tvst

Public Health

Disparities in Eye Care Utilization Among Refugee and Migrant Populations

Ivan A. Copado[1,2], Shahin Hallaj[1,2], Bharanidharan Radha Saseendrakumar[1,2], and Sally L. Baxter[1,2]

[1] Division of Ophthalmology Informatics and Data Science, Viterbi Family Department of Ophthalmology and Shiley Eye Institute, University of California San Diego, La Jolla, CA, USA
[2] Division of Biomedical Informatics, Department of Medicine, University of California San Diego, La Jolla, CA, USA

Correspondence: Sally L. Baxter, Division of Ophthalmology Informatics and Data Science, Viterbi Family Department of Ophthalmology and Shiley Eye Institute, University of California San Diego, 9415 Campus Point Drive, La Jolla, CA 92093-0946, USA. e-mail: s1baxter@health.ucsd.edu

Received: June 29, 2023
Accepted: January 8, 2024
Published: February 20, 2024

Keywords: refugee; migrant; health care utilization; eye care; health disparities

Citation: Copado IA, Hallaj S, Radha Saseendrakumar B, Baxter SL. Disparities in eye care utilization among refugee and migrant populations. Transl Vis Sci Technol. 2024;13(2):14, https://doi.org/10.1167/tvst.13.2.14

Purpose: In this cross-sectional study, we examined refugee/migrant participants' health and eye care utilization compared to controls in San Diego County.

Methods: Data were collected from electronic health records (EHRs) at UCSD Health-affiliated medical centers. Through a manual review of EHRs, eligibility criteria to identify a cohort were developed. A total of 64 refugee/migrant participants and 95 control participants matched based on country of origin, age, and sex were included in the analysis. Demographic characteristics, insurance type, and vision/eye care utilization were compared between the two groups.

Results: A greater proportion of refugee/migrant participants were more likely to be enrolled in government-sponsored insurance programs, predominantly Medicaid when compared to controls (55% vs. 24%, $P = < 0.01$). When adjusting for age, history of ophthalmic procedure, and surgery, refugee status was associated with fewer encounters with ophthalmologists in a multivariable linear regression model (coefficient $= -1.66$ [95% confidence interval [CI] $= -2.89$ to -0.44], $P = 0.009$).

Conclusions: This study highlights disparities in eye care utilization for refugee/migrant populations. When compared to controls, a larger proportion of refugees/migrants had government-funded insurance, and refugee status was associated with fewer encounters with ophthalmologists. These findings underscore the need for further research on this population to better understand potential healthcare barriers these individuals may encounter.

Translational Relevance: This analysis of EHR data illustrates disparities in eye care experienced by refugees/migrants, highlighting potential gaps in care in a vulnerable population.

Introduction

Over the past decade, the United States has experienced a significant influx of refugees seeking asylum from political, social, environmental, and health-related crises in their home countries.[1–3] Los Angeles and San Diego Counties receive a significant portion of these individuals, with approximately 10 percent of the 601,000 resettled refugees between 2010 and 2020 finding placement in these 2 cities alone.[2,4–6] Many of these individuals face significant challenges in accessing healthcare, including eye care services.[7–11]

Chronic diseases, including vision-threatening conditions, are prevalent among this population, often exacerbated by limited access to health care both in their home countries and upon resettlement.[7,8,12,13] Research on recently resettled Syrian refugees in Philadelphia, Pennsylvania, for example, has revealed alarming rates of ocular pathologies and inadequate utilization of eye care services.[7,8] A survey conducted using a validated tool indicated that 35.2% of these refugees endorsed ocular pathologies, whereas 29.4% had never sought care from an eye care specialist; barriers such as cost and lack of knowledge about available resources were frequently cited barriers.[7,8]

Cataracts, glaucoma, age-related macular degeneration, and diabetic retinopathy are the leading causes of vision impairment and blindness globally.[14–16] These trends persist among refugees entering the United States.[7,8,12,13] Despite mandatory health screenings for refugees and migrants upon resettlement, these screenings only provide information without adequate mechanisms for addressing identified health needs or navigating the complex US healthcare system.[17–19] By gaining a comprehensive understanding of the specific needs within this community, we can investigate whether disparities in eye care exist and inform future interventions and resources to support vulnerable populations.

In this study, we aimed to investigate the eye health of refugees and migrants in San Diego County and analyze utilization patterns. This study aims to contribute to the existing literature on health care access barriers faced by refugees in the United States and shed light on the potential impacts of these barriers on eye health. By conducting this study, we hope to generate valuable insights that will inform interventions, policies, and strategies to improve the eye health outcomes of refugees and migrants.

Methods

Data Source and Collection Period

The data were retrospectively collected from the electronic health records (EHRs) system (Epic Systems, Verona, WI, USA) of the University of California San Diego (UCSD) health system and all its affiliated clinical sites in San Diego County. The study period was from January 1, 2005, to March 1, 2022, and the data collection was conducted between March 3, 2022, and March 1, 2023.

Ethical Considerations

The UCSD Institutional Review Board approved this study (IRB #80269). The research was conducted in accordance with the Health Insurance Portability and Accountability Act (HIPAA) of 1996 and adhered to the tenets of the Declaration of Helsinki. To ensure compliance with ethical guidelines, all participants' protected health information (PHI) was handled in accordance with the rules stipulated by the HIPAA Privacy Rule. Strict measures were implemented to protect the privacy and confidentiality of the participant's data.

Data Reporting

The study's findings were presented and aligned with the standards outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[20] This adherence ensured comprehensive reporting of our methodology, participant selection, results, and discussion, promoting transparency and enhancing the reliability of our research outcomes.

