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RESEARCH ARTICLE

Barriers to Personal Protective Equipment, Testing, and Vaccines: The Impact of COVID-19 on Ohioans with Disabilities

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ABSTRACT

Introduction: The COVID-19 pandemic disproportionately affected individuals with disabilities across the state of Ohio. Determining the needs of individuals with disabilities and the barriers that they face is important to improve response efforts during future emergencies.

Methods: A web-based needs assessment conducted within the state of Ohio looked to determine the aspects of the COVID-19 pandemic, including personal protective equipment (PPE) accessibility, COVID-19 vaccines, and testing, that disproportionately affected individuals with disabilities.

Results: Out of 73 respondents, few faced challenges understanding and using PPE, but 34.7% faced moderate to severe struggles to obtain it, especially adaptable PPE, with 16.2% experiencing difficulties obtaining adaptable PPE. While comprehension of PPE usage was high, some confusion about mask policies persisted, and a smaller group requested assistance, indicating accessibility issues. Most participants reported minimal challenges with COVID-19 testing and vaccination processes. Nonetheless, some were confused due to unclear information, accessibility barriers, and complex procedures. Issues included limited manual dexterity for self-testing and transportation problems for drive-up sites. Overall, responses highlighted a demand for clearer communication and more accessible processes.

Conclusion: Access to PPE was good, but individuals with disabilities faced challenges with adaptable options. While understanding PPE was mostly straightforward, confusion over guidelines and accessible PPE remained. Accessible information on testing and vaccination was also a challenge, though general comprehension was high. Approaches needed to prevent disproportionate impacts during public health emergencies include clear, inclusive communication in various formats, dedicated accessible vaccine clinics, enhanced access to adaptable PPE, training for providers on disability etiquette, and improved efforts to combat misinformation.

Keywords: Disability, COVID-19 vaccination, COVID-19 testing, Personal protective equipment, Deductive thematic analysis within a qualitative framework

INTRODUCTION

The COVID-19 pandemic disproportionally affected individuals with disabilities because of the reduced access to health care, negative social impacts, and disparities in information accessibility.[1] In this study, "disability" is understood as existing along a continuum that encompasses a broad range of physical, sensory, intellectual, and chronic health conditions. This includes, but is not limited to, individuals with mobility impairments (eg, those who use wheelchairs or assistive devices), sensory disabilities (eg, deaf, hard of hearing, blind, or low

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vision individuals), intellectual or developmental disabilities (eg, autism spectrum disorder), mental health conditions, and chronic illnesses (eg, diabetes, epilepsy, or multiple sclerosis). Recognizing this continuum emphasizes that disability is not a uniform experience but, rather, varies in type, visibility, and impact on daily functioning. From 2020-2022, individuals with disabilities had higher risks of COVID-19 mortality and worse clinical outcomes, which affected individuals with intellectual disabilities disproportionally.[2-4] Moreover, the Centers for Disease Control and Prevention (CDC) indicates that individuals with disabilities are at an increased risk for severe respiratory illnesses.[5] Increased rates of COVID-19 morbidity and mortality among individuals with disabilities demonstrate significant barriers and/or challenges they faced during the pandemic.

Such barriers and challenges may be shortages of personal protective equipment (PPE), access to adaptable PPE, and accessibility of health information about COVID-19 vaccines and testing. Personal protective equipment can include items such as, but not limited to, cloth masks, surgical masks, N95 masks, respirators, surgical (latex) gloves, eye coverings, face shields, hand sanitizer, and isolation gowns. Nationally, PPE was largely unavailable and inaccessible to both providers and recipients of long-term services and supports, increasing the risk of infection, severe illness, and death for people with disabilities, whether they lived in congregate care settings or in the community during the pandemic.[6] Individuals with disabilities who were unable to drive, carry packages, shop independently, assess their PPE needs, or access the internet—along with those who lacked extra funds for unexpected expenses—faced significant challenges in obtaining and maintaining a PPE supply.[6,7] Moreover, PPE shortages disproportionately affected individuals with disabilities.[7] An Ohio report indicated that most individuals with disabilities had access to PPE for themselves and their caregivers; however, this was in the early phase of the pandemic and not a consensus across the population.[8] However, each disability group experienced different barriers. For example, individuals with traumatic brain injuries indicated that they experienced communication challenges during the pandemic, which is similar to those who use American Sign Language as their primary language due to the use of masks that can prevent lipreading and can muffle voices.[6,9]

