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EDITORIAL

Aging in Ohio: Trends and Preparation

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There are multiple public health challenges faced by Ohioans although many impact some subgroups more than others. In this editorial, I want to consider an issue that is highly likely to impact many Ohioans in a variety of ways, perhaps at different points in their lives.

I am referring to challenges associated with aging—our own and the aging of people around us. Although much has been written about the aging US population, I offer a few projected trends to provide a basic view. First, one in five individuals in the United States will be of retirement age in 2030. Additionally, by 2034—roughly a decade from now—the number of older individuals is expected to be larger than the proportion of children in the United States for the first time ever in the history of the nation.[1] Along with this, chronic conditions associated with age are projected to increase at a concerning rate. Authors of a study where trends from the last 20 years were used to estimate future health outcomes projected a 99.5% increase in the number of individuals aged 50 and older with one chronic condition in the United States between 2020 and 2050, and an increase of 91% of individuals with more than one chronic condition during the same period.[2]

Myriad concerns and costs arise from age-associated declines that impact physical, cognitive, emotional, social, and spiritual aspects of health. Regardless of your own age or health status, where you may find yourself caught up in these issues is in caring for aging family members including parents, grandparents, siblings, partners, or others. Any change in circumstances, such as illness or injury, financial challenges, or loss of a life partner, might severely disrupt what was a comfortable or at least routine lifestyle. I have been impacted regularly by issues associated with the aging of family members for roughly the past 15 years. Based on casual conversations, I often hear others' stories about the need to focus time, energy, and sometimes their personal financial resources to provide, assist with, or coordinate care for an aging relative. Some people are simultaneously dealing with care for their parents and their children.

Some of the specific support tasks for aging family members include identifying and making arrangements for relocation to a smaller residence, senior community, or assisted living facility; helping individuals sort and redirect years of accumulated possessions to allow settling in a smaller space; setting up and transporting individuals to appointments; picking up prescriptions; assisting with self-care; and, in some instances, moving in with a family member or moving a family member into one's own family home. These tasks, based on my own experiences, can be physically and emotionally draining for both the aging individual and the caregivers.

Things are further complicated when aging friends, partners, or other relatives are exhibiting signs of cognitive decline. Medical advances including bypass surgeries, stroke recovery protocols, cancer treatments, and others often extend lifespan and functional abilities. However, declining mental health and cognitive functioning remain profound challenges to quality of life and independent living, despite promising diagnostic and treatment alternatives for some dementias. Additionally, when chronic pain is a consequence of one or more health conditions, quality of life and mental health may be greatly diminished regardless of functional ability in physical and cognitive terms.

Many things impact the ability of Ohioans to retain good health into older age. These include individual factors which may or may not be within an individual's ability to control. While genetics is a typical example of a factor beyond an individual's control, any given person's ability to manage other influential factors, such as stress, sleep hygiene, access to a high-quality diet, or physical activity resources, is highly variable and may be a matter of choices made over time, external factors, luck—good or bad, or a combination of these.

Availability of public or private insurance to finance solutions is often limited and dependent on formal and stable diagnoses. Financially viable facilities or resources are not necessarily sensitive to the unique needs of individuals based on preferences, including spiritual and cultural beliefs. Not all aging individuals are well prepared financially for loss of income, and even those who followed recommendations for retirement savings may find healthcare and support needs exhaust their savings at a far greater rate than experiencing average to good health in retirement.

For some who are financially able, senior communities which offer levels of residence options, ranging from fully independent living to fully supported living, may offer a viable alternative. There are also instances of older adults or multigenerational groups developing their own communal living arrangements.[3,4] Disadvantages of the latter include that planning to develop or reside in one needs to begin early—well before the emergence of need. I also suspect these communal arrangements, like independent living, only work well for people until a greater level of care than typically provided by neighbor support, is needed. Multigenerational households, which I have myself participated in, might offer a mutually beneficial alternative. However, this alternative does not work for everyone, and might be only a temporary solution for others, depending on the makeup of the extended family and the ability and availability of younger or fitter family members to provide essential care.

My concern is that neither Ohio, nor the United States overall, are adequately prepared to manage the extensive care needs required by the middle of this century, should projected trends be accurate. An in-depth analysis of relevant policies is beyond the scope of this editorial, but I want to offer 3 recommendations that might be considered by any OJPH readers, regarding their own context or those of others.

First, regardless of your age and health status, I suggest you familiarize yourself with viable aging care options, including private pay alternatives for assisted living and memory care and investigate costs for services. Retirement savings recommendations may be driven by a target based on proportion of annual earnings at retirement,[5] with the assumption that you will need slightly less income due to not having work related expenses. However, a recommendation that you be able to provide 85% of your working income in retirement may not be nearly enough to secure a space in an attractive facility, even when supplemented by government benefits. Data from the US Federal Reserve[6] suggests an average of 25% of Americans have no retirement savings, and only about 40% believe their savings are adequate. You may want to change your retirement savings strategy or purchase a specific long-term care insurance policy. Although many individuals work hard to remain healthy and fit, there is also a chance many will experience physical and/or cognitive decline. I recommend you strive to be an active agent in your aging planning, and plan for the possibility you or a life partner may at some point require professional care on a regular basis. At the very least I suggest you discuss preferences with those who will be most likely to assist should your health decline including partners, children, or friends.

Second, assuming you prefer to live independently as long as possible, I recommend you take a critical look at the community where you intend to reside after formal retirement, whether in Ohio or elsewhere, and assess its suitability for you as you continue to age. Many in cooler climates, like Ohio, dream of moving south as they age, in part to minimize weather-related challenges. The tradeoff may be increased demand for and delays receiving aging-associated services; this is something you would want to be aware of before deciding to settle somewhere else. If you want to be around similarly aged peers, are there programs or services made available for older adults? Are facilities accessible? One thing that has often remained since the COVID-19 pandemic is availability of home and parking lot delivery options for products including food or groceries—do you have these options near you? If so, you may want to be aware of costs and restrictions such as minimum purchase requirements. If you think your community could improve resources for older adults, I suggest you engage in communications or ad-

vocacy with the appropriate local government offices or the local health department. If you live in a rural area, I recommend you consider the viability of aspects of this—including dependence on retaining the ability to drive, relative distance to services, etc— and factor this into your retirement planning.

Third, I have a specific recommendation for those whose parents, grandparents, or other friends or family members may be approaching the point in their lives when they are beginning to experience challenges in independent living, especially those who have lived in the same home for many years. Based on my experiences and anecdotal evidence from others, the burden of possessions and the anticipated challenge of condensing the household can be so stressful that it deters decision-making or action. I suggest instead of giving nonessential holiday or birthday gifts, the best present you may be able to offer is your willingness to help an aging individual sort through and clean out things. If this can be done over time—one room a year seems like an ideal standard—it can be reasonably enjoyable and not nearly as physically or emotionally stressful as when clean out must be done quickly. I've found in a couple of instances that older relatives who initially resisted discarding things (whether giving to charity or giving to family members) quickly found the process of cleaning out refreshing and took to it with enthusiasm. I do not think this challenge is unusual—the volume of possessions that can be fit in an average–sized home, especially one with a basement—is amazing. This is just one more thing that complicates a sudden need to respond to a health or other life crisis, and I think everyone benefits if things are cleaned out before there is an urgent need to do so.

There is often social benefit derived from the lives of the oldest old, when these are happy individuals who are self-determined in their choices, are able to engage in positive leisure and occupational pursuits, and can, sometimes with minimal adaptations, carry out daily activities. But even those who experience some challenges in physical, cognitive, mental, or other aspects of health can continue to experience enjoyment and make positive contributions to the lives of others. I encourage all Ohioans to consider not only how aging might impact them on a personal or family level but also to be aware of and advocate for policies that ensure all Ohioans can experience high quality experiences as they age. Also, for those who are interested, I suggest you review The Ohio Department of Aging "State Plan on Aging, 2023-2026"[7] to become aware of current priorities.

REFERENCES

1. Vespa J, Armstrong DM, Median L. Demographic turning points in the United States: population projections for 2020 to 2060. US Census Bureau. Accessed March 1, 2024. https://www.census.gov/content/dam/Census/library/publications/2020/demo/p25-1144.pdf
2. Ansah JP, Chiu C-T. Projecting the chronic disease burden among the adult population in the United States using a multi-state population model. *Front Public Health*. 2022; 10:1082183. https://doi.org/10.3389/fpubh.2022.1082183
3. Chaudhuri A. (2024). 'We just held hands and jumped!' How one of Britain's happiest, healthiest communes was built. *The Guardian*. January 30, 2024. Accessed March 12, 2024. https://www.theguardian.com/lifeandstyle/2024/jan/30/we-just-held-hands-and-jumped-how-one-of-britains-happiest-healthiest-communes-was-built
4. Chaudhuri A. "We have brothers, sons, lovers–but they can't live here!' The happy home shared by 26 women. *The Guardian*. August 24, 2023. Accessed March 1, 2024. https://www.theguardian.com/lifeandstyle/2023/aug/24/we-have-brothers-sons-lovers-but-they-cant-live-here-the-happy-home-shared-by-26-women
5. Curry B. Retirement savings calculator: how much money will you have for retirement? *Forbes Advisor*. June 29, 2023. Accessed March 5, 2024. https://www.forbes.com/advisor/retirement/retirement-calculator/
6. Board of Governors of the US Federal Reserve System (2023). Economic well-being of US households. *Retirement and investments*. Accessed March 12, 2024. https://www.federalreserve.gov/publications/2022-economic-well-being-of-us-households-in-2021-retirement.htm
7. Ohio Department of Aging. *State plan on aging, 2023-2026*. https://aging.ohio.gov/about-us/reports-and-data/ohios-state-plan

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RESEARCH BRIEF

A Survey of Behaviors, Beliefs, and Perceptions of COVID-19 in Rural Appalachian Ohio

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ABSTRACT

Background: Preventing the spread of COVID-19 comes with many challenges. Considering the sociobehavioral effects of social distancing in rural communities specifically is incredibly important. No previous studies have been published about adherence to COVID-19 preventative measures and viewpoints on vaccination/other prevention measures in the rural Appalachian region of Ohio specifically. This present study will describe the results of a survey regarding perceptions of COVID-19 in rural communities.

Methods: A 20-question cross-sectional survey was administered over a 6-week period from February to April 2021. Survey distribution was completed via flyers with QR codes hung at 4 medical offices in Columbiana and Tuscarawas counties. The survey was adapted from the standardized FluTEST survey. Descriptive statistics and bivariate analyses were used for comparison.

Results: We had 23 respondents after removing incomplete/nonconsenting responses. Our data showed that contracting COVID-19 was associated with vaccine distrust. Females and those with health risk factors were found to be more cautious when compared to males and those without risk factors, respectively. Respondents under age 65 years were more likely to trust government health agencies. Those with emotional distress were more likely to take precautions in relation to the COVID-19 pandemic.

Conclusion: To prevent widening health inequalities in the particularly vulnerable population of Appalachia, further study with larger sample size should be conducted. This information can be used by health care providers to tailor patient education regarding COVID-19 vaccine administration, treatment, and prevention measures.

Keywords: COVID-19; Survey; FluTEST; Appalachia; Vaccine

INTRODUCTION

SARS-CoV-2, or as it is most known, COVID-19, presents itself on a wide spectrum from patients being asymptomatic to having pneumonia, acute respiratory distress syndrome, and more.[1] These life-threatening complications necessitate an aggressive containment strategy. Community-wide containment and an emphasis on social distancing are proven to reduce asymptomatic and presymptomatic spread.[2] However, compliance with social distancing comes with challenges including cooperation, alteration to individuals' routine, mental health and/or financial burden, and passive monitoring.[3]

These sociobehavioral effects of social distancing in rural communities specifically are important to consider. Generally speaking, rural communities face unique barriers to health care compared to that of metropolitan areas. For example, rural communities may have inadequate access to health care due to physician shortages, increased travel distance to hospitals, and decreased access to public transportation.[4] Physician shortages are also seen due to limited subspecialist availability.[4]

This brief report will describe the results of a survey (Appendix) regarding perceptions of COVID-19 in rural communities. To date, no previous studies have been published about adherence to

COVID-19 preventative measures and viewpoints on vaccination/other COVID-19 prevention measures in the rural Appalachian region of Ohio specifically.

METHODS

Setting and Design

A 20-question cross-sectional survey employing Likert-scale style questions regarding preventative measures taken against COVID-19 adapted from the Flu TElephone Survey Template (FluTEST) was created.[5] This was administered over a 6-week period from February to April 2021. The survey was distributed to patients of 4 medical offices located in the rural Appalachian Ohio counties of Columbiana and Tuscarawas.

Participant Recruitment Process

Physician offices were recruited via emails sent to physicians on a preceptor list provided by the Northeast Ohio Medical University Rural Medicine Education Program. A flyer with a QR code was hung in each office waiting room. The QR code linked to an online survey, which each participant was able to complete on their personal electronic device.

Procedures

Only adults with capacity to take the survey were included in the survey and this was screened for with an introductory question along with a certification of informed consent. Following initial flyer placement, reminder emails were sent to participating offices every 3 weeks (twice in the 6-week period overall) to verify ongoing placement. After the 6-week period was completed, the survey flyers were removed from each location and the survey was closed.

Measures/Outcomes

Anonymous respondent demographics including residing county, age, gender identity, level of education, ethnicity, race, chosen risk factors, and COVID-19 infection status were gathered in the survey. Health risk factors were defined as having a history of diabetes, heart disease, cancer, COPD, asthma, rheumatoid arthritis, tobacco use, or alcohol abuse. In addition, the Likert-scale style questions were adapted from the FluTEST template. Scoring in the Likert scale consisted of answers ranging from definitely, probably, and neither nor, followed by a conditional term and its opposite (ie, true and false or agree and disagree).

Statistical Analysis

Descriptive statistics including frequencies and means were conducted. Bivariate analyses between variables of interest and demographic factors were examined with chi-square tests. Analyses were performed using Stata MP 13 software.[6]

Institutional Review Board

This study was approved by the Northeast Ohio Medical University institutional review board (#20-019).

RESULTS

Demographics

Twenty-three respondents were included in the analysis after removing incomplete responses and nonconsenting responses (16 respondents). Incomplete responses were defined as those that did not respond to all 20 of the questions that were provided in the survey. Respondents were majority female (74%), under age 65 years (83%), college educated (74%), without health risk factors (61%), and without prior COVID-19 infection (83%) (Table 1).

Perception on Vaccines

Those who had not contracted COVID-19 previously were significantly ($p < 0.05$) more likely to get vaccinated (76% vs 33%) and believe the vaccine was safe (84% vs 0%) when compared to those who had contracted the illness.

Table 1. Demographics of Survey Respondents

Demographic		(n=23)
Sex		
	Male	6 (26%)
	Female	17 (74%)
Age		
	<65 years	19 (83%)
	≥65 years	4 (17%)
Education		
	Up to high school education	6 (26%)
	Post-high school education	17 (74%)
Health risk factors		
	No health risk factors	14 (61%)
	1 or more health risk factors	9 (39%)
Prior COVID-19 infection		
	Yes	4 (17%)
	No	19 (83%)

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Perceptions by Sex

Compared to males, female respondents were significantly ($p < 0.05$) more likely to keep away from crowded places (87.5% vs 33%), strongly agree that "catching COVID-19 would cause difficulties for the people important to [them]" (50% vs 0%), and strongly believe everyone should thoroughly and regularly wash their hands when compared to males (87.5% vs 40%) (Figure 1).

Perceptions of Those with Health Risk Factors

Compared to those without health risk factors, those with risk factors were significantly ($p < 0.05$) more likely to strongly agree "people who are important to you think you should thoroughly and regularly wash your hands" (75% vs 8.3%). These individuals were also significantly ($p < 0.05$) less likely to report feeling in control of contracting the virus compared to those with no risk factors (50% vs 14%).

Trust in Public Agencies

Those who were under the age of 65 years were significantly ($p < 0.05$) more likely to trust government health agencies to provide accurate information compared to those who were age 65 years and over (76% vs 50%).

Mental Health

When thinking about the pandemic in the past month 81.8%, 76.2%, 81.8%, and 100% of respondents reported feeling tense, upset, worried, or annoyed, respectively. Feeling worried or tense was significantly ($p < 0.05$) associated with not having enough prescription medication at home to last 7 days.

Respondents that reported feeling tense, upset, or worried were significantly ($p < 0.05$) more likely to cancel or postpone a social event than those who did not report these feelings. The majority of tense/worried respondents reported canceling/postponing events (55.6%, 55.6%, and 62.5%, respectively) compared to 0% of those who did not report these feelings.

Respondents that reported feeling tense, upset, or worried were significantly ($p < 0.05$) more likely to keep away from crowded places, with 88.9% of tense/worried respondents reporting this behavior compared to 0% of those who did not report these feelings.

Respondents that reported feeling tense, upset, or worried, were significantly ($p < 0.05$) more likely to believe in thoroughly and regularly washing hands, with 88.2% of tense/worried respondents reporting this behavior compared to 0% of respondents without these feelings.

Respondents that reported feeling tense, upset, or worried were significantly ($p < 0.05$) more likely to use hand sanitizer more often than before the COVID-19 pandemic, with 94.4% of tense/worried respondents reporting this behavior compared to 50% of respondents without these feelings.

DISCUSSION

Our survey is the first to investigate perceptions of COVID-19 in a rural Appalachian Ohio community. Despite low sample size, we uncovered important information to be examined in future research.

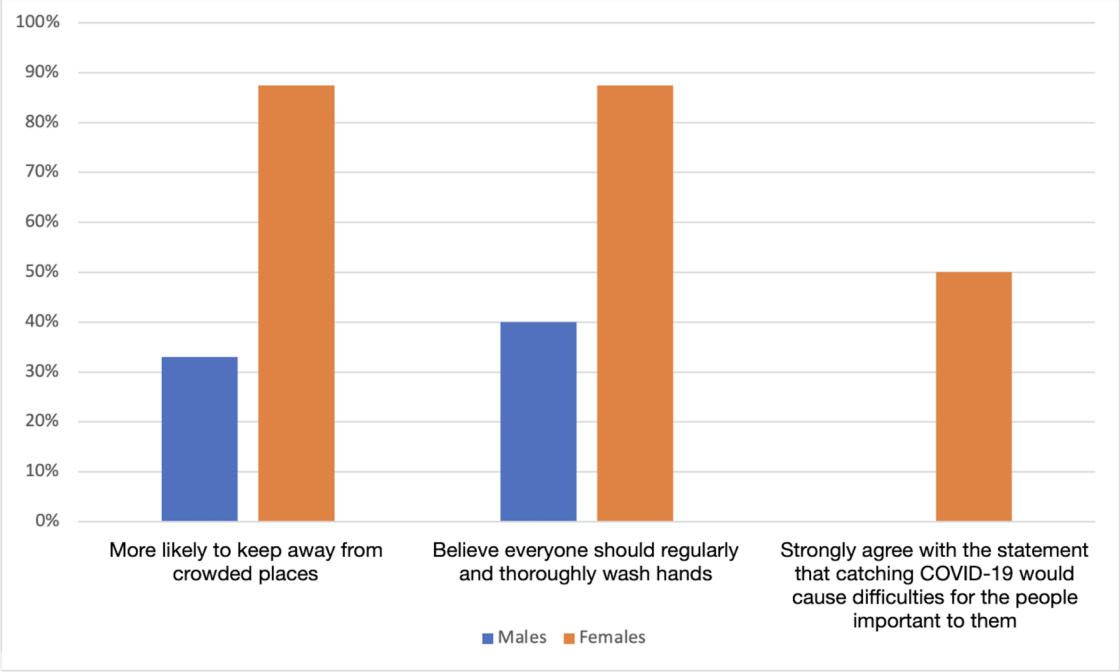

Figure 1. Differences in Beliefs by Sex

Our study found respondents who already contracted COVID-19 were significantly ($p < 0.05$) less likely to get vaccinated (76% vs 33%) or believe the vaccine was safe (0% vs 84%). This finding suggests those who contracted and survived COVID-19 doubt the need for the vaccine, but further study is necessary to understand if this relationship still exists now that the vaccine is more widely available.

We found that women were significantly more likely than men to take precautionary measures (hand washing and keeping away from crowded places). This could be explained by our finding that women were significantly more likely to believe contracting COVID-19 would cause difficulties to people important to them. This may suggest women are more empathetic than men to the needs of their family and therefore might take the pandemic more seriously. This has been supported in previous studies that find women more empathetic than men as a result of contextual factors and traditional gender roles, but further study regarding differences in COVID-19 related practices between sex is necessary.[7,8]

Our study also identified feeling stressed or tense was significantly associated with not having enough prescription medications at home to last 7 days. Further, those with health risk factors were significantly more likely than their counterparts to feel people close to them should wash their hands and that they were not in control of contracting the virus. This suggests rural residents, particularly those with health risk factors, are mindful about their unique challenges regarding COVID-19. Given limited access to health care in rural communities this caution and desire to plan is encouraging.[9]

We further discovered that patients under the age of 65 years were significantly more likely to trust government health agencies when compared to older respondents. This age-related distrust has been reported previously and may be due to older individuals having more health care contact and potentially more negative experiences from now outdated government medical advice.[10]

Social isolation has been associated with poor outcomes in terms of mental and physical health.[11] Our study revealed individuals who voluntarily engage in precautionary social isolation practices, like canceling an event or keeping away from crowded places, may experience emotional distress. In an isolated and already vulnerable rural community this may exacerbate underlying mental health problems.

Our study is not without multiple limitations. The main limitation is the small sample size and convenience sampling which reduces generalizability and therefore limits generalizability. The small sample size is likely due to the low number of doctors' offices (4) that agreed to distribute our survey. Additionally, the administration of the survey was primarily digital, potentially alienating respondents without a phone or those with limited technical comfort/experience. Future study will be conducted using updated distribution methods to replicate and expand upon our findings.

PUBLIC HEALTH IMPLICATIONS

Little has been published on the perceptions of COVID-19 in Appalachian Ohio. This present survey identifies key differences in this population's perceptions when stratified by sex, age, presence of health risk factors, previous COVID-19 infection status, and mental health status. Namely, women, those with health risk factors, and those with emotional distress related to the pandemic were found to be more cautious than their counterparts.

The importance of this investigation lies in the predominance of rural communities within Ohio. Out of 88 total counties in Ohio, 65 counties have over 90% of their area classified as rural.[12] The Rural Health Information Hub estimates that around 2.3 million citizens live in rural Ohio, a region characterized by lower physician to patient ratios compared to more metropolitan areas.[13,14] Given that all our responses were recorded electronically, there is a high level of suspicion that we were unable to evaluate the perspective of Amish populations who are heavily concentrated in rural areas. Due to the lack of technology and media consumption in this population, we believe that their perceptions of the pandemic may differ from other Ohioans. This study has elucidated the importance of physicians acting as liaisons between governmental agencies such as the CDC and the patients whom they serve. Since our results suggest that elderly rural Ohioans continue to maintain a distrust in the government's pandemic protocols, further studies must delve deeper into the physician patient relationship to determine potential methods of reassuring patients of their safety. The resulting information can be used by health care providers to tailor patient education regarding COVID-19.

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REFERENCES

1. Guo YR, Cao QD, Hong ZS, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status. *Mil Med Res*. 2020;7(1):11. https://doi.org/10.1186/s40779-020-00240-0
2. Milne GJ, Xie S. The effectiveness of social distancing in mitigating COVID-19 spread: a modelling analysis. *MedRxiv* Preprint. Published online March 23, 2020. https://doi.org/10.1101/2020.03.20.20040055
3. SARS | Guidance | Interventions for Community Containment | Centers for Disease Control and Prevention. Published May 3, 2005. Accessed June 15, 2020. https://www.cdc.gov/sars/guidance/d-quarantine/app1.html
4. Kedar E, Scott R, Soule DM, et al. COVID-19 in a rural health system in New York – case series and an approach to management. *Rural and*

Remote Health. 2021;21:6464.
https://doi.org/10.22605/RRH6464

5. Rubin GJ, Bakhshi S, Amlôt R, Fear N, Potts HW, Michie S. The design of a survey questionnaire to measure perceptions and behaviour during an influenza pandemic: the Flu TElephone Survey Template (FluTEST). NIHR Journals Library; 2014. Accessed January 26, 2022. http://www.ncbi.nlm.nih.gov/books/NBK263566/
6. *Stata Statistical Software*. Version MP13.0. StataCorp; 2013.
7. Löffler CS, Greitemeyer T. Are women the more empathetic gender? The effects of gender role expectations. *Curr Psychol*. Published online February 2, 2021. https://doi.org/10.1007/s12144-020-01260-8
8. Mestre MV, Samper P, Frías MD, Tur AM. Are women more empathetic than men? A longitudinal study in adolescence. *Spanish J of Psychol*. 2009;12(1):76-83. https://doi.org/10.1017/s1138741600001499
9. Carlson EB, Gouge C. Rural health and contextualizing data. *J Bus Tech Commun*. 2021;35(1):41-49. https://doi.org/10.1177/1050651920958502
10. Armstrong K, Rose A, Peters N, Long JA, McMurphy S, Shea JA. Distrust of the health care system and self-reported health in the United States. *J Gen Intern Med*. 2006;21(4):292-297. https://doi.org/10.1111/j.1525-1497.2006.00396.x
11. Kelly D, Steiner A, Mazzei M, Baker R. Filling a void? The role of social enterprise in addressing social isolation and loneliness in rural communities. *J Rural Stud*. 2019;70:225-236. https://doi.org/10.1016/j.jrurstud.2019.01.024
12. Smith Z. The 20 most rural counties in Ohio [Internet]. Cleveland.com. The Plain Dealer; 2022 [cited 2023 Feb 15]. https://www.cleveland.com/data/2022/04/the-20-most-rural-counties-in-ohio.html#:~:text=CLEVELAND%2C%20Ohio%20%2D%20Landwise%2C%20Ohio,most%20rural%20in%20the%20state%3F
13. Rural Health Information Hub. Social determinants of health for rural Ohio [Internet]. Rural Health Information Hub; 2022 [cited 2023 Feb 15]. https://www.ruralhealthinfo.org/states/ohio
14. Chan M. The nurse is in: a solution for healthcare in rural Ohio [Internet]. AARP Ohio. AARP; 2021 [cited 2023 Feb15]. https://states.aarp.org/ohio/the-nurse-is-in-a-solution-for-healthcare-in-rural-ohio

APPENDIX COVID-19 Rural Survey

Q1 Which Ohio county do you currently reside in?
(*Selections were provided for each of Ohio's 88 counties*)

Q2 How old are you?
- ◊ 18-24 years
- ◊ 25-34 years
- ◊ 35-44 years
- ◊ 45-54 years
- ◊ 55-64 years
- ◊ 65 years or above

Q3 What is your gender identity?
- ◊ Male
- ◊ Female
- ◊ Transgender Male/Female-to-Male
- ◊ Transgender Female/Male-to-Female
- ◊ Other
- ◊ Choose not to say

Q4 What is the highest degree or level of education that you have completed?
- ◊ Less than a high school diploma
- ◊ High school diploma or GED
- ◊ Some college but no degree
- ◊ Associates degree (AA or AS)
- ◊ Bachelor's degree (BA, BS, or BBA)
- ◊ Master's degree (MA, MS, MEng)
- ◊ Professional degree (MD, DDS, JD)
- ◊ Doctorate degree (PhD, EdD)

Q5 What is your ethnicity?
- ◊ Hispanic or Latino
- ◊ NOT Hispanic or Latino
- ◊ Choose not to say

Q6 What is your race? Select all that apply.
- ◊ American Indian/Alaska Native
- ◊ Asian
- ◊ Native Hawaiian
- ◊ Other Pacific Islander
- ◊ Black or African American
- ◊ White
- ◊ Choose not to say

Q7 Do you have any health risk factors? Please click all that apply.
- ◊ Diabetes
- ◊ Heart disease
- ◊ Cancer
- ◊ COPD
- ◊ Asthma
- ◊ Rheumatoid arthritis
- ◊ Tobacco use
- ◊ Alcohol abuse
- ◊ Other

Q8 As far as you know, have you had COVID-19 since February 2020?
- ◊ Definitely yes. I was tested positive.
- ◊ Probably yes. I was not tested.
- ◊ Not sure
- ◊ Probably no
- ◊ Definitely no. I was tested negative.

Q9 Please indicate how much you agree with the statements below.

	Disagree	Neither Disagree or Agree	Agree	Not Sure
The health effects of COVID-19 are usually more severe for people who are 65 years old or more.	O	O	O	O
The health effects of COVID-19 are usually more severe for people who already have a serious medical condition.	O	O	O	O

Q10 Because of COVID-19, in the past month how much have you…

	Significantly Reduced	Moderately Reduced	Did Not Reduce	Moderately Increased	Significantly Increased	Not Sure
Reduced or increased the amount you go to school, college, university or work	O	O	O	O	O	O
Reduced or increased use public transport	O	O	O	O	O	O
Reduced or increased the amount you go into shops such as malls and grocery stores	O	O	O	O	O	O
Reduced or increased the amount of hand washing	O	O	O	O	O	O

Q11 Because of COVID-19, in the past month have you…

	Yes	No	Not Sure
Canceled or postponed a social event such as meeting friends, eating out or going to a sports event	O	O	O
Kept away from crowded places generally	O	O	O
Cleaned or disinfected things you might touch (such as door knobs or hard surfaces), more often than usual	O	O	O
Used sanitizing hand gel to clean your hands, more often than usual	O	O	O
Tried to avoid people who have COVID-19	O	O	O
Usually used gloves when out and about	O	O	O
Usually used mask when out and about	O	O	O

Q12 For each of the following statement, please indicate whether you think they are: definitely true, probably true, neither true nor false, probably false, or definitely false or if you're not sure.

	Definitely True	Probably True	Neither True nor False	Probably False	Definitely False	Not Sure
Should reduce the number of people you meet	O	O	O	O	O	O
Should thoroughly and regularly wash your hands	O	O	O	O	O	O
Should clean or disinfect things that you might touch (such as door knobs or hard surfaces).	O	O	O	O	O	O

Q13 The next questions refer to people who are important to you, such as your family and/or friends. For each of the following statements please indicate whether you think they are: definitely true, probably true, neither true not false, probably false, or definitely false or if you're not sure.

	Definitely True	Probably True	Neither True nor False	Probably False	Definitely False	Not sure
People who are important to you think you should reduce the number of people you meet	O	O	O	O	O	O
People who are important to you think you should thoroughly and regularly wash your hands	O	O	O	O	O	O
People who are important to you think you should clean or disinfect things that you might touch (such as door knobs or hard surfaces).	O	O	O	O	O	O

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Q14 For each of the following statements, please indicate how true you believe these statements to be.

	Definitely True	Probably True	Neither True nor False	Probably False	Definitely False	Not sure
If I don't take any preventative action, then I am likely to catch COVID-19 in the next 6 months	O	O	O	O	O	O
I have little control over whether I will catch COVID-19	O	O	O	O	O	O
COVID-19 would be a serious illness for me	O	O	O	O	O	O
COVID-19 would be a mild illness for me	O	O	O	O	O	O
If I catch COVID-19, it will cause difficulties for people who are important to me	O	O	O	O	O	O

Q15 The next set of questions is regarding preparatory measures in the event of another potential quarantine. Please answer yes, no, or not sure for each one.

	Yes	No	Not sure	Not Applicable
You currently have enough food at home to last 14 days.	O	O	O	O
You have tried to purposely catch COVID-19 to "get it over and done with"	O	O	O	O
You have discussed with a friend or family member what you could do if one of you caught COVID-19	O	O	O	O
You currently have enough prescription medication at home to last 7 days	O	O	O	O

Q16 Please indicate your answer to the question below.

	Definitely yes	Probably yes	Might or might not	Probably not	Definitely not
Do you intend to take a COVID-19 vaccine when it comes out?	O	O	O	O	O

Q17 Select where you have received most of your information about COVID-19 in the last month.

- ◊ People I speak to day to day (ie, family, friends, colleagues)
- ◊ Health care professionals (ie, my doctor, GP, pharmacist, chemist, other health care professionals)
- ◊ Official helplines (ie, CDCINFO, etc)
- ◊ Official websites (ie https://www.cdc.gov, etc)
- ◊ Official departments and agencies (ie, local hospital, Department of Health, World Health Organization, etc)
- ◊ Search Engines (Google, Yahoo, Bing)
- ◊ Social Media (Facebook, Twitter, Instagram)
- ◊ News Websites (ie, Fox News, CNN, ABC, NBC, CBS)
- ◊ Newspapers
- ◊ Television News
- ◊ Radio News
- ◊ Other

Q18 In regards to this source you chose above indicate whether you think the following statements are: definitely true, probably true, neither true nor false, probably false, or definitely false or if you're not sure.

	Definitely True	Probably True	Neither True nor False	Probably False	Definitely False	Not sure
Can be trusted	O	O	O	O	O	O
Is accurate	O	O	O	O	O	O
Tells the whole story	O	O	O	O	O	O
Is biased or one-sided	O	O	O	O	O	O

Q19 Thinking about the CDC, Department of Health and Human Services, and other government health agencies please indicate if the following statements are definitely true, probably true, neither true nor false, probably false, or definitely false or if you're not sure.

	Definitely True	Probably True	Neither True nor False	Probably False	Definitely False	Not sure
Can be trusted	O	O	O	O	O	O
Is accurate	O	O	O	O	O	O
Tells the whole story	O	O	O	O	O	O
Is biased or one-sided	O	O	O	O	O	O

Q20 For each of the following please indicate whether you've felt that way when thinking about the pandemic in the past month. Your options are: Very much, moderately, somewhat, not at all, or if you're not sure.

	Very Much	Moderately	Somewhat	Not at all	Not sure
Tense	O	O	O	O	O
Upset	O	O	O	O	O
Relaxed	O	O	O	O	O
Worried	O	O	O	O	O
Annoyed	O	O	O	O	O

▲ End of Survey

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COMMENTARY

Reducing Overdoses Among African American Individuals in Ohio: An Emerging Public Health Crisis

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ABSTRACT

The drug overdose death rate is a major public health crisis with overdoses now being considered a leading cause of death within the United States, including in Ohio. Currently, opioid overdoses primarily involve heroin, fentanyl, and other drugs such as cocaine and MDMA laced with fentanyl. Of particular concern has been the recent demographic shift regarding those who overdose. Opioid overdoses are increasing at a disproportionately higher rate among African American individuals as compared to individuals in other racial and ethnic populations. A public health approach is needed to address the rising epidemic of opioid overdoses impacting African American individuals. Such an approach would comprise a comprehensive and coordinated strategy in providing prevention, intervention, treatment, and recovery services to achieve a sustainable public health impact.

Keywords: Commentary; African American individuals; Opioids; Overdose; Fentanyl

INTRODUCTION

The drug overdose death rate is a major public health problem throughout the United States as 106 699 lives were lost nationally due to drug-involved overdose in 2021, which is the highest rate ever recorded to date.[1] Among African American individuals, overdose death rates increased significantly in 2020 (44%) and continue to increase at a much higher rate than their White counterparts who demonstrated just a 22% increase during the same time period.[2] The drug epidemic within the United States is not homogenously distributed; 6 states experienced statistically significant higher drug mortality rates than the national rate.[3] These include West Virginia (51.5 overdose deaths per 100 000 persons), Delaware (43.8), Maryland (37.2), Pennsylvania (36.1), Ohio (35.9), and New Hampshire (35.8).[3] Specifically within Ohio, overdose death rates doubled every 3 years from 1999-2016 and demonstrated a 169% increase from 1544 deaths in 2010 to 4157 deaths in 2017.[3] Furthermore, the overdose death rate in 2019 for African American Ohioans (42.9 per 100 000 persons) exceeded the death rate for White Ohioans (37.7) and continues to increase substantially.[4] The purpose of this commentary is to present detailed information about the disproportionate impact of opioid overdoses on African American individuals, with particular focus on Ohio, and to argue for a public health approach to address this crisis. This paper is organized as follows: first, current trends and risk factors are presented. Following, preventive measures, other strategies, and sources of community support are described. The paper closes with a discussion of public health implications in the context of recommendations for future research and enhancements to current programming.

