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## Engagement in the Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine Program: Comparing the Effect of Clinic versus Community-Based Recruitment Strategies

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### Abstract

**Purpose:** To determine the effectiveness of adding community-based recruitment to clinic-based recruitment to engage participants in a glaucoma detection program.

**Design:** Prospective cohort study.

**Subjects:** Anyone 18 years of age who does not meet exclusion criteria.

**Methods:** The Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine (MI-SIGHT) program tests a novel way of improving glaucoma detection in

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Conception and design: Elam, Niziol, Newman-Casey

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Disclaimer:

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

HUMAN SUBJECTS: Human subjects were included in this study. The Institutional Review Board at the University of Michigan approved the study. All research adhered to the tenets of the Declaration of Helsinki. All participants provided informed consent. No animal subjects were used in this study.

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communities with populations at high risk for disease, including people who identify as Black and Hispanic and those living with low socioeconomic status. The MI-SIGHT program is conducted in a free clinic (Ypsilanti, MI) and in a federally qualified health center (FQHC) (Flint, MI). Community engagement methods were used to identify outreach strategies to enhance recruitment. Participants were asked “How did you hear about the MI-SIGHT program?” and responses were summarized overall and by clinic and compared between clinic-based and community-based recruitment strategies.

**Main Outcome Measures:** Proportion recruited by location, within or outside of the clinic.

**Results:** In total, 647 participants were recruited in the first 11 months of the study, 356 (55.0%) at the free clinic over 11 months and 291 (45.0%) at the FQHC over 6 months. Participants were on average 54.4 years old (standard deviation = 14.2); 60.9% identified as female, 45.6% identified as Black, 37.8% identified as White, 9.6% identified as Hispanic, and 10.9% had less than high school education. Participants reported hearing about the MI-SIGHT program from a clinic phone call (n = 168, 26.1%), a friend (n = 112, 17.4%), nonmedical clinic staff (n = 100, 15.5%), a clinic doctor (n = 77, 11.9%), an in-clinic brochure or flyer (n = 51, 7.9%), a community flyer (n = 44, 6.8%), the clinic website or social media (n = 28, 4.3%), or an “other” source (n = 65, 10.1%). Recruiting from the community outside the medical clinics increased participation by 265% at the free clinic and 46% at the FQHC.

**Conclusions:** The Community Advisory Board recommendation to use community-based recruitment strategies in addition to clinic-based strategies for recruitment resulted in increased program participation.

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## Keywords

Community-engaged; research; Glaucoma; detection; Health, equity; Recruitment

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An estimated 80 million people are currently affected by glaucoma,<sup>1</sup> making it the leading cause of irreversible blindness globally.<sup>2</sup> Due to the aging of the population, the prevalence of glaucoma in the United States is expected to grow from 2.7 million in 2011 to 4.9 million by 2030 and 7.3 million in 2050.<sup>3</sup> Additionally, it is estimated that 50% of people with glaucoma remain undiagnosed<sup>4</sup> so as many as 3.6 million people could have glaucoma without knowing it by 2050.

The burden of glaucoma falls disproportionately on Black people in the United States, who are 3 times more likely to have glaucoma,<sup>5</sup> 5 times more likely to have unilateral blindness, and twice as likely to have bilateral blindness compared to White Americans.<sup>6,7</sup> People with lower socioeconomic status are also at increased risk of developing glaucoma after adjusting for race, education, and chronic comorbid medical conditions.<sup>8</sup> In response to the high levels of visual impairment and the disproportionate impact on Black Americans, people with lower socioeconomic status, and people who are medically underserved,<sup>9</sup> the Centers for Disease Control and Prevention launched initiatives to identify methods to

improve the detection and care for glaucoma and other blinding eye diseases in underserved communities.<sup>10</sup>

The Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine (MI-SIGHT) program is part of the Centers for Disease Control and Prevention project to identify novel methods to improve glaucoma detection. The MI-SIGHT program tests a telemedicine-based approach to glaucoma screening and care navigation for people who live in high-risk, medically underserved communities.<sup>11</sup> The MI-SIGHT program used community-engaged research methods to guide the program, beginning with interviewing key stakeholders to inform program implementation and recruitment. The MI-SIGHT Community Advisory Board, comprised of researchers, community clinic administrators, staff and providers, and clinic patients, guided recruitment strategies. This manuscript will explore the various methods of participant recruitment used and determine which techniques had the greatest success within specific subgroups of study participants among the first 647 participants enrolled in the MI-SIGHT program.

## Methods

Participants for MI-SIGHT are being recruited from 2 community-based health care facilities, the Hope Clinic, a free clinic in Ypsilanti, Michigan, and the Hamilton Community Health Network, a federally qualified health center (FQHC) in Flint, Michigan. Both clinics have a 37-year history of service to these 2 cities that both have large populations of people from racial and ethnic minority groups as well as large populations of people living with lower incomes. In Ypsilanti, 28% of residents identify as Black and 5% identify as Hispanic.<sup>12</sup> In Flint, 54% of residents identify as Black and 5% identify as Hispanic.<sup>13</sup> The median household net income is \$68 703 nationally,<sup>14</sup> whereas it is much lower in these 2 communities: \$39 332 in Ypsilanti and \$28 834 in Flint.<sup>12,13</sup> In Ypsilanti and Flint, 32% and 39% of residents, respectively, have incomes below the federal poverty level, compared to 11.4% nationally.<sup>12,13</sup>