Nationally, individuals with disabilities experienced physical, communication, and procedural barriers when obtaining COVID-19 testing and vaccinations.[6] Martin et al found that individuals with disabilities who were unable to work due to a physical, mental, or emotional condition were less likely to obtain COVID-19 testing.[10] Given the inaccessibility of testing initially in the pandemic, federal recommendations included modifications for testing to provide appropriate accommodations for individuals with disabilities.[11] Additionally, individuals with disabilities were less likely to get tested for COVID-19 and were less likely to obtain a COVID-19 vaccination.[10,12] While there was less adoption of the COVID-19 vaccine among individuals with disabilities, it seems vaccine hesitancy is not a cause.[10,12] For other vaccines, such as influenza and pneumococcal, sometimes individuals with disabilities were less likely to become vaccinated; however, whether (or not) individuals with disabilities were more or less likely to receive those vaccines depended largely on a variety of factors including access and integration in health care systems, perceived risk of illness, race, and ethnicity.[13-15] Therefore, this demonstrates that other (or additional) barriers and challenges may have hindered COVID-19 vaccination uptake. In Ohio, specifically, residents with disabilities reported they were fearful at the start of the COVID-19 pandemic because there was no treatment or cure; however, data was collected early in the pandemic and prior to when the COVID-19 vaccines were available.[8] Early long-term fear and a lack of early information could have contributed to individual's reasonings for receiving or not receiving COVID-19 vaccinations.

Moreover, health information about the COVID-19 pandemic was inaccessible to some populations. For example, public service announcements sent out about COVID-19 protocols did not meet accessibility guidelines.[16] Also, there was an instance where a vaccine registration website was inaccessible for some individuals with disabilities due to an inability to use screen readers and difficulty with simple and clear website navigation.[17] Because of the barriers to accurate health information and resources, it is unclear if the information obtained about COVID-19 testing and vaccination protocols and procedures were understood and if PPE guidelines were able to be followed.

Since there is limited information about the barriers and challenges Ohioans with disabilities encountered during the COVID-19 pandemic, the purpose of this study was to determine the unmet needs among Ohioans with disabilities in the use of PPE, testing, and vaccines during the COVID-19 pandemic. The areas examined were barriers to PPE, accessibility and availability of PPE, PPE usage, accessibility and comprehension of health information about COVID-19 vaccines and testing, and COVID-19 vaccination status. The goal was to determine challenges faced during the COVID-19 pandemic and pertaining to PPE and COVID-19 vaccination and testing among Ohioans with disabilities.

METHODS

This study was the second iteration of the Access Center for Independent Living (ACIL) survey. The ACIL is 1 of 12 Ohio Centers for Independent Living and serves 9 Ohio counties including Preble, Montgomery, Greene, Darke, Miami, Clark, Champaign, Auglaize, and Logan counties. The mission of the ACIL is to ensure that people with disabilities have full and complete access to the community in which they reside. Given that the COVID-19 pandemic is officially over, this study retrospectively assessed the needs of individuals with disabilities throughout the pandemic, highlighting their priority needs for emergency planning and responses. The institutional review board approved this study as exempt. This study utilized a cross-sectional survey with a deductive thematic analysis within a qualitative framework. Data collection was conducted through Qualtrics as the primary platform, with paper surveys available upon request. While paper surveys were requested twice, neither were returned to be included in the study.

Participants and Recruitment

Participants were recruited across Ohio, and the survey was active from July 29, 2024, to September 16, 2024. Multiple recruitment strategies were employed. The survey link was posted on the ACIL website and social media platforms. Promotional flyers with the survey link were distributed via email to community partners, including regional and statewide centers for independent living, public health departments, non-profit organizations, and community organizations. Several partnering organizations also posted the survey link to their respective social media pages. To maintain engagement and encourage ongoing participation, biweekly reminders were sent to these partners as well as consumers of the ACIL to promote the survey and solicit additional responses.

Eligibility for participation was extended to any current Ohio resident over the age of 18 years who accessed the survey through the ACIL network, its partners, or related organizations. Although the priority population was individuals with disabilities, responses from support persons, health professionals, case workers, social workers, and caregivers were also sought to provide a broader perspective. The results of this survey included individuals with disabilities, which consisted of individuals with hearing loss, vision loss, mobility loss, limited ability to concentrate, remember, or make decisions, limited ability to complete daily self-care, limited ability to complete errands, and/or those who experience an immunocompromising condition. Individuals who were excluded from this study included those who were under the age of 18 years, individuals who reside outside of Ohio, and individuals who did not select a specific disability on the survey.

