overall (n = 1362) | Vision Care (n = 435) | No Vision Care (n = 927) | |
|---|---|---|---|---|
| **Continuous Variable** | **Mean (SD)** | **Mean (SD)** | **Mean (SD)** | ***P* Value** |
| Income per capita (U.S. dollars) * | 28 982.6 (18 721.1) | 28 992.1 (22 134.9) | 28 978.7 (17 127.1) | 0.0693 |
| National ADI Rank * | 66.3 (26.9) | 63.4 (30.0) | 67.5 (25.4) | 0.2126 |
| Neighborhood People of Color (%) * | 48.0 (33.2) | 52.8 (33.3) | 46.0 (32.9) | **0.0028** |
| Neighborhood Hispanic/Latino (%) * | 17.9 (25.8) | 20.9 (27.3) | 16.7 (25.1) | **0.0221** |
| Neighborhood Medicaid (%) † | 30.8 (16.5) | 33.7 (17.1) | 29.6 (16.1) | **0.0003** |
| People with No Insurance (%) † | 10.6 (7.8) | 10.7 (8.7) | 10.6 (7.4) | 0.2811 |
| Household with No Car (%) * | 19.2 (19.4) | 23.1 (21.6) | 17.6 (18.2) | **0.0003** |
| Average Number of Cars per Household * | 1.5 (0.5) | 1.4 (0.5) | 1.5 (0.5) | **0.0118** |
| Gini Index † | 0.46 (0.07) | 0.462 (0.072) | 0.457 (0.072) | 0.0519 |
| Families Receiving Food Stamp/SNAP Benefits (%) † | 23.3 (17.7) | 25.3 (18.2) | 22.5 (17.4) | **0.0106** |
| Owner Cost Burden (%) * | 23.5 (18.3) | 25.6 (19.6) | 22.7 (17.7) | **0.0277** |
| Renter Cost Burden (%) * | 45.4 (21.2) | 46.0 (20.5) | 45.2 (21.5) | 0.3884 |
| **Categorical Variable** | **Frequency (%)** | **Frequency (%)** | **Frequency (%)** | ***P* Value** |
| Expanded Medicaid | 1055 (77.5) | 349 (80.2) | 706 (76.2) | 0.1082 |
| Urban | 796 (58.4) | 294 (67.6) | 502 (54.2) | **<0.0001** |

ADI = Area Deprivation Index; SNAP = Supplemental Nutrition Assistance Program; SD = standard deviation. Boldface indicates statistical significance.

* Census block group level.

† Census tract level.

**Table 4.**

Separate Logistic Regression Models with Odds Ratio Estimates for the Association of Neighborhood-level Measures with Federally Qualified Health Centers Providing Vision Care

| | Unadjusted Models | | Clinic Characteristics Adjusted Models | | Clinic Characteristics and Urban/Rural Adjusted Models | |
|---|---|---|---|---|---|---|
| **Neighborhood-level Variable** | ***OR*** | **P *Value*** | ***OR*** | **P *Value*** | ***OR*** | **P *Value*** |
| Neighborhood People of Color (per 5%) * | 1.03 (1.01–1.05) | **0.0022** | 1.03 (0.99–1.08) | 0.1207 | 1.03 (0.99–1.07) | 0.1817 |
| Neighborhood Hispanic/Latino (per 5%) * | 1.03 (1.01–1.06) | **0.0149** | 1.08 (1.02–1.14) | **0.0094** | 1.08 (1.02–1.15) | **0.0078** |
| Neighborhood Medicaid (per 5%) † | 1.08 (1.03–1.12) | **<0.0001** | 1.08 (1.02–1.14) | **0.0120** | 1.07 (1.01–1.14) | **0.0197** |
| Household with No Car (per 5%) * | 1.07 (1.04–1.11) | **<0.0001** | 1.07 (1.01 – 1.13) | **0.0142** | 1.06 (1.01–1.12) | **0.0223** |
| Average Number of Cars per Household (per 1 car) * | 0.69 (0.52–0.91) | **0.0077** | 0.65 (0.40–1.04) | 0.0721 | 0.70 (0.43–1.12) | 0.1395 |
| Families Receiving Food Stamp/SNAP Benefits (per 1%) † | 1.01 (1.00–1.02) | **0.0179** | 1.01 (1.00–1.02) | **0.0257** | 1.01 (1.00–1.02) | **0.0480** |
| Owner Cost Burden (per 10%) * | 1.09 (1.01–1.17) | **0.0215** | 1.09 (0.99–1.20) | 0.0771 | 1.08 (0.98–1.20) | 0.1062 |
| Urban vs. Rural | 1.77 (1.39–2.25) | **<0.0001** | 1.48 (0.93–2.36) | 0.1022 | - | - |

Federally Qualified Health Center clinic characteristics include the proportion of patients by age, sex, race, ethnicity, insurance, poverty, and English proficiency.

Boldface indicates statistical significance.

OR = Odds Ratio; SNAP = Supplemental Nutrition Assistance Program.

* Census block group level.

† Census tract level.