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Table of Contents

Manuscripts

Editors’ Note

Maria Gilson deValpine, (about to not be) VJPH Editor

We have a robust issue for all of you—authors and readers--who have been waiting and wondering, whatever became of the early Spring issue of the Journal? You may recall that yours truly tried hard to retire last issue and we lost our beloved Jen Jones to more, not less work. Marilyn Bartholmae remains our stalwart and rock, the last woman standing as I will indeed successfully retire after this issue. In fact, the Journal itself will be taking a hiatus as our new President, Ben Barber, and our new VPHA Board re-envisions and updates the Journal. We’ve had a couple of great years on the new Digital Commons platform and much fine scholarship published, now it’s time for the Journal to take its next step!

Getting to now took a great deal of time, but we have a great, big issue, again full of fine scholarship and commentary for you in this last, pending future, iterations:

Shillpa Naavaal took advantage of our not well used Notes from the Field column to bring us an important work on distribution and characteristics of dentists and related professions.

Tammy Kiser and friends at Valley Urgent Care, with the local Cooperative Extension Agency, and Future Farmers of America nearby chapter, collaborated in a unique project. Implementing Kentucky-developed Farm Safety Dinner theaters, the groups successfully addressed health and wellness issues among Rockingham County’s diverse agricultural community, with plans to expand this creative Community Based Participatory Research Project. Congratulations on a successful pilot.

Using a related strategy, Anne-Marie O’Brien and colleagues developed an understanding of community engagement in health-related research. Looking at barriers and facilitators to collaborative research, authors found—we assume to their pleasure—that there are many facilitators and not too many barriers to community engagement in health research.

Betaneya Daniel and co-authors discovered significant differences in the way immigrants and U.S. born patients experience the health care system, with local applications in Virginia. Not surprisingly, efforts need to be made to understand and better serve immigrant patients and to adapt the U.S. health care system and practices to meet the needs of underserved populations.

Emily Potter and colleagues waited patiently to get their health equity, land use, and water policy manuscript published. Thank you for persisting, it turned out beautifully!
Our previous VPHA President, Ashley Tharpe, and colleagues offers a very nice piece on mentoring new public health professionals, and our current President and policy wonk, Ben Barber, wrote a quick brief on “extreme” public health policies. Failing to pass the legislature in Virginia, we are all relieved that public health has advocates in the legislature, but Ben warns us there’s more to do, in Virginia and across the nation.

My very best to our patient authors—past and present--busy reviewers, VJPH Board and Officers, and especially, to Marilyn. Onward!

Maria

Describing trends in Virginia's Dentist and Dental Hygienist Workforce: Challenges and Opportunities

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ABSTRACT

Purpose: Regular assessment of the dental workforce is essential to improve the population's oral health. This analysis aimed to understand the trends in the distribution of dentists and dental hygienists (DHs) in Virginia.

Methods: Annual survey data (2013-2022) of dentists and DHs from the Virginia Department of Health Professions Healthcare Workforce Data Center was used to examine the trends in provider distribution by age, gender, race/ethnicity, and geography across Virginia.

Results: In 2022, there were 5,720 dentists and 5,290 DH licensees in Virginia. In the dentist workforce, there was a high representation of those aged ≥60 years (23%), males (58%), and Whites (59%). On the other hand, the DH workforce has been predominantly females (98%) and Whites (76%), and the age groups were more evenly distributed. Black dentists and DH were highly underrepresented; compared to the 19% Black population in Virginia, only 6% and 5.2% of dentists and DH workforce were Black, respectively. Over time, several counties have seen a decline in FTEs in dentists compared to DHs. In 2022, 9 counties lacked a dentist/DH or both, and 79 counties had lower dentist and DH FTEs than the state average (0.5 FTE for dentists and 0.4 FTE for DH).

Discussion: Virginia's dentist and DH workforce have seen some diversification in the past decade, but significant work needs to be done to gain diversity and equity.

Conclusion: The development of targeted programs and policies to improve professional entry, growth, and retention is necessary to maintain a sustainable, diverse, and representative workforce and address the oral health needs of Virginians.

INTRODUCTION

Good oral health is essential to overall health, and its maintenance is significantly dependent on a competent and adequate workforce. In the past years, the oral health workforce in the United States has grown and changed significantly. However, provider accessibility and distribution are still some of the common barriers reported by patients who experience disparities impacting their oral health (Northridge et al., 2020). Individuals from low-income households have higher caries rates and more unmet dental treatment needs than those from higher-income households. Data shows workforce composition and availability influence access to oral health and utilization of oral health services, especially among groups with a higher burden of social determinants of health (Quiñonez et al., 2022). For example, dentists registered as Medicaid providers are not always actively participating in Medicaid, which may limit oral health access among the Medicaid population. One of the workforce measures for determining oral health access is the dentist-to-population ratio. In 2022, the dentist-to-population ratio in the US was 61/1000,000 persons (Health Policy Institute, 2022). Although this number may look adequate at first glance, the geographic distribution of dentists is not the same across states or even within the state. There are more than 7,000 dental professional health shortage areas (DPHSA) in the US (Kaiser Family Foundation, 2022), suggesting that there is less than one dental provider for nearly 5,000 people.

Access to health care services operates heavily on a supply and demand equation. A recent report on the dental workforce suggests that the dental sector is facing a workforce shortage. The Health Resources and Service Administration report shows more than 12,000 dental practitioners are needed to relieve shortage areas (Health Resources & Services Administration, 2023a). The COVID-19 pandemic brought significant challenges in recruitment and higher retirement rates. Dental practice capacity has been reduced by nearly 10% nationally due to the inability to fill staff positions (ADA Health Policy Institute & Hygienists' Association, 2022). Data shows that nearly one-third of the DH workforce plans to retire in the next five years or less. Although based on self-report, these estimates have implications for future workforce availability and highlight the need to evaluate the workforce closely at the state and local levels.

Virginia is one of the big states in the US, with a population of 8.6 million. It ranked 14th in United Healthcare's annual America's Health Rankings report (United Health Foundation, 2022); however, according to the oral health report card, it received a C+ grade in 2016 and 2022 (Virginia Health Catalyst, 2023) . The report shows that in 2018, 1 out of 3 adults had no dental insurance. Only a small percentage of children had a dental visit under age five. Pregnant women were less likely to have a routine dental visit. Hispanic women, women with less than HS education or lower family income, were less likely to have dental visits than their counterparts (Naavaal et al., 2019). Evidence shows that all groups do not have equal access. These findings have several reasons, but it is important to note that workforce adequacy and availability are part of the explanation for these findings.

In recent years, Virginia has seen major policy changes, such as expanding Medicaid and implementing comprehensive adult Medicaid dental benefits. These policies have significant implications for increased demand for oral health services. Additionally, in recent years, we have experienced a major pandemic which has caused tremendous upheaval in the healthcare system. The pandemic has changed patient flow, disrupted finances for families and practices, and impacted workforce availability and capacity (Patel, 2020). In light of these changes, it is essential to understand oral health workforce trends, determine the adequacy and spread of dental providers to find ways to support the growing oral health needs of the population and identify strategies to improve oral health care access and utilization at the local level. With a sizable Appalachian population with poor oral health outcomes, understanding factors impacting oral health is further critical for public health in Virginia (Martin et al., 2017).

In this paper, we focus on Virginia's dentist and DH workforce and assess the changes in their demographics and geographical distributions in the past decade. Based on the results of our analysis, we point to the challenges and share potential programs and promising strategies to improve workforce recruitment and distribution to better meet the population's oral health needs.

METHODS

Our study used data from the Virginia Department of Health Professions Healthcare Workforce Data Center (HWDC). HWDC conducts an annual survey and collects data on dentists, DHs, and 28 other licensed professions in Virginia. The HWDC began to use a standard survey template for all its professional surveys from 2013; thus, we use data from the years 2013-2022. From 2013 to 2021, dentists and DHs completed surveys in March when they renewed their licenses. In 2021, the Board of Dentistry changed the regulations so that dentists and DHs now renew their licenses in their birth month from 2022 onwards (Virginia Department of Health Professions, 2021). Thus, data from surveys completed from January to December 2022 was collated at the end of December 31, 2022.

This descriptive study includes a sample of licensed dentists and DHs who renewed their licenses online; 99% of licensees renew online. Between 5,000 and 6,700 dentists and 4,000 and 5,500 DHs have been surveyed annually since 2013.

The survey typically achieves a high response rate each year (>75%), and responses are weighted by age and rurality to represent Virginia's workforce. The survey asks several questions, but for the purpose of our study, we examined select characteristics, which included gender, age, race/ethnicity, and geography.

Gender was categorized as male/ female. Age was grouped into eight five-year categories, starting from under 30 years to above 60 years. Race/ethnicity was categorized as non-Hispanic White, Black, Asian, other races (including Native Americans, Alaskan Natives, Native Hawaiian, other Pacific Islanders, and some other races), two or more races, and Hispanic; respondents who did not provide their race/ethnicity were excluded from the analysis on race/ethnicity. We assumed that missingness was randomly distributed across the racial/ethnic groups. Geography was defined by counties/cities; Virginia has 133 counties/cities.

Survey respondents were asked how many hours they worked in each Virginia county/city. The total hours worked per county were summed. Full-time equivalency (FTE) units were calculated by dividing this sum by the population in the county/city, which was obtained from the US Census Bureau (United States Census Bureau, 2023), and multiplying by 1,000; the HWDC uses 2,000 (40 hours for 50 weeks) as its measure for 1 FTE. To compare the geographical distributions of dentists and DHs by county, we calculated FTEs per 1,000 residents.

Data was summarized using frequencies, counts and/or percentages across the included characteristics for 2013-2022 years and compared with the Virginia population where appropriate. For age and race/ethnicity, we examined 2013 and 2022 data, and for geographic distribution, we only show our results using 2022 data but explain analysis comparing 2013 and 2022 data.

RESULTS

In 2022, Virginia's total number of dentists and DHs was 5,720 and 5,290, respectively. Virginia's dentist workforce grew by 8% between 2013 and 2022; this is comparable to the state's population, which grew by 7%. However, the full-time equivalency units provided by dentists declined by 4% in the same period (Figure 1). By contrast, the DH workforce and the FTEs they provided grew by 18% and 12%, respectively. Both rates are much higher than Virginia's population growth. Although DHs saw a dip in their numbers in 2021, likely due to the pandemic, they rebounded successfully in 2022, whereas dentists have not.

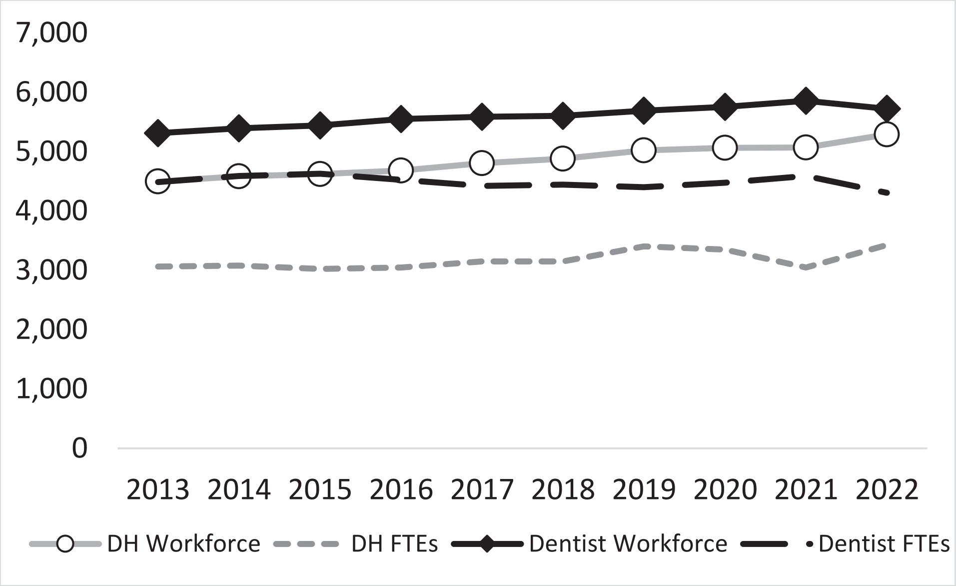


Figure 1. Dentist and DH workforce and FTEs in Virginia

Gender

The percentage of dentists who are females increased from 30% in 2013 to 42% in 2022 (Figure 2) but remains lower than that of the percentage of females in Virginia (51%). Compared to the dentist workforce, the percentage of female DHs is much higher and has stayed between 98% and 99% since 2013 (Figure 3). The number of male dentists declined by 31% between 2013 and 2022, from 3,655 to 2,522. By contrast, female dentists increased by 20%, from 1,544 to 1,855. Both males and females increased in number for DHs, but the percentage distribution did not change. Although male DHs increased from 74 to 102, they still only constituted 2% of the workforce in 2022, as in 2013.

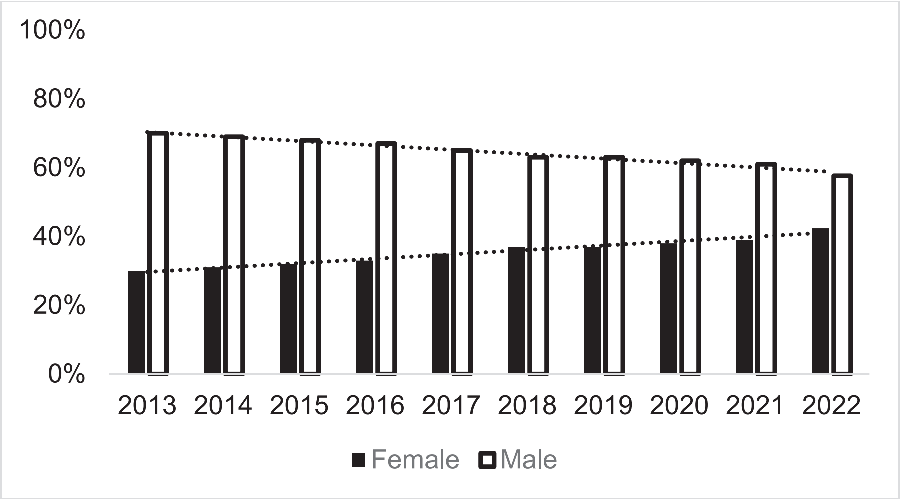


Figure 2. Gender Distribution of the Dentist Workforce in Virginia

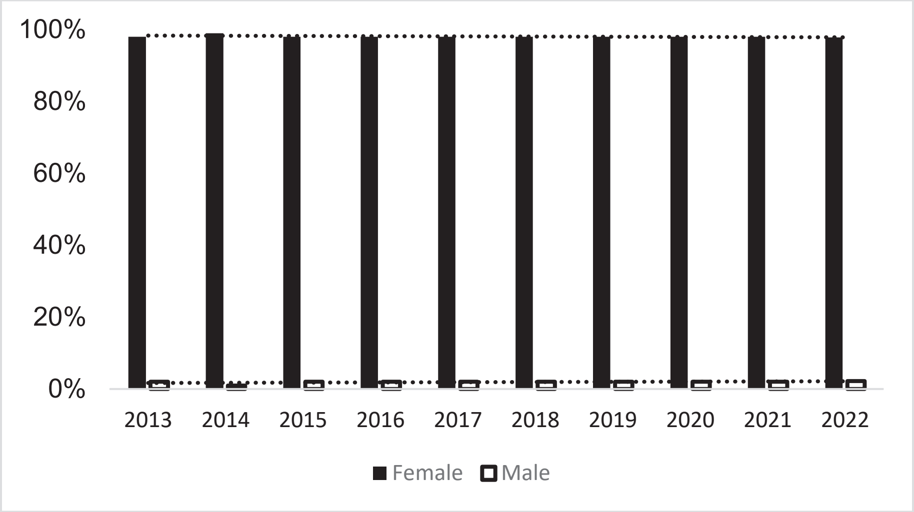


Figure 3. Gender Distribution of the Dental Hygiene Workforce in Virginia.

Age

The dentist workforce had a bimodal distribution in 2022, with the highest proportions above age 60 (23%) and between ages 35-39 (15%); very few were under age 30 (4%) and between ages 55 and 59 (8%) and the rest of the age groups had similar proportions. By contrast, DHs were equally distributed in all age groups, with age groups under 30, 30-34, 35-39, and 60 and above constituting 14% of the population each and the remaining four age groups constituting 10% to 13%.

Only the number of dentists under age 30 and those between ages 45 and 49 saw an increase in 2022 compared to 2013 (Figure 4). The highest decline was observed among dentists above age 60. By contrast, the number of DHs increased for all age groups but for those between 45 and 59 between 2013 and 2022 (Figure 5). It is important to note that even though dentists above age 60 still constitute a sizeable proportion of the workforce, they saw a decline in the numbers between 2013 and 2022; by contrast, DHs saw an increase in the numbers in that age group during the same time.

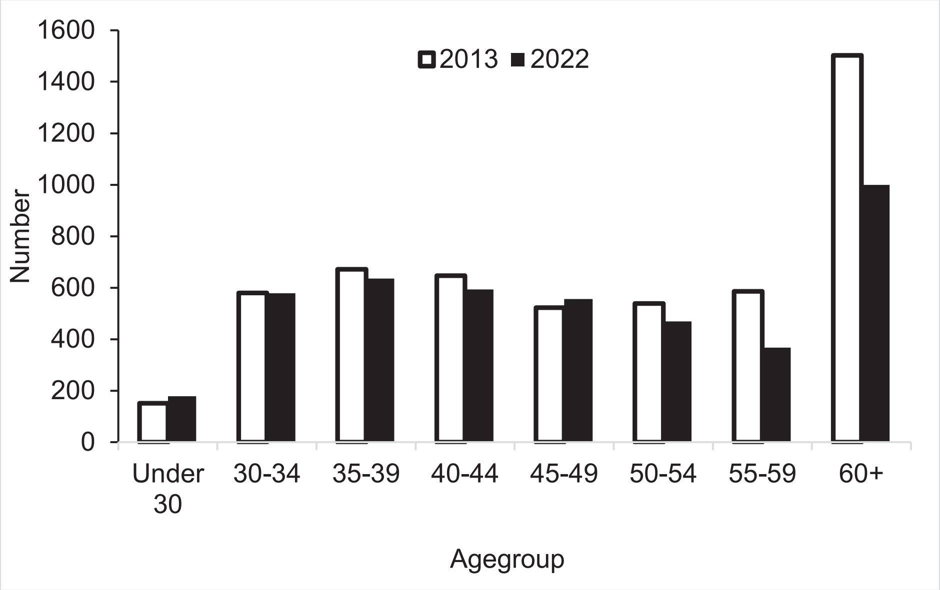


Figure 4. Age Distribution of Dentist Workforce in Virginia.

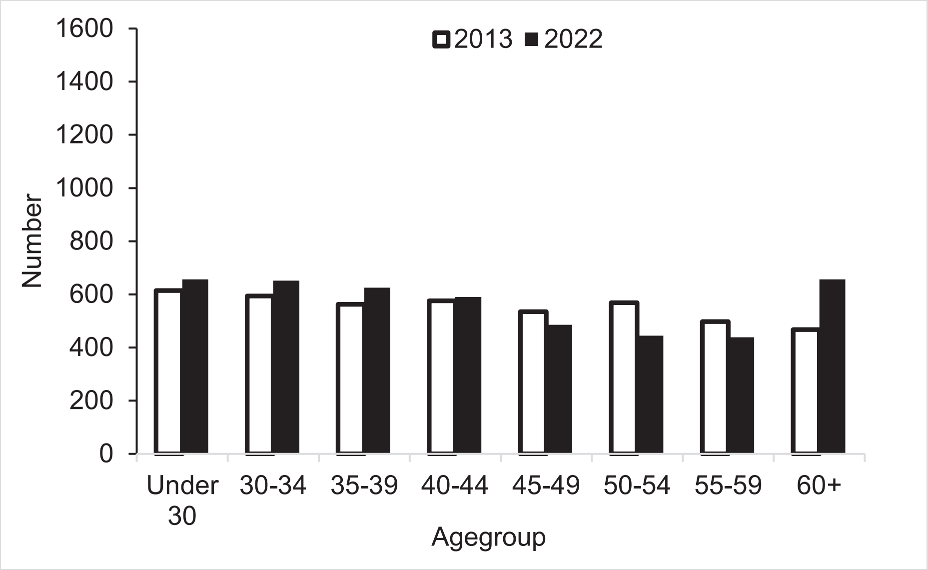


Figure 5. Age Distribution of Dental Hygiene Workforce in Virginia.

Race

In 2022, nearly 6 out of 10 dentists and 8 out of 10 DHs in Virginia were Whites. Compared to the Virginia population, Whites were over-represented in the DH workforce in both 2013 and 2022 but equally represented in the dentist workforce for 2022 (Table 1). Blacks and Hispanics were under-represented among the dental and DH workforce in 2013 and 2022. However, compared to 2013, the dentist and DH workforce saw an increase in the representation of Hispanics and Blacks in 2022. Asians were under-represented in the DH workforce in 2013 but slightly over-represented in 2022. Among dentists, Asians comprised 16% of the workforce in 2013, which increased to 23% in 2022, compared to 6% representation in the Virginia population. As seen in Table, the number not reporting their race/ethnicity saw a large increase in 2022, making the validity of the numerical comparison between 2013 and 2022 questionable; hence, we only show percentages for racial/ethnic categories.

Race/Ethnicity	**2013**			**2022**		
	State	**Dentist**	**DH**	**State**	**Dentist**	**DH**
White	64%	70%	84%	60%	59%	76%
Black	19%	5%	4%	19%	6%	6%

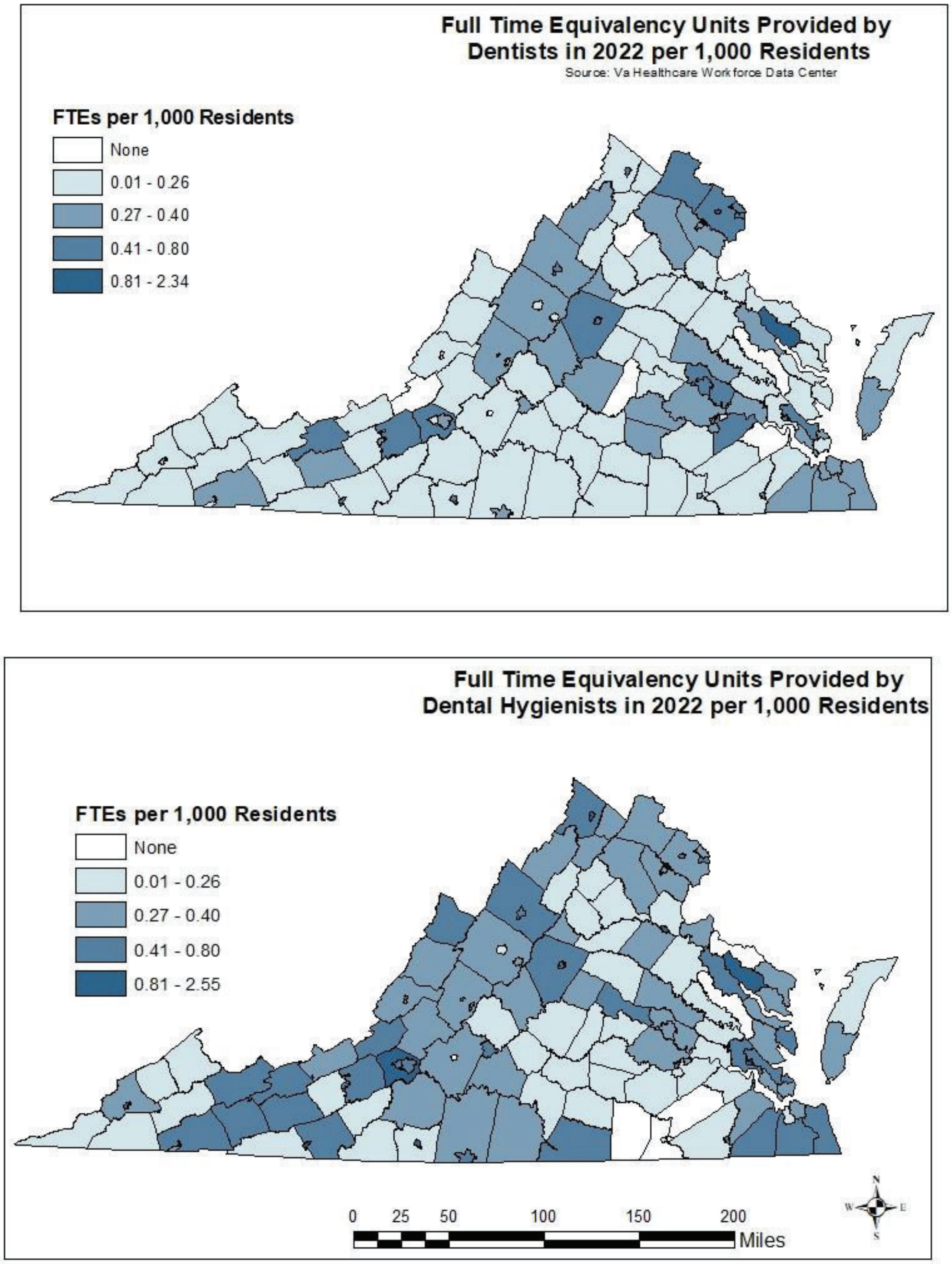
Asian	6%	16%	5%	7%	23%	8%
Hispanic of any race	8%	4%	4%	10%	6%	6%
Other Race	0%	3%	1%	0%	4%	1%
Two or More Races	2%	2%	2%	3%	2%	3%
Total (n)	8,096,604	5,214	4,436	8,642,274	4,383	4,571
Missing (n)		98	60		1,387	719

Table 1. Racial/Ethnic Distribution for Dentists and DHs in Virginia

Geographic Location

Dentists and DHs are not distributed evenly across the state (Figure 5). On average, the Virginia dentist workforce provided 0.50 full-time equivalency units (FTEs) per 1,000 residents in 2022, and the DH workforce provided 0.40 FTEs per 1,000 residents in the same (Healthcare Workforce Data Center, 2023). However, of the 133 counties and cities in Virginia, only 27 have dentists and DHs providing more full-time equivalency units (FTEs) than the state average. Another six counties have higher dentist FTEs than the state average, and 21 have more DH FTEs than the state average. All other counties/cities (79) have lower FTEs for dentists and DHs than the state average. Five counties have zero dentists and DH FTE in the state, but these counties differ for both groups, except one, King and Queen County.