Opioid Use Among African American Individuals

Research results indicate African American males now experience the highest rate of opioid overdose deaths, particularly those aged 35 to 39 years.[3] In fact, in 2017 according to the Substance Abuse Mental Health Services Administration (SAMHSA), non-Hispanic African American individuals had the highest rates of opioid overdose deaths along with total drug-related deaths in regard to synthetic opioids in comparison to additional racial and ethnic backgrounds among the national population.[5] This demographic shift can also be observed throughout the nation, as a significantly

higher proportion of African American individuals are affected by opioid overdoses than are other racial and ethnic groups including White individuals.[5]

Although many lives have been saved due to distribution of naloxone, an opioid antagonist designed to reverse an opioid overdose, along with other grassroots prevention and intervention efforts, opioid overdoses continue to increase.[6] Substantial increases occurred among African American individuals nationally from 2015 to 2017 with African American individuals living in metropolitan neighborhoods experiencing the largest increase compared to other racial or ethnic groups.[7] According to the Health Policy Institute of Ohio (HPIO), during 2019 in the state of Ohio, the opioid overdose death rate among African American Ohioans surpassed the rate among White Ohioans for the first time since 2006, largely due to combinations of fentanyl and cocaine becoming more frequent in the drug supply.[8]

Fentanyl is a synthetic opioid used to treat pain and is up to 50 times as strong as heroin and 100 times as strong as morphine. Fentanyl is also a significant contributor to nonfatal and fatal overdoses across the nation.[9] A 2021 research study determined that 93% of the difference in unintentional overdose deaths within Ohio between the years of 2009 and 2018 can be accounted for the shifts in the lethality of the drug supply.[10] Other research results suggested opioid-related deaths have increased by 60% nationally since 2013 due to synthetic opioids infiltrating the drug supply.[11]

The COVID-19 pandemic has caused health disparities among vulnerable populations to become more prevalent, especially among minority populations, most notably African American individuals.[12] These health disparities have thus contributed to more overdoses among the African American community. For example, between March and June of 2020 when compared to the same months in 2019, the number of unintentional opioid overdoses among Virginia Commonwealth University African American patients who were treated for opioid overdoses in emergency departments increased from 64 to 181 while the number of overdoses treated in emergency departments among White patients increased from just 29 to 32.[12]

Research also suggests that a sizeable percentage of African American individuals who have used drugs report misusing prescription medication to enhance the effects of a combination of other drugs.[7] Along with this, African American individuals living in urban areas are more prone to obtain illegal drugs from drug dealers as compared to African American individuals living in rural areas, as drugs are more readily available in urban areas, which results in increased risk of the drug supply being laced with fentanyl.[7]

Studies show intranasal heroin and other opioid form use along with usage of prescription opioids in a pill form are more common among the African American population when compared to their White counterparts.[7] Consistent with this, African American individuals inject drugs at the lowest level when compared to White individuals and members of the Latinx community.[7] Lower levels of injection may contribute to decreased risk perception and corresponding health disparities, which result in lower attention focused on the opioid epidemic and drug-related problems among this population.[7]

In comparison, cocaine-related overdoses, especially those involving fentanyl, have increased rapidly, especially among African American individuals.[13] African American individuals have the highest rates of overall lifetime cocaine consumption, specifically crack cocaine, when compared to any other racial and ethnic group.[13] In addition to cocaine laced with fentanyl, MDMA use has greatly increased and, as of 2016, is among the most frequently used illicit substance among African American individuals, although these individuals have not historically consumed this product.[14] Although opioids and prescription drugs have been a significant focus in intervention strategies across the nation, the Drug Enforcement Administration (DEA) has also asserted that MDMA is broadly available within numerous inner-city, urban African American neighborhoods across the United States, most notably Chicago, in which MDMA use was reported in 2014 to be the highest among African American individuals.[14]

Adverse health outcomes and impacts within social services have effected individuals and families, most notably within predominantly African American communities. First, infections through injection drug use, for instance hepatitis C and HIV, have become prominent among the drug use community.[15] When individuals share needles and do not disinfect them before usage, they are at elevated risk to contracting infections, which are costly to manage and can lead to death.[15] Second, the opioid epidemic has enhanced the prevalence of neonatal abstinence syndrome succeeding an opioid-positive pregnancy, which lasts several days to potentially several weeks.[15] Third, increased levels of foster care involvement have been observed in areas most impacted by the opioid epidemic when compared to areas in which the opioid epidemic impact has been less severe.[15] Many parents and guardians have been incarcerated or have passed away due to the opioid epidemic, further impacting the foster care system.[13] In addition, grandparents and other relatives have had to provide primary care for their grandchildren because of opioid-related consequences for the parents. Several communities have established relatives raising relatives or grandparents raising grandchildren support groups as a result.

Risk Factors for Opioid Use and Opioid Overdoses

The opioid epidemic has been associated with significant demographic and geographic trends. For instance, vulnerable and marginalized populations within urban areas have experienced increased overdoses.[15] Research suggests that new heroin users are non-Hispanic White individuals and increasingly female; historically, more males consumed heroin.[15] However, the incidence

of opioid overdose deaths among the African American population is now increasing faster than among any other racial and ethnic population.[15] High-risk use of opioids and negative health outcomes disproportionately influence urban neighborhoods and vulnerable populations (ie, sex workers, those within the criminal justice population, and gender minority groups).[15]

The majority of African American individuals with an opioid use disorder come from low-income families and seldom receive culturally competent addiction treatment and recovery resources.[16] Many African American individuals have limited access to evidenced-based treatment and thus this population is seeing more people dying from opioid overdoses.[16] Treatment and recovery providers have been more prevalent in suburban and rural areas when compared to urban areas. A sizeable percentage of African Americans live in urban areas and thus do not have adequate access to treatment and recovery providers.[15]

These concerning trends relate to systemic racism transcending to impact social determinants of health within African American communities. Communities where the majority of the population is African American face increased barriers to education, housing, high-paying jobs, and health care due to distrust and generations of racial discrimination and oppression.[5] Possible solutions include incorporation of culturally competent addiction and treatment providers, rebuild trust with the health care system, and increase access to addiction programming for communities of color.[5]

African American individuals face substantial obstacles that impede them from accessing care, which include residing in racially concentrated neighborhoods, absence of insurance, transportation, childcare, and other barriers, however, the main contributor to risks for overdoses and lower life expectancy is health disparities.[16] African American individuals are disproportionately arrested for buying, dealing, and using drugs across the United States.[15] In 2017, it was found that the African American population represented only 12% of the adult population of the United States although they made up one-third of the incarcerated population.[5] According to the US Sentencing Commission, African American individuals have received longer prison sentences for drug-related offenses than other races in the country despite being convicted for crimes of similar weight.[15] Such statistics indicate that those most likely to be arrested for drug use are those residing in low-income, ethnic and racial minority neighborhoods.[15]

African American Ohioans are 5.4 times more prone to be incarcerated as compared to White Ohioans, and African American children are 1.8 times more prone to experience an adverse childhood experience (ACE) as compared to White children.[4] Results of the ACEs study, led by the Centers for Disease Control (CDC) and Kaiser Permanente during the 1990s to determine how traumatic events that occur during childhood may adversely affect adult mental and/or physical health, revealed direct correlations among childhood trauma, adult incarceration, onset of chronic disease, and employment challenges. Study results also demonstrated a dose-response relationship, the higher the ACE score, the greater the risk for negative outcomes in adulthood.[17]

Research conducted by SAMHSA additionally found that opioid use can be a negative coping strategy within disenfranchised communities affected by trauma from historical poverty, violence, and neglect.[5] Additionally, there are risk factors (which include initiation of drug use at an early age, exposure to traumatic experiences, mental illness, community and familial norms, housing instability, feelings of despair, and lack of social connectedness) at the individual, community, and family level that can contribute to drug use and addiction.[4]

As noted previously, studies have shown that African American men are at higher risk for opioid overdose deaths than other racial and ethnic groups.[3] African American men have historically experienced adverse health outcomes as compared to other demographic groups. Research by the Kaiser Family Foundation on health disparities found that African American men have experienced worse health outcomes on a range of health indicators as compared to White men. Notably, African American men have an unemployment rate that is 2.4 times as high when compared to White men.[18] Research suggests higher rates of opioid overdose deaths among this population can be attributed to a high unemployment rate, health accessibility (primary care and mental health access), and the availability of prescription versus non-prescription opioids.[3]

Additional statistically significant predictors of prescription opioid misuse among African American individuals include educational attainment, housing instability, gender, perceived risk, and socioeconomic status.[14] In 2019, Ohioans with less than a high school education were 15 times more likely to experience an overdose as compared to Ohioans with at least a bachelor's degree.[8] African American individuals in the US are more likely to experience negative health outcomes and consequences from drug use as compared to any other racial and ethnic populations.[14] These outcomes illustrate the impact of social determinants of health and the need for a social-ecological approach to produce systems-level community change through addressing interpersonal, individual, organizational, community, and policy factors to influence behaviors and health outcomes.[5]

African American men and women have long faced structural barriers that narrowed their access to efficient addiction treatment. These included lack of insurance, inadequate transportation, distrust of medical providers, and provider bias. In combination, these barriers resulted in decreased rates of medication assisted treatment (MAT) or other addiction recovery resources among African American individuals with an opioid use disorder.[19] Participants in the National Survey on Drug Use and Health cited a host of reasons, including mental health diagnoses, poverty and employment concerns, lack of health insurance, and public stigma, for not receiving drug treatment.[13] As a result, it might be concluded

African American males are less likely to seek treatment for their drug addiction due to stigma, fear of incarceration, and distrust of the health care system.

With regard to incarceration, African American individuals struggling with addiction within the state of Ohio experience disproportionate results. For instance, 17% of those within the treatment court are African American, while African American Ohioans occupy 45% of the state's prison system.[8] Strikingly, drug overdose is a prominent cause of death among inmates/prisoners returning to their community after being released from prison or jail.[7] According to Leah Dennis Ellsworth, the CEO of the Cincinnati Urban Minority Alcoholism and Drug Abuse Outreach Program (UMADAOP), "African American males normally will not go into treatment. There are also issues around discrimination or how they see African Americans with health care and the access for them to even know how to navigate the health care system."[20]

Preventive Measures and Interventions

Programs and interventions exist at the community, statewide and national level to combat the opioid epidemic. For instance, policymakers have restricted prescribing practices by limiting the daily supply of opiates depending on the patients' need, disciplining doctors who have overprescribed opiates, closing pain clinics also known as "pill mills," and establishing opioid prescription monitoring programs at the state level to prevent patients from doctor shopping.[7] Community-level interventions include syringe exchange programs, fentanyl testing strips, naloxone distribution, MAT, and promoting treatment and recovery resources (namely detox programs and support groups). Stigma reduction campaigns have also been successful in reducing the stigma of addiction and promoting hope for those in treatment and recovery.[15]

Access to MAT and addiction treatment services in general is unfortunately not equitable among varying racial and ethnic groups. Of 13 million outpatient substance use disorder (SUD)-related visits when buprenorphine, an approved opioid use disorder (OUD) treatment in an office setting, was prescribed, 12.7 million of those visits were from White patients whereas 363 000 were from patients of all other race and ethnicities.[21] African American males are less likely to receive addiction treatment and adequate medication for an OUD when compared to others.[3] One potential reason for these disparities is a lack of providers who accept Medicaid and provide treatment for SUD. Persons of color are two times as likely to receive Medicaid assistance when compared to White individuals, however SUD treatment providers that accept Medicaid are far less common in communities with higher rates of people of color.[21] There are disparities in OUD treatment options as well; White individuals are more likely to be distributed buprenorphine, while people of color are likely to be distributed methadone.[21] This trend is troubling as methadone is the most stigmatized form of MAT for an OUD, more deadly if misused, and has been a tool historically identified to control crime.[21]

Racial disparities also exist in the distribution of naloxone. When participants that witnessed an overdose reported whether they have heard of naloxone, of the participants that had not heard of naloxone, the vast majority (94%) were African American.[22] In addition, African American individuals were less likely to engage in naloxone training, less likely to know how to access, and less likely to understand the use of the product.[22] Other findings suggest African American individuals with a fracture and diagnosed with chronic pain syndrome were given naloxone at decreased rates when compared to other racial and ethnic groups.[23] While naloxone distribution has been very successful, continued efforts should be incorporated, especially focusing on African American populations.[23]

Recommended Strategies

Even though progress has been made in providing prevention, treatment, and recovery programs and interventions to reduce opioid overdoses, currently opioid overdoses are increasing among the African American population while other populations have seen rates remain steady or even decrease. Enhanced efforts are needed which ensure that the social determinants of health are addressed. Improvements are greatly needed within the African American community regarding affordable and quality health care, housing, and education.[15]

First, the issue of African American males being incarcerated at a significantly higher rate than White males needs to be addressed. The impacts of potential biases within the criminal justice system include negative health outcomes for African American men who experience extensive barriers to receiving addiction treatment and recovery supports once integrated back into the community after incarceration.[4]

Next, harm reduction efforts can be improved. While naloxone distribution is an imperative tool when responding to an apparent opioid overdose, it is not the only strategy when addressing the opioid epidemic.[21] Naloxone distribution might only prevent 6-7% of opioid overdose deaths and even increase the possibility of nonfatal opioid overdoses since high-risk individuals, as in people who inject drugs, remain alive.[21] This is evidenced in areas in which large quantities of naloxone have been distributed which have still experienced increased overdoses due to factors including increased access to prescription drugs, markets changing among the street opioids, and social isolation, especially among older individuals.[21]

Since 2015, SAMHSA has recommended that naloxone be distributed to patients when they are discharged from recovery or detoxification services, however, few recovery and detoxification programs provide this service.[24] Health care or organization policies might recommend that naloxone distribution during a discharge from a recovery or detoxification program be a standard of practice for opioid users. Programs then might keep track of the number of naloxone kits that they distribute. Naloxone can be

distributed within opioid overdose hot spot neighborhoods through collaborating with local health departments, community agencies, and health care and treatment providers. Most health departments and statewide departments of health currently monitor opioid overdoses in a collaborative effort with emergency departments, coroners, and other public health and health care professionals, and alert the community and respective agencies on overdose trends.[15] In addition, public health professionals can become familiar with the demographics of high-risk opioid users to tailor their harm reduction outreach objectives and meet the target audience accordingly.

Unfortunately, African American individuals, especially African American males, are less likely to access treatment for an OUD. As previously noted, research has demonstrated that African American opioid consumers have the lowest treatment completion rate when compared to other racial and ethnic groups and cite several barriers to MAT including childcare, insurance, and transportation.[7] Additional studies show that African American individuals present cultural beliefs and barriers in accessing treatment, which include overall mistrust in the usage of methadone as a form of MAT and mistrust of syringe/needle exchange programs.[23] In some instances, however, the utilization of peer outreach along with mobile treatment services has resulted in measured improvement in African American individuals gaining access to treatment.[7] Research has suggested that a potential avenue to engage African American individuals who inject drugs is through peer educators distributing naloxone and providing training on how to use it.[22] Peer education is an evidenced-based model that is used for all age levels that has been used tremendously in substance use/misuse prevention along with peer counseling in mental health and addiction treatment and recovery.[15]

One additional harm reduction approach is use of fentanyl testing strips. These could be more widely used and available for communities, especially within urban areas in which large amounts of overdoses have been occurring. In a study of individuals who injected drugs and their usage of fentanyl testing strips, results indicated that African American individuals were significantly less likely than White individuals to use fentanyl testing strips (30% compared to 51.1%), and had almost half the chance of using fentanyl testing strips than any other racial or ethnic group.[25] African Americans individuals who used a fentanyl testing strip were also less likely than White individuals to report a positive result (63.9% vs. 82.2%).[25] Further research is warranted to determine the perception of usage of fentanyl testing strips between the racial or ethnic groups and additional harm reduction outreach efforts can be conducted within African American communities.

Other Sources of Community Support

Implementation of social emotional learning programs, especially among vulnerable and marginalized populations, has been proven effective in reducing the prevalence of substance use and misuse.[5] Since African American children tend to have higher ACE scores, public health and health education professionals should incorporate trauma informed care initiatives to reduce the prevalence of substance use and misuse. These programs can be incorporated into the education and community sector, for instance adding evidenced-based social emotional learning programs within the school curriculum at all grade levels and within community settings such as recreation centers, after school programs, and childcare settings. Some of these programs include Botvin LifeSkills®,[26] and Project Towards No Drug Abuse (TND).[27] It is important to ensure cultural humility is incorporated when these programs are implemented and evaluated to make sure diverse priority populations feel included and represented.[28]

Community settings including barbershops, beauty salons, and churches have been considered culturally competent locations in connecting African American individuals with health and wellness information in overcoming sociocultural and institutional barriers in accessing health services.[18] These may also present opportunities to implement social emotional learning programs as described above, in nontraditional settings. Findings from research suggest that sporting events and barbershops are preferred locations for African American men in receiving health information,[18] while beauty salons serve as accessible locations in all communities and are often frequented by African American women.[29] As such, 94% of licensed cosmetologists have reported discussing health topics with their customers, which makes beauty salons an unconventional opportunity to reach certain target audiences and promote health messages.[29] Public health and health education professionals can collaborate with local barber shops and beauty salons in African American communities to provide education and information on the risks of opioid use/misuse and associated overdose risks. These professionals could also provide naloxone training and naloxone kits, share prevention, treatment and recovery resources, and other harm reduction efforts to better serve the target population. Other avenues of community-driven efforts include support groups for families affected by addiction including the National Alliance on Mental Illness (NAMI) family support group,[30] which have been effective in providing a sense of community and belonging for those impacted by addiction.

Faith leaders within communities of color should be encouraged to assist in implementing evidenced-based programs aimed at opioid use prevention. For instance, a program was developed, implemented, and evaluated through the Faith-Based Network Detroit (FBND), primarily focused on alcohol, tobacco, and other drug (ATOD) prevention strategies.[31] The FBND staff provided quarterly ATOD prevention workshops, which were evaluated through surveys of participants, case study interviews, focus groups, review of program data, and interviews with key informants.[31] In one measure, most of the ATOD prevention program participants (77%) indicated that workshops were “very useful” and that 93% of those surveyed within FBND confirmed that they are conducting ATOD prevention-related programming.[31]

PUBLIC HEALTH IMPLICATIONS

Drug overdoses have a profound negative impact on public health in Ohio, and, among Ohioans, African American individuals are at increased risk for drug overdoses, including opioid overdoses. This emphasizes the importance of highlighting protective factors and mitigating risk factors for African American individuals to further reduce the incidence of OUD among this marginalized population through a comprehensive, evidence-based, public health approach. It is critical that further research be conducted to investigate health disparities affecting African American individuals by active engagement with the priority population. Additionally, there is a need to supplement limited research presently available on improving addiction care for African American individuals. Incorporating equitable data collection and culturally competent programming to best reflect the values and needs of African American individuals can further inform best practices in current and newly developed OUD interventions delivered by public health professionals.

AUTHOR CONTRIBUTIONS

The corresponding author made substantial contributions to the conception of the work, drafting the work and revising it critically for important intellectual content and final approval of the version to be published. The co-author assisted with editing and finalizing the article for submission. Both authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Drug overdose death rates. National Institutes of Health. March 31, 2023. Accessed May 23, 2023. https://nida.nih.gov/research-topics/trends-statistics/overdose-death-rates
2. Overdose death rates increased significantly for Black, American Indian/Alaska native people in 2020. Centers for Disease Control and Prevention. Published July 18, 2022. https://www.cdc.gov/media/releases/2022/s0719-overdose-rates-vs.html
3. Hernandez A, Branscum AJ, Li J, MacKinnon NJ, Hincapie AL, Cuadros DF. Epidemiological and geospatial profile of the prescription opioid crisis in Ohio, United States. *Sci Rep*. 2020;10(1). https://doi.org/10.1038/s41598-020-61281-y
4. Wiselogel N. HPIO Addiction Evidence Project Fact Sheet: Insights on addiction and race. Health Policy Institute of Ohio. Published September 24, 2021. https://www.healthpolicyohio.org/hpio-addiction-evidence-project-fact-sheet
5. The Opioid Crisis and the Black/African American Population: An Urgent Issue | Publications No. PEP20-05-02-001. Office of Behavioral Health Equity, Substance Abuse and Mental Health Services Administration, 2020. https://store.samhsa.gov/product/The-Opioid-Crisis-and-the-Black-African-American-Population-An-Urgent-Issue/PEP20-05-02-001
6. Naloxone. SAMHSA. Accessed May 23, 2023. https://www.samhsa.gov/medications-substance-use-disorders/medications-counseling-related-conditions/naloxone
7. Stevens-Watkins D. Opioid-related overdose deaths among African Americans: implications for research, practice and policy. *Drug Alcohol Rev*. 2020;39(7): 857-861. https://doi.org/10.1111/dar.13058
8. Addiction Evidence Project: Taking action to strengthen Ohio's addiction response. Health Policy Institute of Ohio. Published September 24, 2021. https://www.healthpolicyohio.org/addiction-evidence-project-taking-action-to-strengthen-ohios-addiction-response/
9. Fentanyl facts. Centers for Disease Control and Prevention. May 12, 2023. Accessed May 23, 2023. https://www.cdc.gov/stopoverdose/fentanyl/index.html
10. Hall OE, Hall OT, Eadie JL, et al. Street-drug lethality index: a novel methodology for predicting unintentional drug overdose fatalities in population research. *Drug Alcohol Depend* 2021;221:108637. https://doi.org/10.1016/j.drugalcdep.2021.108637
11. Lee HY, Eyer J, Lee D, Won CR, Hudnall M, Cain DS. The opioid crisis in Alabama: actionable recommendations for prevention, treatment, and recovery in rural communities. *Best Pract Mental Health*. 2020;16(1). https://www.proquest.com/openview/76502e2265e14884a06374a99f64cc0a/1?pq-origsite=gscholar&cbl=2035674
12. Patel I, Walter LA, Li L. Opioid overdose crises during the COVID-19 pandemic: implication of health disparities. *Harm Reduct J*. 2021;18 (1). https://doi.org/10.1186/s12954-021-00534-z
13. Dogan J, Stevens-Watkins D, Knighton JS, Wheeler P, Hargons C. Perceived need for drug treatment among African American male drug-using prisoners. *J Subst Abuse Treat*. 2021;120:108166. https://doi.org/10.1016/j.jsat.2020.108166
14. Rigg KK, Lawental M. Perceived risk associated with MDMA (ecstacy/molly) use among African Americans: what prevention and treatment providers should know. *Subst Use Misuse*. 2018;53(7):1076-1083. https://doi.org/10.1080/10826084.2017.1392985
15. Saloner B, McGinty EE, Beletsky L, et al. A public health strategy for the opioid crisis. *Public Health Rep*. 2018;133(1):24S34S. https://doi.org/10.1177/0033354918793627
16. Griffith C, France BL, Bacchus C, Ortega G. The effects of opioid addiction on the Black community. *Int J Collab Res Intern Med Public Health*. 2018;10(2). Accessed February 19, 2023. https://internalmedicine.imedpub.com/the-effects-of-opioid-addiction-on-the-black-community.php?aid=23302
17. National Human Trafficking Training and Technical Assistance Center. Adverse Childhood Experiences | National Human Trafficking Training and Technical Assistance Center. Accessed May 23, 2023. https://nhttac.acf.hhs.gov/soar/eguide/stop/adverse_childhood_experiences
18. Luque JS, Ross L, Gwede CK. Qualitative systematic review of barber-administered health education, promotion, screening and outreach programs in African-American communities. *J Community Health*. 2013;39(1):181-190. https://doi.org/10.1007/s10900-013-9744-3
19. Banks DE, Carpenter RW, Wood CA, Winograd RP. Commentary on Furr-Holden et al: as opioid overdose deaths accelerate among Black Americans, COVID-19 widens inequities—a critical need to invest in community-based approaches. *Addiction*. 2021;116(3):686-687. https://doi.org/10.1111/add.15362

20. 91.7 WVXU. Cory Sharber. (2021, October 7). With overdose deaths of black men on the rise statewide, Hamilton Co. expands quick response team. WVXU. Accessed October 30, 2021. https://www.wvxu.org/local-news/2021-10-07/overdose-deaths-black-men-rise-ohio
21. Andraka-Christou B. Addressing racial and ethnic disparities in the use of medications for opioid use disorder. *Health Aff.* 2021;40(6):920-927. https://doi.org/10.1377/hlthaff.2020.02261
22. Dayton L, Tobin K, Falade-Nwulia O, et al. Racial disparities in overdose prevention among people who inject drugs. *J Urban Health*. Published online June 8, 2020. https://doi.org/10.1007/s11524-020-00439-5
23. Madden EF, Qeadan F. Racial inequities in US naloxone prescriptions. *Subst Abuse*. 2020;41(2):232-244. https://doi.org/10.1080/08897077.2019.1686721
24. Coffin PO, Santos GM, Matheson T, et al. Behavioral intervention to reduce opioid overdose among high-risk persons with opioid use disorder: a pilot randomized controlled trial. *PLoS One*. 2017;12(10):e0183354. https://doi.org/10.1371/journal.pone.0183354
25. Oh H, Kim K, Miller D, Veloso D, Lin J, McFarland W. Fentanyl self-testing in a community-based sample of people who inject drugs, San Francisco. *Int J Drug Policy*. 2020;82:102787. https://doi.org/10.1016/j.drugpo.2020.102787
26. Botvin LifeSkills® Training. Accessed October 18, 2023. https://www.lifeskillstraining.com
27. Project Toward No Drug Abuse (TND). Accessed October 18, 2023, https://tnd.usc.edu
28. Centers for Disease Control and Prevention (2022, August 8). Global Health – CDC Global Health Equity. Principle 1: Embrace cultural humility and community engagement. Retrieved October 18, 2023. https://www.cdc.gov/globalhealth/equity/guide/cultural-humility.html
29. Linnan LA, Ferguson YO. Beauty salons: a promising health promotion setting for reaching and promoting health among African American women. *Health Educ Behav.* 2007;34(3):517-530. https://doi.org/10.1177/1090198106295531
30. National Alliance on Mental Illness (NAMI) Family Support Group. Retrieved October 18, 2023. https://nami.org/Support-Education/Support-Groups/NAMI-Family-Support-Group
31. Brown DR, Scott W, Lacey K, Blount J, Roman D, Brown D. Black churches in substance use and abuse prevention efforts. *J Alcohol Drug Educ*. 2006;50(2)43-65. https://www.jstor.org/stable/45091721

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RESEARCH ARTICLE

Bridging the Gaps in Women's Primary Care for Those Treated at a Residential Drug Treatment Facility in Southwest Ohio

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ABSTRACT

Background: Patients with substance use disorders (SUD) have higher rates of sexually transmitted infections (STI) and limited utility of preventive and outpatient primary care. Women with SUD are a particularly vulnerable population requiring consistent primary and reproductive health care. This study evaluated the need for providing women's primary health care to patients in a residential SUD treatment facility in rural southwest Ohio.

Methods: A retrospective chart review was conducted using intakes at a female-only residential SUD treatment facility from 2021-2022. Variables recorded in this study were: 1) patient-reported substance use; 2) laboratory screenings for hepatitis B, hepatitis C, HIV, and STIs; 3) reproductive history (contraceptive, Papanicolaou (Pap) test, and pregnancy history); 4) patient-reported connection with a primary care provider (PCP); and 5) patient-reported mental health disorders. The analysis provided descriptive statistics to identify comorbidities and trends in women with SUD.

Results: All completed intake charts were reviewed (n=159) without exclusions. No current PCP was reported in 59% of patients. Papanicolaou tests were needed in 50% of patients, and, of those completed, six (21%) had abnormal results. Almost 20% of patients were found with a positive STI, with highest prevalence of trichomoniasis (23%). Viral infection rate was 42%, the most common being hepatitis C (35% with active infection). Patient-reported comorbid psychiatric illness was 90%, the most common being generalized anxiety disorder (GAD) at 67.3%.

Conclusion: This study supports the need for whole person primary care in residential SUD treatment facilities, particularly in respect to viral and sexually transmitted infections, and for overall women's health.

Keywords: Substance use disorders; Sexually transmitted infections; Contraception; Primary care; Women's health

INTRODUCTION

Individuals with substance use disorders (SUD) are an extremely vulnerable population. Regular access to quality care is limited due to multiple barriers including intersecting risk factors of mental health, Medicaid insurance, and geographic limitations (specifically areas with less access to primary care and substance use disorder treatment).[1-7] Often, individuals seeking care for substance use disorders are at an increased risk for health problems and experience higher rates of mental health comorbidities, sexually transmitted infections, hepatitis, lack of preventive care and psychosocial risk factors including domestic violence and sexual assault.[1-8] National addiction medicine and specialty specific guidelines address this need and provide recommendations for evidence-based care of this population.[8,9] Specifically, the American Society of Addiction Medicine (ASAM) provides national practice guidelines for standards of care based on specific substances and for whole person care for patients seeking care for SUDs. These guidelines address comorbidities, medical complications

common to persons with SUDs, and the critical importance of coordination of care.[10]

The American Academy of Family Physicians (AAFP) provides guidelines for primary care providers (PCPs) for best practices in treating persons with SUDs, highlighting management of the above noted common comorbidities, medical complications, and coordination of care.[8]

Population-based data pertaining to preventive care access, SUDs, and mental health disorders are available in Greene County (Ohio), Ohio at large, and nationally. In 2018 in the geographic area of this study, 80% of persons in Greene County saw a PCP in the last year, similar to 81.9% nationally.[10] Additionally, in 2020 in Greene County, 69% had a Papanicolaou (Pap) test in the last 3 years, versus 80% nationwide in 2018.[10] With regard to rates of self-disclosed mental health disease, crude prevalence of a depressive disorder was 22% in Ohio and 19.6% in the nation.[10] However, it is difficult to ascertain or assess the rates of primary care access, preventive care services, and mental health care in this region for the subpopulation of those persons seeking care for SUDs. It is presumed, but not easily determined, that this population would have less access and worse data measures for these basic health care necessities.

Despite specific population data, the risk of SUDs on overall health is a topic that has not been researched extensively. Preventive health screening decreases the morbidity associated with substance-use related medical complications.[2,4,5] Additionally, drug use plays a role in the spread of sexually transmitted infections and viral illnesses, including HIV, by increasing the likelihood of high-risk sex with infected partners.[1,2,11,12] As this study's population of focus was women seeking care for SUDs, it is important to note that women with SUD have associated poorer overall sexual and reproductive health, including increased sexually transmitted infections, less utilization of contraception, increased rates of unplanned pregnancy, adverse pregnancy outcomes, and high rates of children in out-of-home care than the general population.[3,5,13-17] Yet, too often this population does not receive proper care due to lack of access to affordable and accessible health care as well as limited trust in the health care system.[6] Physicians often are uncomfortable and uncertain in their approach to treating SUD patients for multiple reasons including biases and limited training, while SUD patients are often concerned that they will be mistreated and judged by physicians.[7]

Given the health risks associated with SUDs, SUD treatment facilities are optimally poised to administer primary health care screenings, including screenings at admission for HIV, cervical cancer, hepatitis B, hepatitis C, and various sexually transmitted infections (STIs). In the present study, we examined the rate of positive screening results for these health conditions through a retrospective chart review from intakes of women admitted to a female-only, residential SUD treatment facility in southwest rural Ohio. Our goal was to evaluate the need for screening as well as primary health care for women with SUD.

METHODS

This study applied a single-center retrospective chart review of 159 women with SUD admitted to a female-specific ASAM 3.5 residential treatment facility in southwest Ohio from May 2021 to May 2022. Data derived from patient medical records included demographic information, patient-reported substance use, mental health disorders, results from STI screenings, results from viral disease screening, Papanicolaou test history, contraceptive use, pregnancy rates, and whether or not patients previously had a PCP. Descriptive analysis of the chart review was conducted to produce frequency data and rates related to comorbidities and patient outcomes.

Inclusion criteria were all patients admitted May 2021 to May 2022 who completed intake history. Excluded patients included those admitted but left against medical advice prior to completion of the intake history.

RESULTS

The general patient demographic information is summarized in Table 1. The mean age of patients was 37.2 ± 9.6 years (n = 159). Most patients were White (91.2%), while Black patients represent-

Table 1. Patient Demographic Data (n = 159)

Demographics		Mean ± STD
Age, *y*		37.2 ± 9.6
Race		N (%)
	White	145 (91.2)
	Black	9 (5.7)
	Other	5 (3.1)
Insurance		N (%)
	Medicaid	135 (84.9)
	Medicare	5 (3.1)
	Private	1 (0.6)
	None	18 (11.3)
Has a PCP		66 (41.5)

ed 5.7% of the study population and the remaining percentage identified as neither/other (3.1%). Most of the residents were insured with Medicaid (84.9%), and 11.3% do not have any insurance. Sixty percent of the patient population reported not having a PCP.

The results of self-reported substance use are summarized in Figure 1. The most common substance used was methamphetamine (101), followed by opioids (54), alcohol (13), cocaine (11), and marijuana (1).

Sexually transmitted infection and viral diseases testing results are summarized in Figure 2. The STI screening revealed a 20% overall positivity rate with trichomoniasis (22.7%) being the most common STI, followed by syphilis (5.1%), chlamydia (3.4%), gonorrhea (0.1%), and HIV (0.1%). Viral disease screening revealed a 41.5% positivity rate for any current viral illness, with hepatitis C accounting for 35% of the positive rates, followed by hepatitis B (5.1%) and one case of HIV (0.1%).

The results of self-reported mental health are summarized in Figure 3. Of this patient population, 143 (89.9%) reported some mental health disorder. The most common mental illness by patient's self-report was general anxiety disorder (GAD) (67.3%), followed by major depressive disorder (MDD) (46.5%), posttraumatic stress disorder (PTSD) (36.5%), bipolar disorder (BPD) (28.9%), and schizophrenia (1.9%).

Patient reproductive health history is summarized in Figure 4. Of all patients at the residential treatment facility, 50% needed a Papanicolaou test. However, only 40% of those needing a Papanicolaou test gave permission to receive one. Of those who received a Papanicolaou test, 30% were abnormal and needed a colposcopy. The use of contraceptives was also evaluated, and 60% of patients utilized a method of contraception. However, surgical methods such as hysterectomies and tubal ligations comprised the majority of the contraceptive method, instead of reversible options such as short-term and long-acting reversible contraceptives (LARC).