Measures

Demographic measures included self-identification of age group, race, gender, disability status, Ohio county of residence, and disability service organizations used. The disability groups were selected using the CDC standard disability questions in addition to a question related to status on immunocompromised identifying individuals.[18] Information was also collected regarding the impact of COVID-19 PPE usage, access, vaccination status, and access to COVID-19 vaccinations and testing.

Quantitative measures on the survey included PPE access, use, and understanding how to use the PPE, COVID-19 vaccine processes/protocols, and testing process/protocols. In this study, PPE was defined as, but not limited to, cloth masks, surgical masks, N95 masks, respirators, surgical (latex) gloves, eye coverings, face shields, hand sanitizer, and isolation gowns. Adaptable PPE is defined as, but not limited to, masks with a clear mouth window for lipreading, face shields as an alternative to masks for lipreading, latex free gloves, respirators, headbands for holding masks in place, and isolation gowns. Other items on the survey included identifying barriers experienced with obtaining PPE, COVID-19 testing, COVID-19 vaccines, and COVID-19 boosters. Items on the survey also assessed the level of challenge individuals with disabilities faced in understanding the COVID-19 testing process and the COVID-19 vaccination process. Each of the quantitative items used a 4-point Likert scale with options including no challenges, mild challenges, moderate challenges, and severe challenges.

Additionally, to gain a more in-depth understanding of the responses to the quantitative questions, respondents were also asked to provide open-ended responses to elaborate more on their experiences. These items allowed respondents to describe how the pandemic affected their access to PPE, COVID-19 vaccinations and testing, their experiences, challenges, and barriers and facilitators related to the COVID-19 pandemic.

Data Analysis

Results from the survey were downloaded into an Excel file and analyzed for both quantitative and qualitative data results. Quantitative data were analyzed using Excel to determine descriptive statistics for demographic variables, frequencies and percentages of responses for each of the survey questions, as well as analyzed for each research question. The methods for analyzing quantitative data utilized pivot tables to determine the frequencies and percentages for demographic data and disability status.

The qualitative analysis was conducted with Google Gemini AI to identify related themes. All data included in the analysis were deidentified. The process used for this analysis consisted of following a qualitative analysis guide specifically for using AI.[19] The transcript of the rough qualitative data was pasted into Google Gemini and summarized in 1000 words, the results were then summarized based on the corresponding research question to create codes, and then these results were sorted by Gemini into themes with related excerpts from the original data.[19]

RESULTS

Demographics

Table 1 provides demographic data for the study. Out of 73 respondents, most were aged 18-29 years (37%) and 41-54 years (25%), with most identifying as female (71%) and White (86%). Due to respondents' ability to select multiple disability statuses and disability not happening in silos, it is difficult to classify respondents into a single category of disability type. In this study, 58% of the sample indicated having 2 or more disabilities. Of those who indicated having more than 1 disability, 25% indicated having 2 disabilities and 33% indicated having 3 or more disabilities. Of those with multiple disabilities 71% had difficulty running errands, 69% reporting having difficulty remembering, concentrating, or making decisions, 64% indicated they had difficulty walking or climbing stairs, 52% had difficulty dressing and bathing, 45% had an autoimmune disease, 19% had difficulty seeing, and 14% had difficulty hearing (data not shown). County-level distributions show that most respondents were from Montgomery County (32%), followed by Franklin County (15%) (data not shown).

Personal Protective Equipment

Table 2 shows participant responses about the accessibility, availability, barriers, ability to use, and their understanding of how to use PPE.