Comparing FTEs per 1,000 residents for dentists and DHs between 2013 and 2022 revealed that FTEs per 1,000 residents for dentists increased in only 29 counties/cities, whereas it declined in 101 counties/cities; no change was recorded in 3 counties/cities (data not shown). For DHs, FTEs per 1,000 residents increased in 94 counties/cities, declined in 36, and did not change in three counties/cities.


Full Time Equivalency Units Provided by Dentists in 2022 per 1,000 Residents

Source: Va Healthcare Workforce Data Center

Full Time Equivalency Units Provided by Dental Hygienists in 2022 per 1,000 Residents

Figure 6. 2022 Distribution of Dentist and Dental Hygiene FTEs per 1,000 Residents.

DISCUSSION

Workforce

Adequacy and availability of oral health workforce is a significant public health issue as it is essential for maintaining good oral health in the populations. This study aimed to describe the state of the dentist and DH workforce in the state of Virginia across a span of a decade (2013-2022) to demonstrate the different dynamics present across both workforces in terms of numbers, FTEs, gender, age, race/ethnicity, and geographical distribution. Our findings have the potential to inform and tailor recruitment, retention, and increased resources to best develop each of these workforces.

While the dentist workforce has grown since 2013, the FTEs they provide have decreased. This decrease could be explained, in part, by the impact of the COVID-19 pandemic, during which dentists reduced the number of patients they treated (Liu et al., 2022). This decline in FTEs could have negative implications for dental care use patterns and accessibility to those needing oral health care. In the last ten years, the workforce and FTEs have increased among DHs. Data shows that the COVID effect was seen in the DH group in 2021, whereas in the dentist group in 2022. One explanation for this finding could be linked to DHs' faster re-entry into the workforce after COVID-19, which may have been bolstered by employers' incentives (e.g., bonuses) (Morrissey et al., 2022).

To continue developing and maintaining the dental workforce, it is essential to boost the education, recruitment, and retention pathways. Programs such as the VCU pre-dental programs, the VCU PATHS program, or the Dental Careers Exploration allow middle and high school students to gain exposure to dentistry career paths (VCU School of Dentistry, 2023b; Virginia Commonwealth University, 2022). Early exposure to this career track may provide a pathway for students to gain knowledge about the field, develop interest, and pursue entry into the dentistry workforce (Wilbur et al., 2020).

Age

Considering the dynamics of age in the dentist workforce, the study findings highlight the high percentage of dentists over 60. Reduction of workforce due to retirement can be a significant concern in this group, as the percentage of dentists entering the workforce is lower than those getting closer to retirement. Furthermore, the pandemic seems to have accelerated this process (ADA Health Policy Institute & Hygienists' Association, 2022). In light of this finding, it may be vital to examine and implement retention strategies aimed at older dentists and the recruitment of younger dentists. Aging is also becoming a reality among DHs; the proportion of DHs above age 60 was much higher in 2022 compared to 2013. Strategies focusing on recruiting and retaining should be planned now to avoid future risks of shifts in age dynamics. Also, it is essential to tailor these strategies to the different ages of each workforce, as the interests and reasons to join the dental workforce and resulting work hours provided by both groups may vary.

Gender

In 2013, 7 out of 10 dentists were male. However, in the decade since, there has been an increase in the number of female dentists (from 30% to 42%). This growth demonstrates efforts to increase the number of female dentists in the workforce. However, in the DH workforce, the vast majority are female (98%). This trend has been stable over the past ten years, with virtually no change. Thus, it is essential to test the efficacy of current recruitment strategies and perhaps develop new strategies to recruit males into this workforce.

One strategy could be exposure to the profession at an early age. Elementary to high school students should be exposed to this profession with tailored approaches focused on gender diversity. Gender diversity in the workforce benefits both the profession and patients by bringing in a broader talent pool, different perspectives, enhanced collaboration, improved recruitment and reputation, and better reflection of the patient population. There is a need to increase the number of male DHs while retaining the female DHs in the workforce. Providing scholarships and support to enter the DH workforce could help expand gender diversity. Programs can partner with professional organizations, grant agencies, and oral health stakeholder groups to support programs geared toward engaging and supporting students interested in entering the field.

To make the DH profession more diverse, some lessons from other professional fields can also be applied. For example, although nursing remains predominantly female, it has progressed in depolarizing the gender gap. Studies from the field of nursing have shown that educational program advertising can affect how applicants view the profession. Purposeful advertising using both female and male participants can help break stereotypes and provide a sense of inclusion for those searching for a profession (Clow et al., 2015).

Race

The study findings showed that Black and Hispanic dentists and DHs have been consistently under-represented in 2013 and 2023. This lack of representation is critical to address as it has implications for the oral health of individuals of minority status due, in part, to the importance of racial and cultural congruence between health professionals and their patients on patients' health and treatment adherence (Behar-Horenstein et al., 2017). The 2022 data shows growth in the percentage of representation by these two groups compared to 2013, suggesting some progress in this area, but more programs are needed to improve these numbers.

One example of a program addressing the lack of minority representation in the oral health profession is undertaken by Delta Dental. Its new campaign, 'Driving Greater Diversity in the Oral Health Workforce,' is focused on increasing the number of oral health professionals from historically underrepresented groups (Delta Dental Institute, 2023). It is doing so by making dental education more accessible and affordable through scholarships at minority-serving institutes, conducting outreach to students, elevating oral health value, introducing careers in oral health at an early age, and supporting workforce research. It is necessary to identify and scale promising programs as shared above, while developing new ones to promote racial diversity in the dentist and DH workforce.

Ongoing work at various dental schools, including VCU School of Dentistry, is an example of how educational institutes are supporting diversity and inclusion (VCU School of Dentistry, 2023a). Partnering and creating pathways through scholarships, training, community experiences, service learning, and engaging with high schools and middle schools can help increase access to oral health careers among all students, including those from under-represented minority backgrounds (Northridge et al., 2020).

Geographic Location

There is a huge discrepancy between the distribution of dentists and DHs across the state. Over half of counties/cities in the state have lower FTEs provided by dentists and DHs than the state average. This includes rural areas in the southwestern (Appalachia), southcentral, and eastern portions of the state. In the context of workforce development and public health across the state, it is essential to emphasize the need for accessible oral healthcare. In the case of Virginia, the areas with fewer FTEs could overlap with DPHSAs. One strategy to address these designated shortage areas could be to leverage scholarships or grants that encourage dentists and DHs to work for a mandated period in these areas to address the lack of oral health access (Behar-Horenstein et al., 2017). Successful programs such as the National Health Service Corps (NHSC) Loan Repayment Program (LRP) should be expanded for the oral health workforce in rural areas (Health Resources & Services Administration, 2023b). Research shows that healthcare professionals who grow up in rural areas are more likely to practice there, so recruitment strategies targeting K-12 students in rural Virginia students should be promoted (Hempel et al., 2015). Additionally, it may be imperative to address issues of access and transportation via support for the Teledentistry models, which could allow for providing care in difficult-to-reach areas (Theriault & Bridge, 2023).

CONCLUSION

To promote oral and overall health, it is essential to understand the trends in the oral health workforce over time. This study described trends in the dentist and DH workforce from 2013 to 2022 by selected characteristics and highlighted the unique differences between the two workforces, which have implications for workforce development, retention, and growth. Overall, we saw that the age, gender and race/ethnicity distribution in dentist workforce improved in the last decade but the geographic and FTE distribution did not and rather deteriorated. On the other hand, the FTE units, race/ethnicity and geographic distribution in the DH workforce improved but gender distribution remained same. More DHs were in older age groups but there was growth in younger age groups too, which is promising. The positive trend changes in both groups could be attributed to various ongoing initiatives as shared before, but more work needs to be done to sustain these and improve trends in other areas. To support dental workforce, recruitment strategies early in the education pipeline, alongside increased scholarships and grants, may increase the representation of male DHs and Black and Hispanic dentists and DHs.

Furthermore, grants and programs could be expanded to allocate resources encouraging the dentistry workforce to practice in rural areas. More funding support for professionals to practice in DPHSA-designated sites could have positive implications for oral health accessibility in the community. Finally, recruitment strategies and intervention programs must be tailored to each group to promote their development and diversity.

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Let Public Health Professionals Do Their Jobs: An Update

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Last August, the Virginia Public Health Association published an issue brief, "Let Public Health Professionals Do Their Jobs." This brief celebrated the work Virginia's public health professionals do to keep us safe and healthy. It also highlighted extreme policies some states have adopted that prevent public health professionals from doing their jobs. The brief called on Virginians to reject these policies.

Fortunately, Virginia's General Assembly did just that. Legislators rejected an extreme proposal that would hamper public health professionals from vaccinating communities during an epidemic. Other threats to public health failed to materialize, suggesting that many Virginians and the legislators who represent them increasingly appreciate the importance of public health and public health professionals.

Still, there is much more work to do. Public health is still under threat in many states. A proposal in Iowa would prohibit the Governor from closing a place of worship even in response to a disaster or public health emergency. A proposal in Kansas would prohibit the Secretary of Health and Environment from acting to prevent the introduction and spread of infectious or contagious disease. A proposal in Oklahoma would arbitrarily limit the length of a public health emergency – similar to a bill the Virginia General Assembly approved in 2022.

Supporters of these types of proposals claim that they are advancing individual rights. In truth, these proposals only serve to advance disease and devastation. Public health professionals must be allowed to do their jobs for the same reason first responders must be allowed to do theirs: they keep us safe. Mandatory immunizations and quarantines during a public health emergency must be allowable for the same reason mandatory building and fire codes exist: they keep us alive.

All Virginians deserve to be safe and healthy. Virginia policymakers should continue to reject extreme proposals so public health professionals can do their jobs.

Mentorship Matters: Promising Results from VPHA's Pilot Mentorship Program

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ABSTRACT

Purpose: The Virginia Public Health Association (VPHA) Pilot Mentorship Program seeks to support public health students, early career professionals, and career switchers in their professional growth. The program provides opportunities for participants to gain job-seeking skills, professional orientation and networking opportunities through live webinars, online networking events, and interactions with experienced public health professionals.

Methods: A VPHA committee developed and implemented the program in academic year 2022-23. Initially, it was envisioned as traditional one-to-one mentoring. Due to a lack of mentor volunteers, the team developed a group mentoring program instead. Information from key informants and a survey guided the program design. Events were delivered live (via Zoom) and were held twice a month over a three-month period in Spring 2023. Evaluations were conducted after each session.

Results: The program was conducted in spring 2023 with 10 committee members, 4 additional volunteers, and 19 mentees. Participants were a mix of graduate students, early career professionals, and career switchers. All planned on-line sessions were implemented. There was significant attrition, with only about half of the mentees attending most sessions. Attendees reported that they found the program useful and appreciated the interaction with experienced professionals.

Conclusions: Colleges, universities, and workplaces may not have resources to implement such programs. Statewide programs offered by professional organizations are an efficient way to support the public health workforce. Well-planned group sessions, a set schedule, and the use of online technology to provide interactive programming supported the successful implementation of the program by VPHA and could be modeled elsewhere.

Introduction & Literature Review

Mentoring has been defined in a myriad of ways and the importance of good mentoring for students and emerging professionals is well-understood. The *Blackwell Handbook of Mentoring* offers a multi-disciplinary approach across psychology, management, education, counseling, social work, and sociology and defines mentoring as "a process of instructing, counseling, guiding and facilitating" (Allen & Eby, 2007). Historically, the term originated from a character in Homer's *Odyssey.* As Odysseus, King of Ithaca, was enroute to fight in the Trojan War, he asked his close friend Mentor to advise and teach Telemachus, the King's son. Over time, the term mentor came to refer to someone who is a guide and educator, and a mentoring relationship was seen as a relationship between a teacher and student (Byars-Winston & Maria Lund Dahlberg, 2019). According to Erhabor (2018), mentors are people "that possess a unique designer and drive to share their personal experiences with others (mentees)."

A literature review documents that the field of public health could benefit tremendously from developing mentorship programs that reduce the gap between theory and practice (Palermo & McCall, 2008). Nelson et al. (2012) looked at global health training and concluded that mentoring is an excellent tool that could be used to deal with significant issues in public health, including the lack of leadership, mentoring skills, inconsistent skills development, and personnel shortages. They also examined the transition of new graduates into the workforce facilitated by mentorship and saw the positive outcome for early career professionals who had received some form of mentoring.

Mentorship can include both individual and group experiences and can be conducted either in-person or virtually. Overall, the research shows that mentorship programs offer the resources necessary to connect mentors and mentees. Although the literature reveals that the top-down, individual approach is still the mainstay of mentoring programs, recent work suggests a modified approach can allow for professional growth for both the mentor and mentee. "Mentoring arrangements not only strengthen the capacity of mentees in navigating established institutions and protocols but also bring new thinking and perspectives to mentors, thereby enhancing the adaptive capacity of the scholarship" (Javaid & Hussain, 2020). Further, Zannini et al. (2011) reported that both parties can share knowledge and expertise through mentorship, leading to professional growth, interpersonal skills, and reflection.

Mentorship fills a gap in knowledge left by coursework and credentialing that is needed for professional development in public health. Furgeson et al. (2008) noted that students agreed "that mentoring could be beneficial to them in terms of their future careers' offering networking opportunities and introduction to professional public health associations to gain an understanding of workforce dynamics and employment opportunities." Mentoring was viewed as a necessary tool to communicate public health competencies to recently graduated public health professionals as well. Almaiman (2019), in his study reviewing the literature on public health mentorship programs, observed that offering mentoring to students outside of the curriculum provides these soon-to-enter-the-field professionals with opportunities for immersion and helps prepare them for real-world work situations. In addition, research showed that partnering with young professionals and career changers through mentorships could build on public health competencies for those entering the field as new graduates or those transitioning into public health from another area.

The use of virtual technology in mentorship became much more prevalent during and after the peak of the COVID-19 pandemic. As virtual technologies became a standard tool in the field of public health, they began to be used for mentorship activities as well. "With these advances, mentorship has taken on new forms, including virtual mentorship, which allows individuals in different networks and geographic regions to connect" (Lewis et al., 2016). This is a new way to engage mentors and mentees, and further research is needed. However, current studies reveal the potential for electronic mentoring, also known as E-mentoring, via Zoom or other virtual platforms to help mentees connect to mentors without the geographic, travel and temporal barriers that once impeded success (Chong, Ching et al., 2020).

Purpose

The mission of the Virginia Public Health Association (VPHA) is to improve Virginia's public health by “strengthening public health practice, fostering health equity, and promoting sound public health policy” (VPHA, 2022, para 1). A key contribution to this mission is supporting the development of a well-trained and competent public health workforce. Challenges abound in improving the public health workforce, one of which is the provision for emerging public health professionals. Toward this end, the purpose of this effort was to contribute to the development of Virginia's public health workforce by developing and implementing a group mentoring program for new (and new to public health) professionals. Mentoring has been widely used in both the workplace and academia to develop students and has been proven effective as a tool for career advancement.

The purpose of the VPHA Pilot Mentorship Program is to support public health students, early career professionals, and career switchers in their growth as public health professionals. The program provided opportunities for participants to gain new skills through live webinars, to connect through online networking, and to meet with experienced public health professionals in Virginia.

Methodology

Initial Goals and Development

The pilot mentorship program was developed in response to findings from the VPHA annual (2022) membership survey indicating that a public health mentorship program was needed in Virginia. In the fall of 2022, VPHA formed a mentorship committee to develop and implement such a program. The vision and goals for the mentorship program were informed by contributions from the American Public Health Association (APHA) and affiliates of APHA, such as the Maine Public Health Association and the New Hampshire Public Health Association. The VPHA mentorship handbook, surveys, and other materials were developed and modified based on the resources shared by those associations. Overall, the mentorship program focused on providing guidance to undergraduate and graduate students, early career professionals, or those transitioning into the field of public health.

The goals of the VPHA mentorship program were to:

- Strengthen the public health workforce by cultivating a diverse generation of leaders through educational and professional experiences.
- Provide learning and networking opportunities for mentors and mentees to enrich their ability to develop professional relationships.
- Assist mentees in learning how to navigate the dynamic and ever-changing field of public health.
- Enhance public health students' and early career professionals' skills and knowledge base.

Originally, the VPHA mentorship program was envisioned and promoted as a traditional one-to-one program in which mentees would be matched with mentors across the Commonwealth, who would then individually decide which skills to focus on. Potential mentors were asked to complete an application describing their education, career experiences, and public health specialty area (as well as availability to meet with a mentee). Potential mentees (public health students/early career professionals/career switchers) were also required to complete an application describing their education background, career experience, professional goals and public health topics they were seeking mentoring on (as well as availability to meet with a mentor). All participants were required to be current VPHA members during the program. Applications were submitted online to VPHA between November and December 2022.

Program Participants

A total of nineteen mentees applied to participate in the program. The great majority (95%) were female, which is similar to results seen on governmental public health workforce demographics recording 79% of the workforce made up of women (Nicolaus, 2022). Two-thirds of the applicants were graduate students, and the rest were new professionals (32%) or in a career transition (5%). Slightly over half held a public health credential such as CPH or CHES.

Unfortunately, only one mentor initially applied, which necessitated a change of format to the program. An additional request for mentors was made through VPHA member communication and social media channels, a request of the VPHA board members, and through the VPHA Pilot Mentor Committee Members, which resulted in 11 additional volunteers to help develop and implement the revised (group) program.

VPHA Pilot Group Mentorship Program Development and Mentee Survey Results

While all mentees who applied were accepted, it was clear that the original vision of a one-to-one matching model would not be feasible and the committee had to quickly develop and implement a different model to serve those mentees who had applied and been accepted. The VPHA Pilot Mentorship Committee, made up of association members, developed the program by talking with Virginia public health professionals, surveying potential mentees from the membership as to what they sought in a program, and developing a list of workshop topics based on data collected from potential mentees.

As Table 1 shows, the mentees had a variety of interests in potential program topics, and these were a mix of professionalization skills and technical skills. The top areas named were Networking (89%), Policy & Advocacy (80%), Professional Skills (74%), Program Evaluation (60%) and Job Search Skills (58%). There were also a number of skills that mentees wanted to learn directly from a one-on-one mentor, including: program planning and evaluation (74%), health equity (68%), underserved populations (63%), policy & advocacy both at 63%, research (59%), general public health (53%), and both infectious disease and maternal and child health (each at 42%). Fewer numbers expressed an interest in one-on-one learning for global health, climate change, environmental health, food and nutrition, medical care, oral health, substance misuse recovery and mental health. Finally, the mentees also expressed interest in participating in additional educational opportunities after the Mentorship Program was completed, including an organized roundtable discussion with a moderator and several speakers.

Table 1
Mentee Program Topic Interests

Areas of Interest	***%***
Networking	89
Policy and Advocacy	80
Professional skills (communication, meeting facilitation)	74
Program Evaluation	6
Job Search skills (resume writing, interview strategies)	58
Program management	58
Grant writing/Research	47
Program Development	42

VPHA Pilot Group Mentorship Program Implementation

The final program consisted of two types of live virtual events: one, a more traditional webinar-style presentation, and a shorter, open discussion format called virtual meetups. Both provided topics based on the responses to the mentee surveys collected from potential participants. The webinars focused on professional job-hunting skills development, including resume and cover letter writing, LinkedIn profile creation, interview tips, professional dress, managing stress, professional communication, and transitioning from school to work or a new career. The virtual meetups were designed to provide networking opportunities and to be more interactive discussions. These meetups were led by seasoned public health professionals sharing their journey in the field of public health and focusing on the overarching themes of forming and keeping professional relationships, the importance of networking, and post-graduation credentialing. The mentorship committee and webinar speakers attended the webinars and virtual meetups and acted as virtual mentors for the mentees for the duration of the program.

The format of both types of sessions had a set structure consisting of live 90-minute sessions delivered via Zoom, connecting professionals across the Commonwealth of Virginia. The program met twice a month over a three-month period in spring 2023. Each month, two events were hosted. Three educational webinars with formal ‘how-to’ skills-based presentations from expert speakers were offered to mentees and the other format included virtual ‘meet-ups’ with a more informal structure where Virginia public health professionals could lead informal conversations with the mentees.

Results

The pilot program kicked off with an invitation to the 19 mentees who had initially applied to the program when it was focused on one-on-one mentoring. Overall, only eight of the mentees chose to participate. However, the attendance and participation by these eight was robust, with most of the sessions having full or close to full attendance. It is possible that the significant drop-off was due to the change in the program from a one-on-one program to a group program. The mentees that participated reported they found the program useful and particularly appreciated the interaction with experienced professionals. One mentee stated*, “I learned that networking is good for my mental health due to its social aspect. Prior to tonight's session, I never considered the impact networking has on one's mental health. The more I interact with others, the more social I become and open to share my knowledge, thoughts, and feelings in certain spaces.”* Another participant stated that they enjoyed the *“candid conversations at the end”* of the webinars.

Lessons Learned

Several lessons were learned during this pilot study, especially the need for flexibility. Future mentorship programs should have alternative plans in place in the case where the number of mentees significantly outnumbers the mentors or program resources. While this pilot program was meant to have in-person one-on-one interactions with some virtual events, the association had to pivot and provide virtual events throughout the pilot.