Participant Selection Criteria

The study population consisted of refugees and migrants (heretofore referred to as "refugees/migrants") residing in San Diego County. A set of rigorous inclusion and exclusion criteria were followed to identify eligible participants. Individuals were included in the study if they were 18 years of age or older and had at least one in-person visit with an eye care provider within the study period. An eye care provider was defined as an optometrist or ophthalmologist actively practicing at the time of initiation of eye care. To identify specific refugee groups, we used arrival data made available by the San Diego County Department of Health and Human Services (HHS).[5,6] Upon review of the information from the HHS, we conducted our search to identify individuals who originated from the countries with the largest representation of refugees in San Diego County from 2005 to 2022: Afghanistan, Haiti, Syria, Iraq, Democratic Republic of Congo, Syria, Iran, Burma, Central African Republic, and the Democratic Republic of Congo to include in our study.[5,6] A complete list of inclusion and exclusion criteria are described in Figure 1.

Chart Review and Participant Identification

We used the Epic SlicerDicer tool (Epic Systems, Verona, WI, USA) to query the population of interest.

Eligible participants

1. Refugee or migrant resided in San Diego County at any point between 2005 and 2022.
2. Were 18 years of age or older.
3. Had one or more in-person visit with an eye care provider between 2005 and 2022.
4. Was identified by at least two providers, following manual chart review, as a refugee, asylee seeker, forcibly displaced, or migrant.
5. Had refugee or migrant status designation aligned with definition provided by the Immigration and Nationality Act section 101(a)(42).
6. Originated from Afghanistan, Burma, Central African Republic, Democratic Republic of Congo, Haiti, Iran, Iraq, and Syria.
7. Who did not meet any of these criteria were excluded from the refugee/migrant group and were considered for control group.

Figure 1. Participant inclusion criteria.

A manual chart review was undertaken by two research staff to determine refugee/migrant status. One of the research staff reviewed charts of the queried participants, citing specific areas within the chart where mention of refugee status, as determined above, could be found. A second reviewer then verified this status through manual review. Various sources of information were reviewed, including encounter details, provider notes, social documentation records, demographic data, and medical and surgical procedure notes. Participants were classified as refugees/migrants if two or more providers indicated that the patient originated from one of the countries of interest, if the patient self-identified a circumstance of forced evacuation as defined by the Immigration and Nationality Act (INA), or if the term "refugee" or "migrant" or "asylee" or "recent migrant" was found upon chart review was used to describe the patient's self-identified status.[21] Participants who did not meet any of these criteria were excluded from the refugee/migrant group.

Control Cohort Selection

A control cohort was established to compare the findings with a non-refugee/migrant group. Through EHR review, individuals without available refugee status information or those who self-identified as non-refugee migrants were assigned to the control group. The control cohort was matched to the refugee/migrant group by country of origin, using the list of countries of interest, age, and sex to adjust for potential confounders.

Sample Size and Final Participant Count

Using the EHR system tools, we identified an initial pool of 654 patients. Subsequently, we applied inclusion and exclusion criteria, which are detailed in Figure 1. Additionally, we conducted a manual review of medical records to ensure the accuracy and eligibility of potential study participants and verified the presence of in-person ophthalmology appointments with eye care providers affiliated with or in partnership with UCSD Health. This step led to a potential cohort of 88 patients. We then removed any duplicates among potential participants who had more than one medical record number within the UCSD Health System. These additional steps resulted in a final participant count of 64 refugees/migrants and 95 controls. A comprehensive overview of the study methods used in this research is presented in Figure 2, providing a visual representation of the application of these methods.

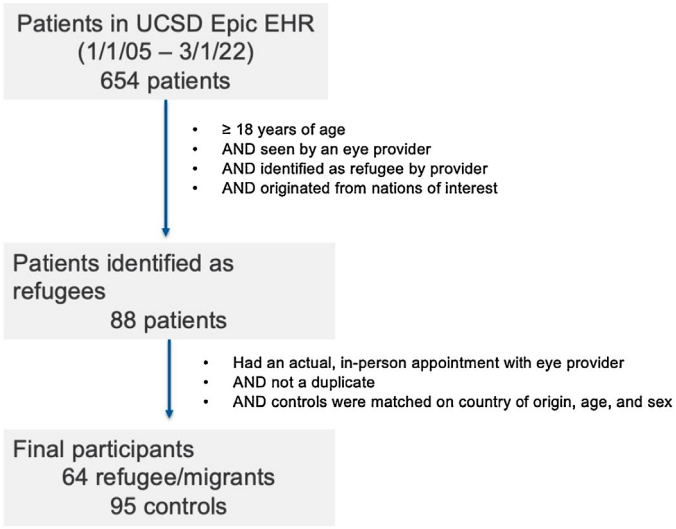

Figure 2. Flow chart of participant selection process.