DISCUSSION

This study highlights the role of substance use treatment settings in providing whole person primary care as recommended in the

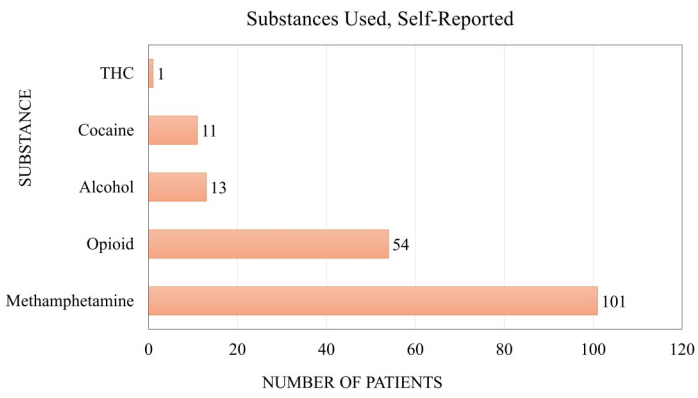

Figure 1. Patient Reported Substance Use (n = 159)

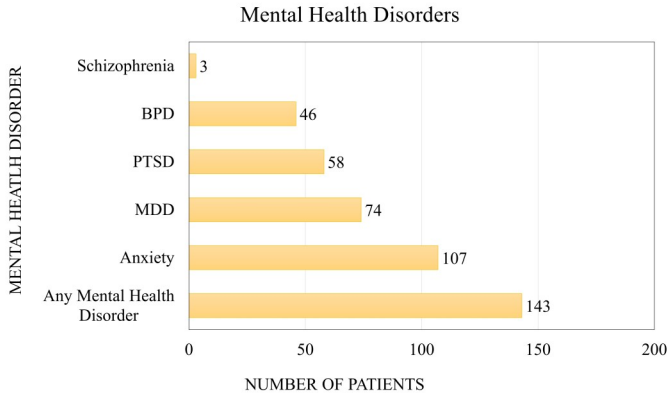

Figure 3. Patient Reported Mental Health Disorders (n = 159)

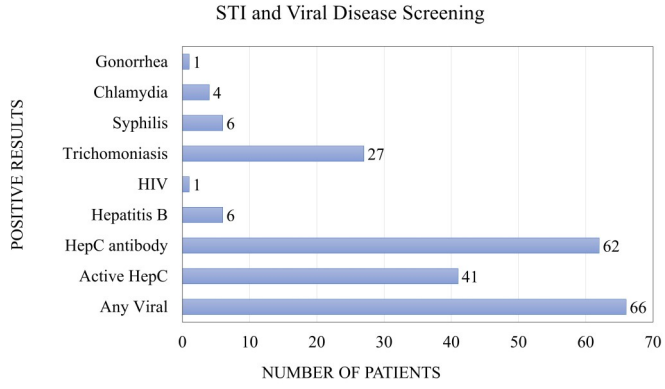

Figure 2. Positive Screenings for STIs and Viral Diseases

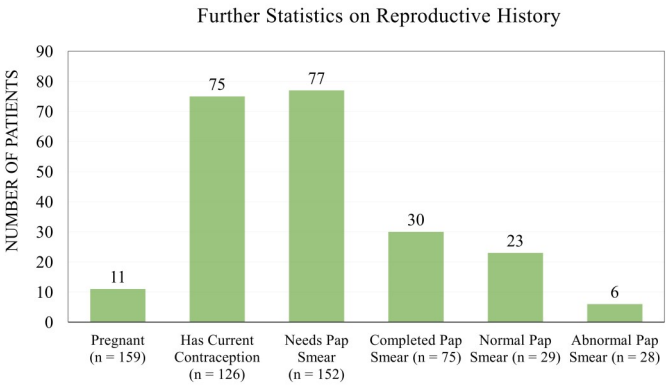

Figure 4. Reproductive Health History (n = variable)

ASAM and AAFP[8-9] guidelines for persons with substance use disorders. The data and metrics recorded in this study began as a quality improvement process. Of note, this particular care location, prior to May 2021, did not screen for any viral infections, sexually transmitted infections, or current access to primary care or contraception. However, with significant noted findings and limited data on the rates of evidence-based and recommended evaluation and preventive care in the residential setting, our study highlights the importance of this care, particularly in the rural Ohio region. The data from 1 year of screening for these variables demonstrates the substantial gaps that can be seen for persons accessing residential treatment.

In regard to viral infections, the rates in this population of active hepatitis C in rural southwest Ohio was on par with and slightly higher than national data which presumes 8% to 25% infection rates.[12] Interestingly, this particular cohort had rates of exposure to hepatitis C at 53%. This highlights the need for testing and treatment of active hepatitis C consistent with ASAM guidelines. The guideline recommendation of treatment of active hepatitis C without requirement for abstinence from substance use is critically important to make an impact on community spread and overall rates.[8,9,12] At this site, we have partnerships with county public health, primary care, and community gastroenterology specialists for options for treatment for hepatitis C and make those connections at time of diagnosis in the residential site. A future endeavor includes analyzing rates of follow-through with treatment and identification of any barriers and outcomes including long-term remission.

With respect to contraceptive care, based on a meta-analysis regarding rates of unintended pregnancy in opioid-using women, unintentional pregnancy is up to 94% in this population.[13] In our study, this statistic was not directly assessed. However, the percentage of individuals in this study with neither a PCP nor current contraception, together with this staggering statistic, highlight the critical need to assess contraception needs at any point a woman with SUD accesses medical care. Additionally, with the changing landscape of elective abortion in the United States and in Ohio, this population is at highest risk for unintended pregnancy, with potential for lack of prenatal care and poor outcomes. Of note, the data from this patient cohort revealed elective sterilization after completion of desired fertility or no contraception. There was very little LARC or short-term contraception utilized by the women in our study. An area of opportunity for many SUD treatment centers is contraception, particularly emergency contraception education and LARC, for women who use substances to allow for patient autonomy in reproductive health.

In review of the data for STI including trichomoniasis, gonorrhea, chlamydia, and syphilis, the rates of trichomoniasis were the most intriguing. Currently, there is a lack of clear national CDC guidance for the screening of trichomoniasis, but there is a recommendation to consider screening in high risk populations.[14] Trichomoniasis is often an asymptomatic condition known to increase rates of HIV transmission as well as association with substantial pregnancy-related complications including premature rupture of membranes, preterm birth and low birth weight.[14] However, it is an easily treated condition at a very low cost. In this study population, routine screening of all persons identified a 22.7% positivity rate. With this high rate, low cost of treatment, and population health risks, we recommend to improve education in SUD treatment centers and primary care on screening and consider stronger language in national guidelines surrounding screening in the SUD population.

As a retrospective cohort study, the study did have a variety of limitations and opportunities for future research. Most glaring is the lack of data available to determine follow up with primary care and completion of treatment for hepatitis C based on our referrals. Additionally, although there was a substantial gap in up-to-date Papanicolaou tests in the study population, many did not complete the screening during their stay at the treatment site. This is presumed due to a variety of factors including patient fears about the exam, no follow up for the testing other than patient-initiated scheduling during their stay, and some schedule-based limitations. Lastly, with no comparison groups and a limited size to this study, it is difficult to extrapolate this data to other treatment centers beyond rural Ohio. Of note, this population has a high rate of methamphetamine use as the primary substance, which may have different health outcomes than treatment centers that have a higher proportion of opioids as the primary substance.

PUBLIC HEALTH IMPLICATIONS

As discussed above, specifically for public health in Ohio, the high rate of hepatitis C exposure and active rates demonstrates a need for enhanced screening, treatment options, and monitoring of rates and barriers to treatment to impact individual health and community spread. Secondly, as highlighted above, the elevated rate of trichomoniasis was unanticipated. With the low cost and effective treatment, screening and treatment of trichomoniasis has the potential to impact HIV spread, associated pregnancy complications, and community spread in persons with SUDs in Ohio.

Next, although noted in many guidelines for SUDs, intentional discussion and evaluation of the need for contraception in this population, especially in the post-Roe era, is essential health care. Specifically, public-health-guided education and access to emergency contraception and highly effective LARC is of critical need in this population. Lastly, access to supportive primary care with an understanding of SUDs and the co-occurring risk factors and illnesses is necessary in all areas of Ohio, but it is particularly necessary in rural areas. In rural areas, access is already limited and the health burden for the individuals with co-occurring SUD in the community is high. Public-health-based education and training are necessary to enhance care for this population.

REFERENCES

1. Volkow ND, Baler RD, Normand JL. The unrealized potential of addiction science in curbing the HIV epidemic. *Curr HIV Res*. 2011;9(6):393-395. https://doi.org/10.2174/157016211798038605
2. Zhou B, Bliss H, Jarvis T, Geary M. Facilitation of coordinated medical care for women in residential treatment for substance use disorder. *R I Med J* (2013). 2021;104:39-42. http://rimed.org/rimedicaljournal/2021/10/2021-10-39-contribution-zhou.pdf
3. Black KI, Day CA. Improving access to long-acting contraceptive methods and reducing unplanned pregnancy among women with substance use disorders. *Subst Abuse*. 2016;10s1. https://doi.org/10.4137/SART.S34555
4. Soccio J, Brown M, Comino E, Friesen E. Pap smear screening, pap smear abnormalities and psychosocial risk factors among women in a residential alcohol and drug rehabilitation facility. *J Adv Nurs*. 2015;71(12):2858-2866. https://doi.org/10.1111/jan.12745
5. Lally MA, Alvarez S, Macnevin R, et al. Acceptability of sexually transmitted infection screening among women in short-term substance abuse treatment. *Sex Transm Dis*. 2002;29(12). https://doi.org/10.1097/00007435-200212000-00003
6. Weissman G, Melchior L, Huba G, et al. Women living with drug abuse and HIV disease: drug abuse treatment access and secondary prevention issues. *J Psychoactive Drugs*. 1995;27(4):401-411. https://doi.org/10.1080/02791072.1995.10471704
7. Merrill JO, Rhodes LA, Deyo RA, Marlatt GA, Bradley KA. Mutual mistrust in the medical care of drug users: the keys to the "narc" cabinet. *J Gen Intern Med*. 2002;17(5):327-333. https://doi.org/10.1046/j.1525-1497.2002.10625.x
8. Visconti AJ, Sell J, Greenblatt AD. Primary care for persons who inject drugs. *Am Fam Physician*. 2019;99(2):109-116. https://www.aafp.org/pubs/afp/issues/2019/0115/p109.html
9. Cunningham C, Edlund M, Fishman M, et al. The ASAM national practice guideline for the treatment of opioid use disorder: 2020 focused update [published correction appears in *J Addict Med*. 2020 May/Jun;14(3):267]. *J Addict Med*. 2020;14(2S Suppl 1):1-91. https://doi.org/10.1097/ADM.0000000000000633
10. Ohio Department of Health. Ohio State Health Assessment. Accessed January 12, 2023. https://odh.ohio.gov/about-us/State-Health-Assessment
11. Page K, Morris MD, Hahn JA, Maher L, Prins M. Injection drug use and hepatitis C virus infection in young adult injectors: using evidence to inform comprehensive prevention. *Clin Infect Dis*. 2013;57 Suppl 2(Suppl 2):S32-S38. https://doi.org/10.1093/cid/cit300
12. Burton MJ, Voluse AC, Anthony V. Integrating comprehensive hepatitis C virus care within a residential substance use disorder treatment program. *J Subst Abuse Treat*. 2019;98:9-14. https://doi.org/10.1016/j.jsat.2018.11.008
13. Auerbach SL, Agbemenu K, Ely GE, Lorenz R. A review of unintended pregnancy in opioid-using women: implications for nursing. *J Addict Nurs*. 2021;32(2):107-114. https://doi.org/10.1097/JAN.0000000000000396
14. Muzny CA. Why does trichomonas vaginalis continue to be a "neglected" sexually transmitted infection? *Clin Infect Dis*. 2018;67(2):218-220. https://doi.org/10.1093/cid/ciy085
15. Lundsberg LS, Peglow S, Qasba N, Yonkers KA, Gariepy AM. Is preconception substance use associated with unplanned or poorly timed pregnancy? *J Addict Med*. 2018;12(4):321-328. https://doi.org/10.1097/ADM.0000000000000409
16. National Center on Substance Abuse and Child Welfare. Child Welfare and Alcohol and Drug Use Statistics. Accessed December 14, 2022. https://ncsacw.acf.hhs.gov/research/child-welfare-and-treatment-statistics.aspx
17. Forray A, Foster D. Substance use in the perinatal period. *Curr Psychiatry Rep*. 2015;17(11):91. https://doi.org/10.1007/s11920-015-0626-5

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RESEARCH ARTICLE

The Role of Comorbid Conditions and Socioeconomic Factors in Mortality for Patients Hospitalized with COVID-19

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ABSTRACT

Background: The emergence of COVID-19 as a global pandemic has provided yet another example of how racial and social factors can exacerbate health disparities and disproportionately affect minority populations. The goal of the current study was to understand how some of these factors impacted survival in patients hospitalized with COVID-19 in Northwest Ohio during the first year of the pandemic.

Methods: This study was a retrospective review of patient data from a single health care system. Electronic medical records were queried to obtain information on patients who were admitted to the hospital and had a laboratory-confirmed COVID-19 infection during their admission. Different predictors were included in the final Cox proportional hazard regression model.

Results: There were 3468 patients included in the analyses with an all-cause mortality rate of 18.5%. On average, White patients were older on admission with higher rates of mortality than patients who were Black or of "Other" races (19.8% versus 12.5% and 11.0%, respectively, $p < .001$). Mortality rates varied significantly by insurance status, with the highest mortality rates observed in the Medicare and "Other" categories (27.1% and 16.5%, respectively). Cox proportional hazard regression model also found race and insurance status to be associated with survival.

Conclusion: Considering race and preexisting conditions adjusted for age in a cohort of patients with COVID-19 reveals that insurance payor is significantly associated with mortality. Those who did not have commercial or public insurance had significantly increased risk of mortality compared to those with commercial insurance.

Keywords: All-cause mortality; Medicaid/Medicare; Social determinants of health; Socioeconomic status; Health disparities

INTRODUCTION

As of March 10, 2023, the United States (US) has confirmed over 676 million cases of COVID-19 caused by SARS-CoV-2 and over 6 million deaths.[1] The COVID-19 pandemic has caused not only physical suffering but other hardships as well. Since the start of the pandemic, millions of people have lost jobs, applied for unemployment assistance, delayed medical care, and had difficulty paying for routine household expenses.[2] Job loss caused by the COVID-19 pandemic has disrupted health coverage for millions of people. Preliminary administrative data for the federal Medicaid program showed enrollment increased by 17 million people (23.9%) between February 2020 and April 2022.[3]

Even though COVID-19 vaccinations are widely available, people in the US continue to be affected by the pandemic. The COVID-19 pandemic has exacerbated health disparities and affected minority populations disproportionately.[4] For example, the Centers for Disease Control and Prevention (CDC) reported overrepresentation of Black patients with COVID-19, as Black individuals make up 18% of the US population but account for 33% of COVID-19-related hospital admissions.[5] It has been suggested that the reason for the disproportionate impact of COVID-19 on Black populations is socioeconomic disparities and higher rates of comorbid conditions such as obesity, diabetes mellitus, cardiovascular disease, and hypertension.[4] According to the US Census Bureau's Household Pulse Survey, Black and Hispanic adults have fared worse than White adults in nearly all survey measures. For example, in April 2021, 64% of Black and 70% of Hispanic adults reported difficulty paying household expenses compared to 42% of White adults, while 14% of Black adults and 16% of Hispanic adults reported household food insecurity compared to 5% of White adults.[6] Furthermore, Black and Hispanic individuals were almost 3 times as likely as White individuals to be hospitalized and 2 times as likely to die due to COVID-19.[7,8] Race, ethnicity, and socioeconomic status are social constructs, often used as proxies for racism that, along with other factors such as occupational exposure to the SARS-CoV-2 virus and access to health care, influence health outcomes.[9]

People of color are also significantly more likely to be uninsured compared to White individuals, resulting in a group of people who are more likely to become ill but less likely to seek medical care.[10] While social determinants of health disparities existed before the pandemic, the differences in COVID-19 outcomes have further exposed these disparities.

This study examined to what extent demographic factors, health status, and health insurance type predicted the survival of patients who were hospitalized for any reason and tested positive for COVID-19 during the early phases of the pandemic in a single health care system serving mainly Northwest Ohio.

METHODS

This retrospective cohort study was based on data from patients served by a single health care system serving mainly Northwest Ohio.

Participants

Eligible participants included all patients who were hospitalized between March 2020 and January 2021 and underwent SARS-CoV-2 polymerase chain reaction (PCR) testing during their admission with a positive result. Patients were included regardless of reason for admission; elective surgeries and other admissions with incidental findings of COVID-19 infection were included.

Procedures

The institutional electronic medical records were queried to gather data, as was the institution's prospectively maintained COVID-19 registry. Patient baseline characteristics were collected including sex, age, race, ethnicity, BMI, zip code of residence, insurance status, admission and discharge date, and discharge disposition. Date of admission and discharge were used to calculate hospital length of stay. Multiple admissions per patient were observed during the period of interest and were categorized as all-cause readmissions. Insurance status was further categorized as Commercial (covered by employer or self-purchased), Medicaid, Medicare, or Other (self-pay, military/veteran insurance, and third-party liability payors). The prospectively maintained COVID-19 database included information regarding ventilator use during admission and comorbidities including previous diagnosis of atrial fibrillation, acute myocardial infarction, anemia, asthma, chronic kidney disease, chronic obstructive pulmonary disorder, congestive heart failure, type 2 diabetes, dementia, depression, hyperlipidemia, hypertension, ischemic heart disease, malnutrition, obesity, osteoarthritis, and stroke. Medical records were manually reviewed to collect missing data when not available in the initial data query. In cases where BMI at admission was greater than or equal to 30 kg/m^2 and no diagnosis of obesity was recorded, patient obesity status was updated. Comorbid conditions were used with age to calculate a limited Charlson Comorbidity Index (CCI) score. Since not all conditions included in that index were available, the limited CCI included age, acute myocardial infarction, cancer, cerebrovascular disease, congestive heart failure, chronic kidney disease, chronic obstructive pulmonary disease, dementia, and type 2 diabetes.

Measures

Patient vital status was the main outcome of interest; all-cause mortality was used for patient status and was not limited to mortality suspected to be related to COVID-19 infection. Status was ascertained by the electronic medical records and discharge disposition. Medical records were examined manually to determine the last date of contact or known date of vital status. Patient status was considered "unknown" and censored from analysis unless an electronic local obituary could be located, matching patient name, date of birth, and city of residence. The percentage of patients with "unknown" status was approximately 5%.

Statistical Analysis

Patient characteristics were presented as descriptive statistics and continuous variables were compared using [Student] t test. Chi-square tests were used to compare categorical variables. Survival curves were drawn using Kaplan–Meier estimates. A Cox proportional hazards regression model adjusting for patient characteristics, limited CCI, comorbidities not included in the CCI score, race, and insurance payor type was created to investigate predictors of mortality.

The model initially included all variables that were not collinear, and Akaike information criterion (AIC) in stepwise regression was used to create a model that included the best-fitting variables. The

final model included limited CCI score, race, sex, hyperlipidemia, obesity, ventilator use, and insurance payor. The variables were analyzed against the Black race and commercial insurance categories as references. Age has been excluded from the final model in order to avoid the effect of collinearity because the limited CCI includes age.

SAS (Version 9.2, SAS Institute Inc., Cary, NC, USA) and R (Version 4.1.0, The R Foundation for Statistical Computing, Vienna, Austria) were used for data analysis. In all tests, a 2-tailed p value less than .05 was considered statistically significant.

Institutional review board approval was obtained prior to data collection and written informed consent was waived due to the retrospective nature of the study.

RESULTS

A total of 3468 patients were admitted to 1 of 12 hospitals in the health care system during the study period. Baseline patient characteristics are shown in Table 1. The average age of those in the cohort was 65 years and the sex distribution was even with 50.9% of the cohort being male. The majority of the patient population was White and not Hispanic/Latino. Most of the cohort had public insurance (Medicaid or Medicare).

The distribution of payor status was investigated by age group and race in a stratified chi-square test (Table 2). In the youngest category of patients, the "Other" race category had the highest proportion of both commercial and other insurance status, while Black patients had the highest percentage of Medicaid insurance. In the 35-49 years age group, the White population had the highest proportion of commercial insurance, while the Black population had the highest proportion of both Medicaid and Medicare. Similarly, in the 50-64 years age group, the White population had the highest rate of commercial insurance, while the "Other" race category had the highest percent of commercial insurance in the 65-79 years age group. Unsurprisingly, nearly all individuals in the 80+ years age group, regardless of race, had Medicare.

The prevalence of comorbid conditions on admission was also investigated by insurance payor status, all of which varied significantly by payor. Most comorbidities were more common in those with Medicare insurance; of the 17 comorbidities investigated, only asthma, depression, hyperlipidemia, hypertension, and obesity were more common in another insurance payor type. Depression and obesity were least prevalent in those with "Other" insurance, while hypertension and hyperlipidemia were least prevalent in those with Medicaid (Table 3).

On chi-square analysis, those with Medicare (27.1%) and "Other" insurance (16.5%) experienced higher rates of mortality than those with commercial or Medicaid insurance ($p < .001$) (Figure 1). The log rank test result for the Kaplan-Meier survival curve had a p value of less than .0001 (Appendix). White patients had higher rates of all-cause mortality (19.8%) than Black patients (12.5%) or those whose race was categorized as "Other" (11.0%, $p < .001$) (Figure 1). The log rank test result for the Kaplan-Meier survival curve had a p value of less than .0001 (Appendix).

All-cause mortality occurred more frequently in males ($p = .002$) and those over 65 years of age ($p < .001$) (Figure 1).

In the final Cox proportional hazard regression model limited CCI, White race, ventilator use, Medicare insurance, and "Other" insurance were significantly associated with survival (Table 4). The unadjusted models are presented in the Appendix. The need for a ventilator was the strongest predictor of all-cause mortality, HR 4.25 (95% CI 3.61-5.0, $p < .001$). Compared to commercial insur-

Table 1. Patient Demographic Information and Clinical Characteristics

Patient Characteristic	Mean ± Standard Deviation
Age (years)	65.0 ± 17.1
Black	58.7 ± 17.6
White	66.6 ± 16.6
Other	59.6 ±18.5
BMI (kg/m^2)	32.7 ± 9.2
Length of stay (days)	8.3 ± 8.1
Limited Charlson Comorbidity Index (CCI)	4.74 ± 2.59
Sex	Frequency (%)
Female	1702 (49.1)
Male	1766 (50.9)
Race	
Black	489 (14.1)
White	2879 (83.0)
Other	100 (2.9)
Ethnicity	
Hispanic/Latino	282 (8.1)
Not Hispanic/Latino	3160 (91.1)
Unknown	26 (0.75)
Insurance payor status	
Commercial	965 (27.9)
Medicaid	362 (10.5)
Medicare	2022 (58.5)
Other	119 (3.1)

Table 2. Descriptive statistics (chi-square test) Investigating Distribution of Insurance Payor by Race, Stratified by Age Group

Age Group/Race	Commercial (%)	Medicaid (%)	Medicare (%)	Other (%)	*P* Value
18-34 years					
Black	33.9	59.7	4.8	1.6	
White	57.7	35.5	3.7	3.2	.003[a]
Other	68.8	18.8	0.0	12.5	
35-49 years					
Black	41.8	40.7	13.2	4.4	
White	63.5	26.0	7.4	3.2	.020[a]
Other	46.2	38.5	7.7	7.7	
50-64 years					
Black	42.4	26.7	25.0	5.8	
White	62.0	11.8	21.6	4.7	< .001[a]
Other	47.4	21.1	26.3	5.3	
65-79 years					
Black	9.2	5.7	81.6	3.6	
White	6.8	1.0	90.0	2.3	< .001[a]
Other	17.9	10.7	60.7	10.7	
80+ years					
Black	0.0	1.5	98.6	0.0	
White	1.3	0.0	97.6	1.1	.040[a]
Other	0.0	0.0	100.0	0.0	

[a] denotes a statistically significant result

ance as the reference group, those with Medicare had higher odds of all-cause mortality, HR 2.32 (95% CI 1.71-3.13, p < .001) when controlling for age and comorbid conditions included in the limited CCI score. Additionally, those with "Other" insurance were more likely to experience mortality, HR 1.93 (95% CI 1.13-3.29, p = .020).

DISCUSSION

By May 11, 2023, the end of the COVID-19 Public Health Emergency in the US, in the state of Ohio 3 445 294 cases of COVID-19 were reported along 140 611 hospitalizations and 42 239 deaths.[11] This study's findings add to the past 3 years of data and evidence-based literature regarding the impact of comorbid conditions and social factors on survival in patients hospitalized with COVID-19 in Northwest Ohio. The results showed that White patients had higher rates of mortality than Black patients or those of "Other" races. It was also observed that mortality rates were significantly different by payor status, and that the highest mortality rates were seen in the Medicare and "Other" categories, whereas the lowest mortality rates were seen in the Medicaid category. The age groups including individuals aged 65 years and older had higher mortality than the younger than 65 years age groups. Importantly, Cox regression demonstrated that those who did not have commercial or public insurance had a significantly increased risk of mortality compared to those with commercial insurance when controlling for age and comorbidity index score.

A previously published study investigating social determinants of health and COVID-19 mortality rates at the county level found that after considering age, percentage of the population that is uninsured in the county, number of days since the county reported 10

Table 3. Descriptive Statistics (chi-square test) Investigating Distribution of Comorbid Conditions by Insurance Payor

Comorbidity	Commercial(%)	Medicaid (%)	Medicare (%)	Other (%)	*P* value
Atrial fibrillation	60 (6.2)	26 (7.3)	494 (23.6)	6 (5.5)	< .001[a]
Acute myocardial infarction	27 (2.8)	13 (3.6)	146 (7.0)	7 (6.4)	< .001[a]
Anemia	142 (15.2)	82 (23.0)	627 (29.9)	21 (19.3)	< .001[a]
Asthma	148 (15.2)	60 (16.8)	161 (7.7)	8 (7.3)	< .001[a]
Chronic kidney disease	249 (25.5)	98 (27.5)	1121 (53.5)	42 (38.5)	< .001[a]
Chronic obstructive pulmonary disease	106 (10.9)	63 (17.7)	665 (31.8)	13 (11.9)	< .001[a]
Type 2 Diabetes	329 (33.7)	134 (37.5)	986 (47.1)	48 (44.0)	< .001[a]
Dementia	10 (1.0)	11 (3.1)	406 (19.4)	8 (7.3)	< .001[a]
Depression	131 (13.4)	70 (19.6)	356 (17.0)	10 (9.2)	.004[a]
Congestive heart failure	62 (6.4)	54 (15.1)	634 (30.3)	13 (11.9)	< .001[a]
Hyperlipidemia	391 (40.1)	124 (34.7)	1419 (40.1)	59 (54.1)	< .001[a]
Hypertension	458 (47.0)	113 (31.7)	853 (40.7)	52 (47.7)	< .001[a]
Ischemic heart disease	126 (12.9)	45 (12.6)	788 (37.6)	29 (26.6)	< .001[a]
Malnutrition	37 (3.8)	10 (2.8)	161 (7.7)	7 (6.4)	< .001[a]
Obesity	467 (47.9)	140 (39.2)	651 (31.1)	29 (26.6)	< .001[a]
Osteoarthritis	9 (0.9)	4 (1.1)	152 (7.3)	1 (0.9)	< .001[a]
Stroke	17 (1.7)	8 (2.2)	112 (5.4)	5 (4.6)	< .001[a]

[a] denotes a statistically significant result

positive cases, percentage of individuals who use tobacco products in the county, overcrowding, percentage of people living in rural areas of the county, percentage of child poverty in the county, and percentage of Black individuals in the county, the only variables that were significantly associated with COVID-19 mortality after a stepwise regression were percentage of uninsured individuals and percentage of Black individuals.[12] However, the individual linear models of the study also suggested that the percentage of people living in rural areas of the county and the percentage of individuals over the age of 65 years were key factors.[12] While the current study corroborates the importance of health insurance status and age as contributing factors to COVID-19 mortality, it was not concluded that Black individuals had the highest mortality rate as the previously mentioned study that looked at county data and was perhaps susceptible to ecological fallacy.[12] This was an unexpected finding, as racial and ethnic minorities are overrepresented in the essential workforce, tend to have lower access to health care, and typically have higher rates of uninsured status.[12] However, it is possible that non-White individuals with COVID-19 symptoms were less likely to seek medical care due to other factors, such as lack of trust in the health care system, during the initial stages of the pandemic.

Another study investigated the association of social determinants of health with COVID-19 mortality in rural and urban counties and found that COVID-19 mortality rates per 100 000 people were higher in urban counties than in rural counties (65.43 versus 50.78).[13] For both rural and urban counties, percentage of the Black population, DM rates, and HIV rates were significantly associated with higher mortality. In urban counties, unemployment rate and residential segregation were associated with increased mortality. The results determined that social determinants of health play an important role in explaining differences in COVID-19 mortality rates and support the results of the current study that comorbid conditions affect COVID-19 mortality. Though the current study did not investigate employment status, employment itself is an important social determinant of health that warrants further investigation.

Chronic conditions have been linked to patients with severe COVID-19 infection, and the Hispanic population is more likely to have multiple chronic conditions compared to non-Hispanic White population that may put them at a greater risk of mortality.[14] The Hispanic population also has the lowest rate of health insurance coverage of all ethnic groups in the US, with a 19.8% uninsured rate.[15] Lack of insurance can reduce access to COVID-19 testing and treatment. Language barriers also pose a problem, with 72% of Hispanic individuals speaking a language other than English at home and almost 30% stating they are not fluent in English.[16] These barriers can reduce access to care and preventive health measures.

Other research investigating racial and ethnic disparities in COVID-19 outcomes found that outcomes between Black, Native American, White, and Hispanic populations exist despite comparable Elixhauser comorbidity indices. Compared to Whites, Black patients have longer hospital stays, higher rates of ventilator dependence, and a higher mortality rate.[17] Also compared to White patients, Native American populations have higher odds of ventilator dependence. In the current study, several chronic conditions were found to be associated with increased mortality, particularly: acute myocardial infarction, cancer, cerebrovascular disease, congestive heart failure, chronic kidney disease, chronic obstructive pulmonary disease, dementia, type 2 diabetes, and obesity (included in the limited CCI score). The rates of these chronic conditions also varied across insurance status, where the majority were unsurprisingly highest in the Medicare population. However, several chronic conditions previously shown to be associated with poorer COVID-19 outcomes such as type 2 diabetes, hypertension,

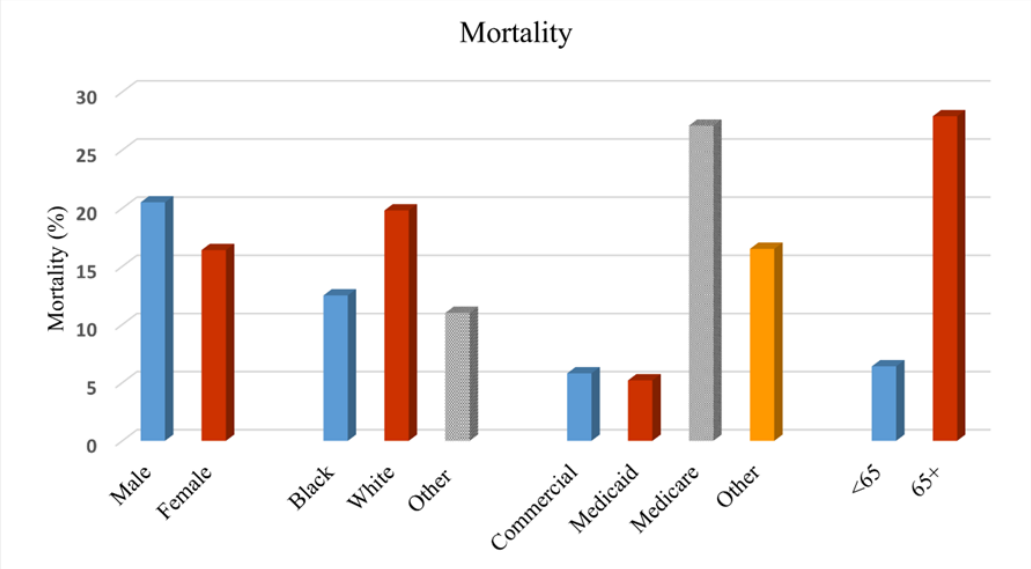

Figure 1. Mortality by Patient Characteristics

Table 4. Cox Proportional Hazard Regression Model Investigating Characteristics Associated with Survival in Patients with Confirmed COVID-19 Infection

Variable	Hazard Ratio Estimate	95% Confidence Interval	*P* Value
Limited CCI	1.32	1.26 – 1.38	< .001[a]
Race – Black	ref		
Race – Other	1.05	0.55 – 2.00	.880
Race – White	1.54	1.18 – 2.01	.002[a]
Sex – Female	ref		
Sex – Male	1.06	0.90 – 1.24	.480
Hyperlipidemia – No	ref		
Hyperlipidemia – Yes	0.88	0.74 – 1.05	.170
Obesity – No	ref		
Obesity – Yes	0.72	0.61 – 0.84	< .001[a]
Ventilator Use – No	ref		
Ventilator Use – Yes	4.25	3.61 – 5.0	< .001[a]
Insurance Payor – Commercial	ref		
Insurance Payor – Medicaid	1.16	0.69 – 1.96	.580
Insurance Payor – Medicare	2.32	1.71 – 3.13	< .001[a]
Insurance Payor – Other	1.93	1.13 – 3.29	.020[a]

[a] denotes a statistically significant result

and ischemic heart disease were higher in patients without commercial or public insurance coverage, particularly compared to those with commercial insurance.

Past research has also demonstrated that higher COVID-19 all-cause mortality rates are seen in counties with a higher proportion of Black residents and greater levels of adverse social determinants of health indicators.[18] The results also suggested that the percentage of uninsured adults, incarceration rate, percentage of adults without a high school diploma, and percentage of households without internet are also linked to increased COVID-19 mortality, further stressing the influence of social determinants of health.

The sample included in these analyses is more representative of the Northwest Ohio population, and therefore this could be another explanation of why the research findings are different in regard to mortality as compared to another study that looked at populations from surrounding communities with a different demographic distribution, such as Michigan, and found that the rates of disease incidence and mortality due to COVID-19 were twice as high than for Whites for all groups except Native Americans. [19]

An important finding refers to the protective effect of obesity observed in this study. Since the authors adjusted in the analyses for ventilator use and severe disease, younger and healthier obese patients might be the ones who were discharged alive after the COVID-19 hospitalization.

The study used the limited age-adjusted CCI that has been shown to be the best predictor for severe clinical outcome in hospitalized patients with COVID-19 infection[20] as compared to CCI which is calculated by considering 19 different comorbidities and was developed in 1987.[21]

The current study is subject to a number of weaknesses, including all of those that are applicable to retrospective studies. An important limitation of this study is the fact that other covariates with a potential confounding or mediator effect such as having a primary care physician, area-level access to health care facilities, social history data or other factors were not collected, and therefore not included in the analyses. Stepwise regression has limitations and may lead to model overfitting. However, due to the limited availability of these potential confounder and mediator variables, other methodological approaches such as a directed acyclic graph (DAG) using the minimal adjustment set for confounding variables were not used.

The study also did not assess the effect on mortality of other clinical variables such as inflammatory markers, in-hospital management, or prehospitalization medication.

PUBLIC HEALTH IMPLICATIONS

While the current study identified social determinants of health associated with COVID-19 mortality that have already been established in published literature, an interesting finding was that, overall, insurance status was significantly associated with mortality in the cohort of patients. Particularly, those without public or commercial insurance had higher odds of mortality within the study period, even after adjusting for preexisting conditions, age, and race. Additional research into these associations is warranted. Another finding warranting additional research is that White individuals had a higher mortality rate than those of "Other" races, as this finding was unexpected. Potential explanations for this finding, considering the composition of the cohort, include White individuals being older upon hospital admission and White individuals being more likely to have access to and seek medical care compared to those of "Other" races.