Finding mentors is a particular challenge. One potential reason that only one person applied for the mentor role could be that the obligation of the mentor appeared too great. One association member commented that they did not volunteer to be a mentor because they felt they were not qualified for the role. Another association member stated that the time commitment sounded greater than they could provide. Future requirements for mentors will be adjusted for alignment with the expectations that potential mentors can meet. The requirement for the mentors and mentees to be VPHA members may also have initially posed a barrier to participation. This program may be well suited to serve as a bridge to getting to know about VPHA and becoming a member.

Finally, the program would have been better served if there was a more robust evaluation planned. Going forward, the mentorship program will be designed with an evaluation plan from the beginning. It is anticipated that pre- and post-program surveys of both the mentees and mentors will be conducted.

Conclusion

The VPHA Pilot Group Mentorship Committee held one final mentorship event, open to all, at the annual VPHA conference on September 21-22, 2023, in Richmond, Virginia. This was designed as a recruiting event for the spring 2024 mentorship program. The conference event was set up as a 'speed-mentoring' style round-table, in which attendees spent 8 minutes at one of five different tables, each of which covered the (very) basics of one topic. Topics included: Resume Writing, LinkedIn, Interviewing, Professional Communication, and School to Work transitions. The session was well-attended, with over 26 participants, and almost all participants signed up to be informed about the upcoming Spring 2024 mentorship program. VPHA also intends to continue with the Group Mentorship program and the committee is exploring the possibility of re-designing and implementing a version of the original plan of one-on-one mentee and mentor interaction over a one-year period.

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Enhancing Community Engagement: Perspectives from Researchers, Community Members and Service Providers

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ABSTRACT

Purpose: Compare and contrast perspectives from Research Team Members (RT), Community Members (CM) and Service Providers/Others (SP/O) about barriers and facilitators to community engagement and participation in health research.

Methods: A cross-sectional, descriptive survey study with a convenience sample of adults who lived and/or worked in the Commonwealth of Virginia was conducted between May and July 2022. Descriptive statistics and chi-square analyses were conducted to identify similarities and differences across the three stakeholder groups.

Results: A total of 303 participants were involved in this study. In general RTs, CMs and SP/Os were similar in their responses to perceived barriers and facilitators. Still, there were five items where there was a significant association between group membership and endorsement of a barrier or facilitator. CMs were most likely to endorse the barrier that research might cause harm and the fear that one could not quit a study. Conversely, RTs were the least likely to endorse the barrier that "they don't understand the benefit of research to society". Among the two significant facilitators, RTs were most likely to endorse researcher training to work with diverse communities. CMs were most likely to endorse training community members to be part of the research team.
Discussion/Recommendations: Several priorities shared across all three groups as well as several divergences. To promote community trust and engagement and

diversity in research participation, academic/clinical research institutions should reward community engagement activities as part of expected tenure/work achievements and dedicate funding for researcher/community member training and community-engaged advisory boards.

BACKGROUND/PURPOSE

Rooted in the principles of equity, justice, and fairness, community-based participatory research (CBPR), also known as participatory action research (PAR) and community-partnered participatory research (CPPR), is a collaborative research approach involving the active participation of community members at each stage of the research process (Brush et al., 2020; Israel et al., 1998; Jones, 2018; Wallerstein et al., 2020). Centered on intentional relationships between academic and community partners, CBPR includes principles of co-learning, mutual benefit, and long-term commitment (Coombe et al., 2020). Through this process, researchers can identify health issues that affect communities and help develop interventions to improve health outcomes, empower community members by involving them in the research process by giving them a voice in decision-making, and build trust between by establishing partnerships and mutual respect (Wallerstein et al., 2020).

Researchers and health professionals should engage with communities at the outset of research for many reasons. For example, access to the diverse perspectives and expertise of their community can increase the value and efficiency of research (Greenhalgh et al., 2019) as well as the relevance and impact of research (Tambor et al., 2018). Indeed, inclusion of the community can foster trust and transparency in the research process and make it more likely that the findings improve health equity and help solve problems that matter most to the community (Skewes et al., 2020). In addition, building trust can improve the diversity of study participants and aid in recruitment (Tilley et al., 2021). Decades of research on community-based participatory research have demonstrated that the association between a community and the health researchers can be a rewarding and productive experience, enhances community health, and generates a beneficial and sustainable impact (Kaiser et al., 2017; Lewis et al., 2016; Tambour et al., 2019, & Wallerstein et al., 2020).

Despite the clear value of community engagement, a recent systematic review of clinical trials found that less than 1% of clinical trials engage patients in the research process and that engagement of minorities occurred only about a quarter of the time (Fergusson et al., 2018). According to Clark et al. (2019), increasing diversity in research "in an effective, sustainable, and scalable way remains a mutual challenge" (p. 150). Their team conducted a qualitative study with key stakeholders (i.e., patients, researchers, and physicians) and identified five critical barriers to minoritized groups' engagement in clinical trials: (1) mistrust (2) lack of comfort with the clinical trial process; (3) lack of information about clinical trials; (4) time and resource constraints associated with participation; and (5) lack of clinical trial awareness. The team then developed a "multistakeholder roadmap" with a set of recommended strategies (facilitators) to specifically target the barriers (Clark et al., 2019, p. 160). For many investigators, however, there are also organizational and professional barriers to building and sustaining these relationships, the result of which is an underrepresentation of racial and ethnic minorities in clinical trials (Konkel, 2015; McCarthy, 1994).

While researchers have acknowledged the many barriers to involving community members in the research process, there is relatively limited information in the literature about practical approaches to community engagement throughout the scope of a research study, with most resources focusing on community engagement only at the start of the research process (Manafo et al., 2018). Without guidance for all stages of the study, researchers may exclude the community when their input is still needed. In one study, researchers reported that community engagement requirements by funders may not always be productive based on the stage of the study or respectful of community members' time (Han et al., 2021). Participants in that study also reported that conflict between the researchers and community members is a common part of a community-engaged research process, often attributed to misaligned research priorities between researchers and community partners and a lack of clear communication about study results (Han et al., 2021). Gaining a better understanding of the barriers and facilitators to community engagement at all stages of the research process can facilitate more productive and sustainable researcher-community partnerships and potentially increase diversity in participant volunteers (Clark et al., 2019).

Since 2012, the Patient-Centered Outcomes Research Institute (PCORI) has required grant awardees to include patient/stakeholder engagement in their projects (Heckert et al., 2020). However, this requirement remains an ongoing challenge for health researchers (Samuel et al., 2018). To better understand the barriers and facilitators to engagement, Heckert et al. colleagues (2020) retrospectively examined two sets of data: their investigator reports and partner surveys. The team found three significant challenges: the need for increased infrastructure support; building authentic associations; and maintaining mutually respectful and empowering associations.

Mann et al. (2018) also retrospectively surveyed patient/public contributors and researchers involved in their study. They found that intentionally including patients and public partners in their randomized controlled trial positively impacted the study and the investigators' and the partners' self-efficacy. Patient/public respondents shared that they enjoyed being part of the study but wished they had been included earlier in the study design process. Conversely, the researchers in the study noted that there could be challenges to working with community partners who lack an understanding of the constraints inherent to the research methodology and processes. While informative, the study included a very small group (N=11). More recently, Morales et al. (2023) noted that in order to foster community engagement research teams should undertake efforts to better understand both the "unique local realities" as well as the expertise of the communities they serve. The lack of research in this area limits the ability of health researchers to design effective strategies to engage communities in research efforts and direct funding efforts toward meaningful engagement. Robust community engagement in some cases may involve a Community Engaged Advisory Board (CEAB) that provides research review for the community, access to a specialized research population and oversight of community involvement in research studies with the help of a community liaison (Halladay et al., 2019). In return, researchers can provide direct benefits to the community outside of recruitment for a study, such as health education and social resources to the community (Mitchell et al., 2020).

The National Institutes of Health Clinical and Translational Science Awards (CTSA) program aims to promote knowledge translation by engaging patients and communities in the research process (National Center for Advancing Translational Sciences, 2023). This study's purpose was to assist institutions in the Commonwealth of Virginia in their efforts to foster community engagement in health research by surveying key stakeholder groups (i.e., research team members, community members, community service providers and others) in order to better understand their perceptions on the barriers and facilitators to community engagement and participation in research. The study's specific objective was to identify similarities as well as differences among the three groups' perceptions on selected barriers and facilitators.

METHODS

The study was a mixed-methods cross-sectional survey design using a convenience sample of adults invited to anonymously complete an online survey. Findings reported here focus on the quantitative portion of the survey.

SURVEY INSTRUMENT

A survey instrument was developed to elicit study participants' perceptions about the barriers and facilitators to community engagement and participation in health research. A review of the literature was first conducted to identify known barriers and facilitators to community engagement with health/clinical research. A draft survey of selected key barriers and facilitators was then developed. The team then consulted with several academic colleagues with expertise in nursing, public health, and social behavioral research as well as members of the integrated Translational Health Research Institute of Virginia (iTHRIV) to further refine the survey. Next with community engagement in mind, the study's draft aim, objectives, and survey were shared with members of a Community-Engagement Studio, provided by iTHRIV colleagues. The research team discussed the study purpose and recruitment plan with the studio members, and then reviewed the planned survey questions. The team took notes and incorporated the studio members' feedback into the survey design and study protocol. The final survey included several demographic questions including (group membership category, region of Virginia, age, education level, gender, race, ethnicity, and experience with research), along with a series of quantitative questions to measure participants' priorities and perceptions related to community-engaged research. The format for the questions included multiple choice, Likert scale (e.g., Extremely, Very, Somewhat, Slightly, Not At All) or a "Select All That Apply". The survey also included several open-ended questions where participants could free-text their answers. The survey was created in REDCap® electronic data collection tool (Harris et al., 2019; Harris et al., 2009) and was estimated to take participants approximately 10-15 minutes to complete.

PARTICIPANTS AND PROCEDURES

The study was open to adults ages 18 and over who self-identified as living and/or working in the Commonwealth of Virginia and could read and write in English. Potential participants were invited via emails and flyers that included a QR code as well as web-link to the study's REDCap® survey. Invitations were also shared via institutional listservs and announcements, social media, community meetings (online and/or in person), and/or organizational presentations. Study team members encouraged recipients to share the flyers and study information emails with community organizations and adult individuals about the opportunity to participate in the study. Data collection occurred for nine weeks during the late spring-early summer of 2022. Study data were collected and managed using REDCap® electronic data capture tool (Harris et al., 2009; Harris et al., 2019) that was hosted at our institution.

ETHICAL CONSIDERATIONS

The anonymous survey was designed so that no individually identifiable demographic data were collected. At the outset of the online REDCap® survey, participants were provided with an information sheet describing the study's purpose, the inclusion and exclusion criteria, the benefits and risks of voluntarily participating and the alternative to not participate. They were informed that answering questions on the survey would serve as their consent to participate in the study and that they were affirming that they meet inclusion criteria. The study was reviewed and approved by the Inova Health System Institutional Review Board and deemed exempt.

STATISTICAL ANALYSIS

Data analysis included descriptive statistics (frequencies/percentages) of the participants' survey answers. Due to the nominal/ordinal levels of the data, chi-square analyses were conducted to identify any group-level differences among the three groups (i.e., researchers, community members, and service providers/others). Statistical significance was set at p<.05. All analyses were conducted using SPSS version 28.

RESULTS

A total of 321 surveys were collected across the Commonwealth of Virginia. Of those, 16 were excluded because the respondent did not indicate their group membership category and two were excluded because even though they indicated their group membership category, they provided no additional answers to the survey. The final sample size included in the analyses was 303 participants (94% of the surveys collected). Of note, not all participants answered all sections of the survey, but the responses they shared were retained in the analyses.

PARTICIPANT DEMOGRAPHICS

Among the 303 participants, more than half (n=156), identified as community members (CM), 66 identified as members of a research team (RT), 62 identified as community service providers (SP/O), and 19 identified as "Other" (O). Given the small number of "Other" participants, their responses were combined with the SP/O group as (SP/O). The sample as a whole was majority female, white, 40 years or older, and had some graduate-level education or degree. Most of the respondents came from the Northern Virginia area (n=180), followed by the Roanoke area (n=46), Charlottesville area (n=35), other (n=21) and Wise area (n=13). Eight respondents did not indicate their institutional region. Given the small regional numbers (with the exception of the Northern Virginia area), the decision was made to analyze the sample as a whole and not separate by region. See Table 1 which provides the demographics of three different groups and the sample as a whole.

Table 1

Demographics of the Sample

Demographic	Research Team (RT)	Community Members (CM)	Service Providers/ Others (SP/O)	Full Sample
	n (%)	n (%)	n (%)	n (%)
Region				
Northern	36 (54.5%)	100 (64.1%)	44 (54.3%)	180 (59.4%)
Roanoke	14 (21.2%)	18 (11.5%)	14 (17.3%)	46 (15.2%)
Charlottesville	15 (22.7%)	13 (8.3%)	7 (8.6%)	35 (11.6%)
Wise	0 (0.0%)	11 (7.1%)	2 (2.5%)	13 (4.3%)
Other	1 (1.5%)	9 (5.8%)	11 (13.6%)	21 (6.9%)
Missing	0 (0.0%)	5 (3.2%)	3 (3.7%)	8 (2.6%)
Age in Years				
18-19	0 (0.0%)	1 (0.6%)	0 (0.0%)	1 (0%)
20-29	9 (13.6%)	6 (3.8%)	1 (1.2%)	16 (5.3%)
30-39	9 (13.6%)	25 (16.0%)	16 (19.8%)	50 (16.5%)
40-49	15 (22.7%)	26 (16.7%)	10 (12.3%)	51 (16.8%)
50-59	16 (24.2%)	27 (17.3%)	23 (28.4%)	66 (21.8%)
60-69	4 (6.1%)	25 (16.0%)	13 (16.0%)	42 (13.9%)
70+	0 (0.0%)	24 (15.4%)	6 (7.4%)	30 (9.9%)
Missing	13 (19.7%)	22 (14.1%)	12 (14.8%)	47 (15.5%)
Education Level				
High School	0 (0.0%)	0 (0.0%)	1 (1.2%)	1 (0.3%)
Some College	0 (0.0%)	12 (7.7%)	6 (7.4%)	18 (5.9%)
College Degree	16 (24.2%)	41 (26.3%)	18 (22.2%)	75 (24.8%)
Some Graduate	2 (3.0%)	14 (9.0%)	5 (6.2%)	21 (6.9%)
Grad Degree	35 (53.0%)	64 (41.0%)	38 (46.9%)	137 (45.2%)
Missing	13 (19.7%)	25 (16.0%)	13 (16.0%)	51 (16.8%)
Racial Category				
Asian	3 (4.5%)	4 (2.6%)	1 (1.2%)	8 (2.6%)
Black	2 (3.0%)	16 (10.3%)	6 (7.4%)	24 (7.9%)
White	39 (59.1%)	106 (67.9%)	59 (72.8%)	204 (67.3%)
Latino	2 (3.0%)	1 (0.6%)	0 (0.0%)	3 (1.0%)
Other	0 (0.0%)	1 (0.6%)	0 (0.0%)	1 (0.3%)
PNA[1]	4 (6.1%)	6 (3.8%)	0 (0.0%)	10 (3.3%)
2+ Race	4 (6.1%)	2 (1.3%)	2 (2.5%)	8 (2.5%)
Missing	12 (18.2%)	20 (12.8%)	13 (16.0%)	45(14.9%)
Gender				
Female	39 (59.1%)	112 (71.8%)	54 (66.7%)	205 (67.7%)
Male	12 (18.2%)	21 (13.5%)	14 (17.3%)	47 (15.5%)
NB	0 (0.0%)	1 (0.6%)	1 (1.2%)	2 (0.7%)
Other	1 (1.5%)	0 (0.0%)	0 (0.0%)	1 (0.3%)
PNA	1 (1.5%)	1 (0.6%)	0 (0.0%)	2 (0.7%)
Missing	13 (19.7%)	21 (13.5%)	12 (14.8%)	46 (15.2%)
Total	66	156	81	303

[1] PNA=Prefer Not to Answer

PARTICIPANT RESPONSES

BELIEF ON WHO BENEFITS THE MOST FROM RESEARCH

Participants were first asked the question, "Who benefits the most from research?", and across all three groups more than two-thirds of the respondents believed that society benefits the most. Of note, CMs were more likely to answer "Don't Know" than the other two groups (10% vs. 5%). A chi-square test of independence, however, found no significant association between the participant's group membership and their selected response (Table 2).

Table 2
Group Membership x Who Benefits the Most from Research

Who	RT		CM		SP/O		Full Sample	
Benefits	n	(%)	n	(%)	n	(%)	n	(%)
Researchers	13	(19.7%)	26	(16.7%)	10	(12.3%)	49	(16.2%)
Patients	4	(6.1%)	2	(1.3%)	2	(2.5%)	6	(1.9%)
Society	46	(69.7%)	112	(71.8%)	65	(80.2%)	223	(73.6%)
Don't Know	3	(4.5%)	16	(10.3%)	4	(4.9%)	23	(7.6%)
Total	66		156		81		303	

RESEARCHERS ENGAGING WITH COMMUNITY: LEVEL OF INTEREST

Participants were then asked two belief statements about researchers' interest in having community members help them with their studies. The 4-point Likert scale ranged from (Strongly Agree, Agree, Disagree, Strongly Disagree). However, due to low expected cell sizes, the participants' responses were collapsed to Agree vs. Disagree. Help with Designing Research Studies: Among the 292 participants who answered, the sample was generally split, but more disagreed than agreed (53% vs. 47%). A chi-square found no significant association between group membership and agreement. (X^2=2.735, df (2), p=.255). Help with Recruiting Research Participants: Conversely, among the n=275 participants who answered, a large majority of the sample (92%) agreed that researchers would like the community's help with recruitment and across all three groups, over 90% of participants agreed. Again, there were no significant association between group membership and agreement (X^2=.906, df (2), p=.636).

RESEARCH-RELATED ENGAGEMENT WITH THE COMMUNITY

The next set of questions asked participants to indicate on a five-point Likert scale the level of importance of eight different researcher-related engagement factors. Choices ranged from: Extremely Important; Very Important; Somewhat Important;

Slightly Important; or Not at All Important. Again, due to several cells having less than five expected cases, participants' responses were dichotomized to those who thought a factor was extremely/very important vs. those who only found the factor to be somewhat, slightly, or not at all important (Table 3).

Table 3

Importance of Researcher Engagement Strategies (Group Membership x Percentage Who Responded Extremely/Very Important)

Engagement Strategy		RT	CM	SP/O	
	N	n (%)	n (%)	n (%)	p-value
Knowledgeable of Community	278	56 (93.3)	130 (90.3)	66 (89.2)	.698
Trained to Work with Diverse Communities	277	55 (93.2)	127 (88.8)	71 (94.7)	.291
Institutional Resources to Recruit a Diverse Study Population	280	54 (90.0)	130 (89.7)	68 (90.7)	.972
Institutions Offer Opportunities to Collaborate with Community Members	277	45 (76.3)	122 (84.1)	64 (87.7)	.204
Discuss Their Work with Community	280	42 (70.0)	115 (79.3)	66 (88.0)	.035
Improve Health of Community	279	46 (78.0)	109 (75.2)	60 (80.0)	.709
Advertise in the Local Communities	278	48 (80.0)	101 (70.6)	65 (86.7)	.023
Improve Participant health	280	32 (53.3)	77 (53.1)	49 (65.3)	.192

Across all eight research-related engagement factors, the majority of study respondents ranked them as extremely/very important. The most highly endorsed factors were those related to knowledge of the local community, training to work with diverse communities, and institutional resources to recruit diverse study populations. The least endorsed factors were those asking if research should directly benefit the research participant and/or community health. Chi-square analyses on each factor to assess the association between group's membership and the importance of the factor, found significant differences for two of the eight factors. First, there was a significant association between group membership and the importance of researchers discussing their results with their local community: Researchers were less likely to rate it as extremely/very important (70.0%) than community members (79.3%) or SP/Os (88.0%) (X^2=6.68, p=.035). Second, there was a significant association between group membership and the importance of research teams advertising in the local community about the research projects they are doing: Researchers were more likely to rate it as extremely or very important (80.0%) than community members (70.6%) or SP/Os (86.7%) (X^2=7.53, p=.023).

BARRIERS TO COMMUNITY ENGAGEMENT IN HEALTH RESEARCH

We next sought to better understand participants' beliefs about the barriers and facilitators to community engagement in health research. Participants were first prompted to share their perceptions on those barriers which might explain why community members sometimes don't participate in research studies. The list of barriers was divided among three main categories: knowledge, concerns, and challenges. Among the 303 participants in the study, we noted that n=27 did not affirmatively answer any further questions on the survey, so they were not included in these last sets of analyses.

KNOWLEDGE-RELATED BARRIERS

The two most highly endorsed knowledge-related barriers (with more than two-thirds of SP/O and RT and more than three quarters of CM) were lack of trust in the researcher and/or institution and not thinking the research will benefit them directly. The two lowest endorsed knowledge-related barriers were not thinking the research is important and preferring to stick with "standard/current healthcare treatments". Chi-square analyses on the six knowledge-related barriers found one significant association between participant group membership and the statement, "They don't understand the benefits of research for society." Research team members were least likely to endorse this factor (55.9%), with 70.6% of community members believing this to be a barrier, and a very large proportion of community-service providers believing a lack of understanding was a barrier (87.8%) (X^2=16.93, p<.001). See Table 4.

Table 4

Percentage of Group Endorsement of Knowledge-Related Barriers

Knowledge Barrier	RT	CM	SP/O
	n (%)	n (%)	n (%)
They don't know what research is.	34 (57.6%)	67 (46.9%)	35 (47.3%)
They don't understand the benefits of research for society.*	33 (55.9%)	101 (70.6%)	65 (87.8%)
They don't think it will benefit them directly.	42 (71.1%)	111 (77.6%)	53 (71.6%)
They don't trust the researcher and/or the institution.	43 (72.9%)	110 (76.9%)	51 (68.9%)
They don't think the research is important.	20 (33.9%)	59 (41.3%)	33 (44.6%)
They would rather stick with "standard/current" healthcare treatments.	25 (42.4%)	50 (35.0%)	26 (35.1%)
Total	59	143	74

Note: N=276; * $p<.05$

CONCERN-RELATED BARRIERS

Among the six concerns-related barriers, the two highest concerns across all three groups were: "They think research might harm them" and "They don't want to be treated like a 'specimen". Researchers were more likely to endorse CM concern about being "treated like a specimen" (85%) than CMs (78%) or SP/O (62%). Between 40-50% of the respondents across all groups endorsed concerns related to prior "bad experience" with research and/or institutions. Less than half of respondents had concerns regarding support persons not wanting a CM to join a study or CMs being worried about quitting. Chi-square analyses of the concerns-related barriers found two significant associations between group membership and barrier endorsement. Nearly half (48%) of CM respondents endorsed the worry that a CM won't be able to quit compared to approximately a third of RTs (32%) and SP/Os (34%) ($X^2=6.59$, df 2, $p=.037$). Conversely, RTs (64%) and SP/Os (62%) were less likely than CMs (78%) to endorse a fear of research-related harm ($X^2=7.03$, df 2, $p=0.30$).

Table 5

Percentage of Group Endorsement of Concern-Related Barriers

Barrier Concern	RT	CM	SP/O
	n (%)	n (%)	n (%)
They think research might harm them.*	38 (64.4%)	111 (77.6%)	46 (62.2%)
They or someone they know had a bad experience in the past with research.	29 (49.2%)	66 (46.2%)	40 (54.1%)
They or someone they know had a bad experience in the past with the institution.	24 (40.7%)	67 (46.9%)	38 (51.4%)
They don't want to be treated like a "specimen".	50 (84.7%)	107 (74.8%)	55 (74.3%)
They don't think their family/partner would want them to be in the study.	14 (23.7%)	40 (28.0%)	17 (23.0%)
They are worried they won't be able to quit being in the study if they don't like it.*	19 (32.2%)	69 (48.3%)	25 (33.8%)
Total	59	143	74

Note: N=276; * $p<.05$

CHALLENGE-RELATED BARRIERS

The final set of barriers included six "Challenges" to community participation in research. The two highest selected barriers across all three groups were: "They can't take time from work to participate" and "They have too much other stress in their life (example family or job)". The majority of participants across all groups identified transportation, distance, and being paid enough as barriers. The least-endorsed challenge-related barrier was "They have participated in too many studies already" with less than 10% of participants identifying this barrier as an issue. There were no significant associations between group membership and barrier endorsement. See Table 6.