Data Collection and Variable Selection

We extracted data comprising fundamental demographic details and socioeconomic factors derived from the EHR review. Demographic information, such as age, sex, ethnicity, country of origin, preferred language, and insurance type were directly obtained from chart notes. Socioeconomic indicators, including occupation history, financial strain, transportation access, and reported food insecurity, were extracted from social documentation in the EHRs when available. Additionally, social determinants of health (SDoH) encompassing occupation history, financial strain, transportation access, reported food insecurity, social isolation, stress, intimate partner violence, physical activity, education levels, and alcohol and tobacco usage were collated when available. These characteristics can be found on Table 1. Notably, tobacco use was regarded as a behavioral variable due to its known association with various ocular diseases, such as glaucoma.[22–26]

Diagnostic data were obtained from EHR review using International Classification of Diseases (ICD) ninth or tenth (ICD-9 or ICD-10) edition codes documented by healthcare providers. These codes were selected based on a comprehensive review of literature focusing on risk factors for prevalent ophthalmologic diseases, encompassing conditions like cataracts, diabetic retinopathy, glaucoma, and other related complications, including, diabetic foot ulcers, chronic kidney disease, kidney failure, hyperlipidemia, and hypertension.[14–16] Furthermore, initial eye screenings and annual vision examinations were integrated into this analysis, labeled as "Vision Screen" in Table 2. A complete list of the ICD-9 and ICD-10 codes utilized

Table 1. Characteristics of Refugees/Migrants ($N = 64$) and Controls From the Same Countries of Origin ($N = 95$)

Variables	Control, $N = 95$[a]	Refugee/Migrant, $N = 64$[a]	P Value[b]
Age, y	66 (55, 72)	66 (47, 76)	0.96
Sex			0.10
Female	35 (37%)	32 (50%)	
Male	60 (63%)	32 (50%)	
Race			0.393
Asian	2 (2.1%)	3 (4.7%)	
White	93 (98%)	61 (95%)	
Living status			>0.99
Living	88 (93%)	59 (92%)	
Not living	7 (7.4%)	5 (7.8%)	
Insurance type			<0.01
Medicaid	23 (24%)	35 (55%)	
Medicare	49 (52%)	24 (38%)	
Private	18 (19%)	5 (7.8%)	
Self-pay	5 (5.3%)	0 (0%)	
Tobacco use	40 (42%)	23 (36%)	0.44
Country of origin			<0.01
Afghanistan	39 (41%)	20 (31%)	
Burma	2 (2.1%)	3 (4.7%)	
Central African Republic	2 (2.1%)	2 (3.1%)	
Democratic Republic of Congo	5 (5.3%)	2 (3.1%)	
Iran	1 (1.1%)	7 (11%)	
Iraq	45 (47%)	25 (39%)	
Syria	1 (1.1%)	5 (7.8%)	
Language			<0.01
Arabic	8 (8.4%)	17 (27%)	
Burmese	0 (0%)	2 (3.1%)	
Chaldean	1 (1.1%)	0 (0%)	
Dari	0 (0%)	2 (3.1%)	
English	79 (83%)	27 (42%)	
Farsi	4 (4.2%)	12 (19%)	
French	0 (0%)	1 (1.6%)	
Other	1 (1.1%)	0 (0%)	
Persian	1 (1.1%)	2 (3.1%)	
Somali	0 (0%)	1 (1.6%)	
Unknown	1 (1.1%)	0 (0%)	

[a] *n* (%); median (interquartile range).
[b] Pearson's Chi-squared test; Wilcoxon rank sum test; and Fisher's exact test.

in this study can be found in Supplementary Tables S1 and S2.

The utilization of eye care services by the participants was collected and validated through a comprehensive manual review of charts. The utilization encompassed any interaction with an eye care provider. An eye care provider was defined as either an ophthalmologist or an optometrist. Encounters were categorized by provider type, delineated as either ophthalmology or optometry encounters, based on a review of the provider's credentials (i.e., MD or OD) attached to each encounter. We determined the age at the first eye care visit, cumulative years under the care of an eye care specialist, and the average number of eye care encounters.

We also tabulated the number of ophthalmology procedures. Ophthalmology procedures constituted diagnostic examinations conducted in clinics, including ocular coherence tomography (OCT), fundus photography, visual field testing, eye ultrasounds, and fluorescein angiography. Moreover, treatments administered in clinics, such as intravitreal injections and

Table 2. Ocular and Medical Comorbidities and Health Care Utilization Among the Refugee/Migrant ($N = 64$) and Control ($N = 95$) Cohorts

Variables	Control, $N = 95$[a]	Refugee/Migrant, $N = 64$[a]	P Value[b]
Vision screen[c]	47 (49%)	34 (53%)	0.65
Cataract	26 (27%)	22 (34%)	0.35
Diabetic retinopathy	54 (57%)	34 (53%)	0.64
Glaucoma	18 (19%)	14 (22%)	0.65
Diabetes	69 (73%)	51 (80%)	0.31
Diabetes complication[d]	18 (19%)	14 (22%)	0.65
Hyperlipidemia	47 (49%)	34 (53%)	0.65
Hypertension	46 (48%)	33 (52%)	0.70
Age of first eye care encounter	60 (48, 66)	61 (44, 70)	0.45
Years of eye care activity	4.0 (3.0, 7.0)	3.0 (2.8, 4.0)	0.03
Average eye care encounters	4 (2, 11)	3 (1, 8)	0.09
Ophthalmology encounter	76 (80%)	55 (86%)	0.34
Optometry encounter	49 (52%)	33 (52%)	>0.99
Ophthalmology surgery	40 (42%)	26 (41%)	0.13
Ophthalmology procedure	26 (27%)	29 (45%)	0.02
Any eye care follow-up	77 (81%)	42 (66%)	0.03
Healthcare use, y	11 (7, 16)	9 (5, 15)	0.12
Any hospital admission	74 (78%)	43 (67%)	0.13
Any emergency department visit	77 (81%)	57 (89%)	0.17
Social determinants of health information available[d]	13 (14%)	6 (9.4%)	0.41

[a] *n* (%); median (interquartile range).
[b] Pearson's Chi-squared test; Wilcoxon rank sum test; and Fisher's exact test.
[c] Any initial visit with optometry or ophthalmic provider requiring visual field testing and eye health screening.
[d] Any diagnosis of diabetes-related complication including diabetic foot ulcer, diabetic nephropathy, or diabetic neuropathy.
[e] Occupation history, financial strain, transportation access, reported food insecurity, social isolation, stress, intimate partner violence risk, physical activity, education levels, and alcohol and tobacco usage.

punctal plug placements, were classified as procedures. Any ophthalmology surgery was also extracted, representing any procedure done within an operating room and carried out by a practicing ophthalmologist. A comprehensive listing of ophthalmology procedures is available in Supplementary Table S3.