Participants are also being recruited from the wider Ypsilanti and Flint communities through outreach guided by the Community Advisory Board. In a prior qualitative study,<sup>15</sup> 30 key stakeholders including clinic administrators, staff, providers, and patients were interviewed to assess opinions about best practices, including barriers to and facilitators of glaucoma screening and eye care implementation in the 2 clinics.<sup>15</sup> Participants from these interviews were invited to participate on the longitudinal Community Advisory Board that meets quarterly to advise the MI-SIGHT program about best practices for community outreach and engagement in glaucoma screening and glaucoma care. Each clinic has a site-specific mechanism for clinic-based recruitment. At the FQHC, the chief administrators recommended that MI-SIGHT program staff contact the 2497 clinic patients with diabetes who had not received an eye examination in the past year. Additionally, clinic physicians and staff referred participants to the program. At the free clinic, there was already a mechanism in place for primary care physicians from the clinic to refer patients for eye care. Specifically, the University of Michigan Kellogg Eye Center had been providing all of the eye care consultations for the free clinic patients free of charge during volunteer Saturday Clinics since 2011. These patients are now referred directly to the MI-SIGHT

program on site at the free clinic and are only seen at the Saturday Clinic at the University of Michigan if they screen positive for eye disease through the MI-SIGHT program. The Community Advisory Board felt that a broad outreach strategy to the community would help engage participants in the MI-SIGHT program in addition to recruitment from the medical clinics. Such outreach included placing flyers in senior apartment buildings, low-income housing buildings, food pantries, and churches, and advertising on public access television, on the radio, and on the clinic websites and social media posts. They also recommended doing outreach through the social service programs available in the same building as the free clinic—the food pantry, dental clinic, baby needs program, social work, and laundry program.

Anyone 18 years of age is eligible to participate in the MI-SIGHT program as long as they do not meet the exclusion criteria, as determined by an initial screening intake. Exclusion criteria include: (1) significant eye pain (Likert scale 8 out of 10); (2) sudden decrease in vision within 1 week; (3) binocular diplopia (double vision in both eyes); (4) cognitive impairment; (5) pregnancy; (6) incarceration; or (7) planning to move outside of driving distance to the clinic within the next 6 months. Following confirmation of study eligibility, written informed consent was obtained. The free clinic serves a population where approximately 50% of patients do not speak English and there is no majority second language spoken. Therefore, informed consent forms were provided in English, Spanish, Albanian, and Arabic, and short form consents were provided in Mandarin, French, Hindi, Korean, Tagalog, and Igbo. People who do not speak the above languages were excluded. The study was approved by the Institutional Review Board at the University of Michigan and adhered to the tenets of the Declaration of Helsinki.

After informed consent was obtained, participants filled out a survey assessing demographic characteristics, health history, and social determinants of health before undergoing the vision and eye health screening. As part of this survey, participants were asked “How did you hear about the MI-SIGHT program?” and could select a response from the following options: clinic doctor, nonmedical staff, friend, phone call from clinic, brochure, clinic flyer, flyer outside of the clinic, clinic website, social media, bus advertisement, cable advertisement, food pantry flyer, dental clinic flyer, health fair, and other. Staff are not included as part of clinic-based recruitment as the staff are part of other outreach programs based in the same buildings.

## Statistical Methods

Enrollment for the MI-SIGHT program began on July 28, 2020, from the free clinic and on January 27, 2021, from the FQHC, and data from participants enrolled as of June 29, 2021, were analyzed. Participant characteristics were summarized with means and standard deviations (SDs) for continuous measures and frequencies and percentages for categorical measures. Clinics were compared for differences in participant characteristics with 2-sample *t* tests, chi-square tests, and Fisher exact tests. Responses to the question “How did you hear about the MI-SIGHT program?” were summarized with frequencies and percentages, overall and by clinic. Associations between question responses and patient characteristics were tested with analysis of variance, chi-square tests, or Fisher exact tests with Monte Carlo

simulation. Significant analysis of variance tests were followed by post-hoc Tukey-adjusted pairwise comparisons. Significant chi-square or Fisher exact tests were followed by post-hoc Holm-adjusted pairwise comparisons. Temporal trends in question responses were visualized monthly with stacked bar charts. The number of participants recruited from clinic-based outreach (physician referral to the eye clinic, phone call from study staff based off of a clinic list, or a flyer or brochure seen in the medical clinic) was compared to the number of participants recruited from community-based outreach (nonmedical staff referrals, heard about it from a friend, a community flyer, the clinic website, or social media). Community flyers included bus advertisement, cable advertisement, food pantry flyer, dental clinic flyer, or health fair flyer. The ratio of the number of participants recruited from community-based outreach to the number of participants recruited from clinic-based outreach was computed to determine the proportionate incremental increase in participation from adding community-based recruitment strategies compared to using clinic-based recruitment strategies alone. This ratio was calculated separately for the free clinic and the FQHC. Line plots were used to compare temporal trends in quantity of community outreach efforts through flyers distributed and question responses from enrolled participants. Analyses were conducted overall and stratified by clinic. Statistical analysis was performed with SAS version 9.4 (SAS Institute).

## Results

A total of 647 participants were enrolled in the MI-SIGHT program from July 28, 2020, to June 29, 2021. Of these, 356 (55.0%) were enrolled at the free clinic and 291 (45.0%) were enrolled at the FQHC. Participant characteristics are summarized in Table 1. Overall, participants were on average 54.4 years old ( $SD = 14.2$ ), 60.9% identified as female, 37.8% identified as White, 45.6% identified as Black, 9.6% identified as Hispanic, and 10.9% had less than a high school education. However, many significant differences in participant characteristics were observed between clinics. Participants from the free clinic were older than those from the FQHC (56.1 years [ $SD = 14.2$ ] vs. 52.4 [ $SD = 13.8$ ], respectively;  $P = 0.0009$ ), a larger percentage was female (64.6% vs. 56.5%;  $P = 0.0379$ ), a smaller percentage identified as Black (35.0% vs. 58.5%,  $P < 0.0001$ ), and a smaller percentage spoke English as their first language (79.7% vs. 97.6%,  $P < 0.0001$ ). Further, a larger percentage of participants from the free clinic versus the FQHC reported they had no medical insurance (47.8% vs. 7.8%, respectively;  $P < 0.0001$ ), no eye care provider (80.1% vs. 60.2%;  $P < 0.0001$ ), and that their last dilated eye examination was more than 2 years ago (54.0% vs. 39.9%,  $P = 0.0017$ ).