Table 6
Percentage of Group Endorsement of Challenge-Related Barriers

Barrier Challenge	RT	CM	SP/O
	n (%)	n (%)	n (%)
They have transportation challenges.	43 (72.9%)	94 (65.7%)	57 (77.0%)
They can't take time off from work to participate.	49 (83.1%)	122 (85.3%)	65 (87.8%)
They have too much other stress in their life (example family or job).	47 (79.7%)	122 (85.3%)	58 (78.4%)
They don't get paid enough for their time.	32 (54.2%)	77 (53.8%)	41 (55.4%)
They have participated in too many studies already.	6 (10.2%)	14 (9.8%)	6 (8.1%)
The research site is too far from their home or work.	35 (59.3%)	94 (65.7%)	41 (55.4%)
Total	59	143	74

Note: N=276; * p<.05

FACILITATORS TO COMMUNITY ENGAGEMENT IN HEALTH RESEARCH

We then asked the participants to share their perceptions on what "could help increase community members participation in research." There were three sets of facilitators: connection, inclusion, and investment strategies. Again, we noted a small, but further drop of six respondents (N=269).

CONNECTION-RELATED FACILITATORS

Among the six connection-related facilitators, the two most highly endorsed were related to researcher communication with the community: Across all three groups, more than 80% of respondents believed it could help if researchers "talk to the community groups about how research can benefit patients and communities" and three-quarters or more across all three groups endorsed the statement that "researchers make sure to report their findings to the community". Interestingly, the least endorsed statement was "Someone on the research team shares the same race, ethnicity, and/or culture as the community". Whereas more than 75% of RTs endorsed this statement, only 64% of CMs and 61% of SP/Os indicated it could help. Chi-square analyses on the six connection-related facilitators found one significant association between the statement "researchers are trained to work with diverse communities" and participant group membership. RTs were much more likely than the other two groups to endorse this statement (91% vs. 75% and 66%) (X2=11.40, p=.003). See Table 7.

Table 7

Percentage of Group Endorsement of Connection-Related Barriers

Connection Facilitator	RT	CM	SP/O
	n (%)	n (%)	n (%)
Researchers go to the activities in the community where they conduct research	43 (74.1%)	97 (69.3%)	48 (67.6%)
Researchers know about the neighborhoods/culture where community members live	45 (77.6%)	112 (80.0%)	52 (73.2%)
Researchers talk to the community groups about how research can benefit patients and communities	52 (89.7%)	122 (87.1%)	57 (80.3%)
Someone on the research team shares the same race, ethnicity, and/or culture as the community	45 (77.6%)	89 (63.6%)	43 (60.6%)
Researchers are trained to work with diverse communities*	53 (91.4%)	105 (75.0%)	47 (66.2%)
Researchers make sure to report their findings to the community.	51 (87.9%)	112 (80.0%)	53 (74.6%)
Total	58	140	71

N=269; *p <0.05

INCLUSION-RELATED FACILITATORS

There were four inclusion-related facilitators which centered around the principles of CBPR. The two most highly endorsed facilitators were “Researchers match their project ideas with the needs of the community” and “Researchers develop an ongoing community advisory board to help with study design and recruitment” with more than 70% of respondents in each group endorsing these statements. Only a small majority of respondents felt endorsed it would help to have “researchers work with a community group in designing a study” or have “Researchers and community members attend trainings together on the value of having community members work on research projects”. Chi-square analyses found no significant associations between the inclusion-related facilitators and group membership. See Table 8.

Table 8

Percentage of Group Endorsement of Inclusion-Related Facilitators

Inclusion Facilitator	RT	CM	SP/O
	n (%)	n (%)	n (%)
Researchers match their project ideas with the needs of the community	46 (79.3%)	113 (80.7%)	54 (76.1%)
Researchers work with a community group in designing a study	34 (58.6%)	91 (65.0%)	43 (60.6%)
Researchers develop an ongoing community advisory board to help with study design and recruitment	45 (77.6%)	99 (70.7%)	52 (73.2%)
Researchers and community members attend trainings together on the value of having community members work on research projects	33 (56.9%)	74 (52.9%)	43 (60.6%)
Total	58	140	71

N=269; *p <0.05

INVESTMENT-RELATED FACILITATORS

The final set of facilitators were related to investment. Of the four statements, the most highly endorsed was that “researchers have money in their budget to increase recruitment of a diverse group of participants” with nearly 75% of respondents in each group endorsing this statement. There was similar agreement across all three groups for “researchers offer skills training” – with 65% or more endorsing this investment. The least-endorsed was creating “Speakers Bureaus or videos”. Interestingly, there was a significant divergence in group response rates to the statement “researchers hire community members to be part of the research team”: 78% of CMs endorsed this statement, compared to only 66% of RTs and 69% of SP/Os. Chi-Square analysis found a significant association between group membership and endorsement of this statement (X2=6.86, p=.032). See Table 9.

Table 9

Percentage of Group Endorsement of Investment-Related Factors

Investment Facilitator	RT	CM	SP/O
	n (%)	n (%)	n (%)
Researchers have money in their budget to increase recruitment of a diverse group of participants.	45 (77.6%)	104 (74.3%)	54 (76.1%)
Institutions create Speakers Bureaus or videos.	32 (55.2%)	74 (52.9%)	37 (52.1%)
Researchers offer skills training.	39 (67.2%)	91 (65.0%)	49 (69.0%)
Researchers hire community members to be part of the research team.*	38 (65.5%)	109 (77.9%)	44 (62.0%)
Total	58	140	71

N=269; *p <0.05

DISCUSSION

This study identified both similarities and differences among research teams', community members' and service providers/others' perceptions of barriers and facilitators to community engagement and participation in health research. While several studies have reported on community members' and researchers' perceptions on this issue (Clark et al., 2019; Fielding-Miller et al., 2022; Han et al, 2021; Heckert et al., 2020, Mann et al., 2018), to our knowledge none has quantitatively surveyed stakeholders using the same set of survey questions. In general, the RTs, CMs and SP/Os in this study were similar in their responses to perceived barriers and facilitators. Still, there were five items where there was a significant association between group membership and the endorsement of a barrier or facilitator. These significant differences in perceptions, highlight the importance of understanding and addressing differences in order to foster effective community engagement and participation in health research.

One of the key findings of this study was that it is vital to all groups that researchers know the local community, receive training on working with diverse communities and obtain institutional resources to recruit diverse study populations. Previous work has identified researchers' training and education as a feature of successful community engagement (Harrison et al., 2018). In this study, the RT group overwhelmingly endorsed "being trained to work with diverse communities" as an important facilitator (91%) compared to the CM group's endorsement (75%) and SP/O group's endorsement (66%). Fielding-Miller et al. (2022) noted the particular salience of researcher training on the tenets of cultural humility given that researchers have relatively limited risk in community-engaged research whereas community members/groups risk potential coercion, re-traumatization, and/or stigmatization from their participation in the process.

At the same time, there were several barriers that were endorsed by a larger percentage of CMs than RTs. These barriers included community's lack of trust in researchers/institutions, a limited understanding of participant rights and how research benefits society. In addition, more than three-quarters of CMs (78%) endorsed the barrier that participants in studies could experience harm, whereas a smaller proportion of RTs (64%) endorsed this concern. These barriers underscore the importance of building trust, establishing reciprocal associations, and fostering genuine partnerships between researchers and community members, all of which have been identified as effective strategies for researchers to create authentic community engagement (Skewes et al., 2020).

Because it is especially important to build and maintain trust with historically marginalized communities, Mitchell et al. (2020) recommended researchers work with intentionality to include beneficial programs such as health education and capacity-building (as requested by the community) in return for their research engagement (e.g., Community Advisory Boards, community discussions and feedback and community liaison engagement). Indeed Mitchell et al. (2020) posited that such programmatic offerings can establish and maintain trusting associations because they provide "tangible" benefits to the community (p. 759). Others like Kaiser et al. (2017) have recommended researchers create opportunities for community empowerment and education by engaging the community early in the research process, involving them in decision-making, and in the co-creation of research objectives and methodologies.

Our findings similarly echo Han and colleagues' (2021) study where participants suggested it would be ideal if researchers became more active and involved with the community. Specifically, a higher percentage of CMs than RTs felt it was extremely/very important for researchers to discuss their work with the community. Conversely, there was a smaller proportion of CMs than RTs who felt it was important researchers advertise the research they are doing. It would be worth exploring these differences as it is possible that "advertising" research might be viewed by communities as only a one-way form of communication for recruitment purposes. Community discussions, on the other hand, could be viewed by communities as an opportunity for researchers to not only educate/explain the benefit of research to historically marginalized and/or under-invited communities, but also an opportunity for bi-directional dialogue/engagement. Clark et al. (2019) developed an excellent set of communication strategies (including a core message map and checklist) to increase community trust and participation in diversity in clinical trials research. Recent studies by McNeal et al. (2021) and Uphold et al. (2022) similarly found that researchers recognize the importance of disseminating their work to nonacademic/non-researcher audiences but often lack time, training, and/or incentives to do so.

Finally, our study findings highlight the importance to community members that they are not only valued members of the research team but also appropriately compensated for their work. This was true for SP/Os as well, but to a lesser extent. Fielding-Miller et al. (2022) highlighted that community-based organizations have concerns about allowing researchers access to their clients due to lack of respect, concerns that the researcher will reinforce harmful stereotypes with the client or create extra work for the site coordinators that are not compensated or acknowledged.

STRENGTHS AND LIMITATIONS

Many studies to date on community-engaged research have involved only one stakeholder group at a time (Killough et al., 2023; McNeal et al., 2021; Morales et al., 2023; Uphold et al. 2022) and/or conducted multi-stakeholder qualitative studies (Clark et al., 2019; Han et al., 2021; Niranjan et al., 2021). Our study appears to be one of the first to use the same quantitative survey to collect several key stakeholder groups' perspectives about the barriers and facilitators to community engagement and participation in health research. With our study design and findings researchers and CEABs in the Commonwealth of Virginia have a starting point for identifying commonalities in stakeholder priorities as well as identify where divergences warrant further stakeholder engagement/conversations. While this pilot study had several limitations it can still offer several lessons learned. First, despite employing diverse strategies to recruit across the communities of Virginia, there was an unequal representation of participants from Northern Virginia, and from those who identified as white, female, and well-educated which limits the generalizability of the study findings. Second, although the study survey tool was assessed to be at a 9th grade reading level, some participants may have found the survey questions difficult to understand and may have introduced response-bias and/or led to participant drop-out. The study lacked funding to translate the survey into Spanish, or to offer the survey in paper-form which might have been barriers to participation from underrepresented groups and thus further contributed to response bias. In several of their free-text comments, study participants articulated the need for surveys such as this one to be available in languages besides English, and we acknowledge the bias and exclusion introduced to the study by not having this resource.

RECOMMENDATIONS AND NEXT STEPS

Our study identified many perceived barriers and facilitators that were shared by all three groups as well as several where there were divergences. The differences in the perceptions between RTs and CMs in this sample suggests a misalignment of expectations, priorities, and experiences with community engagement in health research. Such a disconnect can thwart meaningful collaborations and compromise efforts toward community-engaged research particularly with historically marginalized communities. It is crucial, therefore, to acknowledge and address these discrepancies through transparent communication, training efforts, and a philosophy of mutual respect and value. CBPR principles and methods provide a framework for research teams to adopt the aforementioned strategies. CBPR proponents such as PCORI, the Kellogg Foundation, and the NIH's CTSA program also provide researchers' opportunities to secure dedicated funding for projects that promote community engagement activities and partnerships. To further promote community trust and engagement and foster diversity in research participation, academic and clinical research institutions could consider creating dedicated funding for researcher and community member training and establishment of community-engaged advisory boards. Another incentive for researchers to engage with communities in a more effective and equitable manner would be to reward community-engaged scholarship with dedicated request for proposal awards (RFA) and/or funding resources.

Training and capacity-building initiatives should also be required to help researchers enhance their communication skills when working with diverse communities. For example, CITI Program (2019) has three community-engaged research (CEnR) modules that IRBs can consider requiring of all investigators and not just those engaged in social-behavioral-educational research. Academic and health systems could further promote community capacity building by opening CITI training memberships to their CEAB members and interested community leaders.

Consistent with our recommendations, the findings from our own study will be shared with/disseminated to the community through institutional community-action committees, and through emails and social media posts in the places where recruitment was completed. Discussions about study findings through planned community studios could further generate insights into the findings and identify next steps for fostering CER collaborations in the Commonwealth of Virginia. iTHRIV continues to employ community engagement through Community Studios and distributing research grants to support research institutions partnering with community organizations to address community health priorities. With CTSA support, Inova Health System established a Research Community Advisory Board to educate and receive feedback from the community regarding research projects. This effort is continued through Inova's Health Equity Community Action Committees.

For the last two decades, federal agencies and programs as well as expert CBPR scholars in public health have been calling upon researchers to partner with communities to more effectively address persistent national health disparities (Holkup et al., 2004; Israel et al., 2001; Minkler et al., 2005; Syme et al., 2004). Yet many research-intensive universities and health systems IRBs don't require training or incentives that could foster researchers' meaningful partnership with communities in health research. Finally, we agree with Fleming et al. (2023) that as our country continues to address institutional and structural racism/discrimination, it is time for academic and health institutions with DEI initiatives to include an examination of their research teams' ability to authentically partner with historically marginalized communities whose untapped expertise is critical to achieving health equity for all.

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Addressing Farm Safety: Farm Safety Dinner Theaters in the Shenandoah Valley

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ABSTRACT

Introduction: Statistics demonstrate that farm safety and wellness issues affect all ages in the agricultural community. However, an increased proportion of youth and older farm workers comprise the highest rates of farm-related morbidity and mortality. Engaging farmers in increasing safe practices in the agricultural community is an important, ongoing challenge.

Methodology: Farm Safety Dinner Theaters, an initiative created through community-based participatory research (CBPR) at the University of Kentucky, provide a relaxed environment where farmers and their families can identify safety and wellness issues, watch as the actors process these issues, and enjoy a meal. Seeing the situations played out in theater provides the audience with an opportunity to consider how they would react in similar situations. The event is structured to facilitate open communication among the audience members and their families.

Program Description: Valley Urgent Care in the Shenandoah Valley of Virginia collaborated with the local Virginia Cooperative Extension office and a local Future Farmers of America (FFA) chapter to offer the Farm Safety Dinner Theaters in three areas of Rockingham County. The diverse farming community in Rockingham County benefited from these opportunities to learn in an innocuous environment with friends and neighbors.

Conclusion: The Farm Safety Dinner Theaters were successful. The local newspaper and Virginia public media both wrote about the events which helped to bring more awareness about not only the events themselves, but also about farm safety, health, and wellness. While this project has already reached a number of farmers in the community, we hope to expand even more in the future to help prevent injuries and save lives.

INTRODUCTION

According to the Bureau of Labor Statistics, (2023), agricultural workers aged 55 and older accounted for more than 40% of the 133 labor fatalities in 2021. In the 55 to 64 age range, there were 29 fatalities and another 29 fatalities accounted for workers aged 65 years and older. Of all agricultural workers fatally injured on the job 32 were self-employed.

A study conducted through Penn State (Serap, Judd & Kelly, 2022), contends that the Bureau of Labor Statistics Survey of Occupational Injuries and Illnesses captures only nonfatal occupational injuries, and its data excludes self-employed farmers and family members as well as workers on farms with less than 11 employees. This would indicate actual injury and illness in the agricultural sector is potentially much higher than reported by the Bureau of Labor Statistics.

The Penn State study found that from January 1, 2015, to December 31, 2019, more than 60,000 people were treated in emergency departments for nonfatal, agricultural-related injuries (Serap, Judd & Kelly, 2022). The mean age estimate in this population was 39 years old, with ages ranging from one to 95. Almost two-thirds of patients were male, and almost 80% were white. Approximately 30% and 22% of those injured were youth and elderly patients, respectively. Most injuries occurred from April through September.

These statistics demonstrate that as the average age of the farmer is continuing to increase, safety and wellness issues include not only an older population working with heavy equipment and livestock, but youth as well. Farm workers are often family members, including children, leading to other potential hazards. Farm safety is a constant issue for that is further complicated by the fact that most farmers do not want to engage with the topic. Providing information to increase safe practices in the agricultural environment is a challenge.

METHODOLOGY

A promising approach to increasing safe practices in the agricultural environment was implemented in this project using Farm Safety Dinner Theaters, an initiative created through community-based participatory research (CBPR) at the University of Kentucky (Rural Health Information Hub, 2022). CBPR is a model that emphasizes local relevance of public health problems and ecological perspectives that acknowledge the multiple determinants of health and disease (Minkler & Wallerstein, 2008). The purpose of this project is to describe the implementation of the Farm Safety Dinner Theaters model of providing health and safety education using principles of CBPR and share lessons learned.

CBPR is a collaborative approach where community-academic partners work systematically in cycles to explore concerns and issues that disrupt and/or impact people’s lives. In collaboration, these partners utilize cycles of data collection and reflection to solve and build capacity (Koch & Kralik, 2006). CBPR addresses health disparities and inequities in diverse communities. This approach is well-suited for the agricultural community. In particular, it emphasizes community resilience, resources, and opportunities for positive growth rather than focusing solely on health issues or other issues (Coughlin, Smith, & Fernandez, 2017).

Core components of phases in conducting CBPR as described by Israel, Eng, Schultz, and Parker (2012) are:

1. Forming partnerships

2. Assessing community strengths and dynamics

3. Identifying priority health concerns and research questions

4. Designing and conducting etiological intervention and/or policy research

5. Feeding back and interpreting research findings

6. Disseminating and translating research findings

Dr. Deborah Reed, emeriti from the University of Kentucky, initially began addressing safety issues in the agriculture community in 2014 by creating the Farm Safety Dinner Theaters. Dr. Reed utilized the components of CBPR in her work. Her research outcomes have demonstrated an increase in participants acting on safety issues following their attendance at a Farm Safety Dinner Theater event. Dr. Reed went on to create the Farm Dinner Theater Tool Kit that includes plays facilitators can utilize. The productions are designed to be simple one-act plays where the actors (members of the agricultural community) share with the audience.

The goal of the Farm Safety Dinner Theater is to provide a relaxed environment where farmers and their families can identify safety and wellness issues, watch as the actors process these issues, and enjoy a meal. Seeing the situations play out in theater provides the audience with an opportunity to contemplate how they would react in similar situations. The event is structured to facilitate open communication among the audience members and their families.

In this project, community members, individual farmers, farm families, and representatives from local community agencies, as well as members from the academic community jointly participated and shared control over all phases of the development, implementation, and evaluation of the local Farm Safety Dinner Theater project from assessment (determining the needs of the community) to dissemination (sharing the outcomes). Together this collaborative team adopted strategies to increase the implementation and maintenance of evidence-based interventions for the health and safety of the agricultural community.

Description of the Program

The Shenandoah Valley of Virginia is home to four of the top five agriculture counties in Virginia, accounting for more than a third of agricultural sales in the state in 2017 (USDA National Agricultural Statistics Service, 2017). In Rockingham County family farms dominate the land, making up 96% of all farms accounted for. Only 65% of farms have internet access according to the USDA National Agricultural Statistics Service, (2017).There are roughly 450 dairy farms in Virginia, with 198 of those dairy farms in Rockingham County; and 475 poultry farms in Rockingham County (USDA National Agricultural Statistics Service, 2017). Out of 2,026 farms, 53% are used for crops, with 28% used for pastureland and 13% as woodland.

Males continue to make up the majority of total producers in the county, with 2,276 out of 3,491 farmers being male (USDA National Agricultural Statistics Service, 2017).

In November of 2022, a stand-alone Urgent Care in the Shenandoah Valley of Virginia collaborated with the local Virginia Cooperative Extension office and a local Future Farmers of America (FFA) chapter to offer the Farm Safety Dinner Theaters in three areas of Rockingham County. The events were scheduled over times that were less busy for the local agricultural community. The first was held in January 2023, the second in March of 2023, and the third in June of the same year. The dinners were catered events jointly funded by a Virginia Department of Agriculture and Consumer Services (VDACS) farm health and safety grant; Virginia AgrAbility; the Rockingham County Extension Office and Valley Urgent Care. There was no cost to participants. The first dinner theater was held in a renovated schoolhouse and catered by a traditional Mennonite family. This brought in a wider range of participants from both the traditional Mennonite community and a range of other local farmers. The second dinner theater was held at a community center, and the third at an apple orchard. Each of these dinners were catered by a local catering company. A group of FFA members from a local high school chapter participated in each dinner theater, acting out three skits chosen from the Farm Dinner Theater Tool Kit. Topics covered in the skits included the main topics of: Fall Prevention, Farm Stress, and Tractor Safety. Embedded in each drama were discussions regarding aging out of farming, mental health, farming as a second career, and family dynamics on a farm. Following each ten-minute drama, occupational health nurses from Valley Urgent Care facilitated discussions about the drama topics. These discussions enabled those present to share firsthand experiences and explore the various scenarios presented as well as possible situations that could arise.

In total, 90 farmers and community members attended the three events. The farmers were from a variety of farm sizes and backgrounds. The ages of the farmers were from young beginning farmers to more senior aged farmers. Several farmers brought their entire family for the event. The children seemed especially interested in the dramas and discussion.

One FFA member who served as an actor, Jackie Diaz, commented "I enjoyed the farm safety dinner theater because it gave local farmers the opportunity to have what are often difficult conversations-it is important to spread awareness for the next generation and doing it in a lighthearted way also helped people open up about their own experiences."

One participant commented: “We enjoyed it, and it definitely made us reflect on some of our choices and actions around the farm.”

DISCUSSION

Safety in agriculture is a well-documented industry challenge further complicated by the fact that many farmers do not believe that they have the time or energy to adequately address the issue. Providing information to increase safe practices in the agricultural environment is an ongoing task, given the multiple factors involved. Farm Safety Dinner Theaters provide a relaxed environment where farmers and their families can identify safety and wellness issues and have an opportunity to process the information in a safe and comfortable environment. Additionally, the theater gives the audience an opportunity to consider and plan for how they might respond in similar situations. The Dinner Theaters also spark questions, stories, and responses from the participants that lead to rich dialogue and increased knowledge and support for those in attendance. The theaters are a learning experience for all involved and demonstrate the role of community engagement in successful collaborations to address the needs of a population.

CONCLUSION

The Farm Safety Dinner Theaters were a success. The local newspaper and Virginia public media both authored stories about the events which helped to bring more awareness about not only the events themselves, but also about farm safety, health, and wellness. While this project reached a sizable number of farmers in the community, we hope to expand even more in the future to help prevent more injuries and save more lives. There are plans to hold more of these events convenient in location and time to a variety of farmers.

Future recommendations regarding this project include advocacy for methods of data collection and capturing data associated with our efforts so that we have benchmarks to survey and measure outcomes as a result of our efforts and to guide future outreach efforts. Funding for outcomes measurement is lacking, yet this information is vital to really affecting the safety and wellness of the local agricultural community. A partnership to provide funding to better understand and address the specific safety needs locally is very important.

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Health Equity: Communicating Impaired Water Status

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ABSTRACT

Introduction: Land use changes in the Rivanna River and James River Watersheds have increased the number of impaired recreational waters, and there is a disparity in the equitable communication of these impairments to different populations. Ineffective communication contributes to inequities in access to safe, accessible, and affordable water for vulnerable populations, placing public health at risk.