Furthermore, an extensive review of manual charts was undertaken to assess the overall healthcare system utilization by the study cohort, portrayed in Table 2 as indicators of hospital admissions and emergency department visits.

Statistical Analysis

All statistical analyses were conducted using the R programming language (version 4.3.2, R Foundation, Vienna, Austria). Non-parametric tests were used to compare data characteristics between the refugee/migrant group and the control group. The Wilcoxon Rank Sum test was used for continuous variables, whereas categorical variables were assessed using Pearson's Chi-squared test. In instances where the sample sizes for categorical variables were small, Fisher's exact test was used. Assumptions regarding the tests' applicability were checked, and limitations due to small sample sizes were acknowledged. Univariable analysis was conducted to examine which factors were associated with the number of ophthalmology encounters (continuous variable assessed with linear regression) and with any ophthalmology encounter (binary categorical variable assessed with logistic regression). Variables with $P > 0.1$ were included in multivariable analyses. P values < 0.05 were considered statistically significant.

Results

Participant Demographics

Table 1 summarizes participant demographics in both groups. The refugee/migrant cohort displayed an even distribution of sexes (50%, 32/64 for men and women), whereas the control group exhibited a higher representation of men (60/95, 63%). The results of race/ethnicity distribution showed a higher percent-

age of White individuals (61/65, 95%) compared to Asian individuals (3/65, 4.7%) in the refugee/migrant population. A similar trend was observed in the control population, with a higher percentage of White individuals (93/95, 98%) compared to Asian individuals (2/95, 2.1%). Notably, a lower percentage of refugee/migrant participants reported tobacco use (36%, $N = 23/64$) compared to controls (42%, $N = 40/95$). Furthermore, a significantly higher proportion of refugee/migrant participants were enrolled in Medicaid in comparison to controls (55%, $N = 35/64$ vs. 24%, $N = 23/95$, $P < 0.01$).

Participant Country of Origin and Preferred Language

A greater percentage of refugee/migrant participants were from Iraq ($N = 25/64$, 39%), followed by Afghanistan ($N = 20/64$, 31%), Iran ($N = 7/64$, 11%), and Syria ($N = 5/64$, 7.8%). Among the control group, the majority originated from Iraq ($N = 45/95$, 47%), Afghanistan ($N = 39/95$, 41%), and the Democratic Republic of Congo ($N = 5/95$, 5.3%).

Regarding preferred language, there was a spread of language preference among the refugee/migrant participants, with the greatest proportion endorsing the use of English ($N = 27/64$, 42%), but also substantial proportions preferring Arabic ($N = 17/64$, 27%), or Farsi ($N = 12/64$, 19%). In contrast, the majority of the control group endorsed the use of English ($N = 79/95$, 83%), with only one control participant failing to indicate a preferred language.

Health Care Utilization

As described in Table 2, refugees/migrants had a slightly lower frequency of eye care encounters

Table 3. Linear Regression and Outcome Measure: Number of Ophthalmology Encounters

Variable	Coefficient [95% CI]	*P* Value	Coefficient [95% CI]	*P* Value
Intercept			7.51 [2.27 to 12.74]	0.006
Sex	−0.91 [−3.63 to −1.82]	0.512		
Age, y	**0.09** [**0.01 to −0.17**]	0.029	0.01 [−0.07 to −0.09]	0.757
Living status	0.82 [−1.73 to −3.37]	0.527		
Country of origin	−0.26 [−0.67 to −0.15]	0.215		
Language	0.53 [−0.20 to −1.26]	0.153		
Insurance	1.13 [−0.59 to −2.84]	0.197		
Refugee	−**1.23** [−**2.59** to **−0.13**]	0.077	−**1.66** [−**2.89** to **−0.44**]	**0.009**
Vision screen[a]	**1.66** [**0.34** to **2.98**]	0.014	0.65 [−0.99 to −2.29]	0.440
Cataract	1.20 [−0.26 to −2.65]	0.106		
Diabetic retinopathy	**1.67** [**0.34** to **3.00**]	0.014	−0.10 [−1.84 to −1.63]	0.909
Glaucoma	1.19 [−0.48 to −2.86]	0.163		
Diabetes	0.98 [−0.58 to −2.53]	0.218		
Diabetes complication[b]	**2.03** [**0.38** to **−3.68**]	0.016	1.35 [−0.29 to −2.99]	0.108
Hyperlipidemia	0.44 [−0.91 to −1.79]	0.519		
Hypertension	0.62 [−0.73 to −1.96]	0.366		
Tobacco use	0.74 [−0.63 to −2.11]	0.289		
Age of first eye care encounter	0.03 [−0.05 to −0.12]	0.070		
Any outpatient encounter	3.04 [−2.98 to −9.07]	0.320		
Any hospital admission	**1.90** [**0.40** to **3.40**]	**0.013**	0.87 [−0.54 to −2.29]	0.228
Any emergency department visit	0.74 [−1.10 to −2.59]	0.428		
Ophthalmology surgery	−**1.32** [−**3.39** to **−0.74**]	**<0.001**	**2.04** [**0.74** to **−3.33**]	**0.002**
Ophthalmology procedure	**3.07** [**1.79** to **4.35**]	**<0.001**	**2.75** [**1.43** to **4.08**]	**<0.001**
SDOH[c]	0.39 [0.19 to 0.58]	0.208		

Multiple R-squared = 0.278, adjusted R-squared = 0.2395, *P* value = 4.469e-08, CI = 95% confidence interval. Variables with $P < 0.1$ were included in the multivariable analysis. The *P* values < 0.05 were considered statistically significant, which have been bolded in this table.