REFERENCES

1. John Hopkins University. Johns Hopkins Coronavirus Resource Center. Published 2023. https://coronavirus.jhu.edu/map.html
2. Drake P, Rudowitz R. Tracking social determinants of health during the COVID-19 pandemic. KFF. Published April 21, 2022. Accessed August

21, 2022.
https://www.kff.org/coronavirus-covid-19/issue-brief/tracking-social-determinants-of-health-during-the-covid-19-pandemic/

3. Corallo B, Moreno S. Analysis of recent national trends in Medicaid and CHIP enrollment. KFF. Published August 3, 2022. Accessed August 21, 2022.
https://www.kff.org/coronavirus-covid-19/issue-brief/analysis-of-recent-national-trends-in-medicaid-and-chip-enrollment/#:~:text=Data%20show%20that%20Medicaid%2FCHIP
4. Yancy C. COVID-19 and African Americans. *JAMA*. 2020;323(19):1891-1892.
https://doi.org/10.1001/jama.2020.6548
5. Garg S, Kim L, Whitaker M, et al. Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed Coronavirus Disease 2019 — COVID-NET, 14 States, March 1–30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(15):458-464.
https://doi.org/10.15585/mmwr.mm6915e3
6. US Census Bureau. Household Pulse Survey Data Tables. Census.gov. Published August 5, 2022. Accessed August 21, 2022.
https://www.census.gov/programs-surveys/household-pulse-survey/data.html
7. US Department of Health and Human Services. COVID-19 hospitalizations. COVID-NET. Published 2022. Accessed August 21, 2022.
https://gis.cdc.gov/grasp/covidnet/COVID19_3.html
8. National Center for Health Statistics. Provisional COVID-19 deaths: Distribution of deaths by race and Hispanic origin. Centers for Disease Control and Prevention. Data.CDC.gov. Published August 17, 2022. Accessed August 21, 2022.
https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-Distribution-of-Deaths/pj7m-y5uh
9. Center for Immunization and Respiratory Diseases, Division of Viral Diseases. Risk for COVID-19 infection, hospitalization, and death by race/ethnicity. Centers for Disease Control and Prevention. Published July 28, 2022. Accessed August 21, 2022.
https://stacks.cdc.gov/view/cdc/105453
10. Williams M. COVID-19 and the social determinants of health. Harvard Medical School Primary Care Review. Published July 28, 2020. Accessed July 26, 2021.
https://info.primarycare.hms.harvard.edu/review/covid-social-determinants-health
11. Ohio Department of Health. COVID-19 Dashboard. Published 2023. Accessed May 11, 2023.
https://coronavirus.ohio.gov/dashboards
12. Lam S, Hohman E, Pavon-Harr V, et al. Social determinates of health and COVID-19 mortality rates at the county level. *IEEE Xplore*. 2020;159-165.
https://doi.org/10.1109/MCNA50957.2020.9264276
13. Paul R, Arif A, Pokhrel K, Ghosh S. The association of social determinants of health with COVID-19 mortality in rural and urban counties. *J Rural Health*. 2021;37(2):278-286.
https://doi.org/10.1111/jrh.12557
14. Cheng Y, Kanaya A, Araneta M, et al. Prevalence of diabetes by race and ethnicity in the United States, 2011-2016. *JAMA*. 2019;322(24):2389.
https://doi.org/10.1001/jama.2019.19365
15. Agency for Healthcare Research and Quality. 2018 National Healthcare Quality and Disparities Report | Agency for Healthcare Research & Quality. AHRQ. Published September 2019. Accessed July 25, 2021.
https://www.ahrq.gov/research/findings/nhqrdr/nhqdr18/index.html
16. Office of Minority Health. Hispanic/Latino - The Office of Minority Health. HHS.gov. Published October 12, 2021. Accessed August 23, 2022.
https://minorityhealth.hhs.gov/omh/browse.aspx?lvl=3&lvlid=64
17. Qeadan F, VanSant-Webb E, Tingey B, et al. Racial disparities in COVID-19 outcomes exist despite comparable Elixhauser comorbidity indices between Blacks, Hispanics, Native Americans, and Whites. *Sci Rep*. 2021;11(1).
https://doi.org/10.1038/s41598-021-88308-2
18. Dalsania A, Fastiggi M, Kahlam A, et al. The relationship between social determinants of health and racial disparities in COVID-19 mortality. *J Racial Ethn Health Disparities*. 2021:1-8.
https://doi.org/10.1007/s40615-020-00952-y
19. Zelner J, Trangucci R, Naraharisetti R, et al. Racial disparities in coronavirus disease 2019 (COVID-19) mortality are driven by unequal infection risks. *Clin Infect Dis*. 2021;1;72(5):e88-e95.
https://doi.org/10.1093/cid/ciaa1723
20. Kim DH, Park HC, Cho A, Kim J, Yun KS, Kim J, Lee YK. Age-adjusted Charlson comorbidity index score is the best predictor for severe clinical outcome in the hospitalized patients with COVID-19 infection. *Medicine* (Baltimore). 2021 May 7;100(18):e25900.
https://doi.org/10.1097/MD.0000000000025900
21. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis*. 1987;40(5):373-83.
https://doi.org/10.1016/0021-9681(87)90171-8

APPENDIX

Figure. Kaplan-Meier survival curve by type of insurance

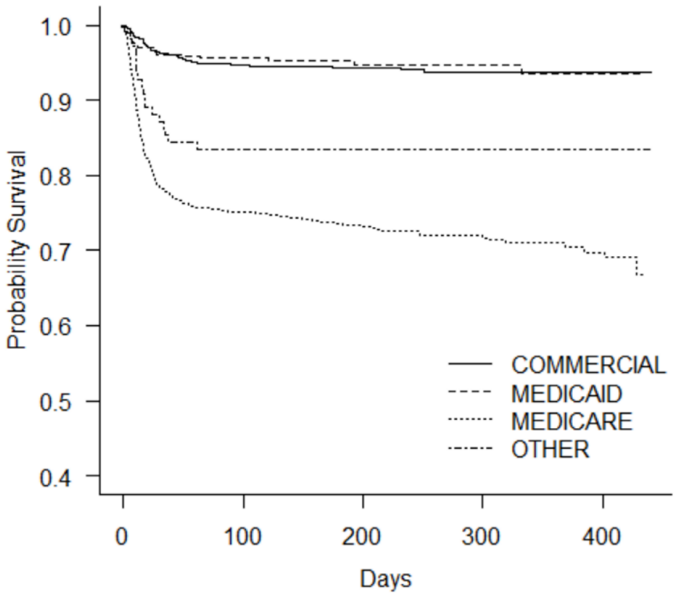

Figure. Kaplan-Meier survival curve by race

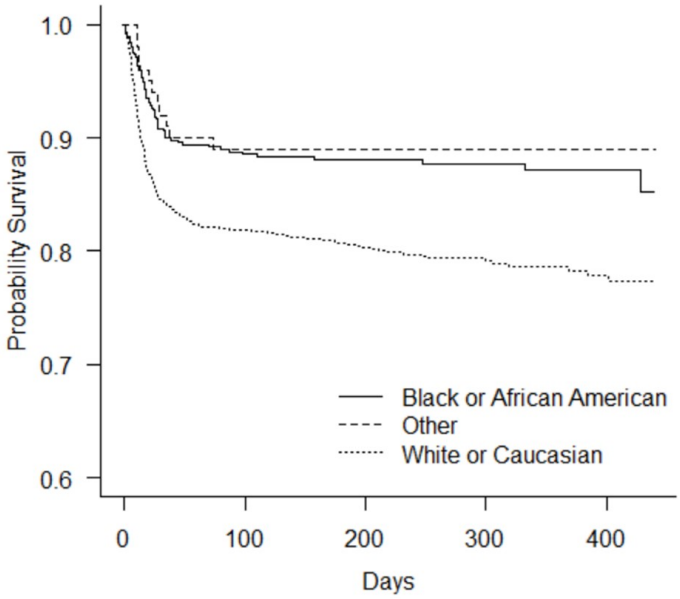

Table. Unadjusted Cox proportional hazard regression models investigating characteristics associated with survival in patients with confirmed COVID-19 infection

Variable	Hazard Ratio Estimate	95% Confidence Interval	*P* Value
Race – Black	ref		
Race – Other	0.70	0.32 – 1.56	.385
Race – White	1.41	1.05 – 1.90	.024*
Sex – Female	ref		
Sex – Male	1.23	1.02 – 1.48	.032*
Hyperlipidemia – No	ref		
Hyperlipidemia – Yes	1.09	0.91 – 1.32	.349
Obesity – No	ref		
Obesity – Yes	1.19	0.99 – 1.44	.065
Ventilator Use – No	ref		
Ventilator Use – Yes	0.68	0.53 – 0.87	.002*
Insurance Payor – Commercial	ref		
Insurance Payor – Medicaid	1.01	0.52 – 1.96	.969
Insurance Payor – Medicare	6.14	4.30 – 8.75	< .001*
Insurance Payor – Other	4.64	2.55 – 8.42	< .001*

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RESEARCH ARTICLE

Impact of the 2022 Mpox Outbreak on Future Public Health Initiatives in Ohio

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ABSTRACT

The 2019 coronavirus disease (COVID-19) created a global public health emergency costing the lives of millions, but the advent of COVID-19 vaccination allowed our society to contain infection and morbidity. As global health began to slowly recover in 2022, the emergence of mpox (monkeypox) in the Western world led to fear that global health would soon be under threat by another viral infection. Mpox is known as a viral zoonosis, or a virus transmitted from animals to humans, which presents with symptoms similar to those of smallpox. Mpox and smallpox belong to the orthopoxvirus genus in the Poxvirdae family, however, mpox is less clinically severe than smallpox, the latter being fully eradicated. Transmission occurs when an individual has direct contact with an infected rash, bodily fluids, respiratory droplets, or via fomites. From July 2022 to May 2023, the World Health Organization (WHO) declared the mpox outbreak as a Public Health Emergency of International Concern (PHEIC). Therefore, the establishment of treatment guidelines and medication has been widely distributed which include vaccinations based on smallpox and supportive treatments. Most importantly, there are apparent health care disparities in vaccine distribution and treatment which disadvantage Black and Latinx populations, in addition to LGBTQIA+ youth. This review characterizes the human mpox infection and analyzes the impact of mpox in the state of Ohio, with a special focus on tackling the disparities that are disproportionately affecting certain groups.

Keywords: Mpox; Sexual and gender minorities; Vulnerable populations; Socioeconomic disparities in health, World Health Organization

INTRODUCTION

Public health officials in Ohio are concerned about the threat level of the recent mpox (monkeypox) outbreak, especially as the world continues to overcome the 2019 Coronavirus pandemic. Initially, mpox was discovered in a colony of monkeys in 1958, while the first human case of the virus occurred in 1970.[1] The spread of mpox is not a foreign concept in the US; in fact, it was disseminated across several states, including Ohio, in 2003. In July 2003, the CDC reported a total of 87 cases of mpox. It is important to note that the transmission routes and affected populations of the 2003 outbreak differed in comparison to the 2022 outbreak.[2] In 2003, mpox was spread through contact with an infected animal, and there was no proven infection through sexual contact.[2] This outbreak led to an influx of research studies focused on the characterization of mpox virus to identify clinical markers and led to potential treatment and prevention education.

The mpox virus is part of the genus orthopoxviruses, which also include cowpox, horsepox, camelpox, and variola (smallpox) viruses.[3,4] Although the mpox virus is similar to the smallpox virus, which was eradicated in 1980, both genetically and in its clinical presentation, mpox has lower rates of contact transmission and mortality rate than smallpox.[3] The 2 ways mpox is transmitted are through animal-to-human transmission and from human-to-human transmission through direct contact, indirect contact, respiratory droplets, and vertical transmission.[3] The mpox virus is a double-stranded DNA virus; it is clinically present in 2 types:

clade I and clade II.[1,5] The recent 2022 outbreak shows infections are from clade IIb, which is a milder form of the virus with a fatality rate of around 1%; this form of the virus exhibits flu-like symptoms in most patients including fever, headache, muscle aches, chills, and fatigue. Patients with clade IIb also present with rashes, bumps, and blisters on their hands, chest, face, and genital areas. The incubation period is 3 to 17 days, in which the patient suffers no symptoms. The symptoms are likely to last anywhere from 2 to 4 weeks.[6] Patients who are immunocompromised, pregnant, or breastfeeding, have a history of eczema, or are under the age of 1 year are at higher risk for serious and possibly fatal complications.[1] Mpox can spread through direct physical contact with infected rashes or sores, prolonged exposure to respiratory droplets or oral fluids from an infected individual, or infected fomites. Patients remain classified as infectious from the inception of their rash until all their scabs heal.[6] Definitive diagnosis of mpox is made through viral DNA taken from the crusts of vesicles or ulcers.[5] Currently, there are no treatments specifically for mpox patients. However, there are numerous drugs used to treat smallpox that may be advised for use in certain mpox patients, for both prevention and treatment methods.[7] In the ongoing 2022 outbreak in Ohio, men who have sex with men (MSM) have been disproportionately affected at high rates.[5,8] It should be noted that the 2022 mpox outbreak shows unique features of interest in the disease's contagion, spread, progression, and clinical presentation.[3]

Transmission, Prevention, and Treatment

At the time of writing, there are no FDA-approved treatments specifically developed for the mpox virus infection, however, there are multiple preventive measures that an individual can take depending upon the transmission route. Any individual who has been in close personal contact with an infected individual is at risk of developing mpox. Individuals who may be at higher risk of infection include health care personnel, veterinarians, and those living with an infected individual.[7] Additionally, there is a risk of vertical transmission occurring when a fetus is exposed to the virus through their infected mother during pregnancy or via close contact after birth.[3,8-10]

It is important to avoid direct skin-to-skin contact with individuals who exhibit a rash that may be from mpox. This rash may present on the genitals, hands, feet, chest, or mouth areas.[3,8] In the 2022 outbreak, cases have uniquely exhibited rashes beginning in the genital or perianal areas. The rash may or may not spread to other parts of the body.[5] The Centers for Disease Control (CDC) also advises individuals to avoid contact with materials that have been used by someone with mpox, which could transmit the infection through indirect contact or respiratory droplets from sneezing or coughing.[3,8] Similar to lessons learned from the COVID-19 pandemic, it is important for individuals to continue to wash and apply sanitizer to their hands to prevent all types of transmission.[8] In addition to these preventive measures, vaccination may be an option to lower the spread of the virus, especially in high-risk individuals.

Historically, the smallpox vaccine has been administered to prevent mpox infection due to the similarities between the 2 viruses.[11] The improvement of clinical symptoms and prevention of mpox has been seen with the usage of the following smallpox vaccines: JYNNEOS™ and ACAM200®.[12] JYNNEOS™ is a live-attenuated, nonreplicating orthopoxvirus vaccine that was licensed in 2019 by the US Food and Drug Administration (FDA). It is currently the primary vaccine utilized for the prevention of smallpox and mpox.[13] ACAM200® is used primarily for active immunization for smallpox for patients with a high risk of infection; ACAM200® was licensed by the FDA in 2007 as a replacement for a previous orthopoxvirus vaccine (Dryvax®) which was removed from circulation.[14] Usage of the vaccines is dependent on the patient and their previous health profiles. Importantly, vaccinia immune globulin (VIG) can be administered to patients suffering from adverse reactions to orthopoxvirus vaccinations.[15]

Measures taken to prevent disease can be categorized into either pre-exposure prophylaxis or post-exposure prophylaxis. In accordance with normal protocol, any person in contact with orthopoxviruses such as laboratory personnel or health care providers should be vaccinated as per the Advisory Committee and Immunization Practices (ACIP).[16] The prevalence and contact with orthopoxviruses or orthopoxvirus-infected patients is variable; consequently, vaccination recommendation is on a case-to-case basis. In contrast, post-exposure prophylaxis is far more complex as mpox transmission requires sustained exposure with an infected patient. The CDC has published a detailed guidance protocol to calculate the risk of exposure and to organize a vaccination schedule. As per the CDC, the first vaccination dose should be given within 4 days of first exposure to prevent infectivity. Additionally, there is a window period of 14 days in which a patient can be inoculated to reduce the severity of symptoms of mpox.[17]

Not only are there preventive measures taken to reduce the chances of mpox transmission, but there are also several options relating to the treatment of infection as well. Vaccinia immune globulin was created in the 1960s to alleviate side effects of smallpox vaccination such as eczema vaccinatum and progressive vaccinia. Supportive care is most effective to treat patients with mild to moderate illness.[15] Furthermore, the common medical treatment these patients require is due to associated symptoms relating to the gastrointestinal system in which patients are given oral rehydration through IV to minimize water loss.[18] Antivirals may be indicated for patients with severe illness; more specifically, Tecovirimat is the most common antiviral prescribed to treat smallpox. The mechanism of action of this antiviral works to stop the spread of the virus inside the host.[19,20]

The treatment and prevention of mpox is consistent in accordance with national health organizations such as the CDC and WHO. The University of Toledo Medical Center published an Infection Con-

trol Precautions protocol on September 6, 2022, in which mpox was designated as both Class A (Airborne) and Class C (Contact) precaution for medical professionals in an inpatient setting.

Class A precaution was maintained until mpox diagnosis was confirmed, and smallpox diagnosis was ruled out. Table 1 shows an abbreviated version of the protocol for Class A.[21]

Class C precaution was maintained until lesions were crusted over. Table 2 shows an abbreviated version of protocol for Class C.[21]

Disparities

In the recent global outbreak, the majority of cases are found to affect men who have sex with men (MSM) and younger people under the age of 35 years.[8,22] There is much hesitation and concern about the increased stigma and discrimination that may arise by labeling this outbreak as primarily found in MSM. However, the concern of misinformation reaching those that are at higher risk may be more harmful than withholding information concerning the realities of whom this 2022 outbreak is primarily affecting.[8] A recent modeling study exhibits the possible impact that personal decisions and public health interventions related to reducing one-time sexual partnerships, which account for approximately 50% of the mpox virus daily transmissions, have in the potential to delay the spread of the virus. The same model estimates that a 40% reduction in one-time partnerships may yield a 31% decrease in the number of infected patients.[23] Therefore, increasing awareness of risks and symptoms of mpox among both health professionals and individuals within these social groups through methods such as advocacy and education may alter contact patterns.[8]

Other possible factors contributing to high infectivity in certain populations include mutations which could lead to higher transmission rates, coupled with the declining rate of individuals who have received the smallpox vaccine.[3,8,24] Additionally, socioeconomic factors such as the wealth of a nation influence both disease emergence and impact, when comparing low-income and high-income countries.[25] As the world grapples with 2 major public health issues back to back, factors such as the disease testing capacity of a nation, as well as the currently enforced COVID-19 related restrictions, or lack of, have a direct impact on the spread of mpox.[26]

The topic of racial disparities plays a significant role in the study of the recent 2022 mpox outbreak and is of importance looking toward the future of the mpox virus in the Western world. At the time of writing in February 2023, there are currently 30 123 cases of mpox reported in the US and 85 536 global cases reported by the CDC.[27] A major issue in targeting racial disparities is the lack of sufficient data assessing the demographics in the early stages of the US mpox outbreak.[22] In September 2022, less than 50% of the total cases provided by the CDC had information regarding race or ethnicity.[22,27] As of February 2023, this number has risen to 93.3%, exhibiting significant improvement and providing useful insight on potential racial disparities within the US.[27] Further-

Table 1. Class A Protocol (abbreviated)

Room	Use of a private airborne infection isolation room (AIIR) with usage of negative pressure ventilation. In case of lack of AIIR, contact Infection Prevention immediately
Notification	Airborne Precaution sign on door of room
Monitoring of AIIR	If the room is not functioning properly in accordance with negative pressure, keep the door closed and contact the facilities management department immediately. Inspect the negative pressure room daily by using the airborne isolation room daily monitor checklist
Respiratory protection	All personnel entering the room must wear either a controlled air purifying respirator (CAPR) or the National Institute for Occupational Safety and Health (NIOSH)-approved N-95 respirator
Personal protective equipment (PPE)	All personnel entering room must wear gown and gloves when required.
Transport and procedures	Patients must remain in the AIIR unless they require essential diagnostic or therapeutic procedures which must be scheduled for the last shift of the day. When the patient is out of the room, they must wear a surgical mask.
Patient equipment	Use a disposable thermometer
Cleaning	Routine cleaning must be completed by staff wearing the proper respiratory protection (as outlined above). If a patient is being discharged, the door must be closed for a minimum of 30 minutes before personnel can enter without respiratory protection.
Visitors	Limit visitors and offer surgical masks to all visitors. Proper handwashing must be followed when entering and exiting the room.

Table 2. Class C Protocol (abbreviated)

Room	Use a private room, the door does not need to be closed. If a private room is unavailable, the patient should be placed in a room with a patient with the same microorganism and resistance pattern, with no additional microorganisms.
Notifications	Place Contact Precautions sign on the door of the room
Personal protective equipment (PPE)	All personnel entering the room must wear a gown and gloves, the gown and gloves must be discarded after usage.
Patient equipment	Disposable thermometers, blood pressure cuffs, and stethoscopes must be used and kept in the room with the patient. No patient care equipment can be shared with another patient without proper disinfectant.
Transport and procedures	Patients must remain in the room unless they require essential diagnostic or therapeutic procedures which must be scheduled for the last shift of the day. When transport is needed, the infected or colonized areas of the patient's body must be covered. Before transport, all personnel must engage in hand hygiene and dispose of all contaminated PPE; personnel should wear clean PPE to handle the patient during transport.
Cleaning	Reusable instruments should be cleaned with appropriate, hospital-approved disinfectant wipes before being used on another patient or exiting the room. Cleaning must be completed with a gown and gloves.
Visitors	Visitors should wear a gown and gloves when they participate in patient care. Proper handwashing must be followed when entering and exiting the room.

more, the states that were initially reporting this demographic information, such as New York, California, and Georgia, were more likely to represent racially diverse populations.[22] As we learned from the early stages of the COVID-19 pandemic, a lack of sufficient comprehensive data on race and ethnicity early on may lead to a misunderstanding of the disease disproportionately affecting certain racial groups more than others. This could have a direct impact on resource allocation and lead to an inequitable distribution of resources such as vaccinations to communities and people most affected. Looking at the cases in late August 2022 in Georgia, 79% of mpox cases were reported in Black residents, while only 45% of those patients received the JYNNEOS™ vaccine. Without data considering how certain racial groups may be disproportionately affected, poor vaccine distribution may result in worse outcomes for these patients most impacted by the virus.[22] Data from the CDC show that Black and Latinx patients comprise the majority of cases since July 2022. Additionally, the rate of Black patients affected has shown an overall decrease over time, while the rates of Latinx patients have increased.[27] An emphasis on educating physicians, patients, and staff on collecting data with standardized inclusive race and ethnicity reporting over the entire US will highlight communities disproportionately affected.[22]

In the context of disparities, it is also important to consider where this virus may be spreading with high transmission rates that also may be disproportionately affecting a specific racial group. One such place is prisons across the Western world, such as in Europe and the US, with the highest incarceration rate in the world.[28,29] Factors such as overcrowding, exchange of clothing and personal items, and poor health care awareness result in prison systems at large contributing to the spread of mpox. In European prisons, there is a significant presence of individuals from mpox endemic countries.[28] Furthermore, compared to the general population, incarceration is higher among sexual and gender minority (SGM) persons.[29] This includes transgender individuals who are at high risk for both incarceration and victimization.[28,29] In the US, Black individuals make up 37.7% of the incarcerated population. Within the population of incarcerated sexual minority men, 27% are Black gay or bisexual, and 34% are MSM.[29] Black MSM are at much greater risk than White MSM for HIV/AIDS infection, yet they are less likely to identify as gay or disclose their sexual identity compared to White MSM.[29] Phenomenons such as race-conscious medical distrust may also negatively impact Black SGM individuals, which could lead to hesitance to seek timely treatment.[29,30] Placing more attention on institutions such as prisons where mpox may spread at high rates can aid in lowering transmission rates of the disease while targeting medical disparities.

In the state of Ohio, where the University of Toledo College of Medicine and Life Sciences is located, the first case of mpox was reported in June 2022. According to the Ohio Department of Health, the process of reporting an mpox diagnosis involves 2 steps. First. all health care providers or any individuals with knowledge of a person diagnosed with mpox must report to the

health district in the area in which the patient resides by the end of the next business day. From there, the health district must report confirmed or suspected infections to the Ohio Department of Health. Since the first diagnosis of mpox in Ohio, there have been 393 total cases reported as of February 28, 2023. Of these cases, the percentage of Black patients accounts for 43.8%, which is the most predominant race afflicted with the mpox virus in Ohio. Lucas County accounts for 15 cases which is far fewer than reported in the county of Cuyahoga in which 156 patients have been recorded.[31] The Toledo-Lucas County Health Department published an mpox information pamphlet on July 26, 2022, which included transmission, symptoms, and a concrete description of what mpox is to ease the fears of the public. Importantly, the health department provided additional information such as a recovery timeline which states that illness resolves within 2 to 4 weeks without specific treatment for mild to moderate cases.[32]

Within the state of Ohio, racial and socioeconomic disparities contribute to the phenomenon of Cuyahoga County's large number of cases. This is illustrated as approximately 61% of the cases within Cuyahoga County are found within the city of Cleveland, a city which has a population of 60% African American residents. In fact, many of those being diagnosed with mpox in this county are Black and from underrepresented backgrounds. Many of these cases consist of people coinfected with HIV. To address this, public health officials in Cuyahoga County are prioritizing equity in their vaccine distribution by focusing their attention on reaching underserved and less affluent community members.[33]

It has been evident that a limited vaccine and resource supply has hindered Cuyahoga County citizens from being vaccinated in comparison to other parts of Ohio, such as Columbus, where mpox rates are lower.[33,34] For example, nearly 2000 more vaccinations have occurred in Franklin County, which includes the city of Columbus, than in Cuyahoga County, despite Cuyahoga County having the overwhelming majority of the mpox cases in Ohio. In Columbus, the demographics within the gay community show a larger White and affluent population, where responses to vaccine rollout programs may be completely different than in a city like Cleveland, where more vaccine education and outreach must be done to reach gay Black men who are primarily affected.[34] In an analysis performed by Kaiser Family Foundation, it was found that, nationwide, mpox case rates are over 5 times greater among Black individuals than White individuals. Other populations particularly vulnerable also include Latinx people and Native Hawaiian and Other Pacific Islanders (NHOPI).[35] In addition, medically uninsured people should be of particular focus as vaccine outreach initiatives ensue. In the state of Ohio, 15% of the African American population and 30% of the Hispanic population are uninsured.[36] These minority populations already face barriers to health care education, but the inability for access to health will lead to negative lifestyle choices and health care through generations.

Such disparities found within the state of Ohio illustrate the complexities involved in vaccine distribution and addressing stigma within the LGBTQIA+ population embedded within certain racial groups. Currently, plans to distribute vaccines in Cuyahoga County aim to target health care settings, and community-based entertainment venues such as gay bars.[33] To further improve accessibility, the Cleveland Department of Public Health has scheduled several vaccine clinics that do not require appointments or preregistration.[33]

Numerous actions and methods exist to help target disparities in the identification and treatment of mpox. First, similar strategies utilized during the COVID-19 pandemic should be leveraged such as isolation procedures when sick, contact tracing, and the use of personal protective equipment (PPE) such as face masks.[28] Since the COVID-19 pandemic, many countries have increased their breadth of molecular testing, trained health care personnel, genomic surveillance, quality of health care interventions, and have enhanced both sanitary infrastructure and evidence-based guidelines.[25] All of this has aided in the prevention of the spread of the mpox virus. Prioritizing data integration and collaboration between fields including public health, medicine, and scientific research will continue to aid in tackling misinformation and promoting efficient risk communication.[25] In addition, boosting the number of immunization campaigns may help lower spread of the virus in at-risk populations.[8] Increasing funding in public health and epidemiology sectors, as well as improving electronic reporting technologies, will aid in data transparency and collaboration.[22]

With the tools and data readily available, our collective responsibility is to protect the most vulnerable populations, who have historically suffered from structural inequities, from these reemergent outbreaks. We have seen the damaging effects of racial and socioeconomic disparities in the contexts of the HIV/AIDS epidemic and the COVID-19 pandemic. Furthermore, to prevent future outbreaks from spreading globally, greater attention must be placed on epidemiology and health care in the non-Western world where diseases may first develop. The initial neglect that the Western world exhibited toward mpox as it increasingly developed in Africa was eerily similar to the neglect exhibited when outbreaks such as Ebola and COVID-19 were developing in the non-Western world.[24] Increasing advocacy, resources, public health planning, research funding, attention, and support for the scientific community will help countries have a response system readily available when future outbreaks arise. It is of utmost importance that we employ the lessons learned from past public health emergencies to continuously inform decisions regarding both mpox and future outbreaks to come.

It remains as crucial as ever for health care professionals, public health officials, and Ohioans to remain informed on disparities affecting our state and nation. The mpox virus has been significantly unexplored in terms of long-term health consequences that may negatively and disproportionately affect certain racial

groups.[37] Increasing advocacy and education across vulnerable communities through public health initiatives will help avoid misinformation or confusion in the long term. As citizens and public health officials continue to collaborate to lessen medical disparities, Ohio will remain a strong example to states across the nation to limit the spread of mpox and future infectious diseases.

PUBLIC HEALTH IMPLICATIONS

The rise of mpox infections in 2022 was unexpected for public health officials and health care personnel who were still recovering from the COVID-19 pandemic. Mpox is an orthopoxvirus that is less clinically severe than smallpox and was first discovered in the 1950s. Originating first in Western and Central Africa, mpox has recently spread to non-endemic countries including the US in 2022, although this is not the first instance of mpox spread into the Western world.[2] Mpox is spread from either animal to humans or humans to humans. Human-to-human transmission occurs when an individual has direct contact with an infected individual via bodily or respiratory fluids, rash, or fomites. Unfortunately, there is no approved treatment specified for mpox virus, but organizations such as the CDC quickly deployed public health guidelines to demonstrate preventive methods and treatments based upon smallpox.[7] Prevention guidelines for healthy adults, immunocompromised, and adolescents were established to reduce the risk of disease or complications because of the unique characteristics of the 2022 outbreak.[5,38] Most importantly, people with a high risk of illness were given smallpox vaccines which included: JYNNEOS™ and ACAM200®.[8] In the 2022 outbreak, the majority of cases affected MSM and adults under the age of 35years. Although there is no one definitive reason why, possible explanations lie in the complex sexual network and patterns within this population that make it easier for the virus to spread quickly. Employing all resources available to eliminate stigma and discrimination toward the MSM community is an absolutely necessary action to limit the spread of the virus. Transmission is likely to increase if individuals within the MSM community feel alienated or ashamed to discuss this disease with their health care providers. There remains a dire need for comprehensive demographic mpox disease data as there are numerous racial and socioeconomic factors at play.The lack of sufficient data to characterize the disease's impact has allowed for gaps in public health efforts causing insufficient prevention, education, and lack of vaccination in Latinx and Black communities. The damaging effect of racial and socioeconomic health care disparities is clear in the transmission of mpox in prisons, institutions that contain a strikingly higher number of sexual and gender minority persons. Poor health care awareness has been a key factor in the spread of mpox. To create long-term change and build a proper system to manage mpox outbreaks, it is necessary for public health initiatives to focus on providing strict guidelines that encompass practices common to the COVID-19 pandemic such as isolation, contact tracing, and the use of PPE. In the current digital age, the process of data integration and validation between health care workers such as family medicine practitioners, public health experts, and research scientists needs to be established to promote efficient communication regarding misinformation, public health initiatives, and preventive methodology.

REFERENCES

1. About Mpox. Centers for Disease Control and Prevention. July 22, 2022. Accessed February 29, 2023. https://www.cdc.gov/poxvirus/mpox/about/index.html
2. Update: Multistate outbreak of monkeypox—Illinois, Indiana, Kansas, Missouri, Ohio, and Wisconsin, 2003. *JAMA*. July 13, 2003;290(3):325. https://doi.org/10.1001/jama.290.3.325
3. Goyal L, Ajmera K, Pandit R, Pandit T. Prevention and treatment of monkeypox: A step-by-step guide for healthcare professionals and general population. *Cureus*. August 2022. https://doi.org/10.7759/cureus.28230
4. Poxvirus diseases. Centers for Disease Control and Prevention. May 11, 2015. Accessed February 29, 2023. https://www.cdc.gov/poxvirus/diseases.html
5. Rizk JG, Lippi G, Henry BM, Forthal DN, Rizk Y. Prevention and treatment of monkeypox. *Drugs*. June 28, 2022;82(9):957-963. https://doi.org/10.1007/s40265-022-01742-y
6. Monkeypox (clade IIB). Monkeypox | SUNY Schenectady. Accessed March 29, 2023. https://sunysccc.edu/Current-Students/Monkeypox.html
7. Patient's Guide to mpox treatment with Tecovirimat (TPOXX). Centers for Disease Control and Prevention. Updated November 28, 2022. Accessed February 14, 2023. https://www.cdc.gov/poxvirus/mpox/if-sick/treatment.html#:~:text=There%20are%20no%20treatments%20specifically,used%20to%20treat%20monkeypox%20effectively
8. Kupferschmidt K. Why the monkeypox outbreak is mostly affecting men who have sex with men. *Science*. June 20, 2022. Accessed February 13, 2023. https://www.science.org/content/article/why-the-monkeypox-outbreak-is-mostly-affecting-men-who-have-sex-with-men
9. Fahrni ML, Priyanka, Choudhary OP. Possibility of vertical transmission of the human monkeypox virus. *Int J Surg* September 2022;105:106832. https://doi.org/10.1016/j.ijsu.2022.106832
10. Mpox. Pregnancy considerations. Centers for Disease Control and Prevention. Updated March 27, 2023. Accessed March 29, 2023. https://www.cdc.gov/poxvirus/mpox/clinicians/pregnancy.html
11. Hammarlund E, Lewis MW, Carter SV, et al. Multiple diagnostic techniques identify previously vaccinated individuals with protective immunity against monkeypox. *Nat Med*. August 7, 2005;11(9):1005-1011. https://doi.org/10.1038/nm1273
12. FDA approves first live, non-replicating vaccine to prevent smallpox and monkeypox. US Food and Drug Administration. September 24, 2019. Accessed March 29, 2023. https:/www.fda.gov/news-events/press-announcements/fda-approves-first-live-non-replicating-vaccine-prevent-smallpox-and-monkeypox
13. Smallpox/monkeypox vaccine information statement. Centers for Disease Control and Prevention. November 14, 2022. Accessed February 3, 2023. https://www.cdc.gov/vaccines/hcp/vis/vis-statements/smallpox-.html

14. ACAM2000 Vaccine. Centers for Disease Control and Prevention. Updated October 21, 2022. Accessed February 5, 2023. https://www.cdc.gov/poxvirus/mpox/interim-considerations/acam2000-vaccine.html
15. Meissner HC. Passive immunization. *Principles and Practice of Pediatric infectious Diseases*. February 10, 2013. https://doi.org/10.1016/b978-1-4377-2702-9.00005-2
16. 2022 US Map & Case count. Centers for Disease Control and Prevention. November 23, 2022. Accessed February 27, 2023. https://www.cdc.gov/poxvirus/mpox/response/2022/us-map.html
17. Vaccines. Centers for Disease Control and Prevention. August 8, 2022. Accessed January 15, 2023. https://www.cdc.gov/smallpox/clinicians/vaccines.html
18. Reynolds M, McCollum A, Nguete B, Shongo Lushima R, Petersen B. Improving the care and treatment of monkeypox patients in low-resource settings: applying evidence from contemporary biomedical and smallpox biodefense research. *Viruses*. December 12, 2017;9 (12):380. https://doi.org/10.3390/v9120380
19. Guidance for Tecovirimat use. Centers for Disease Control and Prevention. February 23, 2023. Accessed February 13, 2023. https://www.cdc.gov/poxvirus/mpox/clinicians/Tecovirimat.html
20. Russo AT, Grosenbach DW, Chinsangaram J, et al. An overview of Tecovirimat for smallpox treatment and expanded anti-orthopoxvirus applications. *Expert Rev Anti Infect Ther*. September 15, 2020;19 (3):331-344. https://doi.org/10.1080/14787210.2020.1819791
21. The University of Toledo Medical Center Department of Infection Control. *Infection Control Precautions*. The University of Toledo Medical Center; September 6, 2022. UTMC publication. Accessed January 28, 2023. https://www.utoledo.edu/policies/utmc/infection_control/pdfs/3364-109-ISO-404.pdf
22. Nsoesie EO, Vu C. Monkeypox: Where are the racial disparities? *Lancet Reg Health Am.* September 23, 2022;17:100372. https://doi.org/10.1016/j.lana.2022.100372
23. Spicknall IH, Pollock ED, Clay PA, et al. Modeling the impact of sexual networks in the transmission of monkeypox virus among gay, bisexual, and other men who have sex with men — United States, 2022. *MMWR Morb Mortal Wkly Rep*. September 2, 2022;71:1131-1135. https://doi.org/10.15585/mmwr.mm7135e2
24. Damaso CR. The 2022 monkeypox outbreak alert: Who is carrying the burden of emerging infectious disease outbreaks? *Lancet Reg Health Am*. July 4, 2022;13:100315. https://doi.org/10.1016/j.lana.2022.100315
25. Rodriguez-Morales AJ, Lopardo G, Verbanaz S, et al. Latin America: situation and preparedness facing the multi-country human monkeypox outbreak. *Lancet Reg Health Am*. July 6, 2022;13:100318. https://doi.org/10.1016/j.lana.2022.100318
26. Gadelha PS, Spara L, Nogueira MF, et al. Monkeypox: A public health emergency in Brazil. *Lancet Reg Health Am.* September 23. 2022;17:100375. https://doi.org/10.1016/j.lana.2022.100375
27. Mpox cases by age and gender, race/ethnicity, and symptoms. Centers for Disease Control and Prevention. August 22, 2022. Accessed February 14, 2023. https://www.cdc.gov/poxvirus/mpox/response/2022/demographics.html
28. Cocco N, Sebastiani T, Giuliani R, et al. Monkeypox epidemic in prisons: How to prevent it? *Lancet Reg Health Eur*. October 19, 2022;22:100530. https://doi.org/10.1016/j.lanepe.2022.100530
29. Baćak V, Thurman K, Eyer K, et al. Incarceration as a health determinant for sexual orientation and gender minority persons. *Am J Public Health*. August 2018;108(8):994-999. https://doi.org/10.2105/ajph.2018.304500
30. Smith AC, Woerner J, Perera R, Haeny AM, Cox JM. An investigation of associations between race, ethnicity, and past experiences of discrimination with medical mistrust and COVID-19 protective strategies. J *Racial Ethn Health Disparities*. June 11, 2021;9(4):1430-1442. https://doi.org/10.1007/s40615-021-01080-x
31. Mpox Dashboard. Ohio Department of Health. Updated March 29, 2022. Accessed March 29, 2023. https://odh.ohio.gov/know-our-programs/mpx/monkeypox-dashboard
32. Monkeypox Information. Toledo-Lucas County Health Department. July 26, 2022. Accessed February 6, 2023. https://lucascountyhealth.com/monkeypox-information/
33. Washington J. With monkeypox cases now totaling 139 in Ohio, 61 in Cuyahoga County, health officials increase local vaccine rollout. cleveland.com. August 24, 2022. Accessed February 15, 2023. https://www.cleveland.com/healthfit/2022/08/with-monkeypox-cases-now-totaling-139-in-ohio-61-in-cuyahoga-county-health-officials-increase-local-vaccine-rollout.html
34. Czekalinski S, Blade T. Nearly half of Ohio's monkeypox cases are in cuyahoga county. why are vaccinations lagging? Ideastream Public Media. October 11, 2022. Accessed January 5, 2023. https://www.ideastream.org/news/health/2022-10-11/nearly-half-of-ohios-monkeypox-cases-are-in-cuyahoga-county-why-are-vaccinations-lagging
35. Kates J, Artiga S, Dawson L. National data show continuing disparities in monkeypox (MPX) cases and vaccinations among Black and Hispanic people. KFF. Published October 5, 2022. Accessed March 29, 2023. https://www.kff.org/racial-equity-and-health-policy/issue-brief/national-data-show-continuing-disparities-in-mpx-monkeypox-cases-and-vaccinations-among-black-and-hispanic-people/
36. Health Disparities in Ohio. Ohio Psychological Association. Accessed March 30, 2023. https://ohpsych.org/page/HealthDisparities
37. DeNatale D, Robins M. 'A downward slope': Monkeypox cases starting to decline in Cleveland and across Ohio. wkyc.com. Updated October 20, 2022. Accessed March 22, 2023. https://www.wkyc.com/article/news/health//downward-slope-monkeypox-cases-starting-decline-cleveland-across-ohio/95-f8d886ce-ce10-4a68-8b34-228d568a89cf
38. Cohen JM, Bamford A, Eisen S, et al. Care of children exposed to monkeypox. *Lancet Reg Health Eur*. September 7, 2022;21:100514. https://doi.org/10.1016/j.lanepe.2022.100514

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RESEARCH ARTICLE

Opiate Use Disorder and Exercise: A Systematic Review

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ABSTRACT

Background: The opiate epidemic continues to cause hardship to American communities, including in all counties in Ohio, and resulted in 100 000 drug overdoses in 2021. Medications such as buprenorphine have helped people affected by opiate use disorder (OUD) to continue through recovery, although medication assisted therapy (MAT) has shown limited retention rates, calling for complimentary interventions to be implemented. Exercise has potential to reduce cardiovascular risk, lower obesity, and improve mental health. The aim of this study is to systematically review the literature on OUD and exercise as an adjunct to MAT. The authors hypothesize that there is a gap in the knowledge as to whether this modality has been thoroughly researched to aid in OUD recovery.