Methods: This study uses secondary data from the Environmental Protection Agency's Watershed Index Online (WSIO) Indicator Data Tables, Virginia Department of Environmental Quality (DEQ), Rivanna River Association, and James River Association. Correlations, linear regression, and percent change were used to identify statistically significant trends between watershed health, biological water quality, water access, and communication estimates.

Results: Monitoring data collected over the past fifteen years indicate that biological water quality in the Rivanna and James River Watersheds have been negatively impacted by pollution due to land use changes with an increasing number of rivers failing to meet DEQ standards. Despite this, and an increasing interest in people seeking information on river conditions, recreational access on these impaired rivers has also increased.

Conclusion: This study shows examples of how existing laws and regulations concerning recreational water quality communication may not be accessible to all, potentially harming already vulnerable populations. Future studies should explore how effectively water impairment status is communicated, and what can be done to ensure all populations are reached to achieve health equity.

Keywords: watersheds, water quality, biological water monitoring, health equity, communication, environmental public health

1. INTRODUCTION

Multiple studies show the connection between healthy watersheds and healthy water used for both drinking and recreational purposes. Studying land use practices and changes within the watershed and the subsequent impact on human health is a One Health approach by recognizing the interconnection of the shared environment between people, plants, and animals. Integrated Water Resources Management is a framework that encompasses the ecological system in water management, and is known as an integrated "One Water" approach to water management. (American Rivers, 2023) Considering the impacts of environmental variability and change, as well as population growth and other stressors on the watershed, may demonstrate how an integrated water system starting with source water protection in the watershed can ensure more equitable access to healthy water and improve public health.

While watershed conditions change over time due to many natural processes, the most extensive changes seen are a result of population increases, which cause land and water use changes, as well as impact climate change. (Environmental Protection Agency) In the Rivanna River Watershed, the decrease of forested land cover and the increase of impervious surface have negatively impacted surface water quality, with impaired surface water also limiting recreational use and increasing the risk of negative health outcomes. Stakeholders across the spectrum agree that these results are not communicated effectively, missing the opportunity for cost saving solutions at the source and putting public health at risk. Additionally, ineffective communication contributes to inequities in access to safe, accessible, and affordable water for vulnerable populations such as minorities and those that are linguistically isolated or in high housing density areas. While there are laws and mandates in place to communicate water quality and regulation compliance, are these reaching drinking water consumers and recreational water users in an equitable manner?

1.1. Drinking Water Communication

The Environmental Protection Agency (EPA) mandates water utilities provide an annual Consumer Confidence Report (CCR) to their customers, which is written at an 11th-grade reading level. (Van Zandt et al., 2023) This once-a-year report is likely the only communication public water consumers receive about their drinking water supply outside of emergencies, and includes information on water quality, regulation compliance, source water, and consumer education. Aside from certain prescribed formats and reporting requirements, there are no criteria that ensure consumers understand the information presented in these reports. (Phetxumphou et al., 2016) The infrequency and reading level potentially make it hard for consumers to understand, particularly non-native English speakers or those with low education. An evaluation of 30 CCRs nationwide found that none passed the Centers for Disease Control Clear Communication Index, indicating CCRs are not communicating effectively with consumers. (Phetxumphou et al., 2016)

1.2. Recreational Water Communication

The Clean Water Act (CWA) was designed to restore and maintain the chemical, physical, and biological integrity of all the nation's waters so they could support the protection of fish, shellfish, wildlife, and recreation in and on the water. (Office of the Federal Register, National Archives and Records Administration. 40 CFR 320 - of the Clean Water Act, as amended, 2002) The CWA directs states to designate uses for all waterbodies; in Virginia, all waters are designated for recreational use and to support aquatic life. Water Quality Standards (WQS) are based on E. coli counts for recreation, and benthic macroinvertebrate sampling for aquatic life. VA Department of Environmental Quality (VADEQ) uses six years of WQS data to assess each waterway, and areas that do not meet WQS are listed as impaired waters. DEQ identifies the location, matter of concern, and likely source, and publicizes the information in a widely circulated, biennial Water Quality Assessment 305(b)/303(d) Integrated Report. (Virginia Department Environmental Quality, 2022)

VADEQ provides the public with an overall view of water quality status through the Integrated Report process. The monitoring program is intended to identify recreational waters in need of a water quality study and cleanup plan; it does not provide real-time swimming condition status for the public. The VA Department of Health is responsible for issuing swimming notices based on high levels of bacteria data and the possible presence of harmful algal blooms, and for issuing fish advisories. However, the real-time information presented on the VA Department of Health website is limited; there is general advice for avoiding recreational water illnesses and harmful algal blooms, and the only swimming advisories listed are for 45 public beaches on the Chesapeake Bay and Atlantic Ocean. (Virginia Department of Health) That means any non-coastal recreational waters are subject to advisories managed voluntarily by local organizations.

1.3. Purpose

This paper explores the topic of recreational water quality communication by looking at examples in the Rivanna and James River Watersheds. Land use changes have increased the number of impaired waters, and there is a disparity in the equitable communication of these impairments to different populations. The Rivanna River, flowing from the Eastern foothills of the Blue Ridge Mountains, is the largest tributary to the upper James River, which is the largest tributary to the Chesapeake Bay. (James River Association) Feeding into the Rivanna River Watershed are 22 community watersheds, or 12-digit Hydrologic Units (HUC12) delineated as the smallest drainage area in the Watershed Boundary Dataset by the

US Geological Survey and Natural Resources Conservation Service. (Environmental Protection Agency, 2021) At 340 miles long, the James River is the largest river in Virginia, with its watershed encompassing nearly 10,000 square miles. It is important in terms of drinking water, commerce, and recreation, with nearly one-thirds of the state's population, or approximately 3 million people, living within the watershed. (James River Association) The 6-digit Hydrologic Unit (HUC6) James River Watershed includes the HUC8s Upper James, Middle James, and Lower James, with 236 HUC12 community watersheds. (Environmental Protection Agency, 2021)

The Rivanna Water and Sewer Authority (RWSA), drawing water from the Rivanna River Watershed, provides water and sewer services to the Charlottesville Utilities Department and Albemarle County Service Authority, totaling about 130,000 customers in the city and "urban ring" of the county. (Rivanna River Basin) RWSA produces approximately 10 million gallons of water a day and treats approximately 9.3 million gallons of wastewater each day. (Rivanna Authorities) The city and county authorities purchase treated water in bulk from RWSA and deliver it to customers through their distribution systems. (Albemarle County Service Authority, 2022)

Biological assessment is used to determine water quality standards in Virginia for Clean Water Act purposes defined in the Water Quality Standards Regulations. (Water Quality Standards 9 VAC 25-260 et seq. 2021) Freshwater aquatic biodiversity measures the abundance of native species, genetic variety, and various habitats and types of ecosystems. (Environmental Protection Agency) The biological health of a river is assessed using benthic macroinvertebrate monitoring (Burton & Gerritsen, 2003) by sampling the bottom-dwelling spineless critters in a river or stream that are responsive to environmental changes and pollution. Because the assessments are designed to measure a river's health relative to natural stream conditions, they are good indicators of human caused impairments providing excellent indication of system stressors over a period. (Rivanna Conservation Alliance)

2. METHODS

Land use and watershed information including ecological, social, and stressor indicators were obtained from the Watershed Index Online (WSIO) Indicator Data Tables compiled and managed by the Environmental Protection Agency (EPA). The WSIO is a comparative analysis tool and an extensive, periodically updated watershed indicator data library. Compilation and analysis of WSIO indicator information involved EPA Regional Offices, Office of Water, Office of Research and Development, and Office of Environmental Information as well as EPA contractors and other collaborators. (Environmental Protection

Agency, 2021) Demographic information was obtained from the 2021 US Census Bureau Database and County Health Rankings & Roadmaps dataset. (United States Census Bureau),(Robert Wood Johnson Foundation, 2023)

Because many people visit rivers through unmonitored points, such as private land or public entries with no tracking mechanisms, it is impossible to know an exact number of how many people access recreational waters. Estimates of recreational access to the Rivanna and James River were gathered from several sources to show potential trends in visitation numbers, rather than exact numbers. Recreational water access estimates were formed by collecting the number of fishing licenses applied for annually through the Virginia Department of Wildlife, number of customers using services through the Rivanna River Company in Charlottesville, VA, and park gate entry information for Richmond, VA, area riverside parks. Numbers of website views for river condition maps were gathered from webmasters at Rivanna Conservation Alliance (RCA) and James River Association (JRA).

Data were cleaned to ensure standardization and devoid of errors and missing information was obtained by recontacting the original sources. Correlations were calculated using Pearson's correlation coefficient for linear relationships quantifying the strength and direction of the relationship between two variables, and linear regression using the least squares method to fit a line through a set of observations analyzed how a single dependent variable is affected by the values of one or more independent variables. Trends were identified showing yearly fluctuations and changes, while overall percent changes were calculated as an average yearly percent change from a base year.

3. RESULTS

Monitoring data from the VADEQ and the RCA collected over the past fifteen years indicate that the aquatic macroinvertebrate community in the Rivanna River Watershed has been negatively impacted by pollution due to land use changes. (Virginia Department of Environmental Quality, 2020) Populations living in and drawing water from the watershed have increased as shown in Table 1, reducing the amount of protected watershed while increasing the demand for water.

Table 1: Land use changes in the RRW including increased population and development, and decreased forested land, have negatively impacted biological water quality.

Land Use Change in the Rivanna River Watershed (2004-2019)	Change	Percent Change

Population	23,515 people	40.89%
Developed Land	3,898 acres	7.34%
Forested Land	-11,534 acres	-3.45%

The PHWA for the Rivanna River Watershed shows that population density, impervious surface, and percent forest cover have similar correlation values in relation to the WHI as displayed in Table 2. (Environmental Protection Agency, 2021) As population density and impervious cover percentage increase, watershed quality is lower; as percentage forest increases, watershed quality is higher.

Table 2: Correlations between Watershed Health Index and land use in the Rivanna River Watershed.

	PHWA WHI Correlation (r)	*Significance (two-tail p value)*
Population Density in Subwatershed	-0.73	0.01
% Impervious Cover in Subwatershed	-0.75	0.04
% Forest in Subwatershed	0.74	<0.01

Correlation analysis using the PHWA shows the impact of percent impervious cover and percent forest on biological stream in the Rivanna River Watershed.

The negative correlation of percent impervious cover is r = -0.82 with a two-tail p value of 0.03 as shown in figure 1.

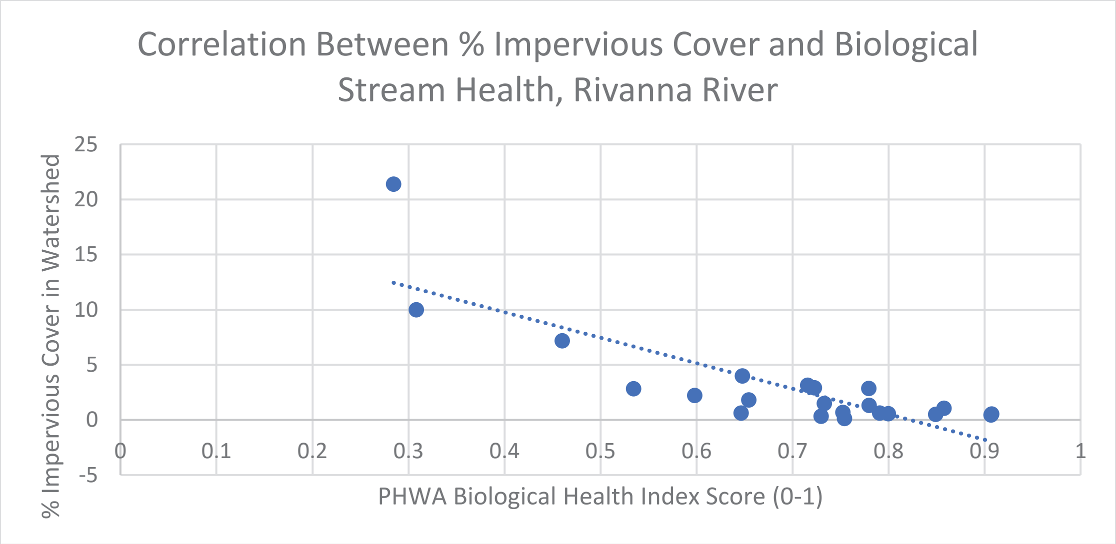

Figure 1: Impervious cover has a negative correlation and harmful impact on biological stream health in the Rivanna River.

The positive correlation of percent forest cover is r = 0.61 with a two-tail p value < 0.0001, as shown in figure 2.

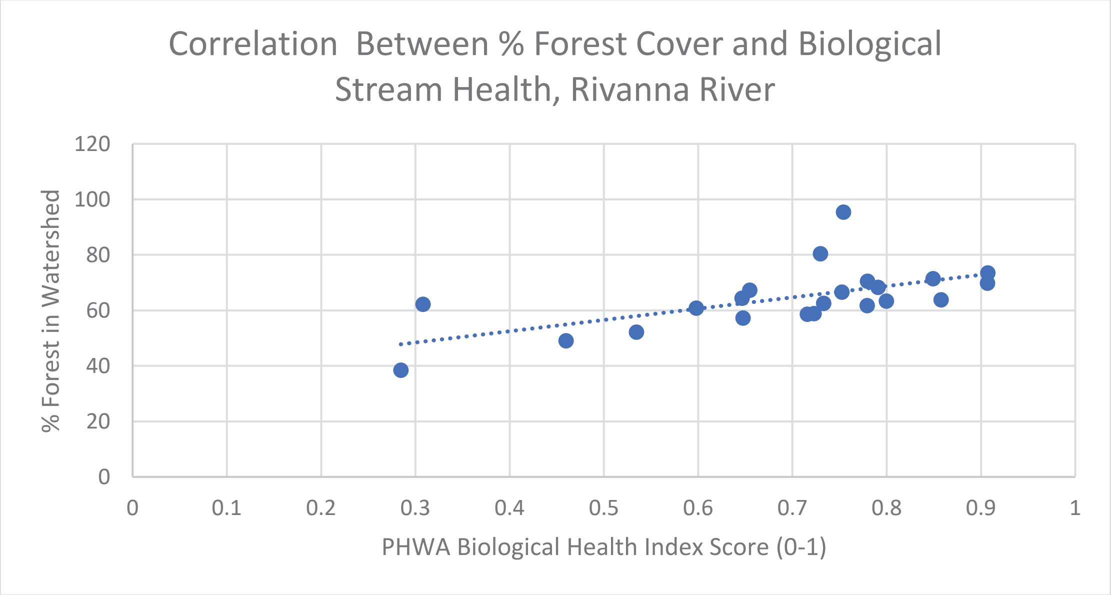

Figure 2: Forest cover has a positive correlation and impact on biological stream health in the Rivanna River.

3.1. Disparities in Drinking Water Quality

There is mistrust in public water utilities within communities of color based off historic discrimination. Black and Brown communities receive fewer infrastructure investments than White communities, and experience higher rates of water insecurity. (Fedinick, 2020) Communities of color are the most likely to be impacted by rising water utility rates. (Montag, 2019) Persistent racial disparity gaps exist in tap water consumption, which widened after the Flint Water Crisis. (Rosinger et al., 2022) Public water systems regularly violating the SDWA are 40% more likely to serve people of color, and also take longer to come back into compliance. (Fedinick, 2020) A 2020 report by the Natural Resources Defense Council found the rate of drinking water violations increased in the following conditions: (Fedinick, 2020)

1. Communities with higher percentage of racial minority populations;
2. Low-income communities;
3. Areas with more non-native English speakers;
4. Areas with people living in crowded housing conditions;
5. Areas where people have sparse access to transportation.

While these factors are used in context of drinking water violations, they may also apply to impaired recreational water scenarios.

3.1.a. Disparities in Impaired Recreational Water: Minority Populations

There is a linear trend relationship between the percent of minority population and percent of impaired waters in the James River Watershed. Minorities as defined by the US Census Bureau American Community Survey include people other than non-Hispanic white-alone individuals. (United States Census Bureau) Data from the 284 HUC12s across the James River Watershed show a trend that increasingly minority populations live in areas with increasingly impaired waters in figure 3. (Environmental Protection Agency)

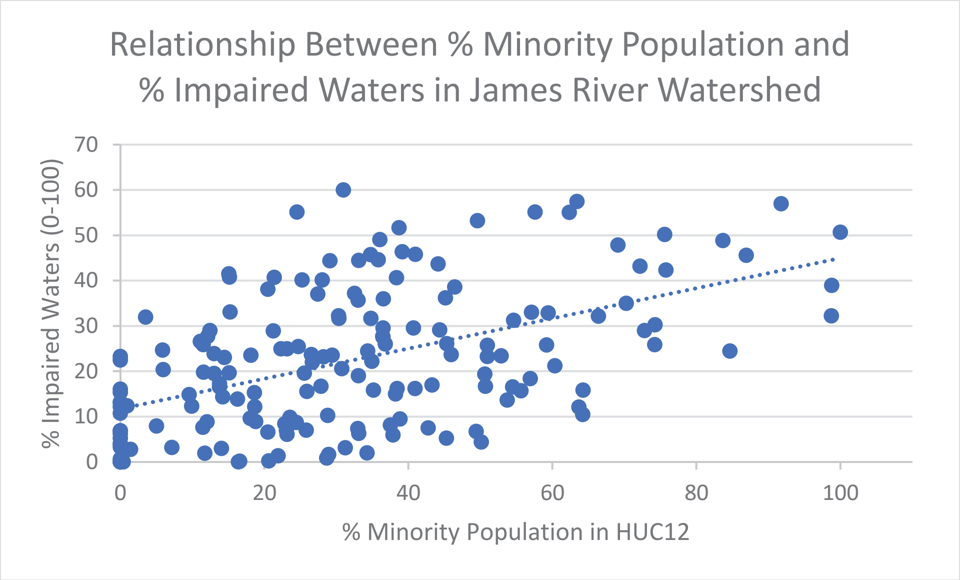

Figure 3: Linear relationship between the percent of minority population and percent of impaired waters in the James River Watershed.

Minority neighborhoods are significantly more likely than predominantly white neighborhoods to lack recreational facilities. (Moore et al., 2008) The increased likelihood of impaired recreational waters near minority populations suggests another source of inequity in that populations who live there may not be able to safely access recreational waters. Or if minority populations unknowingly access impaired waters, over 72,000,000 people in the James River Watershed are at higher risk for waterborne diseases.

3.1.b. Disparities in Impaired Recreational Water: Linguistically Isolated Populations

There is a linear trend between the percent of linguistically isolated population and percent of impaired waters in both the James River and Rivanna River Watersheds. Linguistically isolated populations are defined by the US Census Bureau American Community Survey as households in which all members aged 14 years and older speak a non-English language and speak English less than very well. (United States Census Bureau) Data from across the James River and Rivanna River Watersheds show a trend that increasingly linguistically isolated populations live in areas with increasingly impaired waters as shown in figures 4 and 5. (Environmental Protection Agency)

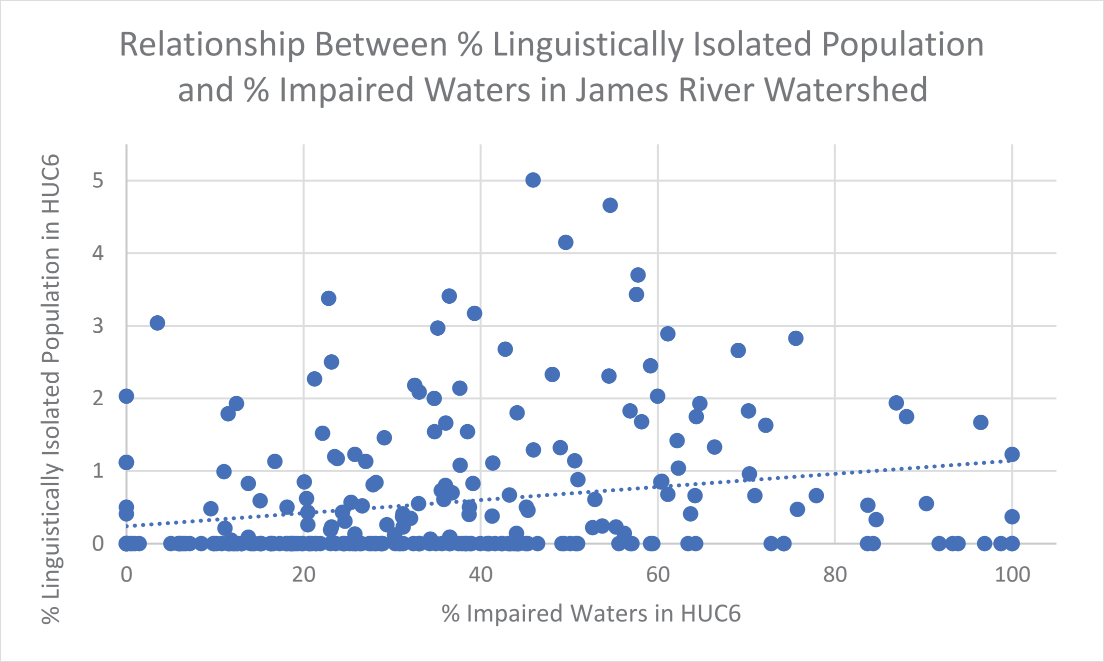

Figure 4: Linear relationship between linguistically isolated populations and impaired water status in the James River Watershed

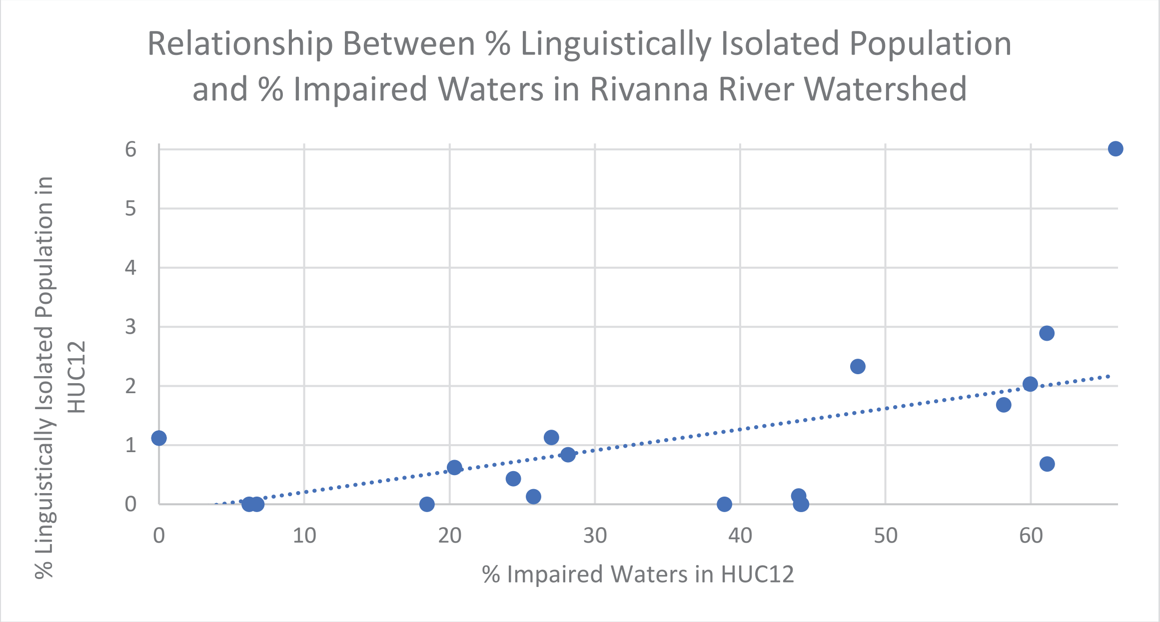

Figure 5: Linear relationship between linguistically isolated populations and impaired water status in the Rivanna River Watershed

While 87% of the population in Albemarle County speaks only English, there are over 4,000 residents who identify as speaking English less than "very well." (United States Census Bureau) In the city of Charlottesville, 86% of the population speaks only English, while over 2,000 residents speak English less than "very well."(United States Census Bureau) This leaves over 6,000 households in the Rivanna River Watershed, and over 18,600,000 households in the James River Watershed, vulnerable to knowing or understanding impaired water status, potentially leaving them at risk if they access these waters.