[a]Any initial visit with optometry or ophthalmic provider requiring visual field testing and eye health screening.

[b]Any diagnosis of diabetes-related complication including diabetic foot ulcer, diabetic nephropathy, or diabetic neuropathy.

[c]Social Determinants of Health: Occupation history, financial strain, transportation access, reported food insecurity, social isolation, stress, intimate partner violence risk, physical activity, education levels, and alcohol and tobacco usage.

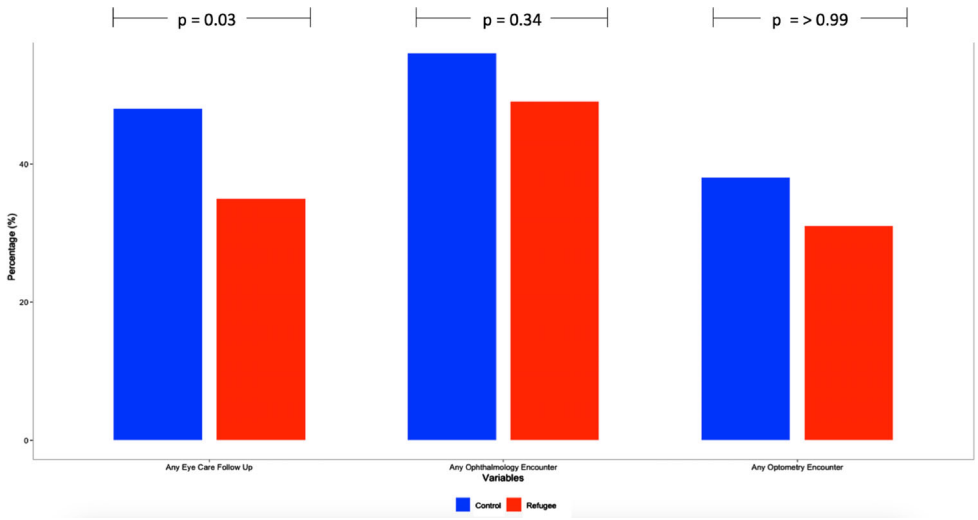

Figure 3. Distribution of various eye care encounter types among the refugee/migrant (*orange*, $N = 64$) and control (*blue*, $N = 95$) groups.

compared to controls (median of 3 interquartile range [IQR] = −1 to −8 vs. 4 [IQR = −2 to −11], $P = 0.09$), this discrepancy did not achieve statistical significance. They also had a significantly shorter duration of continued care with an eye care provider, with a median of 3 (IQR = 2.8-4) years compared to 4 (IQR = 3–7) years for control participants ($P = 0.03$). Although this was confirmed by the univariable regression analysis (coefficient = −0.68, 95% confidence interval [CI] = −1.31 to −0.05, $P = 0.035$), when adjusted for age and history of ophthalmic surgery, the results became marginally insignificant (coefficient = −0.59, 95% CI = −1.24 to 0.07, $P = 0.082$).

When adjusted for age, history of ophthalmic surgery, or ophthalmic procedure, refugee/migrant status was associated with fewer number of encounters with ophthalmologists in the multivariable linear regression model (coefficient = −1.66, 95% CI = −2.89 to −0.44, $P = 0.009$). These findings are described in Table 3.

Additionally, a greater proportion of refugees underwent ophthalmology procedures in comparison to the controls (45%, $N = 29/64$ vs. 27%, $N = 26/95$, $P = 0.02$; see Table 2). However, a smaller proportion of refugees/migrants underwent an ophthalmology surgery than controls (41%, $N = 26/64$ vs. 42%, $N = 40/95$, $P = 0.13$; see Table 2). These findings are depicted in Figure 3.

Refugee status (relative risk [RR] = 0.50, 95% CI = 0.29–0.85, $P = 0.010$), diagnosis of cataract (RR = 15.48, 95% CI = 2.75–87.07, $P = 0.002$), encounter with an optometrist (RR = 4.28, 95% CI = 1.55–11.79, $P = 0.005$), history of ophthalmology surgery (RR = 7.67, 95% CI = 2.14–27.43, $P = 0.002$), and undergoing an ophthalmology procedure (RR = 10.98, 95% CI = 2.79–43.30, $P < 0.001$) were independent predictors of ophthalmology encounter.

There were no significant differences between control and refugee/migrant participants when analyzing the most common causes of non-traumatic or infectious vision impairment or blindness worldwide (see Table 2).

Discussion

In this study, we investigated the differences in healthcare utilization and eye care encounters between refugee/migrant participants and control participants by analyzing EHR data from an academic health system. Our analysis revealed several noteworthy findings: a greater percentage of refugees/migrants were enrolled in Medicaid insurance programs, had a lower number of ophthalmology encounters, and were more likely to undergo an ophthalmology procedure when compared to controls.