Methods: A database literature search of PubMed, CINHAL, and PsychInfo returned a total of 458 abstracts. Four sets of exclusion criteria were implemented resulting in a total of 26 articles. After further review, 8 more articles were excluded by the authors.

Results: Eighteen articles including participants with OUD were systematically reviewed. Only 1 article solely focused on participants with OUD and exercise as an adjunct to treatment.

Conclusion: Exercise as an adjunct to treatment for OUD is an area of addiction treatment that warrants further investigation. Incorporating exercise into a recovery program for people with substance use disorders (SUD) specifically has been touted as a promising modality, however, limitations in OUD only studies and lack of control groups make it difficult to draw a conclusion to support our hypothesis.

Keywords: Substance use disorder; Opioids; Exercise; Physical activity; Systematic review

INTRODUCTION

The opiate epidemic continues to cause hardship to American communities and, too often, takes the lives of family members, friends, and neighbors. Due to this rising trend coupled with the COVID-19 pandemic, more than 100 000 Americans died from drug overdoses in 2021, which was the highest rate of overdose deaths on record.[1] Individuals with opiate use disorder (OUD) have difficulty being able to complete everyday tasks, struggle with malnutrition, and often battle with other physical and mental illnesses.

Ohio is considered by some as an epicenter of the opiate epidemic. In 2020, Ohio had more than 500 deaths, which translates into 45.6 deaths per 100 000 people. At the county level, Cuyahoga County, one of the largest Ohio counties, had more than 489 deaths in 2020, equating to 37.8 deaths per 100 000 people. In contrast, Vinton County, the smallest county in Ohio, recorded 12 overdose deaths in 2020, which equates to the highest per capita death rate in Ohio of 80 deaths per 100 000 people.[2]

To combat the opioid epidemic at the national, state, and local level, OUD rehabilitation is warranted. Opioid use disorder rehabilitation can be viewed as a multifactorial long-term process that

involves numerous modalities to reduce the likelihood of relapse. Of these modalities, medication assisted treatment (MAT) is among the most studied interventions for treatment of OUD. Clinical trials have demonstrated that long-term opioid agonist therapy with methadone or buprenorphine has great efficacy for OUD treatment.[3] Although MAT is commonly used to reduce relapse, studies have shown that the retention rate is 50% or less at 6 months after initiating treatment.[4] This suggests the need for complementary or adjunctive interventions.

Research has suggested that drug-dependent patients commonly show deterioration in their physical health, either due to direct drug consumption, loss of healthy habits, or these things in combination.[5] Of particular concern are negative effects on the cardiovascular system in individuals who have achieved recovery, as studies have shown participants in recovery have higher rates of overweight and obesity.[6] It has also been observed that participants with substance use disorders (SUD) develop dysfunctional eating patterns, also contributing to excessive weight gain and increasing risk for cardiovascular disease.[7]

Between 2008 and 2018, a total of 67 137 individuals with OUD were diagnosed with heart failure out of the 11 692 995 heart failure admissions identified in the general population.[8] A study on OUD and myocardial infarction (MI) showed that the prevalence of individuals with OUD experiencing MI doubled from 2006 to 2015, increasing from 163 to 326 cases per 100 000.[9] In terms of general cardiovascular mortality, research with participants aged 40 to 75 years found long-term opiate use was associated with increased cardiovascular mortality, independent of the traditional risk factors.[10] The American Heart Association (AHA) presidential advisory has concluded that there is a lack of knowledge provided in the existing research with respect to opiates and cardiovascular disease and has called for nonopioid therapies, including multifaceted and community-based interventions to treat OUD, further emphasizing the need for research on other modalities outside of MAT.[11]

Prior researchers have found brief bouts of exercise to be effective for short term relief from alcohol cravings.[12] Additionally, literature on participants in methamphetamine recovery concluded aerobic exercise in combination with a strength training program increased dopamine levels in the subjects, which potentially improves the mental health of participants and reduces their drug cravings.[13] Although these research results suggest exercise has potential to be effective as an adjunct treatment for SUDs, there is insufficient evidence to suggest that exercise is a benefit for people with OUD specifically.

Our interest is specific to the role of exercise as adjunctive treatment for OUD. Opioid use disorder differs from other SUDs in terms of its heightened morbidity and mortality. Although there is abundant evidence that current pharmacological interventions are safe and effective, rates of opiate overdose have continued to increase, stressing the need for additional evidence-based research to augment current OUD therapy. Hence, nonpharmacological modalities warrant further investigation. To this end, it is of the utmost importance to systematically analyze the current literature on the topic of exercise in the context of OUD.

METHODS

A literature search was conducted with the assistance of a research librarian on exercise in the context of SUD. Databases searched included PubMed, CINHAL, and PsychInfo which returned a total of 458 abstracts. The first set of exclusion criteria removed articles unrelated to exercise and SUD. The second set of exclusion criteria removed systematic reviews and meta-analysis, animal studies, studies not in English, studies with the protocol only, duplicate studies from the 3 databases, professional trainings articles, outdated studies (1995 or earlier), studies involving adolescents, and studies that were inaccessible either by the librarian or the study team. The third set of exclusion criteria focused on yoga being the sole exercise, as mind body exercise is a separate topic for investigation. A subtotal of 163 articles remained. The last exclusion set criteria focused on the types of substances being used by participants. The studies had a mix of various substances being used by their participants: alcohol, methamphetamine, cannabis, and tobacco. With all the exclusion criteria, 26 articles remained to systematically review.

These 26 articles were sorted by either “mixed substances with opiates'' or “opiate only.” The authors reviewed the papers. Author 1 was the primary reviewer and reviewed all 26 articles. After review by author 1, authors 2 and 3 split the articles for second review. Author 2 reviewed 14 articles while author 3 reviewed 12 articles. The following criteria were used to systematically review all 26 articles: (1) author, journal, title, (2) alcohol, tobacco, cocaine, amphetamine, cannabis, opiates, other substance, (3) review paper (yes/no), retrospective (yes/no), (4) (cardio, strength, both) exercise type, exercise duration (5) control type, number of control, number of subjects, number of men, number of women, (6) recovery outcomes, included recovery endpoints (yes/no), (7) study limitations, (8) comments. The results were then compared to reviewer 1 comments. Discrepancies were resolved by consensus of the 3 authors. After review, 6 papers were excluded due to systematic reviews and/or meta-analysis in the study design. Two other additional articles were excluded due to discrepancies within the study designs, leaving 18 articles (Figure 1) for full review.[14-31]

RESULTS

Results of the exclusion criteria are as follows: 125 unrelated to SUD in clinical practice, 54 nonrelated exercise/sport modality, 6 duplicates, 26 outdated (earlier than 1995), 10 adolescents, 15 unrelated nonhuman trials, 6 professional trainings/review, 7 inaccessible, 6 non-English, 3 study protocol only, 38 yoga exclusion, 47 methamphetamine only, 63 alcohol only, 22 tobacco only, 4 other substances, and 6 systematic reviews/meta-analysis. Two additional articles were removed after author review (Figure 1).

Those 18 articles were systematically reviewed (Appendix) and all included individuals with OUD. Nine articles were published in the United States, 3 published in China, and 1 published each in Taiwan, Australia, India, Spain, Norway, and Ireland. Of the 18 articles, 17 of the studies focused on participants with various SUDs, 9 included alcohol use disorder, 2 included tobacco use disorder, 13 included cocaine use disorder, 7 included amphetamines, and 9 included cannabis. Other substances were also included in these research designs, including ecstasy, sedatives, inhalants, tranquilizers, and benzodiazepines. Only 2 articles exclusively focused on participants with OUD.

Of the 18 articles, 6 included cardiovascular exercise only, 1 included strength exercise, and 10 included both cardiovascular

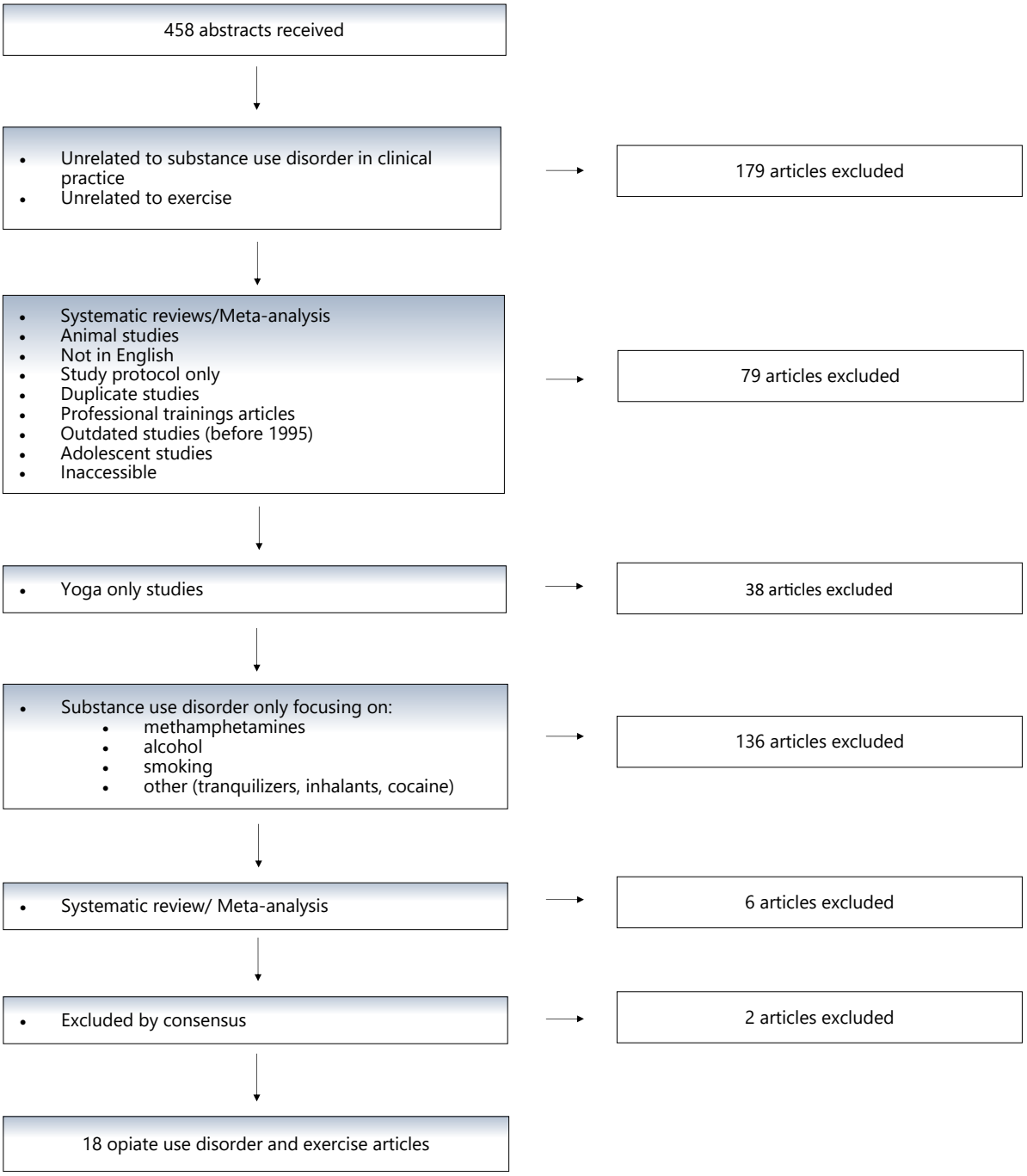

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) Methodology

exercise and strength exercise. Nine of the studies were retrospective in nature. Of the studies that were prospective, exercise duration ranged from 5 days to 14 weeks, with 12 weeks being the mean duration for protocol design. The studies that included control groups varied and included OUD versus no OUD, exercise versus no exercise, and stimulants versus depressants. Eleven articles did not include either a control group for an intervention or a comparison group for a retrospective or recall study. In all, there were 2326 participants; 1154 male and 1172 female. Fourteen of the studies included recovery endpoints. The full table is shown in the Appendix.

DISCUSSION

Regular physical activity is beneficial for many physical and mental health conditions. The reviewed articles illustrate continuing interest in the role exercise plays in recovery from addiction in general. Our specific interest is in the specific effect exercise has in the recovery for OUD. While studies have been conducted that include OUD patients, most studies in our review were conducted with subjects recovering from various SUDs. Only 2 studies[18,24] solely examined the role of exercise in an OUD recovery group. Cocaine was the most common substance included in the studies, identified in 13 of 18 articles, with alcohol use next most common, identified in 9 of 18 articles. This suggests a lack of research with OUD participants at the focus of the study.

Among reviewed studies there was great variation in the type of exercise, intensity, and duration. Studies ranged in duration from days to months. The lack of consistent exercise durations used by different researchers demonstrates a lack of protocol standardization oriented with respect to exercise and SUD. There was also no standard type of exercise used across these studies. The exercise heterogeneity among the studies regarding type and duration makes it difficult to conclude what mode or modes of physical activity is most beneficial for OUD participants.

The lack of control groups is important to note. Only 7 articles were of an experimental design that had control groups. Without a control or comparison group, it is difficult to know to what extent results are similar to or different from non-substance users, and this weakens credibility of results. Of the studies that had a control group, exercise versus no exercise was the most common, with other types of controls also being utilized. The studies with the controls generally generated more concrete results. As an example, a study with 142 control subjects showed that those who completed an exercise-related activity had significantly longer durations of abstinence compared to participants who did not complete an exercise.[14] Another study with a control population of 42 participants showed that a 12-week yoga intervention did not appear to be significantly more effective than the 12-week physical exercise program.[15] The most supporting study with a control group for OUD and exercise came from Giménez-Meseguer et al, which demonstrated improved fitness, reduced injuries, increased vitality, improved mood, increased self-esteem, and reduced cravings.[16] The variety of findings with the small population of control groups supports the need for experimental studies when researching exercise and OUD.

To evaluate the effectiveness of exercise as an adjunct to treatment for OUD, randomized control trials are needed to accurately assess this potential treatment. The review papers mostly consisted of meta-analysis, focusing on numerous papers. It is important to note that these reviews did not solely focus on opiates, and opiates were only a small subsection of the included studies. It seems that there is a greater focus on studying exercise as an adjunct to treatment for alcohol and methamphetamine use disorders. For example, according to the authors of 1 study, their results were encouraging with respect to exercise as an adjunct for individuals diagnosed with various drug and alcohol dependencies,[23] but this study did not provide explicit evidence to support exercise among opiate dependent individuals specifically.

Of the 18 articles, only 2 studies included participants solely with OUD. Opiate use disorder should be studied independently to ensure that the benefits of exercises are applicable to this specific patient population undergoing MAT. Furthermore, within the mixed substance use studies, participants with OUD made up a small fraction of the total study population. Generally speaking, there is a greater proportion of literature to support exercise for other SUDs such as alcohol, tobacco, and methamphetamine, but little to no evidence to support using exercise as an adjunctive treatment specifically for OUD.

Limitations to this research associated with the reviewed sources include limited ability to draw conclusions due to lack of standardization of design and lack of consistency in participants. Variations in interventions and design were described previously. Additionally, 3 studies only involved men while 1 study included only women participants. Participant eligibility with respect to substances varied with alcohol, tobacco, cocaine, amphetamines, cannabis, and others being included as well as opioids. These variabilities limit our ability to draw conclusions regarding the nature of exercise specifically to OUD treatment.

Other potential limitations include that, despite a persistent search, the authors might have overlooked 1 or more eligible articles. Additionally, our sources only included published articles available in English. Other studies may exist which would strengthen this evidence or offer contradictory findings.

Incorporating exercise into a recovery program for people with addiction in general and opiate addiction specifically has been promoted as a promising modality. Based on the findings from this review, participants in the studies generally derived benefit from physical activity participation with respect to physical and mental health. However, because of the limitations of the literature, including the fact that two-thirds of the studies lacked a control group, it is difficult to draw any conclusions regarding benefits to individuals with OUD. Aside from the benefits that ex-

ercise has for general cardiovascular health, it is unclear from the literature if physical activity improves OUD recovery outcomes.

PUBLIC HEALTH IMPLICATIONS

Exercise as an adjunct to treatment for OUD is an area of addiction treatment that warrants further investigation. Specific future areas of focus include use of standardized exercise protocols of long enough duration to demonstrate benefit. Preferably, studies should be designed to compare different modalities of physical activity. Excess cardiovascular morbidity and mortality in this population should also be a research priority. Furthermore, future studies should focus on exercise in respect to recovery outcomes and endpoints. Finally, there needs to be more investigation in a prospective manner to fill the voids that exist in the current literature on exercise as an adjunct to treatment for OUD.

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Other Information

This review is not registered. No amendments were made. No financial or nonfinancial review was requested or received. The authors have no competing interests to report.

REFERENCES

1. Rabin R. Overdose deaths reached record high as the pandemic spread. *The New York Times.* Accessed June 27, 2023. https://www.nytimes.com/2021/11/17/health/drug-overdoses-fentanyl-deaths.html
2. Ohio Department of Public Health. 2020 Ohio Drug Overdose Data: General Findings. Ohio Department of Health, Bureau of Vital Statistics, US Census Bureau. Published online 2020.
3. Strang J, Volkow ND, Degenhardt L, et al. Opioid use disorder. *Nat Rev Dis Primers.* 2020;6(1). https://doi.org/10.1038/S41572-019-0137-5
4. Shulman M, Wai JM, Nunes EV. Buprenorphine treatment for opioid use disorder: an overview. *CNS Drugs*. 2019;33(6):567-580. https://doi.org/10.1007/S40263-019-00637-Z
5. Giménez-Meseguer J, Tortosa-Martínez J, Cortell-Tormo JM. The benefits of physical exercise on mental disorders and quality of life in substance use disorders patients. Systematic review and meta-analysis. *Int J Environ Res Public Health.* 2020;17(10). https://doi.org/10.3390/IJERPH17103680
6. Cowan JA, Devine CM. Diet and body composition outcomes of an environmental and educational intervention among men in treatment for substance addiction. *J Nutr Educ Behav.* 2013;45(2):154-158. https://doi.org/10.1016/J.JNEB.2011.10.011
7. Cowan J, Devine C. Food, eating, and weight concerns of men in recovery from substance addiction. *Appetite.* 2008;50(1):33-42. https://doi.org/10.1016/J.APPET.2007.05.006
8. Chouairi F, Mullan CW, Ravindra N, et al. Brief report: cannabis and opioid use disorder among heart failure admissions, 2008-2018. *PLoS One.* 2021;16(9 September). https://doi.org/10.1371/journal.pone.0255514
9. Ranka S, Dalia T, Acharya P, et al. Comparison of hospitalization trends and outcomes in acute myocardial infarction patients with versus without opioid use disorder. *Am J Cardiol.* 2021;145:18-24. https://doi.org/10.1016/j.amjcard.2020.12.077
10. Nalini M, Shakeri R, Poustchi H, et al. Long-term opiate use and risk of cardiovascular mortality: results from the Golestan Cohort Study. *Eur J Prev Cardiol.* 2021;28(1):98-106. https://doi.org/10.1093/EURJPC/ZWAA006
11. Chow SL, Sasson C, Benjamin IJ, et al. Opioid use and its relationship to cardiovascular disease and brain health: a presidential advisory from the American Heart Association. *Circulation.* 144:218-232. https://doi.org/10.1161/CIR.0000000000001007
12. Linke SE, Ussher M. Exercise-based treatments for substance use disorders: evidence, theory, and practicality. *Am J Drug Alcohol Abuse.* 2015;41(1):7. https://doi.org/10.3109/00952990.2014.976708
13. He Q, Wu J, Wang X et al. Exercise intervention can reduce the degree of drug dependence of patients with amphetamines/addiction by improving dopamine level and immunity and reducing negative emotions. *Am J Transl Res.*2021:13(3):1779-1788. https://e-century.us/files/ajtr/13/3/ajtr0117922.pdf
14. Weinstock J, Barry D, Petry NM. Exercise-related activities are associated with positive outcome in contingency management treatment for substance use disorders. *Addict Behav.* 2008;33(8):1072-1075. https://doi.org/10.1016/J.ADDBEH.2008.03.011
15. Gaihre A, Sasidharan RK, Bista S, Poudel L, Khadka R, Rajbhandari B. Impact of yoga and physical exercise on psychological wellbeing among substance abusers: a randomized controlled trial. *J Complement Integr Med.* 2021; 20(1): 241-249. https://doi.org/10.1515/jcim-2020-0506
16. Giménez-Meseguer J, Tortosa-Martínez J, Remedios Fernández-Valenciano M de los. Benefits of exercise for the quality of life of drug-dependent patients. *J Psychoactive Drugs.* 2015;47(5):409-416. https://doi.org/10.1080/02791072.2015.1102991
17. Wang K, Jiang H, Zhang T, Yin L, Chen X, Luo J. Comparison of methods for the estimation of the maximum oxygen uptake of men drug addicts. *Front Physiol.* 2021;12. https://doi.org/10.3389/FPHYS.2021.683942
18. Pieper B, Templin TN, Kirsner RS, Birk TJ. The impact of vascular leg disorders on physical activity in methadone-maintained adults. *Res Nurs Health.* 2010;33:426-440. https://doi.org/10.1002/nur.20392
19. Powers JM, Woody GE, Sachs ML. Perceived effects of exercise and sport in a population defined by their injection drug use. *Am J Addict.* 1999;8(1):72-76. https://doi.org/10.1080/105504999306108
20. Rutherford G, McGowan I. Substance use disorder: evaluating the effectiveness of the addiction recovery coaching exercise programme. *Ment Health Pract.* 2021. https://doi.org/10.7748/mhp.2021.e1529
21. Cutter CJ, Schottenfeld RS, Moore BA, et al. A pilot trial of a videogame-based exercise program for methadone maintained patients. *J Subst Abuse Treat.* 2014;47(4):299-305. https://doi.org/10.1016/j.jsat.2014.05.007
22. Caviness CM, Bird JL, Anderson BJ, Abrantes AM, Stein MD. Minimum recommended physical activity, and perceived barriers and benefits of

exercise in methadone maintained persons. *J Subst Abuse Treat*. 2013;44(4):457.
https://doi.org/10.1016/J.JSAT.2012.10.002

23. Brown RA, Abrantes AM, Read JP, et al. A pilot study of aerobic exercise as an adjunctive treatment for drug dependence. *Ment Health Phys Act*. 2010;3(1):27.
https://doi.org/10.1016/J.MHPA.2010.03.001
24. Muller AE, Clausen T. Group exercise to improve quality of life among substance use disorder patients. *Scand J Public Health*. 2015;43(2):146-152.
https://doi.org/10.1177/1403494814561819
25. Tremain D, Freund M, Wolfenden L, et al. Modifiable health risk behaviours and attitudes towards behaviour change of clients attending community-based substance use treatment services. *Drug Alcohol Rev*. 2017;36(3):369-377.
https://doi.org/10.1111/DAR.12439
26. Abrantes AM, Blevins CE. Exercise in the context of substance use treatment: key issues and future directions. *Curr Opin Psychol*. 2019;30:103-108.
https://doi.org/10.1016/J.COPSYC.2019.04.001
27. Alessi SM, Rash CJ, Pescatello LS. Reinforcing exercise to improve drug abuse treatment outcomes: a randomized controlled study in a substance use disorder outpatient treatment setting. *Psychol Addict Behav*. 2020;34(1):52.
https://doi.org/10.1037/ADB0000517
28. Dai CL, Chen CC, Richardson GB, Gordon HRD. Managing substance use disorder through a walking/running training program. *Subst Abuse*. 2020;14.
https://doi.org/10.1177/1178221820936681
29. Lee WC, Chen JJ, Hunt DD, et al. Effects of hiking at altitude on body composition and insulin sensitivity in recovering drug addicts. *Prev Med*. 2004;39(4):681-688.
https://doi.org/10.1016/J.YPMED.2004.02.035
30. Wang K, Luo J, Zhang T, Ouyang Y, Zhou C, Lu Y. Effect of physical activity on drug craving of women with substance use disorder in compulsory isolation: mediating effect of internal inhibition. *Front Psychol*. 2019;10.
https://doi.org/10.3389/FPSYG.2019.01928
31. Zhu D, Jiang M, Xu D, Schöllhorn WI. Long-term effects of mind-body exercises on the physical fitness and quality of life of individuals with substance use disorder: a randomized trial. *Front Psychiatry*. 2020;11.
https://doi.org/10.3389/FPSYT.2020.528373

APPENDIX Articles Fully Reviewed

First author	Publish date	Country	Substance*	Exercise category	Activity type	Duration of intervention	# men/ women participants	# in control/ comparison	Reported outcomes	Recovery endpoints included
Lee	2004	Taiwan	C,AM,O	Cardio	Hiking	25 days	26/0	17	Decreased BMI, decreased hyperinsulemia	N
Zhu	2020	China	C, AM, O, OT	Strength	Mind-body exercise	12 weeks	100/0	50	Showed better effects on BMI, SBP, pulse, and PACER test	N
Wang	2019	China	C,AM,O,OT	Cardio, strength	General physical activity	N/A (single measure of VO 2 max)	0/465	0	Physical activity negatively correlated with drug craving, positive for internal inhibition	Y
Dai	2020	US	A,C,O,OT	Cardio	Walking/ running	14 weeks	50/59	0	Study evidenced the influence of utilizing exercise as an adjunct treatment on SUD recovery via participants' perceptions and provided implications for SUD treatment services	Y
Alessi	2020	US	C, M,O	Cardio, strength	Aerobic, strength	Varied	91/29	58	Study did not find benefits of exercise on substance use outcomes	Y
Tremain	2017	Australia	A,C,O	Cardio	Moderate intensity physical activity	N/A (30 day recall)	253/133	0	More than 50% of substance use clients reported that they were seriously considering quitting smoking, increasing physical activity levels and consuming more fruit and vegetables, higher levels of exercise reported than general population	Y
Brown	2010	US	A,C,M,O,OT	Cardio	Walking/ running	12 weeks	11/5	0	Significant increases in percent days abstinence of alcohol and drug use at follow-up timepoints and participants who attended at least 75% of the exercise sessions had significantly better substance use outcomes than those who did not	Y
Rutherford	2021	Ireland	A,C,AM,M, O,OT	Cardio, strength	Aerobic, resistance	6 weeks	5/1	0	Clinically important reductions in depression and anxiety symptoms after the intervention; positive qualitative feedback was provided by participants	Y
Cutter	2014	China	C,O	Cardio, strength	Wii Fit videogame	8 weeks	12/17	14	Results showed a significant reduction in self-reported levels of illicit opioid or cocaine use over time	Y
Wang	2021	US	AM,M,O,OT	Cardio, strength	Power bike, walking, strength assessment	5 days	30/0	15	VO2 max of chemically synthesized drug addicts was significantly higher than that of natural plant-derived drug addicts (heroin), heroin was more damaging than other types of drugs to immune/ organ systems	N
Abrantes	2019	US	O	Cardio	General physical activity	12 weeks	26/7	0	Participants reported high levels of satisfaction; tracking showed low adherence and low compliance with fitbit use	Y
Powers	1999	US	A,C,M,O	Cardio, strength	Sports	N/A (non-specific recall)	32/13	0	Sports provides an escape for people using intravenous drugs, reduce stress Participants observed that sports participation and substance use are incompatible behaviors	Y
Caviness	2013	US	T,O	Cardio, strength	General physical activity	7 days	79/108	0	Findings highlight that methadone programs are treating persons who are at very high risk for cardiovascular disease and other chronic health concerns and may benefit from increased physical activity, participants expressed desire for benefits of exercise	Y
Weinstock	2008	US	A,C,O	Cardio, strength	Sports, aerobic exercises	12 weeks	265/304	0	Those who completed an exercise-related activity had significantly longer durations of abstinence compared to participants who did not complete an exercise-related activity	Y
Pieper	2010	US	O	Cardio	Occupational, sports, walking	N/A (5 year recall)	96/0	0	Chronic venous disease was identified in 92.4% of participants and PAD in 18.5%. Advanced chronic venous disease was highly correlated with injecting in the legs. The high occurrences of chronic venous disease and PAD observed in this study were associated with low level of physical activity	Y
Gaihre	2021	India	A,C,AM,M, O,OT	Cardio, strength	Yoga, aerobic, body-weight	12 weeks	26/11	48	The 12-week yoga intervention did not appear to be significantly more effective than the 12-week physical exercise program on psychological well-being in male participants with substance use disorder, although the 12-week physical exercise program had a positive impact on anxiety, depression, and sleep	Y
Gimenez-Meseguer	2015	Spain	A,C,M,O	Cardio, strength	Aerobic, muscular endurance	12 weeks	26/11	22	Improved fitness, reduced injuries and muscle pain, increased vitality, improved mood, increased self esteem, reduced cravings	Y
Muller	2015	Norway	A,C,AM,M, O, OT	Cardio, strength	Group exercise	10 weeks	26/9	0	Increased peer support for fitness, decrease in anxiety, decrease in use (from 63% to 26%)	N
TOTAL:							1154/1172	224		

*A = alcohol, T = tobacco, C = cocaine, AM = amphetamine, M = cannabis, O = opioids, OT = others (MDMA; inhalants, etc.)

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RESEARCH ARTICLE

Additional Chronic Conditions as Barriers to Depression Management Among Adults Living with HIV

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ABSTRACT

Introduction: An estimated 20% to 30% of people living with HIV (PLHIV) suffer from depression. While the collaborative care model (CCM) is an evidence-based intervention designed to reduce depression, little is known of the impact of additional chronic conditions (ACC) on depression management and CCM response among PLHIV.

Methods: A retrospective cohort study was conducted among 412 PLHIV enrolled in CCM at a large urban community hospital in Cuyahoga County, Ohio, between July 1, 2015, and June 30, 3017. Study participants were identified as clinically depressed at enrollment with at least two PHQ-9 measurements within a year of enrollment. Additional chronic conditions were studied to assess their association with depression treatment response or remission during the study period. Multivariable logistic regression was used to model response and remission considering ACC while adjusting for demographic, program-related, and clinical measures.

Results: Depression outcomes were no different based on the presence or number of ACC. Study participants age 50 years or over with obesity (aOR: 0.15; 95% CI: 0.04-0.64) or heart disease (aOR: 0.15; 95% CI: 0.03-0.84) were less likely to achieve remission. Participants irrespective of age with musculoskeletal disease (MSD) were less likely to achieve remission compared to others without MSD (aOR: 0.48; 95% CI: 0.25-0.93).

Conclusion: Strategies that address obesity may be necessary adjuncts to successfully treating depression among older adults with HIV, while barriers posed by heart disease or MSD should be further investigated.