### Clinic-based Recruitment Strategies

The most common way study participants heard about the MI-SIGHT program was from a phone call from the clinic ( $n = 168$ , 26.1%; Table 2) or from a friend ( $n = 112$ , 17.4%). A lesser percentage of participants reported they heard about the program from a nonmedical staff member ( $n = 100$ , 15.5%), a clinic doctor ( $n = 77$ , 11.9%), a brochure or flyer within the clinic ( $n = 51$ , 7.9%), a flyer outside the clinic within the community ( $n = 44$ , 6.8%), or from the clinic website or social media ( $n = 28$ , 4.3%). A significant association between question response and clinic was observed ( $P < 0.0001$ ; Table 2). Specifically, participants

from the FQHC versus the free clinic were more likely to hear about the program from a phone call from the clinic (49.8% vs. 6.5%, respectively;  $P < 0.0001$ ) and less likely to hear about the program from a nonmedical staff member (4.5% vs. 24.6%;  $P < 0.0001$ ), a flyer outside of clinic (2.1% vs. 10.7%;  $P < 0.0001$ ), or from the clinic website or social media (0.7% vs. 7.3%;  $P < 0.0001$ ).

### Community-based Recruitment Strategies

In terms of recruitment from within the medical clinic compared to recruitment from community outreach strategies, at the free clinic, 27.4% ( $n = 97$ ) participants reported hearing about the program via clinic-based recruitment (physician referral to the eye clinic, study staff phone call, or in-clinic program brochure or flyer), whereas 72.6% ( $n = 257$ ) reported hearing about the program from outside sources (nonmedical staff referrals, friend, community flyer, clinic website, or social media). In other words, we recruited 265% more participants from using community-based recruitment than we would have from using clinic-based recruitment alone at the free clinic. At the FQHC, 68.4% ( $n = 199$ ) of participants reported hearing about the program from the clinic-based recruitment, whereas 31.6% ( $n = 92$ ) reported hearing about the program from community sources. In other words, we recruited 46% more participants using community outreach than we would have recruited using clinic-based recruitment strategies alone at the FQHC.

### Associations between Recruitment Method and Participant Characteristic

**Language Spoken.**—Responses to “How did you hear about the MI-SIGHT program?” showed significant association with participant characteristics at both the free clinic and the FQHC. For the free clinic (Table 3), participant responses were significantly associated with language ( $P = 0.0001$ ) and medical insurance status ( $P < 0.0001$ ). Post-hoc Holm-adjusted pairwise comparisons for analysis of responses from free clinic participants are available in Table S1 (available at [www.ophtalmologyglaucoma.org](http://www.ophtalmologyglaucoma.org)). Specifically, a larger percentage of participants who did not speak English, compared to those who did speak English, reported hearing about the program from a clinic doctor (26.8% vs. 9.2%, respectively; Holm-adjusted  $P = 0.0006$ ) or from a phone call from the clinic (15.5% vs. 4.3%; Holm-adjusted  $P = 0.0041$ ).

**Type of Medical Insurance.**—For those participants who had medical insurance compared to those who did not, a larger percentage reported hearing about the program from a friend (26.7% vs. 12.9%; Holm-adjusted  $P = 0.0074$ ), a flyer outside the clinic (16.1% vs. 4.9%; Holm-adjusted  $P = 0.0050$ ), the clinic website or social media (11.1% vs. 2.5%; Holm-adjusted  $P = 0.0092$ ), or from a source reported as “Other” (13.3% vs. 5.5%; Holm-adjusted  $P = 0.0428$ ). Alternatively, a larger percentage of those without medical insurance compared to those with medical insurance reported hearing about the program from a clinic doctor (23.9% vs. 2.8%; Holm-adjusted  $P < 0.0001$ ) or nonmedical staff (34.4% vs. 16.7%; Holm-adjusted  $P = 0.0011$ ).

**Race/Ethnicity.**—Responses to “How did you hear about the MI-SIGHT program?” showed significant association with participant race at both the free clinic ( $P = 0.0248$ ) and FQHC ( $P = 0.0037$ ), unadjusted for multiple comparisons. Specifically, at the free clinic,

post-hoc pairwise comparisons showed that a larger percentage of participants identifying as Other race (23.1%) reported hearing about the program from a doctor at the clinic compared to White participants (10.6%;  $P = 0.0431$ ). Similarly, a larger percentage of Black participants (31.6%) and Asian participants (33.3%) reported learning of the program from nonmedical clinic staff compared to White participants (17.0%,  $P = 0.0060$  and  $P = 0.0257$ , respectively). Alternatively, a larger percentage of White participants (12.1%) and Asian participants (12.8%) reported hearing about the program from the clinic website or social media compared to Black participants (2.6%;  $P = 0.005$  and  $P = 0.02$ ).

At the FQHC, post-hoc pairwise comparisons showed that a larger percentage of Other race participants report hearing about the program from a friend or clinic flyer (30.4% and 13.0%) than White participants (8.8% and 1.1%,  $P = 0.006$  and  $P = 0.03$ ), but a smaller percentage of Other race participants (30.4%) reported receiving a phone call about the program than White participants (55.0%,  $P = 0.04$ ). Further, a larger percentage of Black participants reported hearing about the program from a clinic flyer (10.5%) than White participants (1.1%,  $P = 0.004$ ). However, none of these associations remained significant after adjustment for the multiple comparisons for race per clinic (all  $P > 0.05$ , Tables S1 and S2, available at [www.opthalmologyglaucoma.org](http://www.opthalmologyglaucoma.org)). There were no significant differences by participant ethnicity at either the free clinic ( $P = 0.3071$ ) or FQHC ( $P = 0.4980$ ). However, because of the small sample size of participants reporting Hispanic ethnicity (free clinic,  $n = 30$ ; FQHC,  $n = 15$ ), we were limited in our power to find significant differences.