A greater percentage of refugee/migrant participants were enrolled in Medicaid compared to controls. This finding may highlight potential barriers and challenges faced by this vulnerable population in accessing comprehensive healthcare coverage.[7,8] The recent loss of expanding funding after the coronavirus disease 2019 (COVID-19) pandemic may further complicate this issue.[27,28] In addition, although our study revealed that controls were more likely to be enrolled in Medicare, it is notable that a substantial proportion of refugee migrants were also enrolled in Medicare. This finding suggests that government-funded insurance coverage plays a crucial role in facil-

itating health care access for this population. Even with access to insurance, some individuals among the refugee/migrant population may encounter coverage gaps when their current insurance plans do not adequately meet their specific health care needs.[29–31] The mismatches between the actual needs of the beneficiaries and the limitations of their plans can create barriers to receiving appropriate and comprehensive care.[29–31] In fact, an estimated 1.9 million Medicaid and 2.9 million Medicare beneficiaries were left underinsured due in large part to specialty clinics, such as ophthalmology, denying care to certain patients attributable to their insurance.[29–31]

A recent study conducted in Ohio highlighted the association between coverage gaps and unmet vision care needs, which further exacerbate disparities in underserved communities.[31] Although not specifically studied within the Ohio study, it is reasonable to infer that a refugee/migrant population heavily reliant on government-funded health insurance may encounter considerable obstacles in obtaining specialist referrals and locating ophthalmology practices that accept Medicaid or Medicare insurance. These challenges can significantly impede their access to necessary eye care services, exacerbating existing disparities in health care, especially the refugee-migrant population highlighted in this study. Future research should explore these barriers in greater detail and devise strategies to address the specific needs of this vulnerable population, ensuring equitable and inclusive eye care provision for all.

Regarding eye care encounters, refugee/migrant status was associated with fewer encounters with ophthalmologists in this study. This finding may indicate disparities in access to eye care services among refugee/migrant populations. Of note, it is important to highlight that vision and eye care insurance is generally only included in most health insurance plans, whether they are private or government-funded, at the age of 65 years or when a medically indicated condition necessitates treatment.[27,28] This gap in coverage can pose challenges for individuals seeking regular eye care and preventive services, especially among those who fall below the age threshold or do not have a specific medical condition that warrants immediate attention.[27,28] As a result, limited access to private insurance options and financial constraints may contribute to the reliance of refugees/migrants on government-funded insurance programs, hindering their ability to address health care needs beyond the initial screening.

Furthermore, our findings indicate that even though refugee/migrant participants had fewer ophthalmology encounters, they had a higher likelihood of undergoing ophthalmology procedures compared to control participants. This difference may suggest variations in the management of studied populations, as many ophthalmic procedures were diagnostic, or may indicate that the lower likelihood of follow-up among refugees/migrants impacted their treatment. A study conducted on recent arrivals of pediatric patients to the United States between 2009 and 2017, including refugees with Special Immigrant Visas from Afghanistan and Iraq, reported a higher prevalence of visual abnormalities, particularly among those from Iraq compared to those from Afghanistan.[32] This finding aligns with studies conducted on adult Syrian refugees in Philadelphia, where a higher prevalence of ocular diseases was observed.[7,8] It is essential to note that several studies have identified significant barriers experienced by vulnerable populations in the United States that have increased the likelihood of loss to follow-up (LTFU), including age greater than 65 years, having Medicaid insurance, having a lower income, and racial and ethnic demographic background.[31,33–36] Many within the refugee/migrant cohort were 65 years or older when initiating care with an ophthalmologist and had Medicaid insurance. As such, one can surmise that more advanced care, congruent with the severity of the disease of a refugee/migrant individual, with fewer encounters to account for a possible loss to follow-up. Further investigation into the specific indications and outcomes of these ophthalmology procedures could provide valuable insights into the ocular health needs and management strategies of refugee/migrant individuals.

Notably, no statistically significant differences were found between the two groups in terms of the most common causes of nontraumatic or infectious vision impairment or blindness worldwide. The smaller sample size and power of this study may have contributed to this finding, which indicates a need for future research on this population with a larger cohort to identify potential relationships between refugee/migrant status and common causes of vision impairment. However, such results may indicate refugees/migrants may not have had sufficient encounters with eye care providers to yield a diagnosis of ocular morbidities. Several studies indicate that vulnerable populations, such as refugees/migrants, often have fewer interactions with healthcare providers and lack the infrastructure required to facilitate continuous care, complicating their ability to access care.[31,37–41] Studies done on refugee populations from Syria, Iraq, and Afghanistan often endorse an increased burden of ocular diseases.[7,8,29] Despite this increased morbidity, members of these populations further endorse little or no interaction with eye care providers and barriers, such as cost and lack of transportation

as barriers to care.[7,8] Further research focusing on the prevalence and management of these conditions within refugee/migrant populations would yield valuable insights into the impact of migration on ocular health.

This study has several limitations that should be taken into consideration. First, the retrospective and cross-sectional design used in this study limits our ability to establish causal relationships and examine long-term health care utilization patterns among refugee/migrant populations. Future research should incorporate longitudinal data collection to provide a more comprehensive understanding of health care utilization trends over time. Second, the study was conducted at a single institution, which may restrict the generalizability of the findings to other refugee/migrant populations. Including multiple centers and diverse populations in future studies would enhance the external validity of the findings. Third, the lack of comprehensive documentation in the EHR system may have resulted in misclassification of patients or the exclusion of individuals who were refugees/migrants. This exclusion of potential participants also reduced the number of eligible participants, impacting the power of our study, and limiting the causal relationships we could infer from these data. Future studies could address these limitations by incorporating additional data sources and using alternative data collection methods, such as surveys or interviews with healthcare providers. Fourth, several socioeconomic and SDoH information, such as education, finances, food insecurity, and transportation, were largely missing from the cohort. A study by Lee et al. described this trend, noting that information on variables such as alcohol and tobacco use was available in a greater percentage of EHRs and another database, whereas other variables had low coverage.[42] These missing data impacted our ability to match multiple factors to reduce potential confounding. Despite these limitations, our findings highlight challenges faced by refugee/migrant populations in accessing and utilizing eye care services effectively. By addressing these limitations in future research, we can gain a more comprehensive understanding of the health care needs of refugee/migrant populations and develop strategies to improve their access to high-quality care.