3.1.c. Disparities in Impaired Recreational Water: Housing Unit Density

There is a linear relationship between the housing unit density and percent of impaired waters in the Rivanna River Watershed. Housing unit density is defined by the US Census Bureau as spaces intended for occupancy per square kilometer. (United States Census Bureau) Data from across the Rivanna River Watershed shows a trend that populations living in increased housing unit densities live in areas with increasingly impaired waters as shown in figure 6. (Environmental Protection Agency)

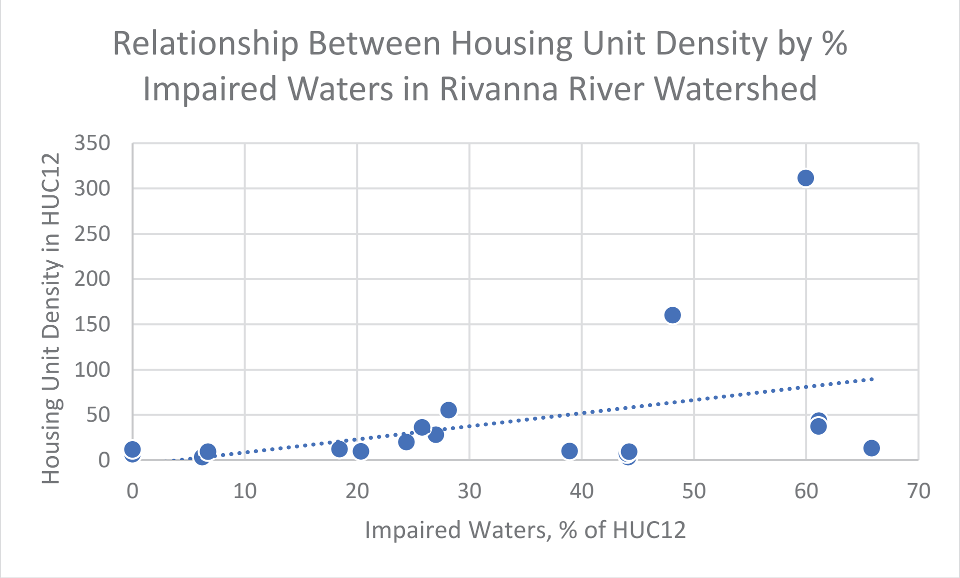

Figure 6: Linear relationship between housing unit density per square mile and percent impaired waters in the Rivanna River Watershed.

While residents in high density housing units are more likely to live near impaired waters in the Rivanna River Watershed, potentially decreasing the number of recreational opportunities or increasing their risk of waterborne disease if they do access these waters, there are also implications towards housing and drinking water quality. The home ownership rate in Albemarle County is over 68%; the remaining renters pay an average of $1,428 per month for housing.

(United States Census Bureau) The home ownership rate in the city of Charlottesville is 41%; the remaining renters pay an average of $1,250 per month in housing. (United States Census Bureau) While there is little public information regarding renters and water quality concerns, they have few safeguards and little leverage when asking landlords to address water safety or quality issues. Landlords must ensure that each residence has hot water, but water quality is not their responsibility. (Van Zandt et al., 2023) Rising water treatment costs may place extra financial burden on renters and lower income households in high density housing units.

3.2. Impaired Recreational Water Communication

The Virginia Water Quality Monitoring, Information and Restoration Act supports the CWA by ensuring waters meet the fishable and swimmable goals. The act includes citizen right-to-know provisions based on the information from the 303(d) and 305(b) Water Quality Assessment Integrated Report. Provisions include requesting the Department of Wildlife Resources or the Virginia Marine Resources Commission to post notices at public access points to all toxic impaired waters; maintaining a citizen hot-line to obtain information about the condition of waterways; displaying information about the presence of toxics in fish tissue and sediments on the DEQ website; and disseminating information through official social media accounts, email notification lists, and local media outlets when discharge may be detrimental to public health. (Code of Virginia, 2007) While these communication procedures are in place, what does that mean for the average citizen?

3.2.1. Rivanna River

The RCA is certified by VADEQ at the highest level, Level III, for biological and bacterial water quality monitoring. RCA’s data are used in the state Water Quality Assessment 305(b)/303(d) Integrated Report to help identify impaired waters. (Rivanna Conservation Alliance) Fifty sites along the Rivanna River are monitored twice a year, while sites with high recreational use are monitored weekly between Memorial Day to Labor Day. Streams that are rated poor or fair fail to meet the VADEQ standard and are considered impaired. The percentage of impaired streams within the Rivanna River Watershed has steadily increased, with over 80% failing to meet VADEQ recreational WQS in the 2022 report. (Virginia Department Environmental Quality, 2022) With many river accesses located on private land, and open public access points lacking visitation numbers, it is impossible to know how many people access the rivers for recreational use when water quality is impaired. But it is possible to examine several data sets exploring interest in stream health and river usage.

RCA posts biological monitoring results online with the number of *E. coli* colonies per 100 milliliters of water and color indicators reflecting if the results meet the standard of 235 MPN/100mL set by the VADEQ for biological monitoring. (Rivanna Conservation Alliance) Website monitoring access data is available from 2016, with overall views increasing. The significant increase in people accessing the data in 2019 is likely due to a new director at the organization who focused on outreach efforts. (Lisa Wittenborn, 2022)

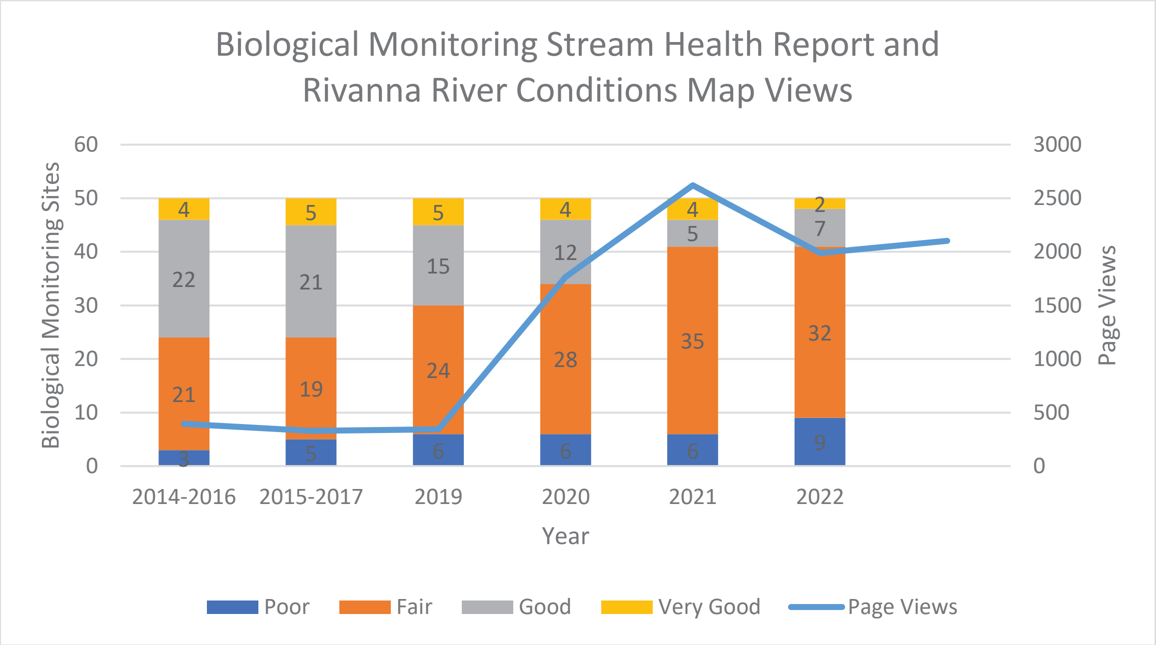

Figure 7: Biological monitoring stream health report of the Rivanna River and the Rivanna Conservation Alliance river conditions map views per year, 2014-2022.

Although communication of impairment status is increasing through website views, there are many unknowns to the effectiveness. There are several questions that would be useful in a future survey of health communication and behavior. Are there unique visitors to the site, or do the same people view the river status each week? Are there any behavioral related changes due to impaired status, or do people still choose to access the river when water quality is impaired? Without adequate survey data, it is impossible to know if health behaviors are impacted by knowledge of water quality status. But given the available data, it is sufficient to say that overall water quality is decreasing, and interest in water quality conditions is increasing. In terms of communication equity, recreational water users would first have to know this website existed. They would also need to have internet access; 88% of households in Albemarle County and 86% of households in the city of Charlottesville have a broadband internet connection. (Robert Wood Johnson Foundation, 2023) Finally, they would need to understand English well enough to interpret the information.

As the results in figure 7 show, biological impairment status of the river has increased, and interest in the condition of the river has increased. This does not necessarily impact health behaviors, as recreational use of the river has also increased. The Rivanna River Company is the only entity to monitor river usage in the Charlottesville area. Their customer numbers of people utilizing their services for paddling and tubing trips since opening in 2016 have steadily increased, including holding steady during shutdowns for COVID-19 when they only offered rentals without their usual shuttle service. From 2016-2022 they have seen an overall increase of 130.48% of customers paddling and tubing on the Rivanna River. Owner and staff observations of private use of the river, people who are not their customers, are that usage has grown at a rate significantly faster than their own, estimated at more than 4 times the number of visitors compared to 2016. (Silver, 2023)

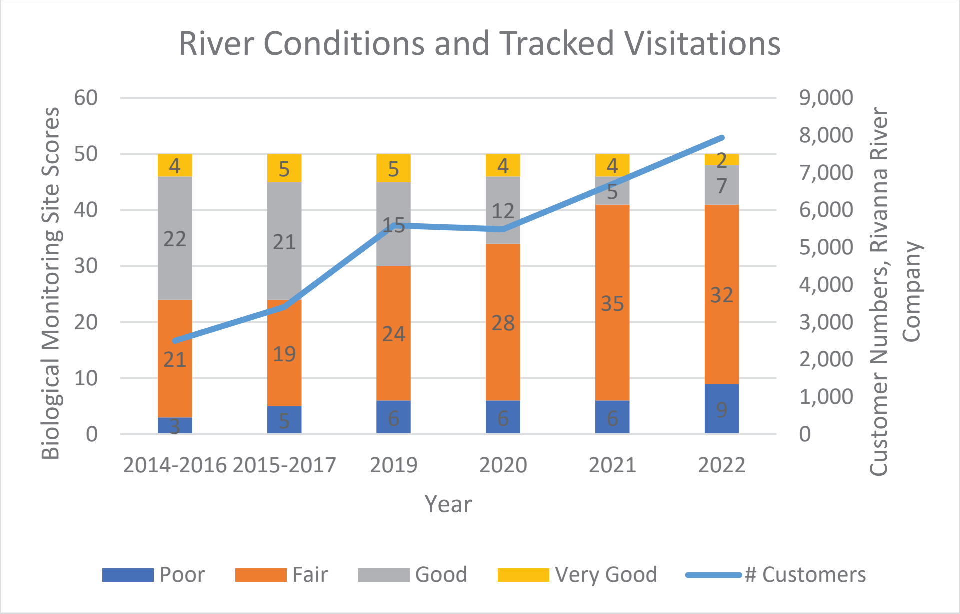

Figure 8: Recreational use of the Rivanna River has increased despite an increase of biological impairment.

3.2.2. James River

With over 200 public access sites on the James River and tributaries, the JRA estimates access through state park entry, boat launch sites, and traffic counters. While this does not provide a comprehensive number of all individuals who access the James River, it does provide a trend estimate of increasing use and visitation across the overall river. Visitation to points where access was recorded throughout the James, including the Richmond region, middle/upper James, and lower James, shows increases of 15% and 8% during the years recorded as shown in Table 3. (Justin Doyle, 2023)

Table 3: Available visitation records show increased use of recreation along the James River in Virginia from 2018-2020.

Year	Number of Visitors	Percent Increase
2018	4,985,322	
2019	5,711,620	15%
2020	6,194,177	8%

The James River Park System, located in the capital of Virginia, has compiled visitor data since 2014. Data shows a steadily increasing number of visitors to the urban Richmond city river parks. (Justin Doyle, 2023) Both mechanisms for measuring river access show increased recreational usage while biological stream health conditions have a decreasing trend. Riverside Parks System Visitation Data shows an overall 91.41% increase from 2014-2022 as shown in figure 9.

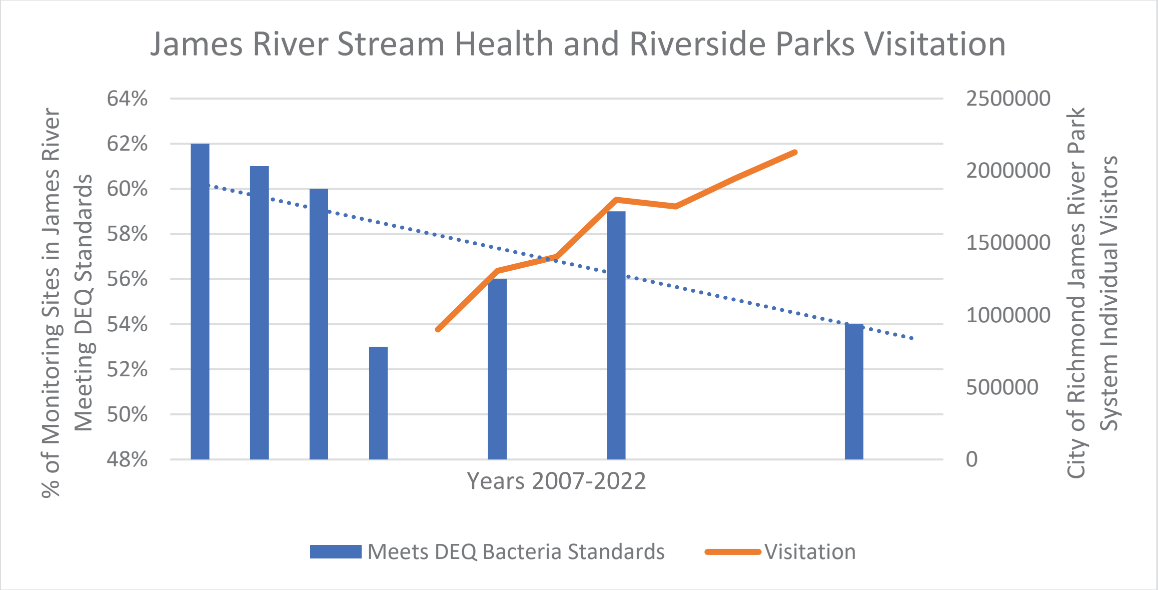

Figure 9: Biological river conditions show a decreasing trend while riverside park visitation has increased in the Middle James.

The JRA runs a website called the James River Watch, which is a water quality monitoring program that displays river conditions across the James River Basin. Volunteers take weekly water samples and report the health status of the river, where the Association posts impairment status every Friday between Memorial Day to Labor Day. This allows recreational users to check up to date river conditions if they are considering swimming, fishing, or other activities where they may come in contact with impaired water. Tracking statistics of the website have varied over the years, but general statistics of number of visitors who clicked on the river conditions map show a decreasing trend, (Angie Williams, 2022) along with the stream health.

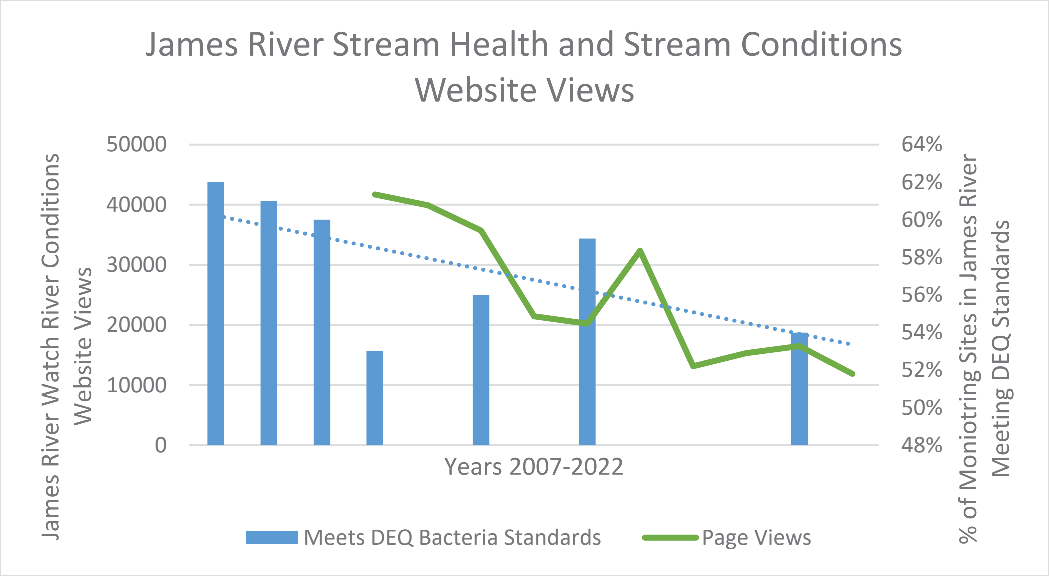

Figure 10: Website views of the James River Conditions Map alongside biological stream health from 2007-2022 showing a decline in both.

While this does not portray how many people actually click on the access points to view the data, or if they view the data and then choose to visit the river, it does provide a general overview of interest in local recreational water quality. Website river condition views have fluctuated or decreased, stream health conditions have decreased, and park visits have increased. In terms of communications equity, 88% of households in Henrico County and 78% of households in Richmond city have broadband internet access. This could suggest that stream health conditions are not effectively communicated or impacting health behaviors.

3.2.3. Fishing

Eating fish and shellfish caught in impaired waters may cause birth defects, liver damage, cancer, and other health problems, (Virginia Department of Health, a) and higher fish consumption from impaired waters puts these underserved communities at greater risk. To determine if fishing waters are polluted, the EPA recommends first looking for warning signs posted along the water's edge. (Environmental Protection Agency Office of Science and Technology, 2014) But this is only realistic at public entry points; many people who fish, especially in rural areas, access the water from private land where signs will not be posted. The second step the EPA advises is to call the local or state health department to ask about any advisories. But if people have limited English, they are unlikely to know this, and even less likely to call an official office to ask. In Virginia, the Department of Health posts information to help anglers make educated decisions about eating the fish they catch. The advisories serve as a caution about the contaminants that may be present in a fish species in that locality, specifying the waterbody affected, contaminants present, and meal recommendations for eating specific fish species caught there. (Virginia Department of Health) Data from the U.S. Department of Fish and Wildlife show a relatively consistent number of fishing licenses obtained from 2013-2022 in the Rivanna and James River Watershed localities, with an overall increase of 2.96%, and abrupt rise during the COVID 19 pandemic. (Virginia Department of Wildlife) Despite increasingly impaired waters and fishing advisories in place for the rivers, people have continued to fish the waters as shown in figure 11, indicating ineffective communication concerning the associated risks.

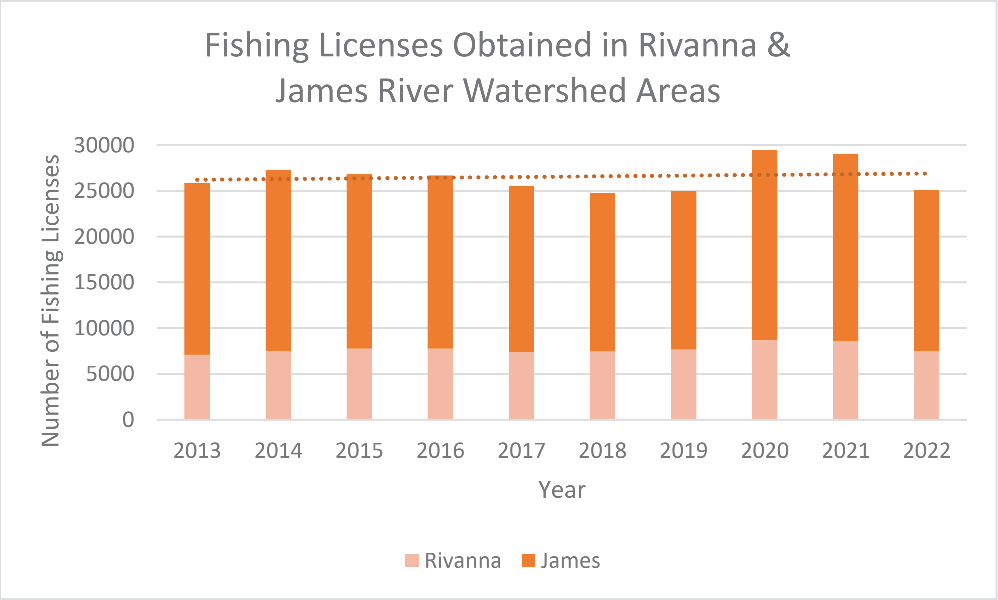

Figure 11: Fishing licenses obtained in the Rivanna River and James River Watersheds have remained consistent or increased over the past decade, despite an increase in biologically impaired waters.

The PHWA defines the demand for recreational freshwater fishing as a social/community indicator of number of fishing day trips per year in the watershed. (Environmental Protection Agency) Because some of the areas with higher numbers of impaired waters may be correlated to higher numbers of minority populations or linguistically isolated populations, it is important information to consider when posting fishing advisories that are targeted to populations who may not read or understand English. The lack of relationship between the two, including high freshwater fishing demand in areas with high impaired water counts, could indicate ineffective communication.

Fish advisories are designed to protect the general public. Pregnant women, young children, and elderly are advised to avoid eating any fish contaminated with polychlorinated biphenyls or mercury. (Virginia Department of Health) While there is no overall correlation between freshwater fishing demand and vulnerable age group populations in the Rivanna River Watershed, there are some subwatersheds with vulnerable populations at more risk. This information could be used locally to increase targeted awareness campaigns where there are higher numbers of both vulnerable age groups and freshwater fishing demand.

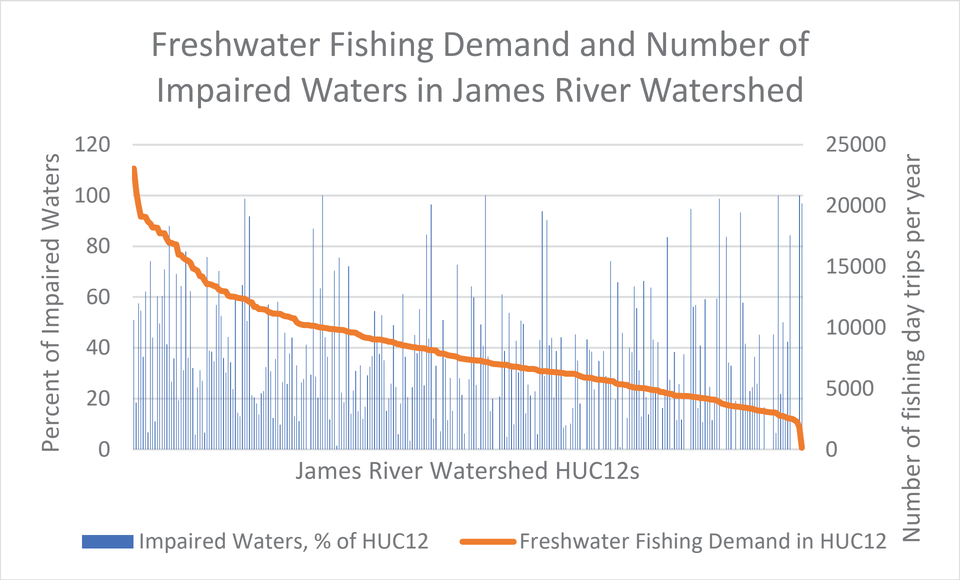

Figure 12: Percentage of impaired waters does not seem to impact the freshwater fishing demand locality in the James River Watershed.