Keywords: HIV; Depression; Chronic conditions; Obesity; Retrospective cohort study

INTRODUCTION

In 2020, there were over 25 000 persons currently living with diagnosed HIV (PLHIV) in the state of Ohio. Among Ohio counties, Cuyahoga—deemed a priority county for HIV intervention by the Ending the HIV Epidemic: A Plan for America (EHE) initiative—has the highest rate of PLHIV at 421.9 per 100 000 persons.[1] Although HIV infection was largely considered a death sentence in the early days of the epidemic (circa 1980s), today PLHIV who are adherent to HIV antiretroviral therapy (ART) can significantly improve their life expectancy and quality of life.[2–6] However, an estimated 20% to 30% of PLHIV suffer from depression, a condition which is largely undertreated and known to complicate the management of HIV.[7–10] Several studies have linked depression in PLHIV to low adherence to ART and missed medical appointments as well as to lower rates of viral suppression and higher rates of HIV-specific mortality.[11–14] Moreover, a cohort study of US veterans showed that the relationship between depressive symptoms and mortality was modified by HIV status where, in stratified analyses, depression was associated with significantly higher rates of

mortality among the HIV-infected but not among the HIV-uninfected.[15]

Collaborative care models (CCM) for depression have been initiated to address depression and mental health issues in HIV clinics.[16] Key components of CCM include routine screening for depression, measurement based care, care coordination, and case consultation of the care coordinator with psychiatry. The aim of these efforts is to improve HIV treatment adherence and HIV-related outcomes. Unfortunately, depression often is not the only health condition faced by PLHIV, as they are at an increased risk of developing other noninfectious chronic conditions such as dyslipidemia, hypertension, obesity, diabetes, and cardiovascular disease.[17,18] Additionally, depression among PLHIV is often linked with substance abuse.[19,20] Therefore, achieving the desired effect via treatment for depression may be hampered when individuals are comanaging HIV and depression while dealing with other health challenges. A cross-sectional study showed that an increased number of chronic conditions among older adults living with HIV was correlated with higher rates of depression. However, the authors were unable to show how rates of depressive symptoms were impacted by the number or presence of specific chronic conditions over time.[21] A similar study examined chronic conditions among PLHIV focusing exclusively on prevalence among those who are at least 50 years of age.[22] To date, no other study has examined the impact of additional chronic conditions (ACC) on depressive symptoms over time for PLHIV across the adult age spectrum. This study attempts to investigate the impact of the presence, number, and/or type of ACC on depression treatment outcomes over time among adult PLHIV diagnosed with depression.

METHODS

In July of 2015, a large urban community hospital in Cuyahoga County, Ohio, implemented CCM to improve the identification and treatment of depression within its HIV clinic. The current study was developed to retrospectively examine changes in depression among patients enrolled in the first year of the intervention who had at least 12 months of follow-up and at least 2 clinic visits documented within the electronic health record (EHR) where depression was assessed. During the 2-year observation period of July 1, 2015, to June 30, 2017, a total of 594 HIV patients screened positive for depression. Of these patients, 416 met criteria for participation with 4 missing either chart review data or program data. For the remaining 412 patients, we evaluated depression outcomes for their first year of enrollment.

The Patient Health Questionnaire (PHQ-9), a 9-item scale (range 0-27), was used to screen for the presence and severity of depression. Individuals who score below 10 on the PHQ-9 are identified as having either minimum/normal (0-4) or mild (5-9) depression; while individuals who score 10 or above are identified as screening positive for either moderate (10-14), moderately severe (15-19), or severe (20-27) depression. Study inclusion requires a positive screen for depression at baseline (ie, a PHQ-9 score ≥ 10 indicative of either moderate, moderately severe, or severe depression). Suggested treatment for study participants, who screened positive for depression, include counseling and/or antidepressant medication to address depressive symptoms. At 1-year follow-up, study participants were identified as achieving a treatment response (50% reduction in PHQ-9 score); remission in depressive symptoms (PHQ-9 score < 5), which assumes a treatment response; or neither remission nor a treatment response.

The study exposure variables consist of 9 specific ACC: diabetes (type 1 or type 2), obesity (body mass index >30), liver disease, cancer, heart disease, hypertension, chronic obstructive pulmonary disease (COPD), musculoskeletal disease (MSD), and kidney disease. A tenth variable ("other ACC") consisting of other conditions such as hyperlipidemia, asthma, Crohn disease, and/or arthritis was also examined. The presence or absence of each condition was manually verified in the medical record. These 10 dichotomous variables represent the presence or absence of specific chronic condition(s). Additionally, an "any ACC" variable was created to determine the presence or absence of at least 1 ACC, and an "ACC Count" variable was created to capture the total number of additional chronic conditions for a patient.

Potential confounders and effect modifiers include baseline age (adults age 18 and over); gender (Male, Female); race/ethnicity (White/non-Hispanic, Black/non-Hispanic, and Other) where "Other" largely consists of Hispanic ethnicity; and substance abuse history (Yes, No) reflecting a history of marijuana, crack cocaine, opiates, methamphetamine, or alcohol abuse. Information was also available on mental health medication use and prescription adherence (Yes, adherent; Yes, non-adherent; or No) as well as the presence or absence of psychiatric disorders including posttraumatic stress, generalized anxiety disorder, panic disorder, and/or personality disorder as psychiatric disorders (Yes, No). Additionally, assessments were made regarding a participant's engagement in CCM using an engagement measure defined as the number of appointments kept plus the number of phone calls completed minus the number of appointments missed within a 12-month period. Participants with expressed disinterest in program engagement and/or engagement scores within the range 0 to 2 were identified as being "Not Engaged" in care; whereas participants with scores within the 3 to 6 range or the 7 and higher range were identified as being "Somewhat Engaged" or "Very Engaged" in care, respectively. Furthermore, baseline HIV viral load (measured as either "Detected" or "Not Detected or less than 200") and baseline PHQ-9 depression score were captured.

The prevalence of at least 1 ACC and specific ACC was determined across the entire sample and by participant characteristics at baseline with significant differences identified using Fisher exact tests. Characteristics that were shown to be statistically significant at the 0.10 level for at least 1 ACC were included in multivariate models. Ordinal logistic regression was subsequently employed to initially conduct multivariate analyses modeling improvement in

depressive symptoms using 3 mutually exclusive ordinal categories (remission > response but not remission > neither remission nor a response). However, after it was determined that our proposed model violated the assumption of proportional odds, an assumption that the effects of independent variables are constant for each increase in the level of the outcome,[23] we chose to perform 2 binary logistic regression analyses by modeling response (PHQ-9 reduction ≥ 50%) and remission (PHQ-9 < 5) separately. Each of the 10 ACC variables were included in models adjusted for age, gender, ethnicity, substance abuse history, psychiatric disorders, mental health medication use, engagement in care, baseline viral load, and baseline PHQ-9 depression score. In addition, models substituting the 10 ACC variables with either the presence/absence of ACC or the number of ACC were developed to determine their potential impact on depressive symptoms. These alternative models used the same set of control variables. While age was operationalized as a continuous variable within models across all patients, an age cut-point of 50 years was used in age-stratified models to assess the adjusted effect on response and remission for younger (age 18-49) and older (age 50+) adults separately. The proposed, revised and final statistical models are displayed in Figure 1.

With respect to missingness, complete data were available on all variables except race/ethnicity for which a value was missing for just 1 patient. Consequently, case-wise deletion was chosen as our strategy for handling missing data in multivariable models. Statistical significance in models was determined based on a *P* value cutoff of 0.05, and SAS Software version 9.4 was used to conduct all statistical analyses for the study.

RESULTS

The mean age of CCM participants at baseline was 43 years with 31.3% age 50 and over. Overall, 72.6% of participants were male, and 89.3% were either Black or White race/ethnicity. Additionally, 42.2% of participants had a prior history of substance abuse or a psychiatric disorder, while 69.4% were prescribed mental health medication. At baseline, 24.0% of study participants were diagnosed with severe depression and 76.9% had an undetectable HIV viral load. Moreover, the number of specific ACC ranged from 0 to 7 for participants with 28.4% having 3 or more documented ACC. The set of CCM characteristics examined across study participants is shown in Table 1.

Overall, 73.8% of participants had at least 1 ACC. Individuals who are age 50 or over, female, and/or prescribed mental health medication were more likely to have at least 1 ACC. Additionally, individuals with an undetectable HIV viral load at baseline were more likely to have at least 1 ACC.

With regard to specific ACC, prevalence varied with MSD being the most prevalent (28.9%) and kidney disease being the least prevalent (4.4%). In most instances the prevalence of each condition was significantly higher for individuals age 50 or over. Overall, the prevalence of MSD was nearly twice as high among females compared to males (43.4% vs 23.4%) and higher for participants with documented psychiatric disorders versus participants without disorders (35.5% vs 23.5%). The prevalence of obesity was 3 times higher for females compared to males (43.4% vs 14.0%) and significantly higher for participants prescribed mental health medication and/or with an undetectable HIV viral load at baseline.

The prevalence of liver disease was twice as high for participants with either severe or moderately severe depression compared to participants with moderate depression (14.5% and 15.2% vs 7.1%), and the prevalence of heart disease was significantly higher for individuals prescribed mental health medication compared to others not prescribed medication. For both COPD and cancer, prevalence varied significantly by race/ethnicity with a lower prevalence of COPD for participants of Black race compared to others of non-Black race. Additionally, a total of 187 participants (45.3%) who were identified as having other ACC exhibited significant variation in prevalence by gender and baseline HIV viral load

Proposed Ordinal Logistic Regression Models [a]

1. $\text{Logit}\,[P(Y \geq \text{REM or } Y \geq \text{RSP} \mid \text{ACC, CHAR})] = \beta_0 + \sum\beta_{ACC} + \sum\beta_{CHAR}$
2. $\text{Logit}\,[P(Y \geq \text{REM or } Y \geq \text{RSP} \mid \text{ACC, CHAR})] = \beta_0 + \beta_{ACC\_YN} + \sum\beta_{CHAR}$
3. $\text{Logit}\,[P(Y \geq \text{REM or } Y \geq \text{RSP} \mid \text{ACC, CHAR})] = \beta_0 + \beta_{ACC\_CNT} + \sum\beta_{CHAR}$

Revised and Final [b] **Binary Logistic Regression Models**

1. $\text{Logit}\,[P(Y = \text{REM} \mid \text{ACC, CHAR})] = \beta_0 + \sum\beta_{ACC} + \sum\beta_{CHAR}$
2. $\text{Logit}\,[P(Y = \text{REM} \mid \text{ACC, CHAR})] = \beta_0 + \beta_{ACC\_YN} + \sum\beta_{CHAR}$
3. $\text{Logit}\,[P(Y = \text{REM} \mid \text{ACC, CHAR})] = \beta_0 + \beta_{ACC\_CNT} + \sum\beta_{CHAR}$
4. $\text{Logit}\,[P(Y = \text{RSP} \mid \text{ACC, CHAR})] = \beta_0 + \sum\beta_{ACC} + \sum\beta_{CHAR}$
5. $\text{Logit}\,[P(Y = \text{RSP} \mid \text{ACC, CHAR})] = \beta_0 + \beta_{ACC\_YN} + \sum\beta_{CHAR}$
6. $\text{Logit}\,[P(Y = \text{RSP} \mid \text{ACC, CHAR})] = \beta_0 + \beta_{ACC\_CNT} + \sum\beta_{CHAR}$

REM: remission; RSP response; ACC: additional chronic conditions; CHAR: participant characteristics; Logit: natural logarithm of odds; P: conditional probability; Y: study outcome; β_0: model intercept; $\sum\beta_{ACC}$: parameter estimates for the set of chronic conditions; β_{ACC_YN}: parameter estimate for the presence of at least 1 additional chronic condition; β_{ACC_CNT}: parameter estimate for the count of additional chronic conditions; $\sum\beta_{CHAR}$: parameter estimates for the set of participant characteristics.

[a] In ordinal logistic regression, the proportional odds assumption requires that the effects (or odds ratios) derived from modeling "REM" versus "not REM" and "REM or RESP" versus "neither" are the same.

[b] Final models include both overall and age-stratified models.

Figure 1. Proposed, Revised and Final Statistical Models

Table 1. CCM Participant Characteristics (N = 412)

Characteristic	n (%)
Age: Mean (SD)	42.7 (11.92)
Age category	
18-49	283 (68.7)
50+	129 (31.3)
Gender	
Male	299 (72.6)
Female	113 (27.4)
Race/Ethnicity	
White (non-Hispanic)	170 (41.4)
Black (non-Hispanic)	197 (47.9)
Other	44 (10.7)
Substance abuse history	
Yes	174 (42.2)
No	238 (57.8)
Psychiatric disorder [a]	
Yes	186 (45.1)
No	226 (54.9)
Mental health medication use	
Yes, adherent	219 (53.1)
Yes, non-adherent	67 (16.3)
No	126 (30.6)
Engagement in care coordination	
Not engaged	194 (47.1)
Somewhat engaged	133 (32.3)
Very engaged	85 (20.6)
Baseline HIV viral load	
Detected	95 (23.1)
Not detected or less than 200	317 (76.9)
Baseline PHQ-9 score: mean (SD)	15.9 (4.60)
Baseline PHQ-9 severity	
Moderate [10-14]	196 (47.6)
Moderately severe [15-19]	117 (28.4)
Severe [20-27]	99 (24.0)
Additional chronic conditions (ACC)	
None	108 (26.2)
1	108 (26.2)
2	79 (19.2)
3+	117 (28.4)

PHQ-9 = Patient Health Questionnaire (9-Item).
[a] Psychiatric disorders include posttraumatic stress, generalized anxiety, panic, and/or personality disorders.

status. The prevalence of any or specific ACC by CCM participant characteristics is shown in Table 2.

After 1 year of follow-up, 168 participants (40.8%) responded to treatment as noted by at least a 50% reduction in their follow-up PHQ-9 score. Of these, 91 (22.1%) achieved remission as noted by a PHQ-9 score below 5. The remaining 244 participants (59.2%) neither achieved response nor remission for depression. Overall, rates of follow-up depression status were not significantly different for participants based on the presence or absence of ACC nor were they significantly different based on ACC burden (ie, the total number of specific ACC).

In multivariable analyses modeling a treatment response versus nonresponse, there were no significant differences between individuals with or without specific ACC after adjusting for age, gender, ethnicity, substance abuse history, psychiatric disorders, mental health medication use, engagement in care, baseline HIV viral load, baseline PHQ-9 score, and the remaining specific ACC.

In similar analyses modeling remission versus nonremission across all participants, differences were identified for individuals with MSD or obesity where individuals with MSD were one-half as likely of achieving remission compared to others without MSD (aOR: 0.48; 95% CI: 0.25-0.93), and individuals with obesity were one-third as likely of achieving remission compared to others without obesity (aOR: 0.37; 95% CI: 0.17-0.83). In age-stratified models of remission, differences were only apparent among individuals within the 50 or over age group. Specifically, participants with obesity were significantly less likely of achieving remission compared to other participants without obesity (aOR: 0.15; 95% CI: 0.04-0.64), and individuals with heart disease were significantly less likely of achieving remission compared to others without heart disease (aOR: 0.15; 95% CI: 0.03-0.84). In effect, older adults without obesity or without heart disease were at least 6 times more likely of achieving remission compared to older adults with obesity or heart disease. The impact of ACC on treatment response and remission overall and by age group is shown in Table 3.

DISCUSSION

For CCM participants, the burden of specific ACC had no significant impact on rates of treatment response during the 1-year follow-up period. However, for CCM participants with specific ACC such as obesity, heart disease and/or MSD, we found significantly lower rates of remission (the more stringent outcome) during follow-up. Among these findings, lower rates of remission were not realized within the 18 through 49 age group. This study is unique in that it investigates the impact of ACC on depressive symptoms among CCM enrollees jointly diagnosed with HIV and depression. In contrast to a cross-sectional study, which revealed a positive correlation between the number of chronic conditions and depression, our longitudinal study did not find such an association.[21] Moreover, our finding that obesity reduces the likelihood of remission during the 1-year follow-up period, differs from that of a CCM study of depression management, which found no associations between patient BMI and 6-month depression treatment outcomes.[24] Perhaps the findings of the 2 studies would have been more in parallel had the follow-up been the same and both investigations restricted to the study of PLHIV. Unfortunately, we can only speculate about this possibility.

Our finding of significantly lower rates of remission among adults with MSD is unique in that no other studies of depression management among PLHIV have alluded to this relationship in the past. Although one might surmise such an outcome for MSD considering the positive association between obesity and MSD,[25–27] our results indicate that MSD significantly reduces the likelihood of remission even after adjusting for other ACC, including obesity. Similar to MSD, our finding of significantly lower remission rates among adults age 50 or over with heart disease is unique and may be an artifact of this study as heart disease among younger adults appears to have an opposite, albeit insignificant, effect on remission.

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Table 2. Prevalence of Additional Chronic Conditions (ACC) by CCM Participant Characteristics (N = 412)

	Any ACC		MSD		Hypertension		Obesity		Liver disease		Diabetes		Heart disease		COPD		Cancer		Kidney disease		Other [b]	
	n (%)		n (%)		n (%)		n (%)		n (%)		n (%)		n (%)		n (%)		n (%)		n (%)		n (%)	
Overall	304 (73.8)		119 (28.9)		118 (28.6)		91 (22.1)		46 (11.2)		43 (10.4)		39 (9.5)		26 (6.3)		25 (6.1)		18 (4.4)		187 (45.4)	
Characteristic																						
Age category																						
18-49 years	188 (66.4)	*	67 (23.7)	*	67 (23.7)	*	58 (20.5)		24 (8.5)	*	19 (6.7)	*	17 (6.0)	*	6 (2.1)	*	11 (3.9)	*	8 (2.8)	*	116 (41.0)	*
50+ years	116 (89.9)		52 (40.3)		51 (39.5)		33 (25.6)		22 (17.1)		24 (18.6)		22 (17.1)		20 (15.5)		14 (10.9)		10 (7.8)		71 (55.0)	
Gender																						
Male	209 (69.9)	*	70 (23.4)	*	78 (26.1)	#	42 (14.0)	*	32 (10.7)		27 (9.0)		27 (9.0)		18 (6.0)		21 (7.0)		13 (4.3)		124 (41.5)	*
Female	95 (84.1)		49 (43.4)		40 (35.4)		49 (43.4)		14 (12.4)		16 (14.2)		12 (10.6)		8 (7.1)		4 (3.5)		5 (4.4)		63 (55.8)	
Race/Ethnicity																						
White (non-Hispanic)	129 (75.9)		49 (28.4)		44 (25.9)		33 (19.4)		22 (12.9)		10 (5.9)	*	14 (8.2)		17 (10.0)	*	15 (8.8)	*	8 (4.7)		84 (49.4)	
Black (non-Hispanic)	145 (73.6)		56 (28.8)		65 (33.0)		50 (25.4)		19 (9.6)		27 (13.6)		21 (10.7)		6 (3.1)		5 (2.5)		10 (5.1)		85 (43.2)	
Other	30 (68.8)		14 (31.8)		9 (20.9)		8 (18.2)		5 (11.4)		6 (13.7)		4 (9.1)		3 (6.8)		5 (11.4)		0 (0.0)		18 (40.9)	
Substance abuse history																						
Yes	128 (73.6)		54 (31.0)		52 (29.9)		31 (17.8)	#	23 (13.2)		12 (6.9)	#	16 (9.2)		10 (5.7)		14 (8.0)		6 (3.4)		78 (44.8)	
No	176 (73.9)		65 (27.3)		66 (27.7)		60 (25.2)		23 (9.7)		31 (13.0)		23 (9.7)		16 (6.7)		11 (4.6)		12 (5.0)		109 (45.8)	
Psychiatric disorder [a]																						
Yes	141 (75.8)		66 (35.5)	*	56 (30.1)		48 (25.8)		24 (12.9)		20 (10.8)		19 (10.2)		9 (4.8)		14 (7.5)		8 (4.3)		85 (45.7)	
No	163 (72.1)		53 (23.5)		62 (27.4)		43 (19.0)		22 (9.7)		23 (10.2)		20 (8.9)		17 (7.5)		11 (4.9)		10 (4.4)		102 (45.1)	
Mental health medication use																						
Yes, adherent	172 (78.5)	*	71 (32.4)		65 (29.7)		58 (26.5)	*	28 (12.8)		25 (11.4)		23 (10.5)	*	14 (6.4)		16 (7.3)		9 (4.1)		111 (50.7)	#
Yes, non-adherent	51 (76.1)		20 (29.9)		23 (34.3)		15 (22.4)		8 (11.9)		6 (9.0)		10 (14.9)		4 (6.0)		4 (6.0)		4 (6.0)		26 (38.8)	
No	81 (64.3)		28 (22.2)		30 (23.8)		18 (14.3)		10 (7.9)		12 (9.5)		6 (4.8)		8 (6.3)		5 (4.0)		5 (4.0)		50 (39.7)	
Engagement in care coordination																						
Not engaged	142 (73.2)		59 (30.4)		57 (29.4)		47 (24.2)		19 (9.8)		20 (10.3)		18 (9.3)		15 (7.7)		15 (7.7)		9 (4.6)		92 (47.4)	
Somewhat engaged	99 (74.4)		35 (26.3)		34 (25.6)		27 (20.3)		16 (12.0)		17 (12.8)		13 (9.8)		6 (4.5)		6 (4.5)		5 (3.8)		61 (45.9)	
Very engaged	63 (74.1)		25 (29.4)		27 (31.8)		17 (20.0)		11 (12.9)		6 (7.1)		8 (9.4)		5 (5.9)		4 (4.7)		4 (4.7)		34 (40.0)	
Baseline HIV viral load																						
Detected	61 (64.2)	*	22 (23.2)		20 (21.1)	#	14 (14.7)	*	10 (10.5)		9 (9.5)		9 (9.5)		3 (3.2)		4 (4.2)		3 (3.2)		34 (35.8)	*
Not Detected or Less than 200	243 (76.7)		97 (30.6)		98 (30.9)		77 (24.3)		36 (11.4)		34 (10.7)		30 (9.5)		23 (7.3)		21 (6.6)		15 (4.7)		153 (48.3)	
Baseline PHQ-9 severity																						
Moderate [10-14]	150 (76.5)		52 (26.5)		56 (28.6)		39 (19.9)		14 (7.1)	*	23 (11.7)		17 (8.7)		10 (5.1)		15 (7.7)		10 (5.1)		91 (46.4)	
Moderately severe [15-19]	85 (72.6)		38 (32.5)		34 (29.1)		28 (23.9)		17 (14.5)		12 (10.3)		15 (12.8)		10 (8.5)		4 (3.4)		5 (4.3)		53 (45.3)	
Severe [20-27]	69 (69.7)		29 (29.3)		28 (28.3)		24 (24.2)		15 (15.2)		8 (8.1)		7 (7.1)		6 (6.1)		6 (6.1)		3 (3.0)		43 (43.4)	

MSD: musculoskeletal disease; COPD: chronic obstructive pulmonary disease; PHQ-9: patient health questionnaire (9-Item)
Fisher exact tests were used to compare prevalence rates.
P Values: p < 0.05 (*), p < 0.10 (#).
[a] Psychiatric disorders include posttraumatic stress, generalized anxiety, panic, and/or personality disorders.
[b] Other ACC include hypercholesterolemia, asthma, arthritis, and/or Crohn disease.

Although our study has important findings, we recognize that it also has some limitations. Detail beyond the presence or absence of ACC, such as length of time with illness at baseline or illness severity, was not available for all patients and thus not factored into analyses to assess their impact on outcomes. Additionally, patients varied in the timing and number of PHQ-9 scores provided during follow-up with a minimum of 1 additional measurement required post-baseline to calculate a change in status. To offset this variation, we added engagement in care, which considers the number of planned visits kept and measurements taken, as a control variable in multivariable models. Due to the complications involved in testing and interpreting a massive number of combinations of chronic disease presentations, the impact of joint illness (eg, diabetes and cancer) on response and remission was not considered in multivariable models. Thus, we were limited to considering the impact of each ACC individually on outcomes in light of other potential confounding factors, which included the presence or absence of other specific ACC. Instead, we used the number of ACC as a general assessment of the impact of joint illness or comorbidity on depression management.

Although we chose to stratify our analyses by age group, based on a desire to compare results in the older age group to other studies that exclusively studied individuals age 50 or over, stratification based on gender and/or ethnicity was not carried out. This was primarily due to concerns of sample size and over testing, thus prohibiting us from evaluating differences in response and remis-

Table 3. The Impact of Additional Chronic Conditions (ACC) on Depression Outcomes

	Response[b]						Remission[c]					
	Overall		Ages 18-49		Ages 50+		Overall		Ages 18-49		Ages 50+	
ACC [a]	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI
MSD	0.69	(0.42-1.16)	0.83	(0.43-1.61)	0.74	(0.30-1.81)	0.48	(0.25-0.93)	0.46	(0.18-1.19)	0.69	(0.24-1.99)
Hypertension	1.18	(0.71-1.98)	1.48	(0.76-2.87)	0.85	(0.33-2.22)	1.34	(0.72-2.51)	1.80	(0.77-4.21)	1.50	(0.51-4.39)
Obesity	0.63	(0.35-1.13)	0.88	(0.42-1.84)	0.38	(0.13-1.14)	0.37	(0.17-0.83)	0.62	(0.22-1.76)	0.15	(0.04-0.64)
Liver disease	0.94	(0.48-1.87)	1.21	(0.48-3.04)	0.74	(0.23-2.39)	1.26	(0.55-2.90)	1.64	(0.52-5.12)	0.71	(0.17-2.99)
Diabetes	1.30	(0.62-2.74)	0.72	(0.24-2.22)	2.81	(0.74-9.46)	1.35	(0.55-3.33)	0.84	(0.20-3.45)	1.68	(0.42-6.66)
Heart disease	0.81	(0.38-1.76)	1.30	(0.42-4.04)	0.57	(0.18-1.86)	0.53	(0.19-1.47)	1.64	(0.41-6.57)	0.15	(0.03-0.84)
COPD	0.44	(0.17-1.14)	0.28	(0.02-3.56)	0.54	(0.16-1.79)	1.18	(0.41-3.41)	1.00	(0.06-16.13)	1.52	(0.41-5.63)
Cancer	1.17	(0.46-2.96)	1.71	(0.43-6.76)	0.72	(0.18-2.92)	2.07	(0.75-5.73)	4.56	(0.88-23.52)	1.26	(0.26-6.00)
Kidney disease	0.92	(0.33-2.60)	0.45	(0.08-2.45)	1.60	(0.34-7.51)	0.95	(0.29-3.18)	0.36	(0.04-3.36)	1.53	(0.28-8.23)
Other [d]	0.92	(0.59-1.44)	0.74	(0.42-1.31)	1.95	(0.80-4.80)	0.84	(0.48-1.46)	0.57	(0.27-1.21)	1.37	(0.51-3.68)

MSD: musculoskeletal disease, COPD: chronic obstructive pulmonary disease; aOR: adjusted odds ratio; CI: confidence interval.
All models adjust for gender, ethnicity, substance abuse history, psychiatric disorder, mental health medication use, engagement in care, baseline HIV viral load, baseline PHQ-9 score, and other ACC. Overall models also adjust for age.
[a] The reference category for each aOR estimate and 95% CI is the absence of the corresponding condition.
[b] Response refers to a PHQ-9 score reduction ≥50% (Reference = "No response").
[c] Remission refers to a PHQ-9 score <5, which implies Response (Reference = "No remission").
[d] Other ACC include hypercholesterolemia, asthma, arthritis, and/or Crohn disease.

sion for subgroups of individuals based on these characteristics alone or jointly with age. Lastly, the results of our study are limited to individuals enrolled in evidence-based CCM programs where proactive efforts are made to manage depression for the purposes of reducing morbidity and premature mortality. Consequently, the results of this study may not be generalizable to depressed PLHIV with additional chronic conditions who are not enrolled in these programs.

Despite these limitations, our findings clearly suggest that obese individuals within our CCM program face challenges managing depression as participants with obesity were less likely to achieve remission. Unfortunately, recent studies have linked weight gain to ART.[28–30] This poses a dilemma to PLHIV who must adhere to ART regimens to sustain life but struggle with health issues such as depression resulting from their ART-related weight gain. Behavioral activation interventions, which have been shown to successfully address issues of depression and obesity may be useful for obese PLHIV in CCM programs.[31,32]

Similar to obesity, MSD affects physical mobility, a factor which might partially explain lower rates of remission among adults diagnosed with MSD. Nevertheless, the significance of these lower rates, as well as those among adults age 50 or over with heart disease, will require further investigation. Overall, it is evident that management of multiple chronic conditions can become extremely complex given their combined impact on a person's physical and mental wellbeing and on the various therapies and interventions required to control each condition. This is of particular importance for PLHIV suffering from depression and other chronic conditions who, at the least, must remain adherent to ART to extend their length of life. To that end, barriers to ART adherence among PLHIV that involve comanaging depression and other chronic conditions must be fully investigated in areas such as Cuyahoga County, Ohio, that have been severely burdened with the HIV/AIDS epidemic.

PUBLIC HEALTH IMPLICATIONS

Drastic decreases in HIV/AIDS-related mortality and corresponding increases in life expectancy have been realized among PLHIV since the advent of ART. More people today are living with the HIV virus than ever before. Nevertheless, quality and duration of life remain an issue, as PLHIV have a higher prevalence of comorbidity compared to HIV-naïve persons, comorbidity increases with age, and comorbidity burden is associated with increased mortality. This is of relevance considering that 50% of PLHIV today are over the age of 50, and 70% of PLHIV are expected to be over the age of 50 by year 2030.[33] Given these realities, public health is faced with the challenge of ensuring that members of this growing, older PLHIV population remain in care and remain virally suppressed.

Treat, 1 of the 4 pillars of the EHE, involves establishing support for retention in care and adherence to HIV medication to prevent AIDS-related mortality among PLHIV and transmission of the HIV virus to others. The findings of this study, conducted in 1 of EHE's high-priority counties, suggest it is harder for older adult PLHIV with chronic conditions such obesity or heart disease to experience remission of depressive symptoms. The generalizability of these results should be investigated in studies of other EHE high-priority areas; and if validated, public health programs that target PLHIV should seek to identify these subpopulations for the purpose of assessing their mental health as it relates to retention in HIV care and ART adherence.

REFERENCES

1. Ohio Department of Health. *Ohio HIV Surveillance Summary.*; 2021. https://odh.ohio.gov/know-our-programs/hiv-aids-surveillance-program/resources/ohio-hiv-surveillance-summary
2. Dutra BS, Lédo AP, Lins-Kusterer L, Luz E, Prieto IR, Brites C. Changes health-related quality of life in HIV-infected patients following initiation of antiretroviral therapy: a longitudinal study. *Brazilian J Infect Dis*. 2019;23(4):211-217. https://doi.org/10.1016/j.bjid.2019.06.005
3. Conway B. The role of adherence to antiretroviral therapy in the management of HIV infection. *J Acquir Immune Defic Syndr*. 2007;45 (Supplement 1):S14-S18. https://doi.org/10.1097/QAI.0b013e3180600766
4. Teeraananchai S, Kerr SJ, Amin J, et al. Life expectancy of HIV-positive people after starting combination antiretroviral therapy: a meta-analysis. *HIV Med*. 2017;18(4):256-266. https://doi.org/10.1111/hiv.12421
5. Palella FJ, Delaney KM, Moorman AC, et al. Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. *N Engl J Med*. 1998;338(13):853-860. https://doi.org/10.1056/NEJM199803263381301
6. Mannheimer SB, Matts J, Telzak E, et al. Quality of life in HIV-infected individuals receiving antiretroviral therapy is related to adherence. *AIDS Care*. 2005;17(1):10-22. https://doi.org/10.1080/09540120412331305098
7. Arseniou S, Arvaniti A, Samakouri M. HIV infection and depression. *Psychiatry Clin Neurosci*. 2014;68(2):96-109. https://doi.org/10.1111/pcn.12097
8. Cholera R, Pence BW, Bengtson AM, et al. Mind the gap: gaps in antidepressant treatment, treatment adjustments, and outcomes among patients in routine HIV care in a multisite U.S. clinical cohort. *PLoS One*. 2017;12(1):e0166435-e0166435. https://doi.org/10.1371/journal.pone.0166435
9. Do AN, Rosenberg ES, Sullivan PS, et al. Excess burden of depression among HIV-infected persons receiving medical care in the United States: data from the Medical Monitoring Project and the Behavioral Risk Factor Surveillance System. Zheng JC, ed. *PLoS One*. 2014;9 (3):e92842. https://doi.org/10.1371/journal.pone.0092842
10. Hernandez D, Kalichman SC, Katner HP, Burnham K, Kalichman MO, Hill M. Psychosocial complications of HIV/AIDS-metabolic disorder comorbidities among patients in a rural area of southeastern United States. *J Behav Med*. 2018;41(4):441-449. https://doi.org/10.1007/s10865-018-9912-0
11. Pence BW, Mills JC, Bengtson AM, et al. Association of increased chronicity of depression with HIV appointment attendance, treatment failure, and mortality among HIV-infected adults in the United States. *JAMA psychiatry*. 2018;75(4):379-385. https://doi.org/10.1001/jamapsychiatry.2017.4726
12. Gokhale RH, Weiser J, Sullivan PS, Luo Q, Shu F, Bradley H. Depression prevalence, antidepressant treatment status, and association with sustained HIV viral suppression among adults living with HIV in care in the United States, 2009–2014. *AIDS Behav*. Published online 2019. https://doi.org/10.1007/s10461-019-02613-6
13. Uthman OA, Magidson JF, Safren SA, Nachega JB. Depression and adherence to antiretroviral therapy in low-, middle- and high-income countries: a systematic review and meta-analysis. *Curr HIV/AIDS Rep*. 2014;11(3):291-307. https://doi.org/10.1007/s11904-014-0220-1
14. Gonzalez JS, Batchelder AW, Psaros C, Safren SA. Depression and HIV/AIDS treatment nonadherence: a review and meta-analysis. *J Acquir Immune Defic Syndr*. 2011;58(2):181-187. https://doi.org/10.1097/QAI.0b013e31822d490a
15. So-Armah K, Gupta SK, Kundu S, et al. Depression and all-cause mortality risk in HIV-infected and HIV-uninfected US veterans: a cohort study. *HIV Med*. 2019;20(5):317-329. https://doi.org/10.1111/hiv.12726
16. Curran GM, Pyne J, Fortney JC, et al. Development and implementation of collaborative care for depression in HIV clinics. *AIDS Care*. 2011;23 (12):1626-1636. https://doi.org/10.1080/09540121.2011.579943
17. Hernández I, Barzallo J, Beltrán S, et al. Increased incidences of noninfectious comorbidities among aging populations living with human immunodeficiency virus in Ecuador: a multicenter retrospective analysis. *HIV AIDS (Auckl)*. 2019;11:55-59. https://doi.org/10.2147/HIV.S193412
18. Rodríguez-Díaz CE, Santiago-Rodríguez EI, Jovet-Toledo GG, et al. Comorbidities in a sample of adults with HIV in Puerto Rico: an exploratory study. *HIV AIDS (Auckl)*. 2019;11:155-164. https://doi.org/10.2147/HIV.S204985
19. Burnam MA, Bing EG, Morton SC, et al. Use of mental health and substance abuse treatment services among adults with HIV in the United States. *Arch Gen Psychiatry*. 2001;58(8):729-736. https://doi.org/10.1001/archpsyc.58.8.729
20. Berger-Greenstein JA, Cuevas CA, Brady SM, Trezza G, Richardson MA, Keane TM. Major depression in patients with HIV/AIDS and substance abuse. *AIDS Patient Care STDS*. 2007;21(12):942-955. https://doi.org/10.1089/apc.2006.0153
21. Havlik RJ, Brennan M, Karpiak SE. Comorbidities and depression in older adults with HIV. *Sex Health*. 2011;8(4):551. https://doi.org/10.1071/SH11017
22. Serrão R, Piñero C, Velez J, et al. Non-AIDS-related comorbidities in people living with HIV-1 aged 50 years and older: The AGING POSITIVE study. *Int J Infect Dis*. 2019;79:94-100. https://doi.org/10.1016/j.ijid.2018.10.011
23. McNulty K. *Handbook of Regression Modeling in People Analytics*. Chapman and Hall/CRC; 2021. https://doi.org/10.1201/9781003194156
24. Angstman KB, Wade TW, DeJesus RS, Rundell JR, Altrichter PM. Patient body mass index does not predict six-month clinical outcome of depression managed under collaborative care. *J Prim Care Community Health*. 2012;4(2):119-123. https://doi.org/10.1177/2150131912454012
25. Anandacoomarasamy A, Caterson I, Sambrook P, Fransen M, March L. The impact of obesity on the musculoskeletal system. *Int J Obes*. 2008;32(2):211-222. https://doi.org/10.1038/sj.ijo.0803715
26. Kortt M, Baldry J. The association between musculoskeletal disorders and obesity. *Aust Heal Rev*. 2002;25(6):207. https://doi.org/10.1071/AH020207
27. Wearing SC, Hennig EM, Byrne NM, Steele JR, Hills AP. Musculoskeletal disorders associated with obesity: a biomechanical perspective. *Obes*

Rev. 2006;7(3):239-250.
https://doi.org/10.1111/j.1467-789X.2006.00251.x

28. Ruderman SA, Crane HM, Nance RM, et al. Brief report: weight gain following ART initiation in ART-naïve people living with HIV in the current treatment era. *J Acquir Immune Defic Syndr*. 2021;86(3):339-343.
https://doi.org/10.1097/QAI.0000000000002556
29. Koethe JR, Jenkins CA, Lau B, et al. Rising obesity prevalence and weight gain among adults starting antiretroviral therapy in the United States and Canada. *AIDS Res Hum Retroviruses*. 2016;32(1):50-58.
https://doi.org/10.1089/aid.2015.0147
30. Stires H, LaMori J, Chow W, et al. Weight gain and related comorbidities following antiretroviral initiation in the 2000s: a systematic literature review. *AIDS Res Hum Retroviruses*. 2021;37(11):834-841.
https://doi.org/10.1089/aid.2020.0216
31. Pagoto S, Bodenlos JS, Schneider KL, Olendzki B, Spates CR, Ma Y. Initial investigation of behavioral activation therapy for co-morbid major depressive disorder and obesity. *Psychotherapy (Chic)*. 2008;45(3):410-415.
https://doi.org/10.1037/a0013313
32. Pagoto S, Schneider KL, Whited MC, et al. Randomized controlled trial of behavioral treatment for comorbid obesity and depression in women: the Be Active Trial. *Int J Obes*. 2013;37(11):1427-1434.
https://doi.org/10.1038/ijo.2013.25
33. Wing EJ. The aging population with HIV infection. *Trans Am Clin Climatol Assoc*. 2017;128:131-144.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5525433/

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RESEARCH ARTICLE

COVID-19 Vaccine Hesitancy by Smoking Status Among Ohio Adults

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ABSTRACT

Background: Research in other countries and limited findings in the United States suggest that adults who smoke are less likely to get COVID-19 vaccines. The objective of this study was to examine vaccine hesitancy by smoking status in Ohio.