**Eye Care Provider.**—For the FQHC (Table 4), in addition to race, participant responses were significantly associated with age ( $P < 0.0001$ ) and whether or not a participant had an eye care provider ( $P = 0.0042$ ). Participants who heard about the program from a friend were significantly younger, on average, than those who received a phone call from the clinic notifying them about the program (47.3 years [SD = 16.2] vs. 55.9 years [SD = 10.2], respectively; Tukey-adjusted  $P = 0.0052$ ). Additionally, participants who responded “Other” as the source of hearing about the program were significantly younger (41.3 years, SD = 18.6) than those who heard about the program from a clinic doctor (54.7 years, SD = 9.7; Tukey-adjusted  $P = 0.0016$ ), a phone call (55.9 years, SD = 10.2; Tukey-adjusted  $P < 0.0001$ ), or from a brochure or flyer located within the clinic (56.0 years, SD = 16.4; Tukey-adjusted  $P = 0.0018$ ). A larger percentage of participants who had an eye care provider reported hearing about the program from a phone call than those who did not have an eye care provider (62.6% vs. 42.0%; Holm-adjusted  $P = 0.0048$ ). Alternatively, a smaller percentage of participants who had an eye care provider reported hearing about the program from a friend compared to those who did not have an eye care provider (6.1% vs. 19.0%; Holm-adjusted  $P = 0.0133$ ). All post-hoc pairwise comparisons for analysis from the FQHC Clinic are available in Table S2.

## Temporal Trends

Temporal trends in participant responses to how participants heard about the MI-SIGHT program are displayed in Figure 1. At the free clinic, the percentage of participants who learned about the program from clinic doctor or nonmedical clinic staff fluctuated, but overall decreased over the study period, whereas the percentage of participants learning of

the program from friends and the clinic website or social media increased over time. Further, quantity of flyer outreach at locations outside of the clinic tended to trend over time with participants reporting they heard about the MI-SIGHT program from flyers (Fig 2). At the free clinic, the largest number of flyers distributed was in March 2021 (1375 flyers), and this corresponded to the largest number of patients reporting flyers as their source of hearing about the program (n = 11 patients). The later deployment of the MI-SIGHT program at the FQHC resulted in limited data on flyer outreach, thus, trends for this center were not investigated.

## Discussion

In this study, we used a community-engaged research approach to understand from community and clinic leaders how best to “get the word out” about the MI-SIGHT program in 2 cities that have large Black communities and have populations with high rates of poverty. Using these community-informed outreach strategies, among the 647 participants recruited in the 11 months of the study, 45.6% identified as Black, 9.6% identified as Hispanic, and 10.9% had less than a high school education. Additionally, recruiting from the community outside of the medical clinics increased participation by 265% at the free clinic and 46% at the FQHC, underscoring the impact of community-guided outreach. Historically, many clinical trials and public health studies do not report the number of racial and ethnic minority individuals and/or have an underrepresented number of racial and ethnic minority participants.<sup>16</sup> To study ways to reduce the racial inequities in glaucoma care, it is important to recruit and include a diverse group of participants in research. Particularly, in studies meant to understand how to best engage people at higher risk of glaucoma—those who identify as Black or Hispanic, and those who have limited economic resources—it may be critical to use recruitment strategies that resonate with these communities.

Our Community Advisory Board suggested clinic-specific and community-specific outreach strategies, thus our mode of engagement significantly differed between the 2 sites. At the FQHC, our team was asked to reach out and call all people with diabetes who were overdue for their eye screening, so participants at the FQHC were more likely to hear about the MI-SIGHT program through a phone call. Because these participants had diabetes, they were also more likely to already have an eye care provider. At the free clinic, participants were more likely to hear about the program through medical clinic providers as our University of Michigan program had been integrated within the free clinic since 2011 and this was already a mode of referral, whereas our relationship with the FQHC only began in 2019. Additionally, more participants at the free clinic heard about the MI-SIGHT program through social media than at the FQHC. The MI-SIGHT program began at the free clinic in June 2019, whereas it began in the FQHC in January 2020, so there was less time for people in the community surrounding the FQHC to hear about the program through social media. As the program continues and social media outreach continues in both communities, we anticipate this equalizing between the 2 sites.

In the free clinic, there were significantly more participants who did not speak English compared to the FQHC, as the free clinic serves a large immigrant population who face unique barriers to enrolling in health insurance plans in the United States.<sup>17</sup> Noncitizens



under age 65 are more likely than citizens under age 65 to live in a family with at least 1 person who works full time, but that full time worker is more likely to be employed in a low-wage job that does not offer employer-based health insurance coverage.<sup>18</sup> Immigrants who are lawfully present must hold a green card for 5 years before they are eligible for Medicaid or the Children's Health Insurance Program.<sup>17</sup> During this 5-year window, immigrants who are lawfully present are eligible for Affordable Care Act subsidies to purchase insurance on the private marketplace.<sup>18</sup> Undocumented immigrants are not eligible for Medicaid, the Children's Health Insurance Program, or to purchase coverage through the Affordable Care Act marketplace.<sup>18</sup> Thus, free clinics are often the only available resource for health care for undocumented immigrants. Because the free clinic serves a large number of immigrants from around the world, communications about the MI-SIGHT program directly from health care providers at the free clinic, where a translator is present when the health service is provided, was the most effective way of engaging people.