4. DISCUSSION

Global estimates on the use of forests for recreation and tourism is increasing, but it is difficult to quantify. (Hamilton, L, 2008) In Albemarle County, only 13% of the population lives within ½ mile of a park or public elementary school, making access to outdoor recreational water opportunities important. (Centers for Disease Control and Prevention) The Virginia Department of Conservation and Recreation developed a Nature-based Recreation Access Model quantifying the availability of opportunities for outdoor, nature-based recreation on public lands and waters, and to identify areas where more opportunities are needed. Water-based recreation metrics that were scored, weighted, and combined include travel time to the nearest water access point, number of water access points and number of water-based activities that can be reached in a 30-minute drive, and water-based recreation pressure based on population size. (Virginia Department of Conservation and Recreation, 2021) In this model, almost the entire city of Charlottesville is scored as High Recreation Need along with the northeast part of Albemarle County. Other portions of the county have moderate need, while the west and southern portions have low or very low water-based recreation needs. While there are many physical and mental health benefits from access to outdoor spaces including recreational water bodies, and adverse health impacts from lack of access, what are the impacts on people who access impaired waters?

4.1. Impacts

Common symptoms of water-related illnesses include diarrhea, skin rashes, ear or eye pain, and cough or congestion. Vulnerable populations, such as people who are immunocompromised, may be more likely to face serious illness or death. Because these may be symptoms of other common illnesses, and many do not require mandatory reporting, many waterborne illnesses may not be attributed to water exposure and are likely underreported. A five-year study of outbreaks associated with treated recreational water from 36 states voluntarily reporting found only 208 outbreaks. (Hlavsa et al., 2021) Outbreaks or illness from untreated recreational water are even more likely to be unidentified or underreported. The National Outbreak Reporting System (NORS) itself addresses the limitation that case counts are an underestimate of the true burden of waterborne disease outbreaks, but an estimated 90 million recreational waterborne illnesses occur annually nationwide. (DeFlorio-Barker et al., 2018) The three most common pathogens causing recreational waterborne illnesses in Virginia are *Cryptosporidium, Giardia*, and *Vibrio*. (Virginia Department of Health) Mandatory cases of waterborne illness in the state of Virginia to the NORS for all available years, 1971-2020, for recreational water exposure only includes two outbreaks, 14 illnesses, one hospitalization, and zero deaths. (Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, 2022) The populations who do not receive or understand the communications regarding impaired water status are also less likely to report waterborne illnesses. They may lack information regarding reporting procedures and may also be less likely to seek medical attention due to lack of healthcare coverage.

There are many economic costs to consider as a result of poor communication involving recreational water quality. More specifically, higher quality water can reduce pollution related medical costs; most pollution-related illnesses occur from direct contact with polluted water, or from eating contaminated fish or seafood. In 1994, the EPA estimated that economic benefits of the Clean Water Act related to human health effects ranged from $40 million to $320 million. (U.S. Environmental Protection Agency, 1994) Later estimates of direct healthcare costs for 17 waterborne infectious diseases estimated $3.33 billion annually. (Collier et al., 2021) For those without insurance, the impacts of misunderstanding water quality are high. In Charlottesville, 7% of the population is without health care coverage, while 5.8% of the county population does not have health care coverage. (United States Census Bureau) Because of the underreporting, there is little data specifically on the costs of waterborne diseases. One combined analysis of sporadic gastrointestinal illness associated with surface water recreation found incidental contact, such as boating, canoeing, fishing, kayaking, and rowing, costs average $1,220 per case, and swimming/wading illness costs average $1,676. (DeFlorio-Barker et al., 2017)

4.2. Conclusion

Communicating scientific information is an important component to One Health. Environmentalists and medical professionals must be able to communicate the interconnection of human, animal, and environmental health to a broad audience to guide public health practices and policies. (Cardona et al., 2015) There are many existing laws and regulations protecting drinking and recreational water, making them safe for human use. There are also safeguards in place when waters are impaired and access should be limited. This study shows examples of how this communication may not be accessible to all, potentially harming already vulnerable populations. As land use, climate change, and emerging pathogens continue to impact water quality, this is an area of public safety that warrants more attention.

This research identifies a gap in water quality communication, particularly impaired water status of recreational waters. While there are procedures in place to communicate impaired water status, it is unknown whether that information moves past official channels and reaches the individual. This is especially important in terms of health equity, as vulnerable populations are less likely to know about impaired water status but may suffer greater consequences. It would be beneficial for local groups to conduct quantitative surveys on recreational users, obtaining information on if/how they receive information about impairment status, and if/how their behavior changes as a result. Environmental justice is a complex issue, with fragmented stakeholders and actors in play. A study exploring how these results affect different communities equitably could guide stakeholders in future policy decisions.

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Differences in Immigrant and U.S. Native Born Patients' Experiences in the American Healthcare System: A Correlational Study

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BACKGROUND

Use of "herbs, teas, ointments and wonder pills from pharmacies in Mexico" are cultural home remedies immigrants may use in avoidance of hospital bills, insurance policies and untrusted physicians (Aparicio, 2008). Although these may help to mend common flu's and injuries, frequent avoidance of the doctor visits when healthcare or services are necessary can lead them to exhibit a declining health status. 'Immigrants' can be classified as non U.S. native born patients that have emigrated from their primary countries for reasons such as seeking asylum, family reunification, better health or education institutions, and political disruption. Given these widely varying instances for migrating, each immigrants' personal backgrounds and interactions with the U.S. system are complex. In addition to their individual complexities, immigrant patients' experiences in the healthcare system are highly contrasting amongst different races and ethnicities.

Overall, the vast immigrant population can face negative health outcomes when evading imperative health needs. Immigrants have been shown to underutilize health services in the U.S., with a $2,293 per capita difference in health spending between authorized immigrants and U.S. born individuals (Wilson et al., 2020). Acknowledged reasons for underutilization of healthcare are due to barriers in the healthcare system such as distrust between healthcare providers and institutions, spatial accessibility, and lack of access to a variety of health services (Naylor et al., 2019). However, when highlighting these disparities amongst the healthcare system, solely economic factors are considered and do not compare access between U.S. born natives and immigrants or the role healthcare providers/ institutions play in their experiences.

In areas of diverse demographics, socioeconomic factors should not be the only examined aspect due to the wide variety in possible experiences. Focusing solely on socioeconomic factors of immigrants does not yield efficient policy implications because it fails to reflect comprehensive reasoning for the underutilization of health care. To determine the areas in which barriers significantly inhibit utilization of healthcare, a correlational analysis will examine both socioeconomic statuses and U.S. born individuals.

As exhibited in the study conducted by Wilson et al., (2020), immigrants underutilize the healthcare system, despite their contribution to healthcare expenditures. Their study in addition to other research (Seo, 2011; Castañeda, et al., 2015; Samson, 2016; Adekeye, Adesuyi & Takon 2018, Wang, 2021) acknowledge the possibility of barriers inhibiting them to receive adequate services. However, research has not sufficiently addressed what areas of barriers immigrants are less likely to utilize in comparison to U.S. born natives to increase accessibility. The following sources will provide insight into the disconnect between immigrants and the American healthcare system and research in an attempt to bridge the gap.

INNER WORKINGS OF THE US HEALTHCARE SYSTEM

To efficiently examine the perceived barriers in the system, researchers such as Castañeda, et al. (2015) and her colleagues suggest considering immigration as a social determinant of health, which influences a person's health and quality of life. Considering immigration's significant effect on the health of individuals due to societal, political and economic conditions, it is still not considered or applied as a social determinant in public health research. Castañeda, et al reviewed numerous published research on frameworks used in public health literature to argue for a broader examination of immigration populations. The author suggested addressing the impacts of social and policy-related factors that affect immigrant health outside of healthcare access. The studies included in Castañada's review disregarded the effect immigration has on their health. The US healthcare system is made up of several institutions, clinics, and private practices professionals and is faced to cope with the rising demand from both US born patients and immigrants. Portes, et al. (2009) and colleagues studied the relationship between the healthcare system and the surge of immigrants by applying basic concepts from a socioecological theory. The study determined handicaps immigrants face in the system are lack of English fluency, different cultural definitions of illness/ health, tenuous legal status and residential instability, poverty, and lack of insurance. The system deals with the rising demand from immigrants with these coping mechanisms: cannot provide healthcare due to ineligibility for public health programs (escapism), provide healthcare as a commercial good (profit-seekers), provide healthcare as a right (angels), provide healthcare as part of a "mission" (Good Samaritans). These approaches are deemed ineffective due to the still increasing number of immigrants facing limitations in accessing healthcare. The study concludes the systematic framework of institutions plays a larger role in health care's accessibility to immigrants than providers do.

National policy changes can also greatly influence the barriers in the system. After the implementation of a national policy guidance in 2003 which allowed for limited English proficient patients to access language services, it mitigated language barriers between providers and patients. After this major change, Schwei, et al. (2016) studied the state of language barriers in and out of the US since 2003 and compared the conducted research. The cross-sectional study analyzed 136 studies prior to 2003 and 426 studies from 2003 to 2010. Post-2003, more research examined either the provider's perspective or both the patient's and provider's perspective. The policy change allowed for progression past the acknowledgment of the presence of language barriers and conducting more useful research to provide sufficient care for immigrants.

ACCESSIBILITY WITHIN IMMIGRANTS GROUPS

Given accessibility plays a vital role in the utilization of healthcare, Lu Wang (2021) evaluated the spatial accessibility amongst recent and long-standing immigrant groups to linguistically diverse physicians. The method employed English proficiency, distance, and physical availability to determine accessibility. It resulted in finding no consistent pattern between the two immigrant groups because same language physicians may not be as important as they hypothesized. Patients' English proficiency can improve or they can have their English-speaking children accompany them on visits. This study was one of the first to apply this approach when determining healthcare accessibility and similarly replicated in the US by Chi and Hancock, (2014), but employed broader factors. The study surveyed over 50,000 Californians and included socioeconomic factors. Integrating this into the data collection resulted in finding significant distinctions between recent and non-recent immigrant groups which were driven primarily by lack of insurance, financial resources, and English proficiency. This drove future research to find what factors inherently influence these limitations in the system itself. Naylor, et al. (2019) researched to compare spatial accessibility of healthcare provider types to examine factors associated with higher spatial accessibility in the US. By using the 2014 National Plan and Provider Enumeration System, medical claim, and the 2010 U.S. Census data to provide for participants in the study, it resulted in widely differing spatial patterns throughout the country. Internal medicine physicians had the highest spatial accessibility in urban locales with population-dense areas. Nurse practitioners had their higher spatial accessibility in moderate population-dense areas and racially/ethnically diverse areas. Contrastly, family medicine physicians had their highest spatial accessibility in areas with the lowest population-dense and higher racially/ethnically diverse areas. The distributions of specific healthcare providers is unevenly present throughout the US and requires further examination of the maldistribution by implementing components beyond spatial accessibility, accommodation, affordability and availability.

KNOWN FACTORS DETERMINING ACCESSIBILITY AND BARRIERS

The component accessibility in the previous study can translate to patient's and provider's distrust because it plays an integral role in accessibility. Samson (2016), researched the specific component by examining the correlation between physician distrust, immigration-based diversity, and declining social capital. The study surveyed 1,080 adults and were asked to answer on a 5-point scale from strongly agree to strongly disagree about general statements about doctors assessing their overall trustworthiness. The study found immigration attitude predicts physician distrust. Over the last 50 years, the US has shown to exhibit a decline in physician distrust which could be a result of immigration attitude or declining social capital. Although to better understand this trend, future research could compare generalized trust in doctors to particular doctor trust. Lack of trust between patients and healthcare providers can cause doubt in the efficiency of provider's services. This could lead U.S. natives and especially immigrants to disregard their health concerns due to disbelief in professionals or declining social capital which will leave them to be uneducated about their health status.

To increase health literacy, the degree to which individuals are knowledgeable of important health information to carry out proper health practices, health fairs can be used as a method of outreach to increase awareness and help minority populations understand their health statuses. Disparities in health literacy are most prevalent among racial minorities, lower education levels, advanced age, and low economic statuses. Seo (2011) surveyed 1,701 participants in an annual Indiana Black and Minority Health Fair using a pre-posttest and 15-month follow-up health counseling. The survey investigated the relationships between key health indicators, behaviors, and socioeconomic statuses to evaluate the health fairs' effect. The study concluded those observed after the 15-month counseling sessions had meaningful improvement in their self-reported health statuses. Behavioral changes were not as prevalent between the baseline and pre counseling. This suggested the necessity of a follow-up component in health fairs to improve health literacy and health outcomes in individuals. The critical role health fairs play with follow-ups in educating people who are aware of basic health information/ practices was also shown in a study conducted by Adekeye, Takon (2018). Surveying 144 African-born immigrants aged 18 and older at a health fair. The survey examined if African immigrants were knowledgeable of barriers to healthcare, common cancer, and cancer risks enough to utilize needed care. The study concluded well-organized and repetitive health fairs with participant follow-ups are effective in spreading awareness of health to people who may not have accessibility or do not seek access. Many participants within the study had limited contact with health care due to lack of health insurance and or unaffordability of medical costs, providing reasoning for their lack of accessibility. African immigrants are commonly grouped as African American or Black, which has subdued the effect of interventions and recommendation when attempting to fix the disparities amongst African immigrants. They are also the least studied immigrant group despite being included in research amongst immigrant populations to find disparities in the healthcare system. Omenka, Watson, Hendrie (2020) studied African immigrants to develop lines of inquiry using the identified knowledge gaps of African immigrant health.

Literature published in the English language between 1980 and 2016 was reviewed in five stages: question, relevant studies, screening, data extraction and synthesis and results. About 1,446 articles were identified through database searching and only 14 articles contained 14 articles. Within these 14 articles, the research concluded the two main recurring barriers to African immigrant health are cultural influences and adverse experiences with the US healthcare system. Lack of sufficient research has caused unidentified root causes of barriers.

METHODS

A mixed-method research design was employed to investigate the experiences of the diverse array of individuals accessing healthcare in the United States. The study aimed to address the question of whether the US healthcare system presents barriers to immigrant patients that US natives do not experience. The primary research method utilized a Likert scale and correlation scale to perform factor analysis, which was accompanied with correlational statistics. An experimental design allowed for comparative analysis of how immigrants and U.S. born individuals addressed specific factors during their interactions with healthcare services. All surveys included an informed consent form to ensure participants were knowledgeable of the data being collected, its purpose, and that their participation is completely voluntary with the ability to withdraw at any time. The participants' responses were kept anonymous to preserve confidentiality and any identifying information was not disclosed.

The sample population was sought out to be participants from various backgrounds to represent the mixed experiences when interacting with the healthcare system using convenience sampling. Individuals who reported being born outside of the US were identified as immigrants. Potential participants, aged thirteen and older, were recruited between March and April 2021 both online and in-person. Online recruitment was distributed via social media platforms, through Twitter and Instagram. In-person recruitment was done through soliciting households, medical offices/facilities and cultural restaurants all located in Woodbridge, Virginia. Participants were required to have received medical care and or encountered the US healthcare system.

The Likert scale gauged patients' experiences in five areas: access to healthcare, barriers to healthcare, healthy practices, relationships with healthcare providers, and relationships with health institutions. The survey can be found in Appendix A. Each of these factors were analyzed using five questions per factor. The participants' experiences were quantified ranging from 1 to 5 (1= strongly disagree, 5= strongly agree). However, a duplication of a survey question occurred within the survey administered to US natives and immigrants. The resulting data served as the primary dataset for correlational statistics and factor analysis.

In addition to the survey administered to patients, a second survey was given to healthcare providers. The survey assessed healthcare providers' perceptions on the effectiveness of their care delivery and about the state of health institutions and the healthcare system currently in place. The experimental design addressed the quality and trust of interactions with their patients and the efficiency of their services, allowing for comparative analysis between patients and providers. The research method also utilized a Likert scale and correlation scale to perform factor analysis, accompanied with correlational statistics.

The sample population was healthcare providers aged eighteen and older and were recruited using convenience sampling. Individuals who identified as administering medical services to patients and having significant impact on the care patients receive in the healthcare system were considered healthcare providers. Potential participants were recruited both online and in-person, between March and April 2021. Online recruitment was distributed via social media platforms, through Twitter and Facebook. In-person recruitment was done through soliciting medical offices/facilities located in Woodbridge, Virginia.

The Likert scale measured providers' perceptions in two areas: their provided care and the state of the way health institutions operate. The survey can be found in Appendix B. Both of these factors were analyzed using five questions per factor. The providers' perspectives were quantified ranging from 1 to 5 (1= strongly disagree, 5= strongly agree). However, when conducting t-tests to compare the trust between providers/health institutions, US born natives, and immigrants, an adjustment to one factor in the interest of using uniform statistics in algorithms was made. This increases slight potential for error in the analysis of data

ANALYSIS

Correlation coefficients were calculated by comparing the scores of Likert questions within each factor (access, barriers, healthy practices and relationships with providers). The correlation coefficients were made including all U.S born natives and immigrants experiences. Further calculations were made by conducting two tailed t-tests of the Likert scores among the sub populations. These were done by comparing the scores of U.S. born natives with immigrants and comparing the scores of men and women. The second survey quantifying the beliefs of health providers' efficacy of their own services and current state of health institutions was compared to U.S. born natives and immigrants beliefs. This was done by conducting two tailed t-test scores of the correlation coefficients and the results of the survey from health providers. T-test scores were conducted comparing immigrants' belief of the efficacy of providers and institutions with that of the providers' beliefs. Similarly, t-test scores were conducted comparing U.S. born natives' belief of the efficacy of providers and institutions with that of the providers' beliefs.

RESULTS

Factors such as access/barriers to healthcare services, healthcare provider relationships, execution of healthy practices, and health institution relationships were considered as part of the correlational inquiry. Correlational analyses and t-tests were tested amongst US-born natives, immigrants, men, and women using the healthcare system. The correlation coefficients and t-test values were then compared amongst groups to assess a possible relationship or lack thereof.

200 surveys were administered and 94 respondents were available for data analysis. Demographics of the 94 respondents are summarized in Figures 1, 2, and 3. Most were US-born natives (68.1%, n= 64), female (71.4%, n=67) and had a median household income of greater than 110k (39.4%, n=37).

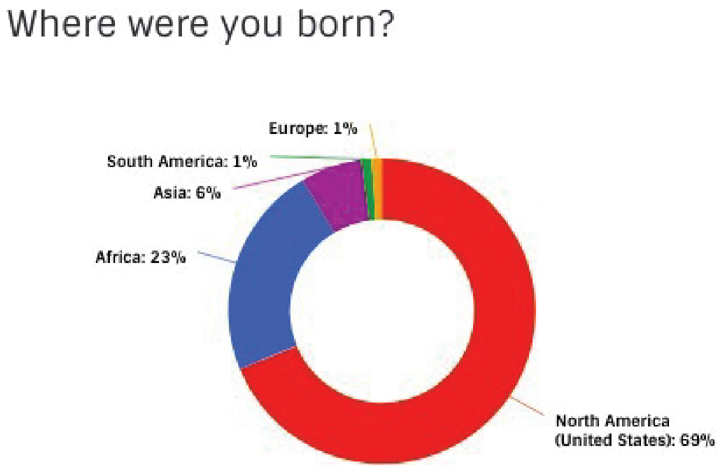


Figure 1: Users of the US healthcare system place of birth

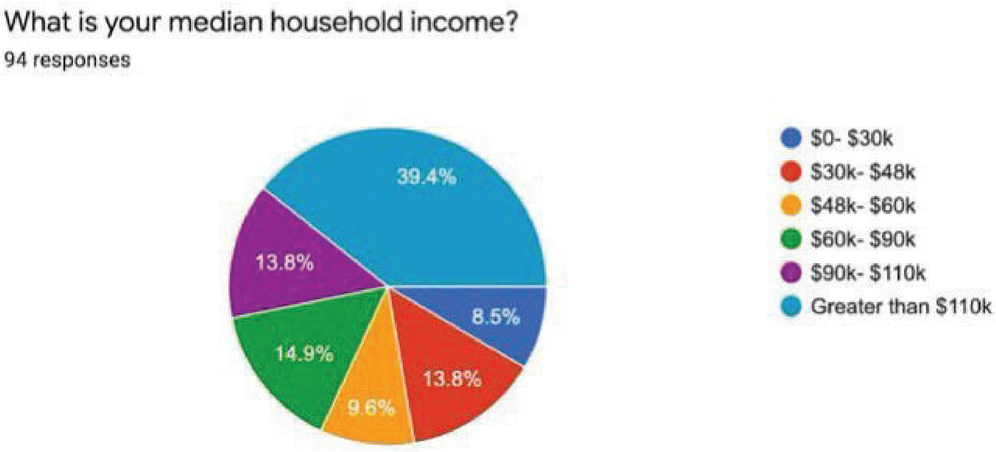


Figure 2: Users of the US healthcare system median household income

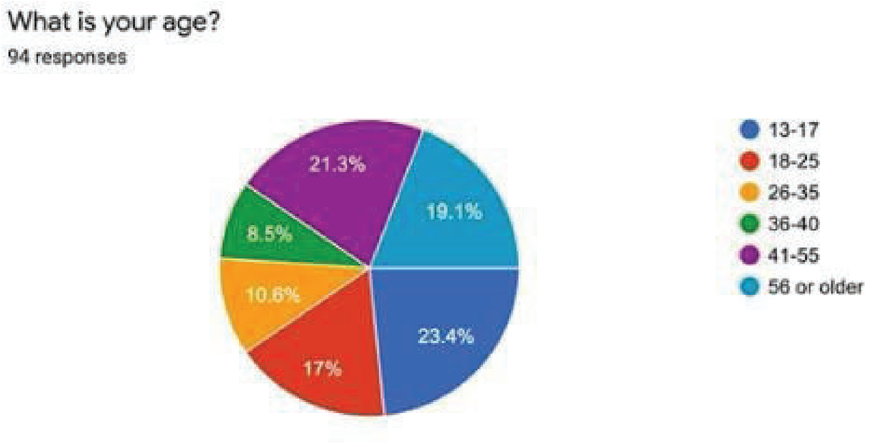
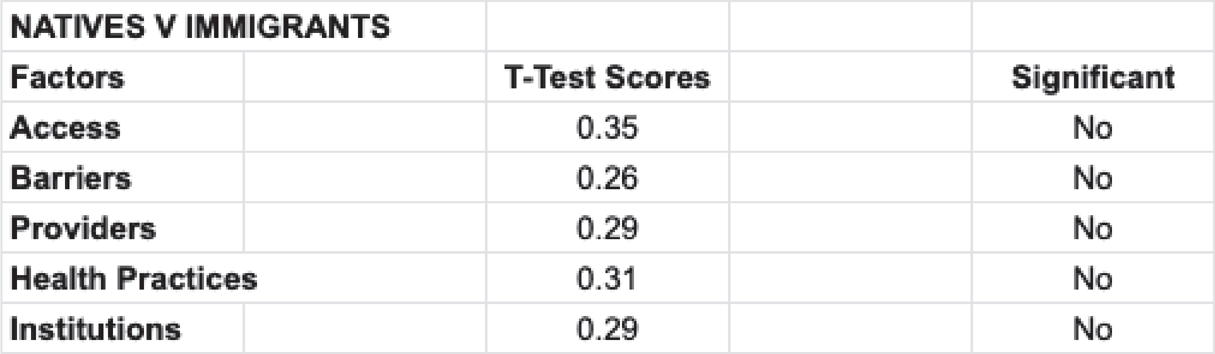


Figure 3: Users of the US healthcare system ages

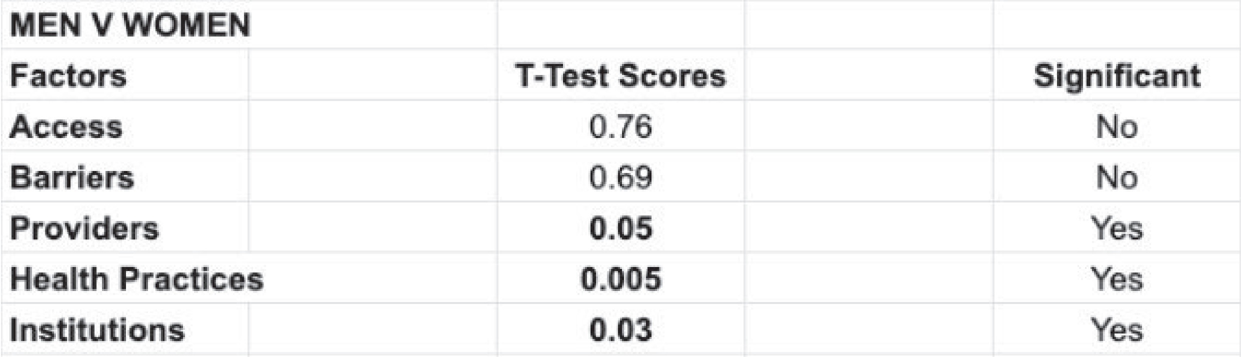
Participants' responses in relation to their access to healthcare there was no significant difference between US born natives' and immigrants' (t= 0.35). Participants' responses in relation to the barriers they possibly face in healthcare were also not statistically significant (t= 0.26). Women tended to have more beneficial relationships with their healthcare providers (t= 0.05), a better connection to resources of health institutions (t= 0.03), and most notably their implementation of healthy practices was significantly different than that of men (t= 0.005). In comparison of their correlation coefficients, women have greater access when they have a positive relationship with health (0.59). Even though there were no significant differences between US born natives and immigrants, correlation coefficients highlighted distinctions between the two, as seen in Tables 3 and 4. Providers had a greater impact on the access patients received in healthcare in immigrants (0.63) than US natives (0.43). Barriers were also more positively correlated with health institutions in immigrants (0.21), in comparison to a negative correlation in US natives (- 0.38). Healthy practices had little to no effect on barriers to the healthcare system in immigrants (-0.08), while it more negatively correlated with barriers in US native (-0.27). Healthy practices did have a positive correlation with access to the healthcare system in US natives and immigrants. Providers had a negative correlation with barriers to the healthcare system in both groups.