Methods: We performed a secondary analysis of multiple 8-week waves of the Ohio COVID-19 Survey (OCS) from March 2021 to July 2022. The OCS participants comprised a subsample from the 2019 Ohio Medicaid Assessment Survey, a statewide health survey. After the COVID-19 vaccine was available, participants were asked about vaccination status and, among those not vaccinated, vaccine intentions. To compare vaccine hesitancy by smoking status, multivariable survey-weighted logistic regression models were fit, adjusted for potential confounders. Reason for vaccine hesitancy was asked using an open-ended question; data were coded and analyzed descriptively.

Results: Adults who smoked, compared to those who never smoked, had significantly higher odds of being vaccine hesitant between March and April 2021, June and August 2021, October and November 2021, and May and July 2022, with odds ratios ranging from 1.60 to 2.44. Reasons for vaccine hesitancy were not different by smoking status.

Conclusion: Although the difference in hesitancy by smoking status was attenuated after December 2021, coinciding with an increase in cases, evidence from summer 2022 indicates that adults who smoked continued to display vaccine hesitancy. These results have implications for COVID-19-related outcomes and more research is needed to understand reasons for vaccine hesitancy, which could also serve to educate adults who smoke about vaccination for other diseases.

Keywords: COVID-19; Vaccine hesitancy; Smoking; Survey research

INTRODUCTION

The COVID-19 pandemic has brought unprecedented changes in the daily lives of people across the world due to loss of lives, deteriorating physical and mental health, an economic downturn, lack of mobility, and restricted social activities. Amidst the crisis, the development of efficacious vaccines has given the hope of returning to normalcy. Yet, vaccines are most effective in protecting populations when a sufficient number of people are vaccinated.[1,2] In addition, vaccinating high-risk individuals is an important goal.[3] One such high-risk group is tobacco users.

Smoking and COVID-19

The associations between tobacco use and COVID-19 infection and severity have been examined in several studies, with mixed results. For example, in the largest study to date, with over 2 million individuals, Young-Wolff and colleagues reported that current

smoking was associated with lower adjusted rates of COVID-19 infection, hospitalization, ICU admission, and death.[4] Additionally, Simons et al found that individuals who smoked, compared to those who never smoked, had a 26% reduced risk of COVID-19 infection.[5]

Prior literature, however, suggests that there are associations between smoking and risks for symptomatic and severe COVID-19. In a meta-analysis of studies examining smoking and COVID-19 risk, Gülsen and colleagues estimated a 1.5-fold increased risk of symptoms, ICU admission, and mortality among adults who smoked compared to those who never smoked.[6] Former smokers also appear to be at risk for severe COVID-19. In 1 study, veterans who formerly smoked had an increased 30-day mortality risk following COVID-19 infection compared with those who currently smoked and those who never smoked.[7]

The intensity of tobacco use, measured by frequency of use or dual use, appears to increase the risk for symptomatic COVID-19.[8] In a study of adolescent and young adults, dual cigarette and e-cigarette users were 6.8 times as likely to be diagnosed with COVID-19 and 4.7 times as likely to experience COVID-19 symptoms compared to nonusers.[9] In another study of college students, use of multiple tobacco products was associated with 2-fold to 3-fold increased odds of COVID-19 symptoms and diagnosis.[10,11]

Smoking and Vaccine Hesitancy

Because of risks for COVID-19 illness, smokers should be encouraged to get vaccinated to prevent severe COVID-19. However, compared to those who never smoked, those who currently smoke have been found in the past to be vaccine hesitant in general.[12,13] Studies examining hesitancy toward the COVID-19 vaccine are beginning to emerge.[14-17] Jackson et al reported that in the United Kingdom, those who currently smoked were 1.5 to 2 times more hesitant to get the COVID-19 vaccine than those who formerly smoked or never smoked, respectively, with lack of trust and beliefs about corporate profiteering from vaccines being major reasons for vaccine hesitancy.[15] Vaccine hesitancy was also 1.8 times as high among those who smoked in Hong Kong.[16] In Israel, adults who currently smoked had a 10% lower odds of receiving the COVID-19 vaccine compared to nonsmokers.[17] Data from the United States (US) are limited. During the initial rollout of the COVID-19 vaccine in the US (December 2020 – January 2021), Yang and colleagues found no difference in hesitancy between people who smoked or vaped versus nonsmokers or vapers.[14]

Current Study

Vaccine hesitancy is a threat to public health in the US, particularly with the variants that started surging during summer of 2021 and the concern about future variants.[18,19] Vaccine uptake is a critical component of an infectious disease control plan for populations. At the individual level, vaccines are key to preventing severe COVID-19, as unvaccinated individuals are more likely to be hospitalized and die from COVID-19.[20,21] People who smoke are at higher risk for chronic respiratory conditions, such as asthma, chronic obstructive pulmonary disease, and lung cancer.[22] Because their lungs are already vulnerable to disease, adults who smoke should be targeted with additional rigor through public health initiatives, like vaccine drives, or their health care providers to promote vaccine uptake.

To examine trends in vaccine hesitancy among smokers versus nonsmokers in Ohio, we examined data from the Ohio COVID-19 Survey (OCS). The OCS was an ongoing surveillance survey, fielded in biweekly samples, that was representative of adults aged 19 years and over in Ohio and ran from April 2020 through December 2022. The OCS monitored COVID-19 infection and testing, vaccination behavior, and social distancing, as well as employment and insurance status, financial security, and other important physical and mental health outcomes. This study focused on trends in vaccine hesitancy by smoking status in Ohio. We hypothesize that adults who smoke would be more vaccine-hesitant than adults who never smoked. A second objective is to identify reasons for vaccine hesitancy overall and by smoking status.

METHODS

Participants

This study is a secondary data analysis of multiple waves of the OCS. The OCS participants comprise a subsample from the 2019 Ohio Medicaid Assessment Survey (OMAS), a state-level periodic survey that assesses health care access and the health status of Ohio's population, and is weighted to be representative at the statewide and Ohio regional levels.[23] While the survey name includes "Medicaid," respondents were not limited to those enrolled in Medicaid. The 2019 OMAS was designed as a stratified random digit dial telephone (landlines and cell phones) survey which interviewed approximately 32 000 Ohio adults from July to December 2019. The 26 660 OMAS participants who had agreed to be recontacted comprised the sampling frame for the OCS. The OCS targeted 650 interviews for each biweekly sample.

Procedures

The OCS was designed as a rotational panel with weekly samples starting on April 20, 2020. Beginning on September 8, 2020, biweekly samples were fielded. After releasing a rotational sample every other Monday, sample members were sent a series of text messages and emails (if available) with a link to complete the survey by web. If there was no response from the sample member, text/email reminders were followed by calls made by interviewers to complete the survey by phone. The survey took approximately 10 minutes to complete. Survey weights were adjusted to correct for potential panel selection bias so that the design-based weight for each OCS participant fully represents the state population and subpopulations within the state. These weights were recalibrated to the CDC's COVID-19 administrative data vaccine totals for Ohio to further correct for survey nonresponse. The in-

stitutional review board at The Ohio State University determined the secondary use of OCS data to be exempt.

Measures

The primary dependent variable for this analysis was vaccine hesitancy. Beginning in January 2021, after the US Food and Drug Administration (FDA) had approved the Pfizer vaccine for emergency use, the OCS included the following question about COVID-19 vaccine uptake, "Have you ever received a COVID-19 vaccine?" For those who had not yet received the vaccine, there was a follow-up question, "When a COVID-19 vaccine is available to you, how likely are you to get it?" A 4-point response scale of "not likely at all," "not too likely," "somewhat likely," and "very likely" was given. Those who responded 'somewhat likely' or 'very likely' were categorized as nonhesitant whereas those responding 'not too likely' or 'not likely at all' were categorized as vaccine hesitant.

The secondary dependent variable for this analysis was the reason/reasons for vaccine hesitancy. If a participant indicated they were 'not too likely' or 'not likely at all' to receive the COVID-19 vaccine, they were then asked, "In one sentence please explain why you would not get the COVID-19 vaccine." Prior to independent coding, research assistants were trained on how to code the open-ended responses. Several practice rounds were completed. After the coders reached good reliability (Krippendorff's alpha > 0.80), two trained research assistants independently coded each open-ended response for as many themes that were present in the quote. After that, they met and compared responses and discussed any disagreements. Following the discussion, final codes were assigned. The following themes were coded: safety concerns, anti-vaccination feelings in general, lack of trust in the government, concerns about other comorbidities, belief that vaccine is not needed because COVID-19 is not severe or that a prior infection means one does not need the vaccine, vaccine shot may be painful, concerns about access, or other response that does not fit into any of the predetermined themes.

The main independent variable of interest was smoking status of the participants. To identify whether participants were smokers, we relied on their responses to questions about smoking on the 2019 OMAS. We classified the participants as current smokers (smoked at least 100 cigarettes in their lifetime and currently smoked every day or some days), former smokers (smoked at least 100 cigarettes in their lifetime and currently smoked no days at all), and never smokers (did not smoke at least 100 cigarettes in their lifetime).

The other independent variables included in the models were county type (rural Appalachian, rural non-Appalachian, metropolitan, and suburban), age (in years), gender, education status (dichotomized as no college degree and college or above), race and ethnicity (non-Hispanic White, non-Hispanic Black, other), and poverty level (dichotomized as below and at-or-above 138% of the federal poverty level (FPL)).

Analysis

For the primary analysis, data from March 08, 2021, to July 26, 2022, were analyzed, which comprised 9 waves of data collection. For our analysis, we used survey-weighted multivariable logistic regression models to estimate odds ratios (ORs) for the association between smoking and vaccine hesitancy. Models were adjusted for age, gender, race and ethnicity, county type, educational attainment, and poverty level. Confounder identification was conducted using a directed acyclic graph. All analyses accounted for the complex sampling design of the OCS and sampling weights were adjusted when pooling multiple weeks of data. A 2-sided p-value less than 0.05 indicated statistical significance. We ran the analysis on R (Version 4.1.2).[24]

For the secondary analysis of reasons for hesitancy, wave 7, which corresponds to August 9, 2021, through October 3, 2021, was selected to examine the reasons for vaccine hesitancy. To examine the secondary outcome, we compared the reasons for vaccine hesitancy by smoking status using chi-square tests that were corrected for multiple testing using the Bonferroni-Holm method.

RESULTS

Demographic characteristics of participants were consistent across waves (Table 1). The average age of respondents was approximately 42 years, about half were male, approximately 70% of respondents were non-Hispanic White, nearly 30% had at least some college education, between 24% and 29% lived below the FPL, and more than 56% lived in metropolitan areas. COVID-19 vaccination increased from 26.4% in the March 8 to April 18, 2021, period to 75% in the May 16 to July 26, 2022, period. Vaccine hesitancy ranged from approximately 29% to 39%.

Adults who smoked, compared to those who never smoked, had significantly higher odds of being vaccine hesitant in 3 of 6 waves between early March 2021 and late November 2021 (Table 2). These periods coincided with a generally increasing trend in COVID-19 cases in Ohio (Figure 1). December 2021 and January 2022 were characterized by large increases in COVID-19 cases in Ohio, and we did not observe a significant difference in vaccine hesitancy between smokers and nonsmokers. We also did not observe differences coinciding with the decrease in cases between late-January and April 2022. However, adults who smoked had significantly higher odds of being vaccine hesitant between May and July 2022. We did not find a statistically significant difference between adults who formerly smoked and those who never smoked in vaccine hesitancy except for the period between May and June 2022 (Table 2, Figure 1).

Reasons for vaccine hesitancy did not differ significantly by smoking status (Figure 2). Among the 394 vaccine hesitant individuals, most reported being hesitant because of concerns about the vaccine being too new or unsafe, concerns about other comorbidities which could interfere with the vaccine, lack of trust in the govern-

Table 1. Weighted Demographic Characteristics of OCS Sample at Each Wave of Data Collection

	3/8 – 4/18/21 (n = 1262)	4/19 - 6/13/21 (n = 1687)	6/14– 8/8/21 (n = 1773)	8/9 – 10/3/21 (n = 1792)	10/4 - 11/28/21 (n = 1635)	11/29/21 -1/23/22 (n = 1726)	1/24 - 3/20/22 (n = 1668)	3/21 - 5/15/22 (n = 1768)	5/16 - 7/26/22 (n = 1337)
Age (mean [SD])[a]	41.7 [13.5]	41.8 [13.6]	41.8 [13.6]	41.8 [13.6]	41.9 [13.5]	41.9 [13.5]	41.9 [13.7]	41.9 [13.4]	41.9 [13.5]
Race/Ethnicity[a]									
Non-Hispanic White	78.3%	78.5%	78.5%	77.3%	78.5%	78.0%	78.3%	78.0%	78.0%
Non-Hispanic Black	13.2%	12.9%	13.0%	14.1%	12.5%	13.1%	12.6%	12.9%	12.8%
Other	8.5%	8.6%	8.5%	8.6%	9.0%	8.9%	9.1%	9.1%	9.2%
Gender[a]									
Male	49.2%	49.1%	49.2%	49.1%	48.7%	48.9%	48.6%	48.9%	49.0%
Female	50.8%	50.9%	50.8%	50.9%	51.3%	51.1%	51.4%	51.1%	51.0%
Education[a]									
College or above	30.2%	29.3%	29.1%	30.4%	29.5%	29.7%	29.9%	29.6%	29.9%
High school or less	69.8%	70.7%	70.9%	69.6%	70.5%	70.3%	70.1%	70.4%	70.1%
Federal poverty level[a]									
Below	27.9%	29.8%	28.9%	28.7%	28.7%	24.8%	24.9%	26.2%	24.2%
At or above	72.1%	70.2%	71.1%	71.3%	71.3%	75.2%	75.1%	73.8%	75.8%
County type[b]									
Rural Appalachian	14.6%	15.2%	15.3%	13.8%	15.0%	14.3%	14.8%	14.4%	14.2%
Rural non-Appalachian	11.5%	11.3%	12.1%	12.9%	12.6%	12.8%	12.5%	13.3%	12.1%
Suburban	16.7%	16.5%	15.8%	16.3%	16.2%	16.1%	15.9%	15.6%	15.6%
Metropolitan	57.2%	57.0%	56.8%	57.0%	56.2%	56.8%	56.8%	56.7%	58.1%
Smoking status[a]									
Never	54.1%	56.1%	54.4%	53.8%	53.3%	55.6%	55.8%	57.3%	56.8%
Current	24.7%	23.5%	25.5%	26.1%	27.1%	22.9%	24.2%	22.8%	22.7%
Former	21.1%	20.4%	20.1%	20.1%	19.6%	21.5%	20.0%	20.0%	20.5%
Vaccine status[b]									
Yes	26.4%	46.7%	53.0%	57.6%	61.3%	64.8%	67.1%	67.7%	67.4%
No	73.6%	53.3%	47.0%	42.4%	38.7%	35.2%	32.9%	32.3%	32.6%
Vaccine hesitancy[b]									
Yes	37.5%	38.9%	38.5%	34.4%	33.7%	30.1%	29.0%	30.8%	31.2%
No	62.5%	61.1%	61.5%	65.6%	66.3%	69.9%	71.0%	69.2%	68.8%

[a] Source of data: 2019 Ohio Medicaid Assessment Survey.
[b] Source of data: Ohio COVID-19 Survey.

Table 2. Adjusted Odds Ratios (ORs)[a] and 95% Confidence Intervals for Vaccine Hesitancy Associated with Smoking Status at Each Wave of Data Collection

	Smoking status		
OCS wave	**Never (Ref)**	**Former**	**Current**
3/8 – 4/18/21	1.0	1.26 (0.78, 2.04)	**1.98 (1.18, 3.31)**
4/19 – 6/13/21	1.0	1.09 (0.69, 1.70)	1.47 (0.91, 2.38)
6/14 – 8/8/21	1.0	1.00 (0.64, 1.57)	**1.60 (1.04, 2.45)**
8/9 – 10/03/21	1.0	1.21 (0.76, 1.95)	1.27 (0.79, 2.04)
10/04 – 11/28/21	1.0	1.37 (0.85, 2.19)	**1.73 (1.06, 2.82)**
11/29/21 – 1/23/22	1.0	1.34 (0.85, 2.12)	1.37 (0.81, 2.32)
1/24 – 3/20/22	1.0	1.41 (0.85, 2.34)	1.28 (0.74, 2.20)
3/21 – 5/15/22	1.0	1.55 (0.96, 2.52)	1.46 (0.88, 2.44)
5/16 – 7/26/22	1.0	**2.71 (1.58, 4.62)**	**2.44 (1.40, 4.26)**

[a] Boldfaced ORs and Confidence Intervals indicate statistically significant results.

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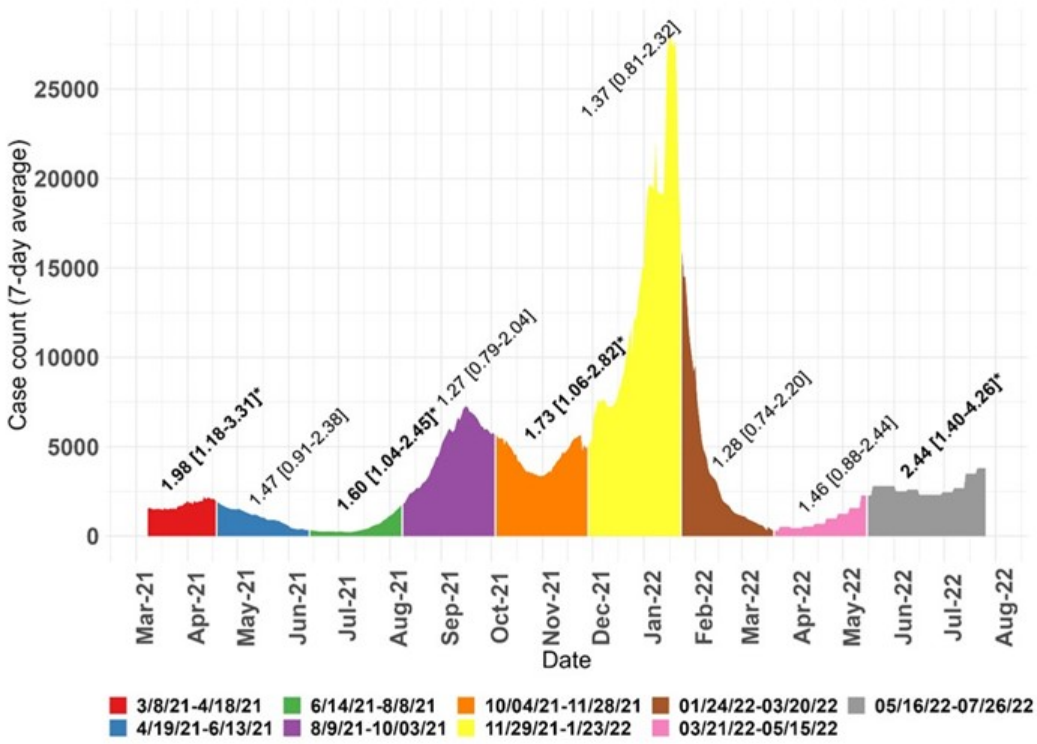

The y-axis of the plot is the 7-day average for COVID-19 case counts for Ohio obtained from the CDC (https://www.nytimes.com/interactive/2023/us/ohio-covid-cases.html).
Colors indicate each wave of the OCS with annotated odds ratio and confidence intervals for the association between smoking and vaccine hesitancy across each wave.

Figure 1. Odds Ratios and 95% Confidence Intervals Comparing Ohio Smokers to Nonsmokers with Respect to Vaccine Hesitancy Over Time, Superimposed Over New Daily COVID-19 Case Counts

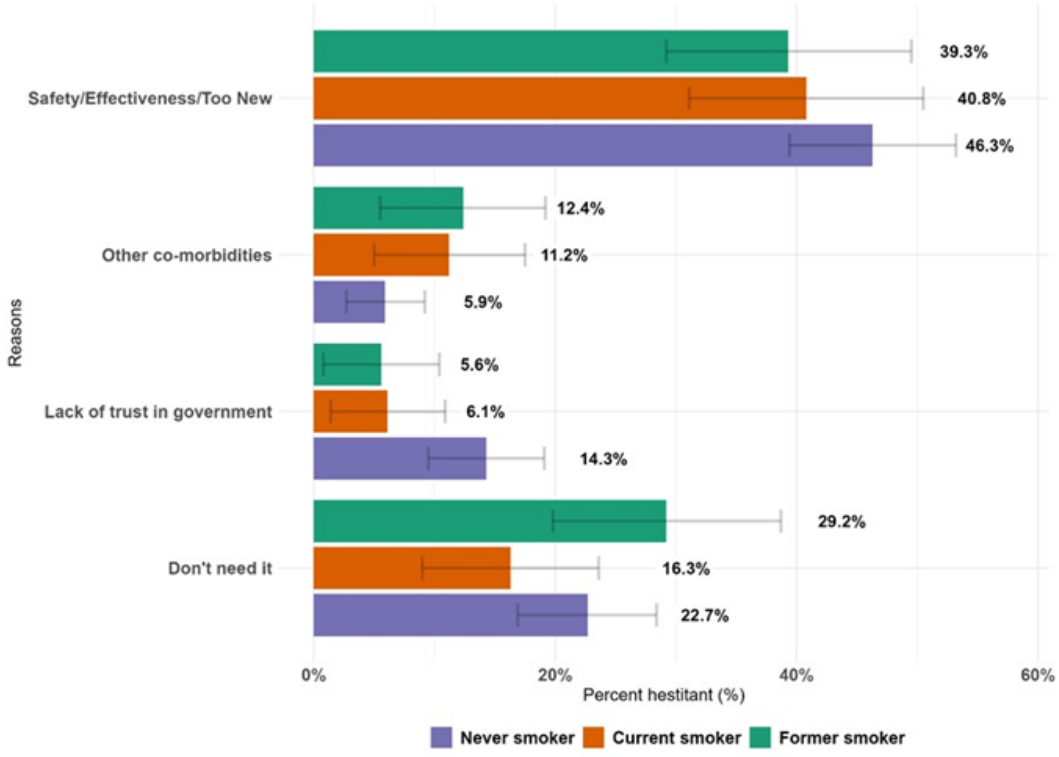

Figure 2. Reported Reasons for Vaccine Hesitancy (8/9/2021 to 10/3/2021)

ment, or a belief that the vaccine was not needed. Sample quotes from these codes are the following:

Vaccine is too new and unsafe:

> *Not enough research has been done; still isn't working for those who have gotten it. I don't trust the system.*
>
> *I don't think they actually know what they're doing it's possible they're giving us COVID-19 or other things. They've made it way too fast.*

Other comorbidities interfere with the vaccine:

> *I have an autoimmune disease and I am also having other issues that they think might be due to COVID.*
>
> *Not ready yet. I have other health issues, and do not want to chance on side effects.*

Lack of trust in the government:

> *My trust is in God not the government.*
>
> *Don't trust the current government. People with the shot are still getting COVID and dying.*

COVID-19 vaccine is not needed:

> *I have no need I am healthy and will be fine.*
>
> *I don't need to because I work from home. I have already had COVID.*

DISCUSSION

We investigated whether adults who smoked and those who did not smoke differed with respect to COVID-19 vaccine hesitancy over a period shortly following expanded vaccine rollout in March 2021 through the summer months of 2022. We found some evidence that in Ohio, adults who smoked were more hesitant to get the COVID-19 vaccine during certain points in the pandemic. The significant difference in vaccine hesitancy based on smoking status mostly coincided with periods of relatively lower COVID-19 cases in Ohio prior to the peak in infections in December 2021 and January 2022.

Consistent with our findings across periods when the vaccine was available to all adults and most children, a study by Shkalim Zemer and colleagues found that Israeli adults who smoked were less likely to receive a COVID-19 vaccine[17] during the time when it was widely available. However, the differences across smoking status we saw across the early months following vaccine rollout were contrary to a finding by Yang and colleagues who reported that at the initial rollout, adults in the US who smoked were not significantly more hesitant compared to those who did not smoke.[14] It is important to note that during the early months of 2021, the eligibility for receiving the COVID-19 vaccines was limited to health care workers and a few other groups.[25] Thus, "hesitancy" was more of a theoretical behavior. It is important to highlight the finding that vaccine hesitancy was significantly greater among smokers during summer 2022. This finding could suggest that COVID-19 vaccine hesitancy is lingering in some groups, such as adults who smoke. Public health professionals should continue to focus vaccination efforts on this group of high-risk individuals.

As COVID-19 continues to cause hospitalizations and deaths in the US, it is important to track vaccine hesitancy to understand which vulnerable groups might need further intervention to promote receipt of 1 of the highly effective COVID-19 vaccines. Adults who smoke are 1 such vulnerable group, as most (but not all) studies have demonstrated that they are at increased risk for severe COVID-19 outcomes.[4-11] Our novel finding that the reasons for being hesitant do not differ by smoking status is important because it suggests that efforts to target hesitant individuals, in general, may not need to be tailored based on smoking status, and instead might focus on other demographic characteristics. The most prominent concern about the COVID-19 vaccine in the OCS was that the vaccine is too new and thus has not been tested enough for safety and effectiveness. This finding is generally supported by other studies which find that concerns about the safety of vaccines, anxiety about efficacy, and a desire for more information, are some of the primary drivers of COVID-19 vaccine hesitancy among adults in China, Portugal, Italy, and the US.[26-30] Another common concern in the OCS was a belief that the vaccine is not needed because COVID-19 is not severe or a misunderstanding that the vaccine is not needed if a person has already had COVID-19. This latter concern, which appears to be driven by misinformation and poor health literacy, is also supported by survey research in the US that finds that the degree of threat perception around the virus is associated with vaccine hesitancy.[31] The prevalent role of fear and misinformation around the COVID-19 vaccines among vaccine hesitant Ohioans indicates the importance of targeting public health education campaigns to address these concerns in particular.

There are many strengths to this study. First, it included data covering a period of 17 months from March 2021 up until the summer months of 2022, covering the time from the initial limited vaccine rollout to a period where nearly everyone in the US had access to vaccines. We were therefore able to capture whether COVID-19 vaccine hesitancy has changed over time and examine potential variations across smoking status across different phases of the pandemic. Second, because of the variants that resulted in case surges at different times, we could qualitatively examine associations between rises and falls in COVID-19 cases and how they might have impacted attitudes about vaccination. Third, we collected open-ended responses to understand why individuals may be hesitant.

The main limitation of this study is that smoking status was obtained from the 2019 OMAS. Thus, some participants could have changed their smoking status by the time they were selected for the OCS. A second limitation is that we could not account for smoking intensity, as the 2019 OMAS only gathered information about smoking status.

PUBLIC HEALTH IMPLICATIONS

At certain periods during the COVID-19 pandemic, Ohioans who smoked appeared to be more hesitant to receive the COVID-19 vaccine compared to those who never smoked. Across all waves, the prevalence of vaccine hesitancy was higher among adults who smoked; and across 3 of the 6 initial waves (March 8, 2021 – November 28, 2021) adults who smoked were significantly more hesitant compared to their nonsmoker counterparts. Although these results suggest that vaccine hesitancy could have attenuated over time, increases in hesitancy in the summer months of 2022 indicate a need to further understand and characterize smokers' attitudes toward the vaccine. These results may help public health officials and health care providers in Ohio to better educate adults who smoke so that they become less hesitant and more likely to receive a COVID-19 vaccine. These findings also have implications for other vaccines designed to prevent lung infections, such as the influenza and pneumococcal vaccines. Future research should examine the extent to which people who smoke are hesitant to receive these immunizations. Tailored interventions may be needed to promote uptake of these vaccines.

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PB conducted the literature review and wrote the initial draft of the paper.
AT conducted all analyses and edited the paper.
MN, LT, TS, NF were all involved in the design and collection of OCS data.
AF was involved in all aspects of the paper, collection of OCS data, and analysis of qualitative data. AF also engaged in heavy editing of the paper prior to submission.

REFERENCES

1. Gumel AB, Iboi EA, Ngonghala CN, Ngwa GA. Towards achieving a vaccine-derived herd immunity threshold for COVID-19 in the US. *Front Public Health.* 2021;9:709369. https://doi.org/10.3389/fpubh.2021.709369
2. Omer SB, Yildirim I, Forman HP. Herd immunity and implications for SARS-CoV-2 control. *JAMA.* 2020;324(20):2095-2096. https://doi.org/10.1001/jama.2020.20892
3. Chapman LA, Shukla P, Rodriguez-Barraquer I, et al. Risk factor targeting for vaccine prioritization during the COVID-19 pandemic. *Sci Reports.* 2022;12(1):3055. https://doi.org/10.1038/s41598-022-06971-5
4. Young-Wolff KC, Slama N, Alexeeff SE, et al. Tobacco smoking and risk of SARS-CoV-2 infection and disease severity among adults in an integrated healthcare system in California. *Nicotine Tob Res.* 2022; Apr (3):ntac090. https://doi.org/10.1093/ntr/ntac090
5. Simons D, Shahab L, Brown J, Perski O. The association of smoking status with SARS-CoV-2 infection, hospitalization and mortality from COVID-19: a living rapid evidence review with Bayesian meta-analyses (version 7). *Addiction.* 2021;116(6):1319-1368. https://doi.org/10.1111/add.15276
6. Gülsen A, Yigitbas BA, Uslu B, Drömann D, Kilinc O. The effect of smoking on COVID-19 symptom severity: systematic review and meta-analysis. *Pulm Med.* 2020:7590207. https://doi.org/10.1155/2020/7590207
7. Wilkinson LA, Mergenhagen KA, Carter MT, et al. Smoking status related to COVID-19 mortality and disease severity in a veteran population. *Respir Med.* 2021;190:106668. https://doi.org/10.1016/j.rmed.2021.106668
8. Zhang F, Baranova A. Smoking quantitatively increases risk for COVID-19. *Eur Respir J.* 2021:2101273. https://doi.org/10.1183/13993003.01273-2021
9. Gaiha SM, Cheng J, Halpern-Felsher B. Association between youth smoking, electronic cigarette use, and COVID-19. *J Adolesc Health.* 2020;67(4):519-523. https://doi.org/10.1016/j.jadohealth.2020.07.002
10. Merianos AL, Russell AM, Mahabee-Gittens E, Barry AE, Yang M, Lin H-. Assessment of exclusive, dual, and polytobacco e-cigarette use and COVID-19 outcomes among college students. *Am J Health Promot.* 2022;36(3):421-428. https://doi.org/10.1177/08901171211055904
11. Merianos AL, Russell AM, Mahabee-Gittens E, Barry AE, Yang M, Lin HC. Concurrent use of e-cigarettes and cannabis and associated COVID-19 symptoms, testing, and diagnosis among student e-cigarette users at four U.S. universities. *Addict Behav.* 2022:107170. https://doi.org/10.1016/j.addbeh.2021.107170
12. Der-Martirosian C, Heslin KC, Mitchell MN, Chu K, Tran K, Dobalian A. Comparison of the use of H1N1 and seasonal influenza vaccinations between veterans and non-veterans in the United States, 2010. *BMC Public Health.* 2013;13:1082. https://doi.org/10.1186/1471-2458-13-1082
13. Guay M, Gosselin V, Petit G, Baron G, Gagneur A. Determinants of vaccine hesitancy in Quebec: a large population-based survey. *Hum Vaccin Immunother.* 2019;11:2527-2533. https://doi.org/10.1080/21645515.2019.1603563
14. Yang Y, Dobalian A, Ward KD. COVID-19 vaccine hesitancy and its determinants among adults with a history of tobacco or marijuana use. *J Community Health.* 2021;46(6):1090-1098. https://doi.org/10.1007/s10900-021-00993-2
15. Jackson SE, Paul E, Brown J, Steptoe A, Fancourt D. Negative vaccine attitudes and intentions to vaccinate against COVID-19 in relation to smoking status: a population survey of UK adults. *Nicotine Tob Res.* 2021;23(9):1623-1628. https://doi.org/10.1093/ntr/ntab039
16. Luk TT, Zhao S, Wu Y, Wong JYH, Wang MP, Lam TH. Prevalence and determinants of SARS-CoV-2 vaccine hesitancy in Hong Kong: a population-based survey. *Vaccine.* 2021;39(27):3602-3607. https://doi.org/10.1016/j.vaccine.2021.05.036
17. Shkalim Zemer V, Grossman Z, Cohen HA, et al. Acceptance rates of COVID-19 vaccine highlight the need for targeted public health interventions. *Vaccines (Basel).* 2022;10(8):1167. https://doi.org/10.3390/vaccines10081167
18. McAteer J, Yildirim I, Chahroudi A. The VACCINES Act: deciphering vaccine hesitancy in the time of COVID-19. *Clin Infect Dis.* 2020;71 (15):703-705. https://doi.org/10.1093/cid/ciaa433
19. Khubchandani J, Sharma S, Price JH, Wiblishauser MJ, Sharma M, Webb FJ. COVID-19 vaccination hesitancy in the United States: a rapid nation-

al assessment. *J Community Health.* 2021;46(2):270-277. https://doi.org/10.1007/s10900-020-00958-x

20. Scobie HM, Johnson AG, Suthar AB, et al. Monitoring incidence of COVID-19 cases, hospitalizations, and deaths, by vaccination status - 13 US jurisdictions, April 4-July 17, 2021. *MMWR Morb Mortal Wkly Rep.* 2021;70(37):1284-1290. https://doi.org/10.15585/mmwr.mm7037e1
21. Di Fusco M, Marczell K, Deger KA, et al. Public health impact of the Pfizer-BioNTech COVID-19 vaccine (BNT162b2) in the first year of rollout in the United States. *J Med Econ.* 2022;25(1):605-617. https://doi.org/10.1080/13696998.2022.2071427
22. Centers for Disease Control and Prevention. Health effects of cigarette smoking. Updated 2021. Accessed December 8, 2023 https://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/index.htm
23. Frazier LA, Seiber E, Harlow KJ, Attipoe S, O'Rourke B, Ohio COVID-19 Survey Team. The Ohio COVID-19 survey: preliminary findings and their use during the pandemic. *OH J Public Health.* 2021;4(1):11-22. https://doi.org/10.18061/ojph.v4i1.8067
24. R Core Team. *R: A language and environment for statistical computing.* R Foundation for Statistical Computing; 2020. https://www.r-project.org
25. The White House. National Strategy for the COVID-19 Response and Pandemic Preparedness. 2021. Accessed 8/19/2023. https://www.whitehouse.gov/wp-content/uploads/2021/01/National-Strategy-for-the-COVID-19-Response-and-Pandemic-Preparedness.pdf
26. Di Giuseppe G, Pelullo CP, Della Polla G, Pavia M, Angelillo IF. Exploring the willingness to accept SARS-CoV-2 vaccine in a university population in southern Italy, September to November 2020. *Vaccines.* 2021;9(3). https://doi.org/10.3390/vaccines9030275
27. Liu R, Zhang Y, Nicholas S, Leng A, Maitland E, Wang J. COVID-19 vaccination willingness among Chinese adults under the free vaccination policy. *Vaccines.* 2021;9(3). https://doi.org/10.3390/vaccines9030292
28. Soares P, Rocha JV, Moniz M, et al. Factors associated with COVID-19 vaccine hesitancy. *Vaccines.* 2021;9(3). https://doi.org/10.3390/vaccines9030300
29. Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. Attitudes toward a potential SARS-CoV-2 vaccine a survey of U.S. adults. *Ann Int Med.* 2020;173(12):964-973. https://doi.org/10.7326/M20-3569
30. Solís Arce JS, Warren SS, Meriggi NF, et al. COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries. *Nat Med.* 2021;27(8):1385-1394. https://doi.org/10.1038/s41591-021-01454-y
31. Fridman A, Gershon R, Gneezy A. COVID-19 and vaccine hesitancy: a longitudinal study. *PLoS One.* 2021;16(4). https://doi.org/10.1371/journal.pone.0250123

Erratum:
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RESEARCH ARTICLE

COVID-19 and Mental Health in Ohio: Trends from 2017 to 2021

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ABSTRACT

Background: Mental health impairment (MHI) refers to a high threshold of mental health diagnosis, whereby individuals are unable to participate in work or other usual activities due to a mental health condition or emotional problem. This study aimed to estimate COVID-19-related trends and disparities in high MHI for Ohio adults throughout the COVID-19 pandemic. An additional goal was to identify modifiable factors associated with high MHI.