Race/ethnicity patient-provider concordance has been shown to increase the likelihood of seeking preventative care for Black, Hispanic, and Asian-American patients.<sup>19</sup> Racial concordance between patients and staff members has also been found to be significantly associated with lower rates of perceived mistreatment in the health care environment than nonconcordance.<sup>20</sup> All of the health care workers providing the care and patient education at the FQHC and 50% at the free clinic are from racial and ethnic minority groups. This was an intentional action by our study investigators, the importance of which was confirmed by our Community Advisory Board. Ensuring diversity of clinical and research providers and staff may provide an avenue to recruiting and retaining diverse study participants, which could lead to decreasing disparities in glaucoma care. Language concordance may also be an important way to improve study recruitment and retention efforts.<sup>21</sup>

The recruitment and retention of eligible participants can be a major barrier in research and has an impact on the success of many studies.<sup>22</sup> The inability to recruit and retain diverse study participants can impact the generalizability of the results and thus may contribute to inequities, as accurate information is not available to inform health policies.<sup>23,24</sup> These challenges are intensified among racial and ethnic minorities, non-English speakers, and patients with low-income, low health literacy, or experiencing mental health problems or drug addiction.<sup>25</sup> Reasons for lower participation of people from these communities can stem from mistrust of research and healthcare, but also include barriers stemming from a lack of financial resources such as inadequate transportation.<sup>26</sup> Several interventions have attempted to increase the recruitment and retention of research participants from minority populations with varying success.<sup>27</sup> Examples of successful strategies include collaborations with community-based organizations such as local churches,<sup>28</sup> culturally relevant advertisements,<sup>29</sup> and inclusion of researchers that are representative of the target community.<sup>26</sup> We used many of these methods as part of our recruitment strategies beginning with partnering with 2 community clinics with long histories of serving the selected communities. We created culturally relevant flyers and brochures as they depicted Black and White people wearing glasses and using their vision in activities such as reading. We also have a diverse research team with Black, White, and Asian researchers and we collaborate with the community clinic administrators, providers, and staff, who also include members from diverse backgrounds, in our Community Advisory Board.

It is also important to note that this study took place during the time when coronavirus disease 2019 restrictions were still in place. Although difficult to ascertain how and to what extent, it is possible that our recruitment effort outcomes may have been different before the coronavirus disease 2019 pandemic and may be different now that most restrictions have been lifted.

Partnering with the community in which our study resides, via the Community Advisory Board, is a strength of this study. As such, our study results may not be generalizable to studies conducted in communities where a relationship between the research study team and community is not well-established, which could be considered a weakness of the study design. Additionally, our findings may have differed in populations with different variety in ages, geographic locations, or socioeconomic status. Research shows that community-based research studies are more successful when they start with the community and the unique characteristics and needs of its members<sup>30</sup>; these results were mirrored in this study in which we demonstrated that using community-engaged research strategies to inform community outreach greatly increased participation from people from diverse backgrounds in our glaucoma detection program compared to clinic-based recruitment alone.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Disclosures:

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## Abbreviations and Acronyms:

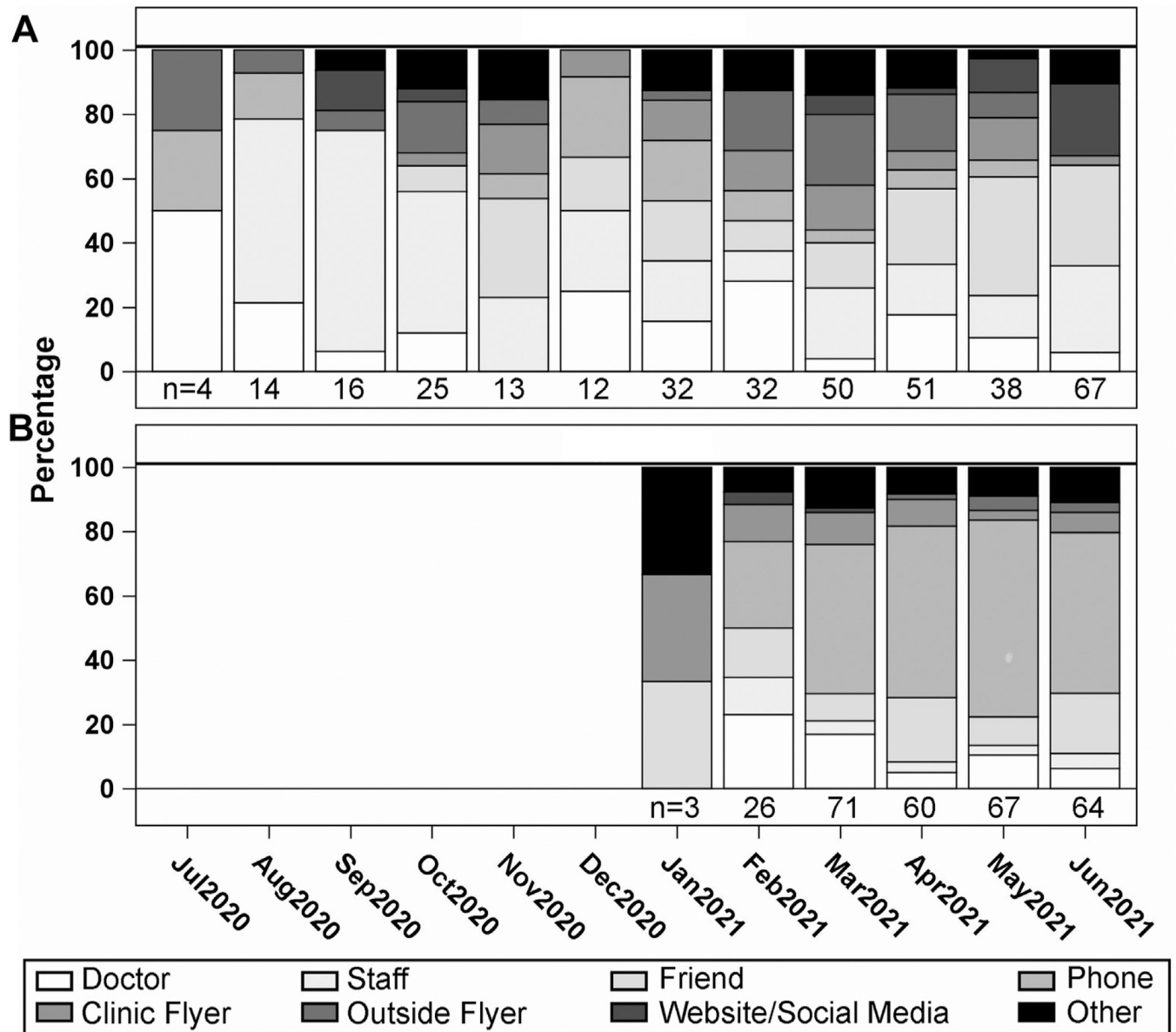
<b>FQHC</b>	federally qualified health center
<b>MI-SIGHT</b>	Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine

**SD** standard deviation

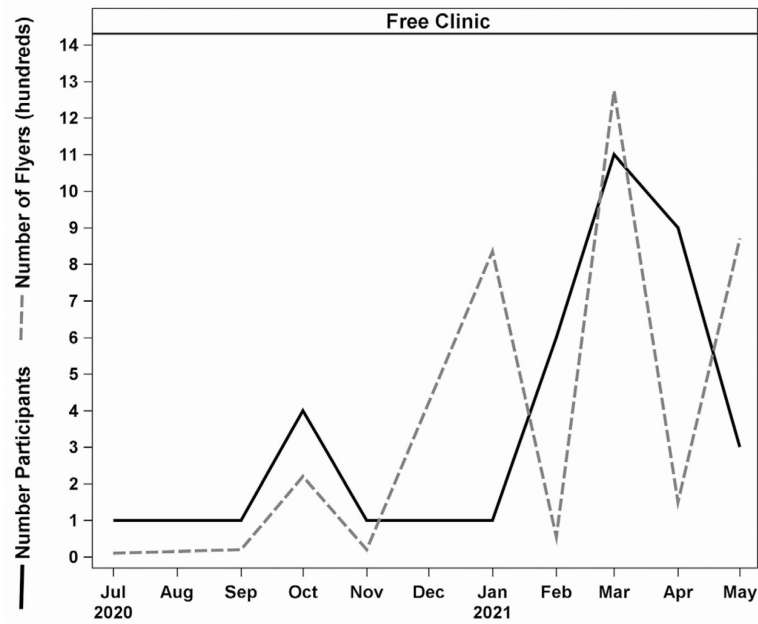
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**Figure 1.** Stacked bar charts displaying the percentage of each response over time to “How did you hear about the SIGHT program?,” within the (A) Free Clinic and (B) Federally Qualified Health Center (FQHC). SIGHT, Screening and Intervention for Glaucoma and Eye Health Through Telemedicine.



**Figure 2.** Line plots displaying trends over time in quantity of outreach flyers delivered to the Free Clinic community and number of participants reporting they heard about the MI-SIGHT program from a flyer. MI-SIGHT, Michigan Screening and Intervention for Glaucoma and Eye Health Through Telemedicine.

**Table 1.** Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine Participant Characteristics

Continuous Variable	Overall (N = 647)			Free Clinic (N = 356)			FQHC Clinic (N = 291)			P value*
	Mean (SD)	Min, Max	Frequency (%)	Mean (SD)	Min, Max	Frequency (%)	Mean (SD)	Min, Max	Frequency (%)	
Age (yrs)	54.4 (14.2)	18.1, 94.2	56.1 (14.2)	18.8, 94.2	52.4 (13.8)	18.1, 86.4				0.0009
Categorical Variable			Frequency (%)			Frequency (%)			Frequency (%)	P Value <sup>†</sup>
Sex										
Male	248 (39.1)			124 (35.4)			124 (43.5)			0.0379
Female	387 (60.9)			226 (64.6)			161 (56.5)			
Race										
White	232 (37.8)			141 (41.8)			91 (32.9)			<0.0001
Black	280 (45.6)			118 (35.0)			162 (58.5)			
Asian	40 (6.5)			39 (11.6)			1 (0.4)			
Other	62 (10.1)			39 (11.6)			23 (8.3)			
Ethnicity										
Hispanic	45 (9.6)			30 (11.0)			15 (7.6)			0.2199
Non-Hispanic	425 (90.4)			243 (89.0)			182 (92.4)			
Education										
< HS	69 (10.9)			37 (10.7)			32 (11.2)			0.8425
HS +	563 (89.1)			309 (89.3)			254 (88.8)			
Income										
\$29 999	396 (73.5)			203 (71.2)			193 (76.0)			0.2119
\$30 000 +	143 (26.5)			82 (28.8)			61 (24.0)			
Language										
English	563 (87.7)			283 (79.7)			280 (97.6)			<0.0001
Non-English	79 (12.3)			72 (20.3)			7 (2.4)			
Insurance										
No	187 (29.9)			165 (47.8)			22 (7.8)			<0.0001
Yes	439 (70.1)			180 (52.2)			259 (92.2)			
Eye care provider										
No	452 (71.1)			278 (80.1)			174 (60.2)			<0.0001

Continuous Variable	Overall (N = 647)		Free Clinic (N = 356)		FQHC Clinic (N = 291)		P value*
	Mean (SD)	Min, Max	Mean (SD)	Min, Max	Mean (SD)	Min, Max	
Yes	184 (28.9)		69 (19.9)		115 (39.8)		
Last dilated eye examination							
Within 2 yrs	259 (52.6)		119 (46.0)		140 (60.1)		0.0017
More than 2 yrs	233 (47.4)		140 (54.0)		93 (39.9)		

Note: percentages are reported on the nonmissing sample.

FQHC = federally qualified health center; HS = high school; Max = maximum; Min = minimum; MI-SIGHT = Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine; SD = standard deviation.

\* Two-sample *t* test.

† Chi-square test or Fisher exact test (where cell counts < 5).



**Table 2.**

Distribution of Responses to “How did you hear about the MI-SIGHT program?”