Conclusions

This study provides insights into the disparities in health care utilization and eye care encounters between refugee/migrant and control participants. The findings underscore significant differences, including higher enrollment in Medicaid insurance programs among refugees/migrants, reduced ophthalmology encounters, and a higher likelihood of undergoing ophthalmology procedures compared to controls. Further research is warranted to identify the specific factors influencing low rates of health care access among refugee/migrant populations. This future investigation should aim to uncover barriers and facilitators impacting the eye care experiences of these populations, leading to the development of effective interventions to enhance their ocular health and overall well-being.

Acknowledgments

Disclosure: **I.A. Copado**, University of California San Diego School of Medicine Program in Medical Education – Health Equity (F), University of California Berkeley School of Public Health (F), and Blue Shield of California; **S. Hallaj**, National Institutes of Health, Bridge2AI common fund (F): OT2OD032644; **B. Radha Saseendrakumar**, National Institutes of Health: DP5OD029610 and P30EY022589 (F); **S.L. Baxter**, National Institutes of Health: DP5OD029610 and P30EY022589 (F), The Glaucoma Foundation, Research to Prevent Blindness (F), University of California Office of the President (F), Topcon (N), Optomed (N) outside the submitted work

References

1. Monin K, Batalova J, Lai T. Refugees and asylees in the United States. MigrationPolicy.org. Published May 12, 2021. Accessed June 1, 2023. Available at: https://www.migrationpolicy.org/article/refugees-and-asylees-united-states-2021.
2. USC Dornsife. Refugee Arrivals | CIDP. California Immigrant Data Portal. Published 2022. Accessed June 9, 2023. Available at: https://immigrantdataca.org/indicators/refugee-arrivals.
3. US Department of State. Refugee Admissions. United States Department of State. Accessed June 9, 2023. Available at: https://www.state.gov/refugee-admissions/.
4. US Citizenship and Immigration Services. Refugees | USCIS. USCIS.gov. Published October 26, 2022. Accessed June 9, 2023. Available at: https://www.uscis.gov/humanitarian/refugees-and-asylum/refugees.

5. San Diego County Health & Human Services. Refugee Arrival Data. SanDiegoCounty.gov. Published August 25, 2022. Accessed June 9, 2023. Available at: https://www.sandiegocounty.gov/content/sdc/hhsa/programs/sd/community_action_partnership/OfficeofRefugeeCoord2.html.
6. San Diego County Health & Human Services. Refugee Health Programs. SanDiegoCounty.gov. Published 2018. Accessed June 9, 2023. Available at: https://www.sandiegocounty.gov/hhsa/programs/phs/tuberculosis_control_program/refugee_health_programs.html.
7. Bal S, Duckles A, Buttenheim A. Visual health and visual healthcare access in refugees and displaced persons: a systematic review. *J Immigrant Minority Health*. 2019;21(1):161–174.
8. Bal S. Vision-related quality of life and access to eye care among recently resettled Syrian refugees in Philadelphia. *J Glob Health Rep*. 2018;2:e2018013.
9. Morris MD, Popper ST, Rodwell TC, Brodine SK, Brouwer KC. Healthcare barriers of refugees post-resettlement. *J Community Health*. 2009;34(6):529–538.
10. Vermette D, Shetgiri R, Al Zuheiri H, Flores G. Healthcare access for Iraqi refugee children in Texas: persistent barriers, potential solutions, and policy implications. *J Immigrant Minority Health*. 2015;17(5):1526–1536.
11. Mirza M, Luna R, Mathews B, et al. Barriers to healthcare access among refugees with disabilities and chronic health conditions resettled in the US Midwest. *J Immigrant Minority Health*. 2014;16(4):733–742.
12. Wien SS, Kumar GS, Bilukha OO, Slim W, Burke HM, Jentes ES. Health profile of pediatric Special Immigrant Visa holders arriving from Iraq and Afghanistan to the United States, 2009–2017: a cross-sectional analysis. *PLoS Med*. 2020;17(3):e1003069.
13. Kumar GS, Beeler JA, Seagle EE, Jentes ES. Long-term physical health outcomes of resettled refugee populations in the United States: a scoping review. *J Immigr Minor Health*. 2021;23(4):813–823.
14. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. *Lancet Glob Health*. 2020;9(2):e144–e160.
15. Park SJ, Ahn S, Park KH. Burden of visual impairment and chronic diseases. *JAMA Ophthalmol*. 2016;134(7):778–784.
16. Bourne RRA, Flaxman SR, Braithwaite T, et al. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. *Lancet Glob Health*. 2017;5(9):e888–e897.
17. California Department of Public Health. Office of refugee health: program overview. CDPH.gov. Accessed June 9, 2023. Available at: https://www.cdph.ca.gov/Programs/CID/ORH/Pages/Program%20Overview.aspx.
18. Amodeo J. Medical refugees and the future of health tourism. *World Medical Health Policy*. 2010;2(4):65–81.
19. Gurnah K, Khoshnood K, Bradley E, Yuan C. Lost in translation: reproductive health care experiences of Somali Bantu women in Hartford, Connecticut. *J Midwifery Women's Health*. 2011;56(4):340–346.
20. Cuschieri S. The STROBE guidelines. *Saudi J Anaesth*. 2019;13(Suppl 1):S31–S34.
21. Immigration and Nationality Act | USCIS. USCIS.gov. Published July 10, 2019. Accessed June 10, 2023. Available at: https://www.uscis.gov/laws-and-policy/legislation/immigration-and-nationality-act.
22. Solberg Y, Rosner M, Belkin M. The association between cigarette smoking and ocular diseases. *Surv Ophthalmol*. 1998;42(6):535–547.
23. Nishida T, Mahmoudinezhad G, Weinreb RN, et al. Smoking and progressive retinal nerve fibre layer thinning in glaucoma. *Br J Ophthalmol*. 2023;107(11):1658.
24. Mahmoudinezhad G, Nishida T, Weinreb RN, et al. Impact of smoking on visual field progression in a long-term clinical follow-up. *Ophthalmology*. 2022;129(11):1235–1244.
25. Mahmoudinezhad G, Nishida T, Weinreb RN, et al. Smoking cessation may reduce risk of visual field progression in heavy smokers. *J Glaucoma*. 2022;31(10):796.
26. Eslani M, Nishida T, Weinreb RN, et al. Effects of smoking on optic nerve head microvasculature density in glaucoma. *J Glaucoma*. 2022;31(9):710–716.
27. Tolbert J, Ammula M. 10 things to know about the unwinding of the Medicaid Continuous Enrollment Provision | KFF. KFF.org. Published June 9, 2023. Accessed June 11, 2023. Available at: https://www.kff.org/medicaid/issue-brief/10-things-to-know-about-the-unwinding-of-the-medicaid-continuous-enrollment-provision/.
28. McCormick I, Mactaggart I, Bastawrous A, Burton MJ, Ramke J. Effective refractive error cover-