Table 1. Demographic Characteristics of Survey Respondents by Disability Status

	Total n (%)	Vison Loss	Hearing Loss	Mobility Loss	Concentration, Remembering, Making Decisions	Daily Cares	Running Errands	Immuno-compromised	More than 2 Disability Types
Age n (%)									
18-29 years	27 (37)	1 (100)	4 (66.6)	1 (14.3)	4 (36.4)	-	-	2 (33.3)	15 (35.7)
30-40 years	5 (6.8)	-	-	-	1 (9.1)	-	-	-	4 (9.5)
41-54 years	18 (25)	-	-	-	4 (36.4)	-	-	1 (16.7)	13 (31)
55-64 years	14 (19.1)	-	1 (16.7)	2 (28.6)	1 (9.1)	-	-	2 (33.3)	8 (19)
65 years and over	9 (12.2)	-	1 (16.7)	4 (57.1)	1 (9.1)	-	-	1 (16.7)	2 (4.8)
Total	73	1 (1.4)	6 (8.2)	7 (9.6)	11 (15.1)	-	-	6 (8.2)	42 (57.5)
Gender n (%)									
Male	15 (20.8)	-	1 (16.7)	2 (33.3)	1 (9.1)	-	-	-	11 (26.2)
Female	51 (70.8)	1 (100)	5 (83.3)	4 (66.7)	10 (90.9)			6 (100)	25 (59.5)
Transgender (female to male)	2 (2.8)	-	-	-	-	-	-	-	2 (4.8)
Gender non-conforming	3 (4.2)	-	-	-	-	-	-	-	3 (7.1)
Other	1 (1.4)	-	-	-	-	-	-	-	1 (2.4)
Total	72	1 (1.4)	6 (8.3)	6 (8.3)	11 (15.3)	-	-	6 (8.3)	42 (58.3)
Race n (%)									
White	63 (86.3)		3 (50)	5 (71.4)	11 (100)			6 (100)	38 (90.5)
Black or African American	3 (4.1)	1 (100)	1 (16.7)	1 (14.3)					1 (2.4)
Asian Indian	1 (1.4)								1 (2.4)
Other Asian	1 (1.4)		1 (16.7)						
Two or more races	5 (6.8)		1 (16.7)	1 (14.3)					2 (4.7)
Total	73	1 (1.4)	6 (8.2)	7 (9.6)	11 (15.1)	-	-	6 (8.2)	42 (57.5)

Respondents had the ability to select any and all disability categories that they identified with.

Table 2. Accessibility, Availability, Barriers, and Understanding of How to Use Personal Protective Equipment among Ohioans with Disabilities, 2024

		No challenges	Mild challenges	Moderate challenges	Severe challenges	Not Aware of Availability	Total
Obtaining COVID-19 PPE	n (%)	30 (42.9)	23 (32.9)	10 (14.3)	7 (10)	-	70
Understanding how to use COVID-19 PPE	n (%)	54 (79.4)	8 (11.8)	2 (2.9)	4 (5.9)	-	68
Ability to use COVID-19 PPE	n (%)	50 (73.5)	10 (14.7)	3 (4.4)	5 (7.4)	-	68
Barriers to obtaining adaptable[a] COVID-19 PPE	n (%)	34 (50)	11 (16.2)	2 (2.9)	9 (13.2)	12 (17.6)	68

Abbreviations: PPE, personal protective equipment.

[a]Adaptable personal protective equipment includes, but is not limited to, masks with a clear mouth window for lipreading, face shields as an alternative to masks for lipreading, latex free gloves, respirators, headbands for holding masks in place, and isolation gowns.

Responses indicate that most respondents had limited challenges related to using and understanding how to use PPE. Very few respondents indicated moderate or severe challenges related to these themes. The biggest challenges for respondents were related to ability to obtain PPE with 24.3% facing moderate to severe challenges in this area. While general PPE posed minimal challenges, adaptable PPE showed differing results: 50.0% reported no challenges, 17.6% were unaware of its availability, while 32.3% faced some level of challenge.

While 2% of respondents reported not understanding how to use PPE appropriately, proportionately more discussed difficulty in obtaining PPE (13.6%), as shown in Table 3. Some themes expressed included confusion about PPE especially about mask policies and best practices for self-protection. Additionally, 10% of respondents reported challenges related to using PPE and requiring assistance.

COVID-19 Testing and Vaccine Understanding

Table 4 provides results that indicate most respondents had limited challenges related to understanding the COVID-19 testing and vaccine processes. Few respondents indicated moderate or severe challenges with understanding the COVID-19 testing process (3%) and the COVID-19 vaccination process (3%), while several respondents indicated this was not necessary at 11.9% regarding testing and 7.6% regarding vaccinations. However, several participants chose not to disclose this information for each process at 4.5% for testing and 7.6% for vaccinations.