Response	Total (N = 647 <sup>*</sup> ) n (Column %)	Free Clinic (N = 356 <sup>*</sup> ) n (%)	FQHC (N = 291) n (%)	Pairwise P Values <sup>†</sup>	Holm P Value <sup>‡</sup>
<b>Clinic-based recruitment</b>					
Clinic doctor	296 (45.9)	97 (27.4)	199 (68.4)		1.0000
Phone call	77 (11.9)	45 (12.7)	32 (11.0)	0.5038	<0.0001
Clinic brochure/flyer	168 (26.1)	23 (6.5)	145 (49.8)	<0.0001	1.0000
<b>Community-based recruitment</b>					
Nonmedical clinic staff	349 (54.1)	257 (72.6)	92 (31.6)		<0.0001
Friend	100 (15.5)	87 (24.6)	13 (4.5)	<0.0001	0.1860
Flyer outside of the clinic	112 (17.4)	71 (20.1)	41 (14.1)	0.0465	<0.0001
Clinic website/social media	44 (6.8)	38 (10.7)	6 (2.1)	<0.0001	0.0002
Other	28 (4.3)	26 (7.3)	2 (0.7)	<0.0001	1.0000
	65 (10.1)	35 (9.9)	30 (10.3)	0.8593	

FQHC = federally qualified health center; MI-SIGHT = Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine.

Bolded entries denote overarching categories of clinic-based versus community-based recruitment.

<sup>\*</sup>Two patients from the Free Clinic with missing response data.

<sup>†</sup>Chi-square or Fisher exact test for 2 × 2 pairwise comparisons between clinics with

<sup>‡</sup>Holm adjustment for multiple comparisons.

**Table 3.**

Comparison of Responses to “How did you hear about the MI-SIGHT program?” between Categories of Participant Characteristics for the Free Clinic

Variable	Clinic Doctor		Clinic Staff		Friend		Phone Call		Clinic Flyer		Community Flyer		Website/Social Media		Other		P Value*
	Mean (SD)	Frequency (Row %)	Mean (SD)	Frequency (Row %)	Mean (SD)	Frequency (Row %)	Mean (SD)	Frequency (Row %)	Mean (SD)	Frequency (Row %)	Mean (SD)	Frequency (Row %)	Mean (SD)	Frequency (Row %)	Mean (SD)	Frequency (Row %)	
Age (yrs)	55.2 (13.6)		55.0 (14.1)		57.8 (14.7)		56.9 (11.2)		55.8 (11.8)		57.8 (15.5)		59.1 (14.3)		52.6 (17.1)		0.5821
Sex																	
Male	20 (16.1)		29 (23.34)		23 (18.6)		12 (9.7)		8 (6.5)		12 (9.7)		7 (5.7)		13 (10.5)		0.4820
Female	24 (10.7)		57 (25.3)		48 (21.3)		11 (4.9)		20 (8.9)		25 (11.1)		18 (8.0)		22 (9.8)		
Race																	
White	15 (10.6)		24 (17.0)		33 (23.4)		7 (5.0)		13 (9.2)		13 (9.2)		17 (12.1)		19 (13.5)		0.0248
Black	14 (12.0)		37 (31.6)		23 (19.7)		7 (6.0)		9 (7.7)		15 (12.8)		3 (2.6)		9 (7.7)		
Asian	4 (10.3)		13 (33.3)		5 (12.8)		3 (7.7)		6 (15.4)		2 (5.1)		5 (12.8)		1 (2.6)		
Other	9 (23.1)		10 (25.6)		7 (18.0)		4 (10.3)		1 (2.6)		4 (10.3)		1 (2.6)		3 (7.7)		
Ethnicity																	
Hispanic	6 (20.0)		7 (23.3)		4 (13.3)		4 (13.3)		2 (6.7)		5 (16.7)		1 (3.3)		1 (3.3)		0.3071
Non-Hispanic	26 (10.7)		65 (26.9)		48 (19.8)		14 (5.8)		20 (8.3)		23 (9.5)		23 (9.5)		23 (9.5)		
Education																	
< HS	10 (27.0)		9 (24.3)		9 (24.3)		1 (2.7)		0 (0.0)		5 (13.5)		1 (2.7)		2 (5.4)		0.0683
HS +	34 (11.0)		76 (24.6)		60 (19.4)		20 (6.5)		29 (9.4)		32 (10.4)		25 (8.1)		33 (10.7)		
Income																	
\$29 999	25 (12.3)		49 (24.1)		33 (16.3)		12 (5.9)		24 (11.8)		28 (13.8)		11 (5.4)		21 (10.3)		0.2092
\$30 000 +	9 (11.0)		22 (26.8)		22 (26.8)		5 (6.1)		3 (3.7)		7 (8.5)		6 (7.3)		8 (9.8)		
Language																	
English	26 (9.2)		68 (24.0)		64 (22.6)		12 (4.3)		27 (9.5)		31 (11.0)		24 (8.5)		31 (11.0)		0.0001
Non-English	19 (26.8)		19 (26.8)		7 (9.9)		11 (15.5)		2 (2.8)		7 (9.9)		2 (2.8)		4 (5.6)		
Insurance																	
No	39 (23.9)		56 (34.4)		21 (12.9)		14 (8.6)		12 (7.4)		8 (4.9)		4 (2.5)		9 (5.5)		< 0.0001
Yes	5 (2.8)		30 (16.7)		48 (26.7)		7 (3.9)		17 (9.4)		29 (16.1)		20 (11.1)		24 (13.3)		
Eye care provider																	

Variable	Clinic Doctor		Clinic Staff		Friend		Phone Call		Clinic Flyer		Community Flyer		Website/Social Media		Other	P Value*
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
No	40 (14.4)	73 (26.4)	52 (18.8)	17 (6.1)	22 (7.9)	30 (10.8)	18 (6.5)	25 (9.0)	0.0748							
Yes	2 (2.9)	14 (20.3)	17 (24.6)	5 (7.3)	7 (10.1)	7 (10.1)	8 (11.6)	9 (13.0)								
Dilated eye examination																
2 yrs	11 (9.2)	37 (31.1)	27 (22.7)	13 (10.9)	10 (8.4)	10 (8.4)	5 (4.2)	6 (5.0)	0.0064							
> 2 yrs	20 (14.3)	30 (21.4)	25 (17.9)	4 (2.9)	13 (9.3)	14 (10.0)	14 (10.0)	20 (14.3)								

HS = high school; MI-SIGHT = Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine; SD = standard deviation.