age: an eye health indicator to measure progress towards universal health coverage. *Ophthalmic Physiol Opt*. 2020;40(1):1–5.
29. Rudowitz R, Drake P, Tolbert J, Damico A. How many uninsured are in the coverage gap and how many could be eligible if all states adopted the Medicaid expansion? KFF. Published March 31, 2023. Accessed June 18, 2023. Available at: https://www.kff.org/medicaid/issue-brief/how-many-uninsured-are-in-the-coverage-gap-and-how-many-could-be-eligible-if-all-states-adopted-the-medicaid-expansion/.
30. Center on Budget and Policy Priorities. The Medicaid Coverage Gap: State Fact Sheets | Center on Budget and Policy Priorities. CBPP.org. Published July 8, 2021. Accessed June 18, 2023. Available at: https://www.cbpp.org/research/health/the-medicaid-coverage-gap.
31. Muhammad M, Vang J, Tumin D. Association of gaps in health insurance coverage with unmet needs for vision care among adults in Ohio. *JAMA Ophthalmol*. 2023;141(5):488–492.
32. Wien SS, Kumar GS, Bilukha OO, Slim W, Burke HM, Jentes ES. Health profile of pediatric Special Immigrant Visa holders arriving from Iraq and Afghanistan to the United States, 2009–2017: a cross-sectional analysis. *PLoS Med*. 2020;17(3):e1003069.
33. Heilenbach N, Ogunsola T, Elgin C, et al. Novel methods of identifying individual and neighborhood risk factors for loss to follow-up after ophthalmic screening. *J Glaucoma*. 2023, doi:10.1097/IJG.0000000000002328. Online ahead of print.
34. Khurana RN, Li C, Lum F. Loss to follow-up in patients with neovascular age-related macular degeneration treated with anti–VEGF therapy in the United States in the IRIS Registry. *Ophthalmology*. 2023;130(7):672–683.
35. Chen EM, Ahluwalia A, Parikh R, Nwanyanwu K. Ophthalmic emergency department visits: factors associated with loss to follow-up. *Am J Ophthalmol*. 2021;222:126–136.
36. Obeid A, Gao X, Ali FS, et al. Loss to follow-up in patients with proliferative diabetic retinopathy after panretinal photocoagulation or intravitreal anti-VEGF injections. *Ophthalmology*. 2018;125(9):1386–1392.
37. Edward J, Hines-Martin V. Exploring the providers perspective of health and social service availability for immigrants and refugees in a southern urban community. *J Immigrant Minority Health*. 2015;17(4):1185–1191.
38. Zhang X, Andersen R, Saaddine JB, Beckles GLA, Duenas MR, Lee PP. Measuring access to eye care: a public health perspective. *Ophthalmic Epidemiol*. 2008;15(6):418–425.
39. Mishori R, Aleinikoff S, Davis D. Primary care for refugees: challenges and opportunities. *Am Fam Physician*. 2017;96(2):112–120.
40. Copado IA, Baxter SL. Unmet needs in vision care among vulnerable patients. *JAMA Ophthalmol*. 2023;141(5):492–493.
41. Acuff K, Delavar A, Radha Saseendrakumar B, Wu JH, Weinreb RN, Baxter SL. Associations between socioeconomic factors and visit adherence among patients with glaucoma in the All of Us Research Program. *Ophthalmol Glaucoma*. Published online February 4, 2023, doi:10.1016/j.ogla.2023.01.008.
42. Lee TC, Saseendrakumar BR, Nayak M, et al. Social determinants of health data availability for patients with eye conditions. *Ophthalmol Science*. 2022;2(2).