Table 3. Qualitative Results for Personal Protective Equipment (PPE) Accessibility, Availability, Barriers, Ability to Use, and Understanding How to Use PPE

Theme	Codes	Excerpts
Access versus usability	PPE access insufficient, PPE access versus usability, N95 understanding lacking, Physical exertion PPE use, PPE self-application challenges, Caregiver dependent PPE, Disability and PPE use, Limited PPE access, Clear mask scarcity, N95 access financial barrier, Transportation limits access, PPE availability issues, Respirator cost prohibitive	Someone gave me an N95 mask, but I could not figure out how to put it on me. After someone showed me how to put it on, I had great difficulty breathing. I have a great piece of PPE equipment I would like to continue to use, but it's physically taxing to put on and off...So I don't use it, even though it would help my lungs a lot more. Need caregiver's physical assistance to use any PPE. As I said previously, due to my disability I cannot put on personal protective equipment myself. Since I can't drive or safely use paratransit, the only place I could obtain masks was Amazon. I often had to use surgical (less effective) from doctors' offices because I couldn't afford more when I needed them. Respirators add up quickly financially. It can be difficult to find ones that fit, are comfortable, and not extremely expensive. I only really had access to masks. I sometimes had to re-wear the one-use masks since I did not have that many. Difficulty finding clear masks. Transportation limited my options for obtaining masks. I would have benefited more from N95 masks, but I was unable to locate a supplier and could not financially have afforded them.
Knowledge and ability gaps	N95 understanding lacking, Conflicting mask guidance, Early pandemic confusion, Conflicting mask information, Misinformation PPE use	Someone gave me an N95 mask, but I could not figure out how to put it on me. In the early hours and days of COVID myself as a nurse had to buy my own N95 mask...In my own personal experience we were told at first not to use any mask and I was willing to be terminated because I wore it...Then we were told that if we didn't wear it we would be terminated! There seemed to be conflicting instruction about masking...when it was needed, what type of mask was best, how masks should be worn, etc. Misinformation caused confusion and frustration on which kind of masks are safe to use.
Disability and accessibility	Disability PPE access, Caregiver dependent PPE, Blindness and PPE use, Sensory needs and PPE, Allergies limit PPE options, Material sensitivity masks, Disability and PPE use, Clear mask scarcity	Need caregiver's physical assistance to use any PPE. I had to not wear gloves because I'm blind. So, I needed to be able to feel things...So, I had to use wet wipes on my cane, hands, etc. Hand sanitizers triggered by environmental illness. I am allergic to material lot of face masks made out of so sometimes it harder to find bamboo masks or masks made out of materials were safe, so I had severe pain in my face had constant steroids to be out in public. As I said previously, due to my disability I cannot put on personal protective equipment myself. Difficulty finding clear masks.
Financial and resource barriers	Financial barriers PPE, Less effective PPE used, Respirator cost prohibitive, Limited PPE access, Mask reuse necessity, N95 access financial barrier	Since I can't drive or safely use paratransit the only place I could obtain masks was Amazon. I often had to use surgical (less effective) from doctors' offices because I couldn't afford more when I needed them. Respirators add up quickly financially. It can be difficult to find ones that fit, are comfortable, and not extremely expensive. I only really had access to masks. I sometimes had to re-wear the one-use masks since I did not have that many. Transportation limited my options for obtaining masks. I would have benefited more from N95 masks but I was unable to locate a supplier and could not financially have afforded them.
Social and practical constraints	Social stigma PPE use, Physical exertion PPE use, PPE access versus usability, Transportation limits access	I have a great piece of PPE equipment I would like to continue to use, but it's physically taxing to put on and off...But the way people treat you if you need PPE is so bad...So I don't use it, even though it would help my lungs a lot more. Since I can't drive or safely use paratransit the only place I could obtain masks was Amazon.

Abbreviation: PPE, personal protective equipment.

Respondents highlighted challenges regarding COVID-19 testing and vaccination processes (Table 5). Common themes included unclear and overwhelming information, accessibility barriers, limited access, and complex procedures. Challenges also arose from the need for manual dexterity in self-testing and transportation for drive-up options.