\* Analysis of variance (age), chi-square (categorical variables with cell counts  $\geq 5$ ), or Fisher exact test with Monte Carlo simulation (categorical variables with cell counts  $< 5$ ).

**Table 4.**

Comparison of Responses to “How did you hear about the MI-SIGHT program?” between Categories of Participant Characteristics for the Federally Qualified Health Center

Variable	Clinic Doctor	Clinic Staff	Friend	Phone Call	Clinic Flyer	Community Flyer	Website/Social Media	Other*	P Value †
Age (yrs)	Mean (SD) 54.7 (9.7) Frequency (Row %)	Mean (SD) 50.0 (14.5) Frequency (Row %)	Mean (SD) 47.3 (16.2) Frequency (Row %)	Mean (SD) 55.9 (10.2) Frequency (Row %)	Mean (SD) 56.0 (16.4) Frequency (Row %)	Mean (SD) 42.0 (13.1) Frequency (Row %)	Mean (SD) 43.3 (9.6) Frequency (Row %)	Mean (SD) 41.3 (18.6) Frequency (Row %)	< 0.0001
Sex									
Male	14 (11.3)	3 (2.4)	18 (14.5)	62 (50.0)	8 (6.5)	3 (2.4)	0 (0.0)	16 (12.9)	0.7648
Female	18 (11.2)	8 (5.0)	23 (14.3)	81 (50.3)	13 (8.1)	3 (1.9)	2 (1.2)	13 (8.1)	
Race									
White	15 (16.5)	2 (2.2)	8 (8.8)	50 (55.0)	1 (1.1)	3 (3.3)	1 (1.1)	11 (12.1)	0.0037
Black	14 (8.6)	10 (6.2)	25 (15.4)	78 (48.2)	17 (10.5)	3 (1.9)	0 (0.0)	15 (9.3)	
Asian	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Other	2 (8.7)	7 (30.4)	7 (30.4)	7 (30.4)	3 (13.0)	0 (0.0)	1 (4.4)	2 (8.7)	
Ethnicity									
Hispanic	1 (6.7)	0 (0.0)	1 (6.7)	10 (66.7)	1 (6.7)	0 (0.0)	1 (6.7)	1 (6.7)	0.4980
Non-Hispanic	14 (7.7)	9 (5.0)	31 (17.0)	95 (52.2)	13 (7.1)	6 (3.3)	1 (0.6)	13 (7.1)	
Education									
< HS	3 (9.4)	1 (3.1)	4 (12.5)	21 (65.6)	0 (0.0)	0 (0.0)	0 (0.0)	3 (9.4)	0.6718
HS +	29 (11.4)	12 (4.7)	37 (14.6)	122 (48.0)	21 (8.3)	6 (2.4)	2 (0.8)	25 (9.8)	
Income									
\$29 999	24 (12.4)	9 (4.7)	28 (14.5)	103 (53.4)	9 (4.7)	5 (2.6)	0 (0.0)	15 (7.8)	0.0711
\$30 000 +	8 (13.2)	4 (6.7)	5 (8.2)	27 (44.3)	8 (13.1)	1 (1.6)	2 (3.3)	6 (9.8)	
Language									
English	30 (10.7)	11 (3.9)	40 (14.3)	141 (50.4)	21 (7.5)	6 (2.1)	2 (0.7)	29 (10.4)	0.8314
Non-English	1 (14.3)	0 (0.0)	1 (14.3)	3 (42.9)	1 (14.3)	0 (0.0)	0 (0.0)	1 (14.3)	
Insurance									
No	5 (22.7)	0 (0.0)	4 (18.2)	7 (31.8)	1 (4.6)	2 (9.1)	0 (0.0)	3 (13.6)	0.0888
Yes	26 (10.0)	13 (5.0)	35 (13.5)	136 (52.5)	19 (7.3)	4 (1.5)	2 (0.8)	24 (9.3)	
Eye care provider									

Variable	Clinic Doctor	Clinic Staff	Friend	Phone Call	Clinic Flyer	Community Flyer	Website/Social Media	Other*	P Value †
No	18 (10.3)	7 (4.0)	33 (19.0)	73 (42.0)	15 (8.6)	4 (2.3)	1 (0.6)	23 (13.2)	0.0042
Yes	13 (11.3)	6 (5.2)	7 (6.1)	72 (62.6)	7 (6.1)	2 (1.7)	1 (0.9)	7 (6.1)	
Dilated eye examination									
2 yrs	18(12.9)	8 (5.7)	14 (10.0)	76 (54.3)	7 (5.0)	2 (1.4)	1 (0.7)	14 (10.0)	0.5153
> 2 yrs	9 (9.7)	3 (3.2)	10 (10.8)	47 (50.5)	10 (10.8)	4 (4.3)	0 (0.0)	10 (10.8)	

HS = high school; MI-SIGHT = Michigan Screening and Intervention for Glaucoma and Eye Health through Telemedicine; SD = standard deviation.

\* Patients who responded "Other" were significantly younger than those who responded "Clinic Doctor" ( $P = 0.0016$ ), "Phone Call" ( $P < 0.0001$ ), or "Clinic Brochure/Flyer" ( $P = 0.0018$ ) and those who responded "Friend" were significantly younger than those who responded "Phone Call" ( $P = 0.0052$ ; pairwise comparison  $P$  values reported after Tukey adjustment for multiple comparisons).

† Analysis of variance (age), chi-square (categorical variables with cell counts  $\geq 5$ ), or Fisher exact test with Monte Carlo simulation (categorical variables with cell counts  $< 5$ ).