The correlation coefficients were strongly positive when considering the relationship between providers and institutions for US natives (0.65) and immigrants (0.69). This positive relationship between providers and institutions was also found in between men (0.68) and women (0.68). In addition, there was a strong positive correlation in the relationship with institutions and access to the healthcare system in US natives (0.57), immigrants (0.56), and women (0.59). There was a stronger positive correlation between access to the healthcare system and the relationship with providers for men (0.54). Consequently, greater access to the healthcare system was strongly negatively correlated with barriers for US natives (-0.68), men (-0.73) and women (-0.53) and less strongly for immigrants (-0.39).



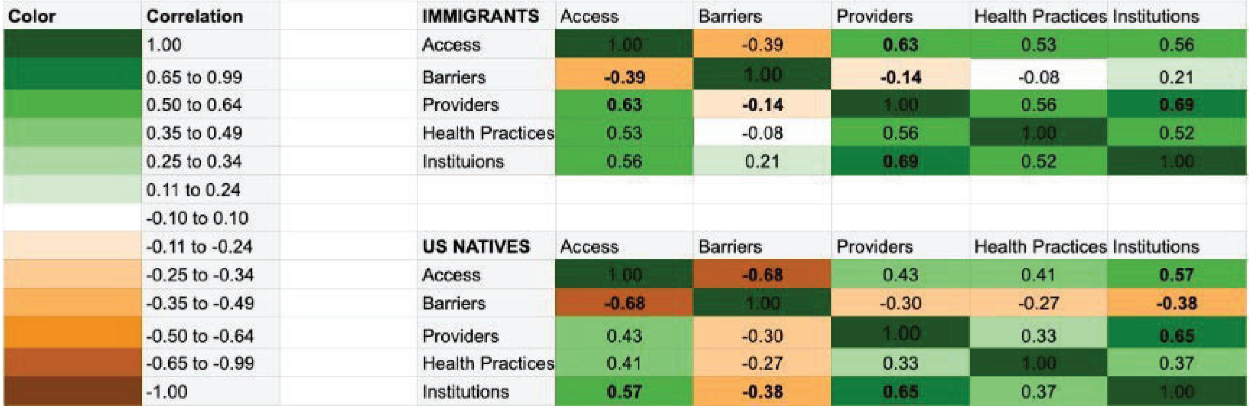
NATIVES V IMMIGRANTS				
Factors		**T-Test Scores**		**Significant**
Access		0.35		No
Barriers		0.26		No
Providers		0.29		No
Health Practices		0.31		No
Institutions		0.29		No

Table 1: T-test values of US natives and immigrants using the healthcare system



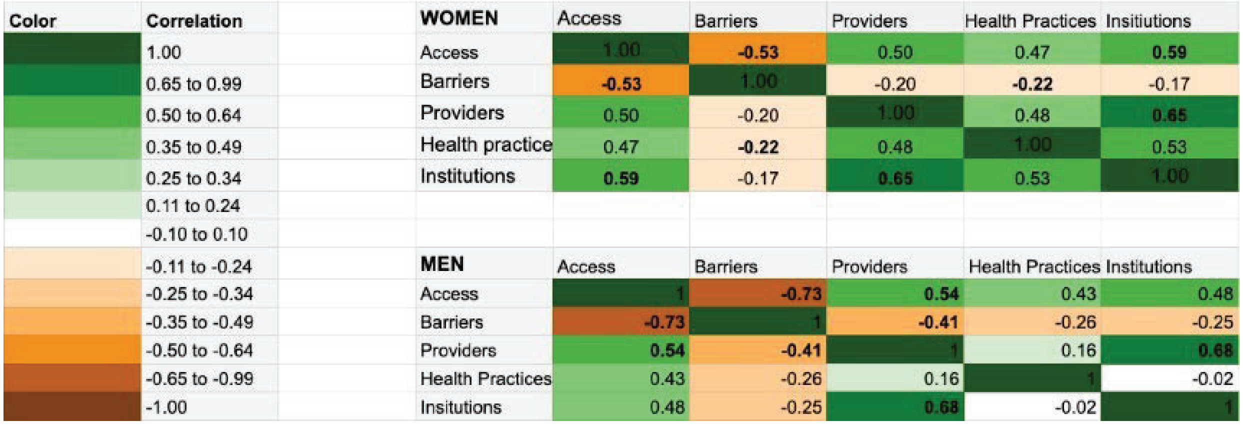
MEN V WOMEN				
Factors		**T-Test Scores**		**Significant**
Access		0.76		No
Barriers		0.69		No
Providers		**0.05**		Yes
Health Practices		**0.005**		Yes
Institutions		**0.03**		Yes

Table 2: T-test values of men and women using the healthcare system



Color	**Correlation**		**IMMIGRANTS**	Access	Barriers	Providers	Health Practices	Institutions
🟩	1.00		Access	1.00	-0.39	**0.63**	0.53	0.56
🟩	0.65 to 0.99		Barriers	**-0.39**	1.00	**-0.14**	-0.08	0.21
🟩	0.50 to 0.64		Providers	**0.63**	**-0.14**	1.00	0.56	**0.69**
🟩	0.35 to 0.49		Health Practices	0.53	-0.08	0.56	1.00	0.52
🟩	0.25 to 0.34		Instituions	0.56	0.21	**0.69**	0.52	1.00
🟩	0.11 to 0.24							
⬜	-0.10 to 0.10							
🟧	-0.11 to -0.24		**US NATIVES**	Access	Barriers	Providers	Health Practices	Institutions
🟧	-0.25 to -0.34		Access	1.00	**-0.68**	0.43	0.41	**0.57**
🟧	-0.35 to -0.49		Barriers	**-0.68**	1.00	-0.30	-0.27	**-0.38**
🟧	-0.50 to -0.64		Providers	0.43	-0.30	1.00	0.33	**0.65**
🟫	-0.65 to -0.99		Health Practices	0.41	-0.27	0.33	1.00	0.37
🟫	-1.00		Institutions	**0.57**	**-0.38**	**0.65**	0.37	1.00

Table 3: Correlation matrix of factors of US-born natives and immigrants



Color	Correlation		WOMEN	Access	Barriers	Providers	Health Practices	Insitiutions
🟩	1.00		Access	1.00	**-0.53**	0.50	0.47	**0.59**
🟩	0.65 to 0.99		Barriers	**-0.53**	1.00	-0.20	**-0.22**	-0.17
🟩	0.50 to 0.64		Providers	0.50	-0.20	1.00	0.48	**0.65**
🟩	0.35 to 0.49		Health practice	0.47	**-0.22**	0.48	1.00	0.53
🟩	0.25 to 0.34		Institutions	**0.59**	-0.17	**0.65**	0.53	1.00
🟩	0.11 to 0.24							
⬜	-0.10 to 0.10							
🟧	-0.11 to -0.24		**MEN**	Access	Barriers	Providers	Health Practices	Institutions
🟧	-0.25 to -0.34		Access	1	**-0.73**	**0.54**	0.43	0.48
🟧	-0.35 to -0.49		Barriers	**-0.73**	1	**-0.41**	-0.26	-0.25
🟧	-0.50 to -0.64		Providers	**0.54**	**-0.41**	1	0.16	**0.68**
🟫	-0.65 to -0.99		Health Practices	0.43	-0.26	0.16	1	-0.02
🟫	-1.00		Insitutions	0.48	-0.25	**0.68**	-0.02	1

Table 4: Correlation matrix of factors of men and women using the healthcare system

Providers

In the survey administered to healthcare providers/workers, all respondents consented and consisted of 36 responses for data analysis. Majority of respondents were female (69.4%, n=25), identified as Asian (44.4%, n=16), or Caucasian (41.7%, n=14) and ages mostly ranged from 26 to 45.

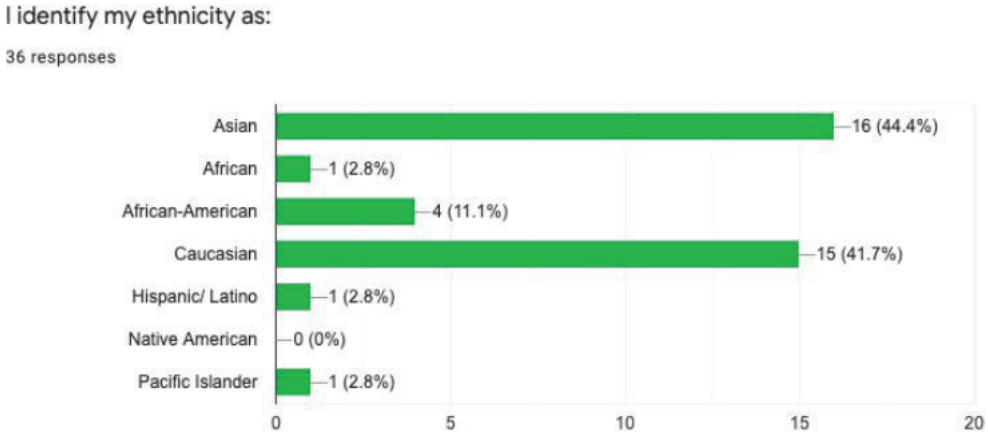


Figure 4: Healthcare providers' ethnicities

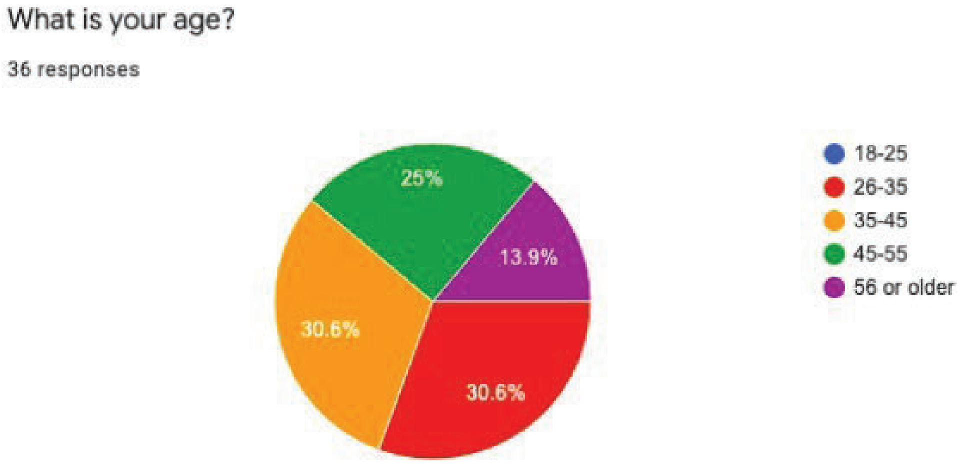
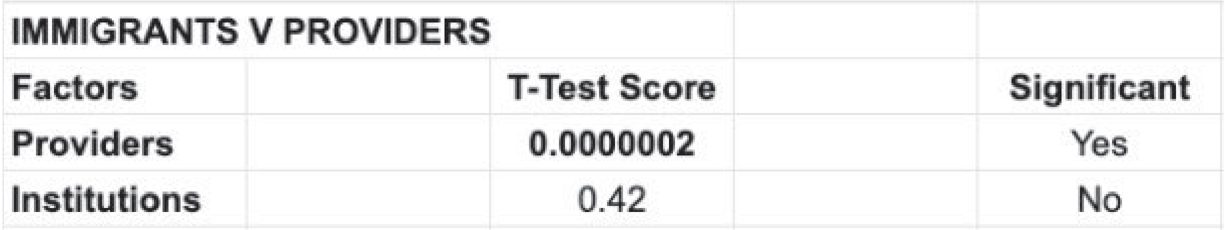


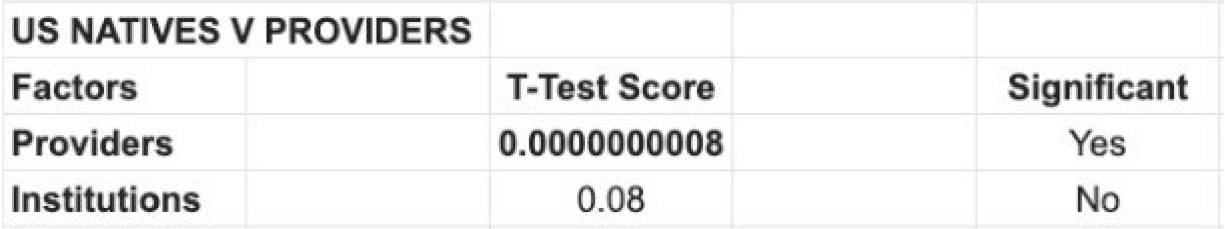
Figure 5: Healthcare providers' ages

Healthcare providers' belief in the efficacy of their services and belief in health institutions' influence on users of the US healthcare system were compared to user's responses who were asked about their experience with providers and health institutions using t-tests (see Table 5 and 6). There was a significant difference in providers' belief in the efficacy of their services and how much immigrants trust the efficacy of their services (0.0000002). A significant difference in the trust between providers and users were also found amongst US natives which was an even greater difference than immigrants (0.0000000008). Providers' belief in the administration of health services by health institutions were however not significantly different that US natives (0.08) or immigrants (0.42).



IMMIGRANTS V PROVIDERS				
Factors		**T-Test Score**		**Significant**
Providers		**0.0000002**		Yes
Institutions		0.42		No

Table 5: T-test values of immigrants using healthcare system and healthcare providers



US NATIVES V PROVIDERS				
Factors		**T-Test Score**		**Significant**
Providers		**0.0000000008**		Yes
Institutions		0.08		No

Table 6: T-test values of US natives using healthcare system and healthcare providers

DISCUSSION

In the analysis of the study's participants, differences between US native born and immigrants in the healthcare system were found in areas such as provider trust, health institutions relations, access regarding healthy practices, and significant differences even amongst men and women. Significant differences were also found in healthcare provider trust in both US natives and immigrants.

A significant difference was found between men and women in their relationships with health practices, healthcare providers, and health institutions. A similar correlation was found in a study conducted by Sood (2019) and colleagues, which found women had a higher self-efficacy in regards to maintaining a healthy diet. However, this difference was not statistically significant (Sood et al.). In addition to their less adequate health practices, in a systematic review of why men are less likely to seek healthcare, plenty of barriers contributed to their poor health-seeking behaviors (Yousaf, Grunfeld & Hunter, 2013). These included poor communication with providers, inability to build rapport with providers, and uncertainty in their credibility. Distrust in providers' ability to efficiently address their health concerns decreases trust in health institutions as well. As seen in the correlation analysis, a positive relationship with providers correlated with a positive relationship with health institutions in men (0.68).

An expected find was the prevalence of barriers in institutions inhibiting immigrants from receiving full access to care. Immigrant participants were subjected to more barriers in institutions (0.21) in comparison to US natives (-0.38), but there wasn't a significant statistical difference. Previous literature (Portes et al., 2009; Castañeda et al., 2015) argued studies do not take into account the systematic barriers imposed by the US healthcare system. Immigration affects multiple aspects of an individual's lifestyle and should be looked at as more than just one factor and as a social determinant of health as well.

Barriers within health institutions have been embedded into the system to prevent immigrants from full access. Health institutions' frameworks' inherent ways which inhibit care from immigrants led a study (Portes, Light & Fernandez-Kelly) to infer institutions play a larger role in healthcare's accessibility than providers do. As seen in this study's correlational analysis, health institutions have a higher correlation to barriers in immigrants (0.21) than providers do (-0.14).

Lack of English fluency was perceived as a barrier to access health care services, and also known to handicap individuals along with cultural differences, legal status, and poverty in a study conducted by Portes and colleagues (2009). However, with further research (Schewi, et al., 2016; Wang, 2011), the need to bridge this barrier has been mitigated with the implementation of a national policy to provide access to language services to those who need it. The patient's language proficiency can also improve over time or their children can speak on their behalf. The study stayed consistent with the lack of need for better communication between healthcare providers and immigrants. Immigrants; relationship/ trust with providers is positively correlated with access (0.63), even higher than that of US natives (0.41), and allowed for increased access within the healthcare system. US born natives may have a lower provider trust due to immigration attitude relating directly with physician attitude (Samson, 2016). Those with a disdain for immigration were subject to higher distrust for physicians, and in addition, the US has been seen to decline in physician distrust due to declining social capital.

An expected trend was healthy practices correlating positively with access to health care in immigrants and US natives. This can be reasoned for using previous literature (Adekeye, Adesuyi & Takon, 2018; Seo 2011), which show health fairs with consistent follow-ups can help increase access to predetermined objectives by spreading awareness of accessibility to those who may not seek it and increase their health literacy. In doing so, it can expand knowledge of healthy practices to increase utilization of healthcare. If people, especially immigrants, are knowledgeable of healthy choices to protect their health, it will increase their chances in seeking care. However, if their access to care is inhibited through barriers, even with their knowledge of healthy practices, utilization of the healthcare system will not be as apparent. In addition, health practices and utilization may vary amongst different counties/cultures/sub-groups. As seen in a cross-sectional comparison of US county-level public health performances, grouping counties based on sociodemographic (rurality, socioeconomic status, race, ethnicity, etc.) linked to the outcome of interest, facilitates a deeper understanding of additional factors influencing prevalence of health outcomes (Wallace et al., 2019). Accounting for these differing measures and experiences, health institutions can better equip their services to cater to the other determinants of health which impact their practices in addition to being an immigrant. Intervention efforts to increase utilization rates will become meaningful in reaching targeted health outcomes because they are more tailored to the populations' experiences that may be impacted by the additional sociodemographic factors that are not considered if they are solely labeled an immigrant.

Significant figures of distrust between patients and providers were found in the study which could also be due to immigration attitude or social capital in the US. Providers were assessed on the adequacy of the care they administered and their trust between their patients, and the patients were inquired of the same thing. There were significant differences in patients' trust with providers compared to providers' believed trust with their patients in both immigrants (0.0000002) and US natives (0.0000000008). The disconnect in trust level between patients and providers may be due to the sociopolitical environment of healthcare, such as the politicization of health practices, declining social capital and arguments over government involvement in healthcare systems. As seen in the current state of COVID-19 pandemic, mask-wearing is a prime example of health practices becoming politicized. In a study Young, et al. (2022) examining mask-wearing and its correlation with political beliefs, psychological reactance and conflict orientation, found conflict style and political preferences has implications on the "implementation of health messaging and health policy". This in turn affects the patient's willingness to practice proper health practices and behaviors. Health communication amongst health providers and public health officials with patients are further undermined and creates barriers in transparency. Distrust was shown in a study supported by the National Institute of Mental Health and the Robert Wood Johnson Foundation (2014) which did a review a historical polling data on public distrust in US physicians and medical leaders and found even though the US has high patient satisfaction, it has low overall trust in providers (Blendon, Benson & Hero, 2014). This low overall trust, even with high patient satisfaction could be due to costs of care and or medical professions' lack of public effort to lower these costs. Providers' trust in the adequacy of health institutions was not significantly different than patients' trust in health institutions. This may be due to providers' understanding of the high expenses of healthcare imposed by health institutions.

CONCLUSION

The immigrant population in the US has demonstrated low utilization of the healthcare system which could impact their overall health outcomes. This could be attributed to the distrust between immigrant patients and their providers, which this study highlights a difference in patient's trust, and providers' perceived trust. The importance of improving patient-provider relationships for all demographics, especially men, is imperative because it can influence the behavior patients make in their personal health choices. This study displays a difference between native born and immigrants' provider trust, health institution relations, and access to exhibit healthy practices. However studies researching a larger cohort is necessary to draw a valid conclusion. This signals a distinction between the two groups and signifies that the US healthcare system should implement resources and enact services to reach a disserviced population of immigrants.

LIMITATIONS

Findings concerning both US born natives and immigrants were collected and distributed in the mid-Atlantic region which limits generalizability. It is also limited by its small sample size which may not adequately represent the broader populations of interest. Moreover, limited sample size heightens data variability and diminishes the ability to draw dependable conclusions or identify statistically significant variances. Consequently, findings derived from this study may exhibit diminished robustness. Additionally, it often yields wider margins of error, compromising the precision of the study outcomes and impacting the confidence level of conclusions drawn.

IMPLICATIONS AND RECOMMENDATION FOR FURTHER RESEARCH

Ensuring that immigrants have access to adequate care will not only benefit immigrants but will also benefit other marginalized groups within the US healthcare system such as African-Americans, ethnic minorities, and those with lower socioeconomic status. The system is overloaded with individuals lacking sufficient care, but if their concerns are appropriately addressed, their money can go towards the care they need and lessen the load on the system to provide care to the overwhelming number of individuals. Increasing the public's health literacy through health fairs, jobs, and schools will also decrease the demand of health institutions and better the overall health status of the public. The implications reach well beyond those noted in this research and require identifying how to combat the systematic barriers embedded into the structure of healthcare. The healthcare system requires intensive reform with policy implementation to allow for immigrants and marginalized groups to receive specialized care. Just as health care policy changes were implemented to counter language barriers, notable distinctions in care such as healthy practices, health institution trust, and provider trust can be modified as well. This can be done by implementing proper health communication guidance to health professionals to ensure efficient modes of relaying information among patients and providers. This can alleviate the level of distrust and create meaningful relationships for patients to rely on for their health information.

For future research, the types of healthcare providers and way providers communicate with their patients should be studied to help mitigate the significant difference in trust between the two as seen in the study by conducting randomized controlled samples across the US to increase generalizability. Future research should also examine specific interactions healthcare providers have with different demographics, especially men and women, to find reasoning for their significant differences in interactions with healthcare providers/ institutions. Differences in men's and women's interactions with healthcare weren't aligned with the research study, but more research should be dedicated to investigating it. The general demographic of 'immigrants' can also be more detailed into identified populations by nationality or ethnicity and would be advantageous in specifying their relationships with providers.

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