DISCUSSION

Personal Protective Equipment

There was a significant need for PPE among Ohioans with disabilities during the COVID-19 pandemic. Differences between being able to obtain PPE, understanding how to use PPE, and having the ability to use PPE showed substantial differences for respondents. In response to being asked if obtaining PPE presented challenges, 42.9% of respondents stated that this was not a challenge for them; however, 47.2% indicated that they faced mild to moderate challenges related to obtaining PPE. This finding supports that local governments such as public health departments, local organizations, and stores that offered PPE did well at maintaining these supplies throughout the pandemic but could have improved access to PPE supplies. Several respondents reported standard supply issues, including difficulties obtaining N95 masks and respirators due to transportation, financial barriers, or unavailability, which mirrors other literature.[6,7] Although only 24.3% faced moderate to severe challenges in acquiring PPE, more significant issues were noted early in the pandemic by respondents. Respondents reported access to PPE but emphasized the importance of understanding its use. Information on PPE from various sources—health departments, doctors, hospitals, social media, and news—strengthens this understanding.

Without proper knowledge of how to effectively use PPE, PPE is ineffective.[20,21] Notably, 79.4% of respondents encountered no challenges in understanding how to use PPE, indicating effective communication and education on the topic. Additionally, 73.5% faced no difficulties in using PPE during the COVID-19 pandemic, highlighting its accessibility for individuals with disabilities. Some respondents indicated confusion about masking guidelines, including when to wear masks, which types to use, and proper wearing techniques. Some individuals struggled to use specific PPE independently, requiring assistance to put on or remove masks. Additionally, certain types of PPE triggered illnesses or allergies, limiting their use.

While general PPE was not a significant issue, 32.3% of respondents encountered difficulties with adaptable PPE, suggesting a need for better access and education about its availability. Common statements among Ohioans related to communication barriers, such as difficulties in reading body language, lip and expression reading, muffled speech, and hearing in virtual settings, which further complicated adherence to COVID-19 regulations.[6,7] Individuals with hearing loss frequently reported difficulty finding clear-window masks for lipreading. They also struggled with the general supply and cost of these adaptable masks, feeling torn between understanding others or risking exposure to COVID-19 by removing masks, even in health care settings. Additionally, individuals with vision loss reported difficulty wearing gloves, which hindered braille reading and touch navigation. While PPE was generally available, its inaccessibility increased barriers for individuals with disabilities, such as increasing communication barriers and limiting their public awareness about COVID-19 and other issues and decreasing social access.

COVID-19 Vaccinations and Testing

Individuals with disabilities did not have significant challenges understanding the COVID-19 testing and COVID-19 vaccination process. While 68.7% of respondents reported no challenges with the testing process and 16.4% either did not need testing or chose not to respond, a small portion did face difficulties. Similarly, 72.7% reported no challenges with understanding the vaccination process. Although in this study there were not many challenges related to understanding, it is important to consider that providing accessible information about testing and vaccinations is essential to reduce stress and anxiety and should be considered best practice.[3] However, respondents reported challenges in understanding complex information, emphasizing the need for clear, concise communication in multiple formats which mirrors other research.[3] In the current study, respondents who reported challenges indicated confusion over vaccination schedules, types, and availability, highlighting issues of unclear and inaccessible information. Although Ontario's study incorporated accessible clinics for individuals with disabilities, addressing these challenges through dedicated accessible vaccine clinics could effectively meet the needs identified by respondents.[3]

Table 4. COVID-19 Testing Process and Vaccine Process Understanding among Ohioans with Disabilities, 2024

Understanding the COVID-19 testing process n (%)	46 (68.7)	8 (11.9)	1 (1.5)	1 (1.5)	8 (11.9)	3 (4.5)	67
Understanding the process of receiving a COVID-19 vaccine n (%)	48 (72.7)	6 (9.1)	2 (3)	-	5 (7.6)	5 (7.6)	66

Table 5. Qualitative Results for COVID-19 Testing Process and Vaccine Process Understanding

Theme	Codes	Excerpts
Complex testing procedures	Rapid tests difficult, not user-friendly, difficulty understanding information, uncomfortable procedures	Well, information wasn't simple to understand lot of people wouldn't let do it yourself had put your hands on person sucks I don't want to be touched.
		None of it was intuitive. The rapid tests are the most difficult. They require manual dexterity, maintenance in memory, and flexibility in instructions between tests that PCRs in the drive-through didn't have.
		But I don't like rapids; I prefer PCRs. Now they aren't easy to get any more and we have a lot of rapids stacked up in a corner well-meaning people sent to us that are just expiring.
Accessibility barriers to testing	Accessibility issues, transportation barriers, unethical advice, accessing testing difficult	My son who is blind had issues at first with using the test.
		Drive-up testing built on expectation everyone has access to a ride. If I got sick I was told to take an Uber, potentially exposing someone else. Unethical ass advice. Had to wheel miles in the freezing cold to get tested. Nerve damage.
Confusing vaccine information	Booster information confusing, CDC unhelpful	It's hard to understand the vaccine booster and dosage dates honestly. I never really know when I should get one or which kind and the CDC website is literally no help when it comes to that.
Limited vaccine access	Vaccine access limited	I was in school so they offered it at my college.
Information overload/difficulty	Difficulty understanding information	Well information wasn't simple to understand lot of people wouldn't let do it yourself had put your hands on person sucks I don't want to be touched.

Abbreviation: CDC, Centers for Disease Control and Prevention; PCRs, polymerase chain reaction tests.

Limitations

This study's interpretation of the data should consider its limitations. As a cross-sectional design, it cannot establish causal relationships. It is susceptible to biases such as response, recall, and self-selection bias. The convenience sample was not randomized, and the survey, primarily distributed online and through select channels, may not represent all Ohioans with disabilities. The results may not be generalizable due to its distribution methods, the nature of online surveys, and the limited sample size. Respondents might have skewed opinions regarding COVID-19 policies that do not reflect the broader population. Additionally, the survey's self-identification questions may lead to recall and self-selection biases. Responses to the survey were allowed for individuals with disabilities and their support people; therefore, there may be instances of support people who are filling out the survey on behalf of an individual with a disability. This could limit the results of the study. Additionally, participants were able to select multiple disabilities, making precision difficult; however, there is no homogeneity across disability statuses. Although precision is limited in this study, the measure provides a beneficial means of quantifying the overall effect. The qualitative analysis, conducted using Google Gemini, raises concerns as AI can misinterpret data, potentially leading to inaccurate results.[22] A thorough review was conducted by the primary investigator to ensure the themes identified matched respondent consensus.

PUBLIC HEALTH IMPLICATIONS

The survey results highlight critical public health implications for future emergency planning and response, emphasizing the issues of limited access of PPE and use of appropriate PPE as well as the complexity and lack of accessibility of COVID-19 testing and vaccines. These factors pose significant challenges during emergencies, such as pandemics, especially as social media and politicized news can influence public behavior. The notable challenges for individuals with disabilities can be addressed through improved preparedness by professionals and public health professionals responding to emergencies in Ohio. Addressing misinformation is essential to mitigate fear and ensure compliance, while also focusing on those most vulnerable to false information.[23] Moreover, accessible information for individuals with disabilities is vital. Existing policies, like the Americans with Disabilities Act (ADA), mandate that emergency communication services are equally accessible. To improve communication, agencies should implement readable captions, unobstructed interpreters, and various formats that ensure equal access.[24] Additionally, if utilizing web content to disseminate messages, consulting the Web Content Accessibility Guidelines in message development is paramount.[25] To assist with developing messages for

emergency communication, templates should be developed and evaluated with appropriate audiences.[26] Additionally, the CDC has resources available about COVID-19 for individuals with disabilities that might be able to be adapted if another pandemic occurs.[27]

While PPE was available for individuals with disabilities, adaptable options were limited. Ensuring access to adaptable PPE is crucial for inclusivity. Further research to determine the most appropriate and effective types of PPE for individuals with disabilities could be paramount in addressing these barriers. Additionally, development of PPE and/or PPE use strategies that require limited assistance from caregivers needs to be investigated.

With the increasing population of individuals with disabilities, educating health professionals and the public about disability-related challenges is vital.[28] Training on disability, accommodations, resources, and ADA policies can enhance understanding and improve services, such as providing masks with clear windows for better communication for the deaf or hard of hearing. The COVID-19 pandemic exposed significant access gaps for individuals with disabilities, underscoring the need to address these barriers proactively to enhance access during emergencies. Partnering with disability community members is crucial, as their insights are invaluable for effective planning. The principle "Nothing about us, without us" serves as a critical reminder for public health professionals in emergency preparedness.[28]

AUTHOR CONTRIBUTION

Marissa Bergman led the study conceptualization, data collection, data analysis, and manuscript drafting. Amanda Hinson-Enslin and Nicole Kinzeler contributed to study design, interpretation of findings, critical manuscript revisions, and approval of the final version. All authors approved the manuscript prior to submission.

DISCLOSURE STATEMENT

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