Methods: Analyses were conducted using data from the 2017, 2019, and 2021 Ohio Medicaid Assessment Survey (OMAS). This a repeated, cross-sectional random probability survey of noninstitutionalized adults assessing the health of residential Ohioans, with a concentration on Ohio's Medicaid, potentially Medicaid eligible, and non-Medicaid populations.

Results: The prevalence of high MHI among Ohio adults rose between 2017 (6.4%) and 2021 (8.2%). This increase was particularly pronounced among Black and Hispanic individuals; 2021 also saw high MHI among young women. In adjusted analysis, indicators of low fiscal stability and having unmet health care needs were associated with greater prevalence of high MHI.

Conclusion: Pandemic-related mental health trends and disparities extended to those at the highest levels of mental illness severity and treatment need. Several modifiable factors could be targeted to potentially improve mental health symptoms and to be better prepared for the next public health crisis.

Keywords: COVID-19; Mental health; Mental health impairment; Disparities; Survey

INTRODUCTION

The COVID-19 pandemic has, thus far, resulted in over 6.8 million deaths worldwide, including over 1.1 million deaths in the United States[1] and over 42 thousand deaths in Ohio.[2] In addition to this direct impact, the indirect impacts of the pandemic have been widespread and serious concern has been directed to the consequences for mental health.[3–6] Indeed, a meta-analysis of 2020 data indicates a population-level rise in negative mental health symptoms, particularly in the months immediately following the initial outbreak.[7] Although these rates declined by the end of the 2020 calendar year,[7] negative mental health symptoms appeared to rise again during the upsurge of the Delta variant of COVID-19 in 2021.[8]

Having established that the prevalence of poor mental health increased during the COVID-19 pandemic, it is important to further understand the consequences of these pandemic-associated

trends. Mental health impairment (MHI) can be defined as the inability to participate in work or other usual activities due to a mental health condition or emotional problem.[9] As a higher threshold than mental health diagnosis, this definition helps distinguish the highly-impaired from those who meet criteria for a mental disorder but who do not exhibit significant impairment; it also helps identify individuals with a high treatment need.[10–12]

Beyond examining population-level trends in MHI overall, it is imperative to also test for subgroup differences across sociodemographic characteristics. Several studies have, in fact, documented greater mental health concerns among racial and ethnic minority groups during the COVID-19 pandemic.[8,13,14] Females and young adults also appear to be groups who have experienced particularly heightened negative mental health outcomes during the pandemic.[8,15] Whether MHI is also heightened among these and other sociodemographic subgroups is, to our knowledge, an unexplored question.

Finally, in order to move toward addressing pandemic-related MHI, it is necessary to identify factors that are associated with MHI and that could be targeted with health and social services. Such modifiable factors may include indicators of fiscal stability (eg, employment) and indicators of an unmet health care need (eg, reporting an unmet drug treatment need) as both have well-documented associations with mental health outcomes and disparities.[16–20] A better understanding of these modifiable factors could be used to help guide treatment, interventions, and public policy.

Given the ongoing questions and concerns about pandemic-associated MHI, the purpose of this study was to examine trends, patterns, and factors associated with high MHI among Ohio adults throughout the COVID-19 pandemic. Specifically, we sought to: (1) estimate trends in the prevalence of MHI associated with the onset of the COVID-19 pandemic, (2) identify populations disproportionately affected by MHI by examining how pandemic-related trends in MHI differed across sociodemographic groups, and (3) identify modifiable factors associated with high MHI.

METHODS

Data and Participants

Data came from the 2017, 2019, and 2021 adult Ohio Medicaid Assessment Survey (OMAS). This a repeated (recently, biannual) cross-sectional random probability survey of noninstitutionalized adults (aged 19 and older) in Ohio that provides information about the health of residential Ohioans, with a concentration on Ohio's Medicaid, potentially Medicaid eligible, and non-Medicaid populations. The OMAS uses a complex, stratified, probability-based sampling design and a combination of random-digit-dialing to landline telephones, random sampling of cell phone numbers, and address-based sampling. A detailed description of survey procedures is provided on the OMAS website,[21] where deidentified OMAS data are also made publicly available. We obtained ethical approval for conducting the present analyses from The Ohio State University Institutional Review Board (IRB) (#2023B0158). The IRB also approved a waiver of the consent process, as this study comprised secondary data analysis.

Measures

Mental Health Impairment (MHI)

All participants were asked the number of days in the past 30 days prior to being interviewed that a mental health condition or emotional problem kept them from participating in work or other usual activities (ie, functional impairment). Those who reported at least 14 days of functional impairment due to mental health or emotional problems were classified as having high MHI. The 14-day threshold aligns with the US Centers for Disease Control and Prevention (CDC) recommendations for measurement classification.[9]

Fiscal Stability Indicators

A participant's health insurance status was categorized as Medicaid, uninsured, and other (the latter included insurance that was directly purchased, employer-sponsored insurance, or self-reported other insurance plans). The OMAS also assessed employment (working vs not working) and increased difficulty paying rent in the past 12 months (classified as whether it had gotten harder vs gotten easier or stayed the same). Finally, participants were classified as whether their income was less than 100% of the federal poverty level (FPL); this value was based on annual family income and the number of family members in the household.

Unmet Health Care Need

To investigate participants' unmet health care needs, we used OMAS items assessing whether, during the past 12 months, there was a time when participants needed but could not get (1) mental or emotional health care or counseling services and (2) alcohol or other drug treatment (both items were classified as yes vs no or did not need that type of care).

Sociodemographic Characteristics

The OMAS assesses gender (male, female), race and ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, Asian, another race or ethnicity), age (years), and educational attainment (high school or below, some college or an associate degree, college degree or higher). Due to unstable estimates from small cell sizes, we were ultimately only able to examine 3 racial and ethnic groups in our trend analyses: non-Hispanic White ("White"), non-Hispanic Black ("Black") and Hispanic. In addition, we examined county of residence, which was classified as metropolitan, rural Appalachian, rural non-Appalachian, or suburban in accordance with guidance from the Appalachian Regional Commission (ARC), US Census Bureau, and the Federal Office of Rural Health Policy at the Health Resources and Services Administration (HRSA).

Data Analysis

We began with descriptive statistics to identify the prevalence of high MHI over time (2017, 2019, and 2021) and among priority populations (based on gender, race and ethnicity, age, county of residence, and education). Next, to quantify subgroup differences, we conducted a series of Pearson's chi-square tests to compare mean prevalence estimates. Finally, in order to identify factors associated with high MHI, we conducted logistic regressions in which our measures of fiscal stability and health status were the independent variables and high MHI in 2021 was the dependent variable; in adjusted analyses, we further controlled for gender, age, race/ethnicity, county type, and educational status. Due to differing financial supports available for elderly adults in the United States, all analyses were restricted to nonelderly adults (ie, aged 19-64). All analyses were adjusted for the complex sampling design using weights to be representative of Ohio's noninstitutionalized working-age adult population.

RESULTS

Trends and Descriptive Statistics

The prevalence of high MHI among Ohio adults aged 19 to 64 grew from 6.4% in 2017 and 7.5% in 2019 to a high of 8.2% in 2021 (Table 1). This represents a 28% proportionate increase in MHI across the 4 years.

Trends in the prevalence of high MHI differed by race and ethnicity. As illustrated in Figure 1, the prevalence of high MHI showed a steep 39% increase among Black adults between 2019 and 2021; Hispanic adults experienced notable increases in high MHI between 2017 and 2019 as well as between 2019 and 2021 (31% between 2017 and 2019; 21% between 2019 and 2021). Consistently over time, a greater prevalence of high MHI was seen among Hispanic and Black adults compared to White adults. Demographic differences were also observed by gender and age (Figure 2). In particular, in 2021, women aged 19 to 24 experienced the greatest prevalence of high MHI.

Subgroup Comparisons

High MHI status was significantly associated with all sociodemographic factors that were examined (Table 1). Specifically, individuals with high MHI were disproportionately female, Black, aged 19 to 24, and with less than a college degree. Conversely, subgroups with disproportionately low levels of high-MHI prevalence were males, non-Hispanic White adults, those aged 55 to 64, those living in rural non-Appalachian counties, and those with 4-year or advanced college degrees.

Regression Outcomes

Adjusted logistic regressions indicated that all measures of fiscal stability were significantly associated with high MHI (Table 2).

Table 1. Prevalence of Sociodemographic Characteristics by High Versus No/Low Mental Health Impairment: 2021

Characteristic	No/Low Mental Distress % (90% CI)	High Mental Distress % (90% CI)	Test Statistic for Significant Difference (*P* value)
Gender			
Male	50.6 (49.7–51.4)	40.7 (38.1–43.4)	32.32 (0.000)
Female	49.4 (48.6–50.3)	59.3 (56.6–61.9)	
Race or Ethnicity			
Black	12.1 (11.6–12.6)	15.2 (13.5–17.0)	3.86 (0.006)
Hispanic	3.7 (3.4–4.0)	4.9 (3.9–6.2)	
Non-Hispanic White	79.1 (78.4–79.8)	74.6 (72.3–76.8)	
Asian	2.9 (2.6–3.2)	2.1 (1.3–3.5)	
Another racial/ethnic group	2.3 (2.1–2.6)	3.2 (2.5–4.0)	
Age			
19-24	12.7 (11.9-13.5)	17.2 (14.9-19.6)	3.64 (0.000)
25-34	22.0 (21.3-22.8)	23.5 (21.3-25.7)	
35-44	20.1 (19.4-20.7)	21.0 (18.9-23.2)	
45-54	21.4 (20.8-22.1)	21.2 (19.3-23.1)	
55-64	23.8 (23.2-24.4)	17.0 (15.4-18.6)	
County type			
Appalachian	14.6 (14.1-15.1)	17.2 (15.4-18.9)	2.92 (0.002)
Metropolitan	55.4 (54.7-56.1)	58.4 (55.9-60.9)	
Rural non-Appalachian	13.1 (12.7-13.6)	10.1 (8.6-11.6)	
Suburban	16.8 (16.3-17.4)	14.3 (12.3-16.3)	
Education			
Less than high school	8.5 (7.9-9.2)	16.7 (14.7-18.7)	4.47 (0.000)
High school or GED	30.5 (29.6-31.4)	39.2 (36.5-41.8)	
Some college	18.0 (17.3-18.6)	22.0 (20.0-24.1)	
Associate degree	12.6 (12.1-13.1)	11.3 (9.9-12.7)	
4-year college graduate	17.5 (16.9-18.0)	7.1 (6.2-8.1)	
Advanced degree	13.0 (12.5-13.4)	3.7 (2.9-4.4)	

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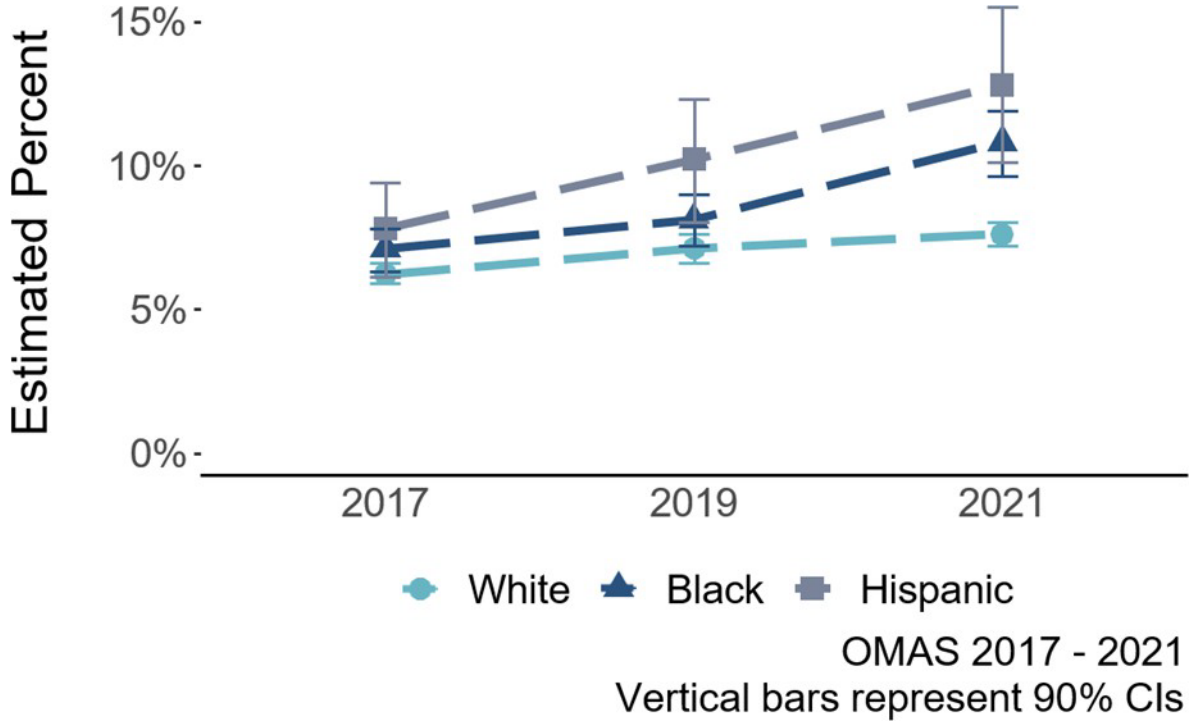

Figure 1. Trend in Percentage of Adults (aged 19-64) with High Mental Health Impairment, by Race and Ethnicity: 2021

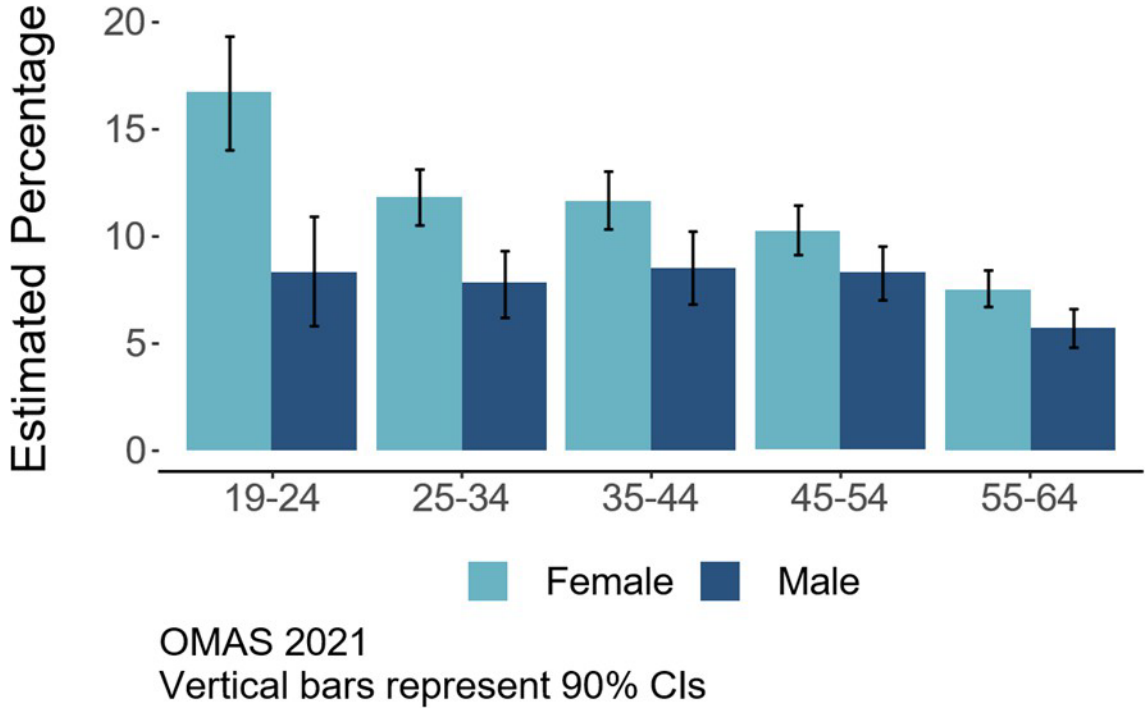

Figure 2. Prevalence of Adults (aged 19-64) with High Mental Health Impairment, by Age and Gender: 2021

Table 2. Unadjusted and Adjusted Associations of Fiscal Stability and Health Status Indicators with High Mental Health Impairment: 2021

	Unadjusted Values			Adjusted Values		
Indicator	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Insurance status						
Medicaid	0.23	0.20–0.26	<0.001	0.29	0.25–0.33	<0.001
Other insurance	1.10	0.90–1.34	0.370	1.12	0.91–1.37	0.289
Uninsured	1.60	1.25–2.05	<0.001	1.30	1.01–1.68	0.042
Unemployed	3.13	2.76–3.54	<0.001	2.59	2.27–2.95	<0.001
Income less than 100% federal poverty level (FPL)	2.99	2.65–3.38	<0.001	2.33	2.05–2.66	<0.001
Harder to pay rent in past 12 months	3.63	3.21–4.12	<0.001	3.21	2.82–3.65	<0.001
Unmet mental health needs	7.62	6.54–8.88	<0.001	7.35	6.24–8.64	<0.001
Unmet drug or alcohol treatment needs	5.60	3.64–8.62	<0.001	5.13	3.21–8.19	<0.001

Adjusted analyses control for gender, age group, race and ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, Asian, another race or ethnicity), county type, and education.

Accounting for the role of other factors (eg, poverty, education), adults with Medicaid insurance (vs adults with other insurance or who were uninsured) were less likely to have high MHI. Being unemployed, having an income less than 100% FPL, and experiencing increased difficulty paying rent in the past 12 months were all associated with high MHI.

Both measures of unmet health care need (ie, mental or emotional health care or counseling services; alcohol or other drug treatment) were also significant in adjusted logistic regression. After adjusting for sociodemographic predictors, adults reporting an unmet health need had over 7 times the odds of having high MHI than those without an unmet health need; adults reporting an unmet drug or alcohol treatment need had over 5 times the odds of having high MHI than those without an unmet drug or alcohol treatment need.

DISCUSSION

Findings from this study demonstrate that the prevalence of MHI among Ohio adults rose substantially between 2017 (6.4%) and 2021 (8.2%). These findings are consistent with previous work indicating a population-level rise in mental health symptoms that occurred concurrently with the timing of the COVID-19 pandemic.[7,8] Yet, as the majority of work on mental health and COVID-19 concerns the first several months of 2020, the present findings are noteworthy because they indicate a trend that extended (at least) through the end of 2021—nearly 2 years after the pandemic's onset. Our focus on MHI (a higher threshold than mental health diagnosis) also resulted in the important finding that pandemic-related mental health trends include those at the highest levels of mental illness severity and treatment need.

Findings additionally indicated that the increase observed in MHI was particularly pronounced among Black and Hispanic individuals (compared to White individuals), and among young women (compared to other age and gender groups). These disparities align with previous findings indicating that pandemic-related mental health concerns have been greater among these subgroups.[8,13–15] The reasons for these disparities are likely multifaceted. Suggested factors include the exacerbation of systematic differences in socioeconomic hardships,[22] the loss of informal community support services,[14] heightened experiences of structural and interpersonal racism,[23–25] as well as developmental and cohort differences.[26] As an example of the latter, some speculate that high amounts of time spent on social media could be partly responsible for the rise in mental health symptoms among young adults during the pandemic.[27]

Our findings additionally indicate that, in adjusted analysis that accounts for the role of sociodemographic characteristics, individuals with low fiscal stability and unmet health care needs were more likely to have high MHI in 2021. These outcomes provide public health practitioners and policymakers with modifiable factors (eg, health care access, food and housing insecurity) that could be enhanced with health and social services in order to potentially improve mental health symptoms.

Implications

The findings from this study are consistent with longstanding historical trends in which the prevalence of negative mental health symptoms aligns with changes in the economy (eg, the 2008 financial crisis) and health policies (eg, Medicaid expansion) that influence financial stress and access to health care.[28–30] This prior research also indicates that individuals with preexisting mental health concerns are more vulnerable to negative economic and social events.[31,32] Accordingly, the COVID-19 pandemic, which escalated economic stress and barriers to health care, appears to have increased the prevalence and negative impact of MHI. The change was also particularly pronounced among members of historically marginalized groups. Moving forward, it is critical that, as the COVID-19 pandemic wanes, health-serving institutions learn from this experience in order to be better prepared for the next medical or economic crisis.

Limitations

It is important to note the limitations to this study. First, although our research characterizes trends in MHI over time, the repeated

cross-sectional design of the OMAS does not allow the temporal ordering of events at an individual level. Causal relationships between the pandemic onset, MHI, and other associated factors should, therefore, be interpreted with caution. Our analyses were also limited to variables available in the OMAS datasets; we were thus unable to assess additional sociodemographic factors (eg, LGBTQ+ identity) that could signal additional disparities. Findings may not be generalizable to other states and should be evaluated considering state-by-state variations in COVID-19 response and mental health care treatment and access. Finally, the last time point of data available is from 2021; as COVID-19 outbreaks persist, continued longitudinal data are needed to characterize enduring effects of the pandemic into 2022 and beyond. Future research will be necessary to understand and address long-term pandemic-related mental health outcomes and treatment (such as the toll on resilience) as well as the complexity of dual diagnoses (eg, the overlap between depression, anxiety, and substance use disorder).

PUBLIC HEALTH IMPLICATIONS

During the early months of the pandemic, there were many strong examples of changes in mental health policy and other emergency reforms designed to rapidly respond to mental health concerns.[33,34] Yet there is also data indicating that the unmet demand for mental health services grew during the pandemic.[35] Difficulties have also been reported by many states in terms of making quick pivots during the pandemic, including issues like delays in implementing billing code adjustments and approving emergency waivers to support telehealth services.[36] To be better prepared for the future, experts have made several recommendations, including: (1) increasing the dollar amount and infrastructure surrounding financial aid at the federal, state, and local level so that it can be rapidly issued for community-led approaches to mental health service delivery and crisis response;[23] (2) optimizing crisis-led response interventions, including training for law enforcement on how to effectively interact with people experiencing a health crisis;[23] (3) continued growth and development of telehealth services and infrastructure for mental health;[37,38] (4) prioritizing access to health care services that go beyond mental health care and that are integral to holistic health, such as primary care services;[39] (5) prioritizing access to "upstream" services that are strongly related to mental health, including social safety nets, food and housing security, eldercare, and care and schooling for children;[14,37] and (6) improving care and promoting wellbeing across all health and social care systems; this would include greater investment in mental health screening and access to care while also supplementing existing mental health care with well-being promotion.[37] Investing in these improvements now will help us—come the next public health crisis—to address mental health concerns in a way that is more rapid, effective, and equitable.

DISCLOSURES

The authors report no conflicts of interest.

REFERENCES

1. World Health Organization. WHO COVID-19 Dashboard. Published online 2022. https://covid19.who.int/
2. Ohio Department of Health. Coronavirus Disease 2019 (COVID-19) Dashboard. Accessed June 20, 2024. https://coronavirus.ohio.gov/dashboards/overview
3. Pfefferbaum B, North CS. Mental health and the Covid-19 pandemic. *N Engl J Med*. 2020;383(6):510-512. https://doi.org/10.1056/NEJMp2008017
4. Cullen W, Gulati G, Kelly BD. Mental health in the COVID-19 pandemic. *QJM*. 2020;113(5):311-312. https://doi.org/10.1093/qjmed/hcaa110
5. Moreno C, Wykes T, Galderisi S, et al. How mental health care should change as a consequence of the COVID-19 pandemic. *Lancet Psychiatry*. 2020;7(9):813-824. https://doi.org/10.1016/S2215-0366(20)30307-2
6. Frazier LA, Seiber E, Harlow KJ, Attipoe S, O'Rourke B, Team OC 19 S. The Ohio COVID-19 Survey: preliminary findings and their use during the pandemic. *Ohio J Public Health*. 2021;4(1):11-22. https://doi.org/10.18061/ojph.v4i1.8067
7. Robinson E, Sutin AR, Daly M, Jones A. A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic in 2020. *J Affect Disord*. 2022;296:567-576. https://doi.org/10.1016/j.jad.2021.09.098
8. Anderson KN, Radhakrishnan L, Lane RI, et al. Changes and inequities in adult mental health–related emergency department visits during the COVID-19 pandemic in the US. *JAMA Psychiatry*. 2022;79(5):475-485. https://doi.org/10.1001/jamapsychiatry.2022.0164
9. Centers for Disease Control and Prevention. Measuring healthy days. *Atlanta, GA*. 2000;CDC.
10. Regier DA, Kaelber CT, Rae DS, et al. Limitations of diagnostic criteria and assessment instruments for mental disorders: implications for research and policy. *Arch Gen Psychiatry*. 1998;55(2):109-115. https://doi.org/10.1001/archpsyc.55.2.109
11. Kessler RC, Merikangas KR, Berglund P, Eaton WW, Koretz DS, Walters EE. Mild disorders should not be eliminated from the DSM-V. *Arch Gen Psychiatry*. 2003;60(11):1117-1122. https://doi.org/10.1001/archpsyc.60.11.1117
12. Novak SP, Colpe LJ, Barker PR, Gfroerer JC. Development of a brief mental health impairment scale using a nationally representative sample in the USA. *Int J Methods Psychiatr Res*. 2010;19 Suppl 1:49-60. https://doi.org/10.1002/mpr.313
13. McKnight-Eily LR, Okoro CA, Strine TW, et al. Racial and ethnic disparities in the prevalence of stress and worry, mental health conditions, and increased substance use among adults during the COVID-19 pandemic — United States, April and May 2020. *MMWR Morb Mortal Wkly Rep*. 2021;70(5):162-166. https://doi.org/10.15585/mmwr.mm7005a3
14. Thomeer MB, Moody MD, Yahirun J. Racial and ethnic disparities in mental health and mental health care during the COVID-19 pandemic. *J Racial and Ethnic Health Disparities*. Published online March 22, 2022. https://doi.org/10.1007/s40615-022-01284-9
15. Gibson B, Schneider J, Talamonti D, Forshaw M. The impact of inequality on mental health outcomes during the COVID-19 pandemic: a sys-

tematic review. *Can Psychol*. 2021;62:101-126. https://doi.org/10.1037/cap0000272

16. Evans J, Repper J. Employment, social inclusion and mental health. *J Psychiatr Ment Health Nurs*. 2000;7(1):15-24. https://doi.org/10.1046/j.1365-2850.2000.00260.x
17. Modini M, Joyce S, Mykletun A, et al. The mental health benefits of employment: results of a systematic meta-review. *Australas Psychiatry*. 2016;24(4):331-336. https://doi.org/10.1177/1039856215618523
18. Knifton L, Inglis G. Poverty and mental health: policy, practice and research implications. *BJPsych Bull*. 2020;44(5):193-196. https://doi.org/10.1192/bjb.2020.78
19. Mechanic D, Olfson M. The relevance of the Affordable Care Act for improving mental health care. *Annu Rev Clin Psychol*. 2016;12:515-542. https://doi.org/10.1146/annurev-clinpsy-021815-092936
20. Mongelli F, Georgakopoulos P, Pato MT. Challenges and opportunities to meet the mental health needs of underserved and disenfranchised populations in the United States. *Focus (Am Psychiatr Publ)*. 2020;18(1):16-24. https://doi.org/10.1176/appi.focus.20190028
21. Ohio Medicaid Assessment Survey | Ohio Colleges of Medicine Government Resource Center. Accessed May 31, 2019. http://grc.osu.edu/OMAS
22. Park J. Who is hardest hit by a pandemic? Racial disparities in COVID-19 hardship in the US. *IJUS*. 2021;25(2):149-177. https://doi.org/10.1080/12265934.2021.1877566
23. Shim RS, Starks SM. COVID-19, Structural racism, and mental health inequities: policy implications for an emerging syndemic. *Psychiatr Serv*. 2021;72(10):1193-1198. https://doi.org/10.1176/appi.ps.202000725
24. Chae DH, Yip T, Martz CD, et al. Vicarious racism and vigilance during the COVID-19 pandemic: mental health implications among Asian and Black Americans. *Public Health Rep*. 2021;136(4):508-517. https://doi.org/10.1177/00333549211018675
25. Mpofu JJ, Cooper AC, Ashley C, et al. Perceived racism and demographic, mental health, and behavioral characteristics among high school students during the COVID-19 pandemic—adolescent behaviors and experiences survey, United States, January–June 2021. *MMWR Suppl*. 2022;71(3):22-27. https://doi.org/10.15585/mmwr.su7103a4
26. Bruine de Bruin W. Age Differences in COVID-19 risk perceptions and mental health: evidence from a national US survey conducted in March 2020. *J Gerontol B Psychol Sci Soc Sci*. 2021;76(2):e24-e29. https://doi.org/10.1093/geronb/gbaa074
27. Lee Y, Jeon YJ, Kang S, Shin JI, Jung YC, Jung SJ. Social media use and mental health during the COVID-19 pandemic in young adults: a meta-analysis of 14 cross-sectional studies. *BMC Public Health*. 2022;22(1):995. https://doi.org/10.1186/s12889-022-13409-0
28. Forbes MK, Krueger RF. The Great Recession and mental health in the United States. *Clin Psychol Sci*. 2019;7(5):900-913. https://doi.org/10.1177/2167702619859337
29. Thomas KC, Shartzer A, Kurth NK, Hall JP. Impact of ACA health reforms for people with mental health conditions. *Psychiatr Serv*. 2018;69(2):231-234. https://doi.org/10.1176/appi.ps.201700044
30. Fry CE, Sommers BD. Effect of Medicaid expansion on health insurance coverage and access to care among adults with depression. *Psychiatr Serv*. 2018;69(11):1146-1152. https://doi.org/10.1176/appi.ps.201800181
31. Frasquilho D, Matos MG, Salonna F, et al. Mental health outcomes in times of economic recession: a systematic literature review. *BMC Public Health*. 2016;16(1):115. https://doi.org/10.1186/s12889-016-2720-y
32. Sullivan G, Vasterling JJ, Han X, et al. Preexisting mental illness and risk for developing a new disorder after Hurricane Katrina. *J Nerv Ment Dis*. 2013;201(2):161-166. https://doi.org/10.1097/NMD.0b013e31827f636d
33. Bartels SJ, Baggett TP, Freudenreich O, Bird BL. COVID-19 emergency reforms in Massachusetts to support behavioral health care and reduce mortality of people with serious mental illness. *Psychiatr Serv*. 2020;71(10):1078-1081. https://doi.org/10.1176/appi.ps.202000244
34. Goldman ML, Druss BG, Horvitz-Lennon M, et al. Mental health policy in the era of COVID-19. *Psychiatr Serv*. 2020;71(11):1158-1162. https://doi.org/10.1176/appi.ps.202000219
35. Zhu JM, Myers R, McConnell KJ, Levander X, Lin SC. Trend in outpatient mental health services use before and during the COVID-19 pandemic. *Health Aff*. 2022;41(4):573-580. https://doi.org/10.1377/hlthaff.2021.01297
36. Pinals DA, Hepburn B, Parks J, Stephenson AH. The behavioral health system and its response to COVID-19: a snapshot perspective. *Psychiatr Serv*. 2020;71(10):1070-1074. https://doi.org/10.1176/appi.ps.202000264
37. Aknin LB, De Neve JE, Dunn EW, et al. Mental health during the first year of the COVID-19 pandemic: a review and recommendations for moving forward. *Perspect Psychol Sci*. 2022;17(4):915-936. https://doi.org/10.1177/17456916211029964
38. Zhai Y. A Call for addressing barriers to telemedicine: Health disparities during the COVID-19 pandemic. *Psychother Psychosom*. Published online June 4, 2020:1-3. https://doi.org/10.1159/000509000
39. Britz JB, Huffstetler AN, Henry TL, et al. Primary care: a critical stopgap of mental health services during the COVID-19 pandemic. *J Am Board Fam Med*. 2022;35(5):891-896. https://www.jabfm.org/content/35/5/891

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RESEARCH ARTICLE

It's the Small Things: An Intersectional Approach to African American Women on Medicaid Receiving Prenatal Care

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ABSTRACT

Background: When examining prenatal care utilization rates, African American women were more likely to receive inadequate prenatal care. Yet, research about African American women's prenatal care experiences fails to account for how their experiences may vary by socioeconomic status and insurance type. Therefore, the purpose of this study was to provide African American women on Medicaid with the opportunity to speak to what they found to be meaningful during their interactions with their prenatal care provider using an intersectionality framework.

Methods: Individual interviews were conducted with pregnant African American women (n = 20) receiving Medicaid who were in their second or third trimester of pregnancy. Participants aged 18 to 45 years were recruited from various health care systems located in Ohio. Researchers applied a thematic analysis approach during data collection and data analysis.

Results: Two overarching themes emerged about what these African American women considered meaningful when they talked to their prenatal care provider during pregnancy: (1) conversations around my prenatal care and (2) equipping me with knowledge.

Conclusion: The results obtained through the application of intersectionality theory allow researchers the opportunity to create effective solutions, interventions, and policies that can be implemented to improve infant health outcomes and reduce the risk of infant mortality among pregnant African American women receiving Medicaid. Implications also suggested that public health practitioners in Ohio should increase their awareness of what is important to this population to build patient's trust in provider recommendations and patient's confidence in shared decision-making.

Keywords: African American; Medicaid; Prenatal care; Qualitative

INTRODUCTION

The interaction between prenatal care providers and their patients offers a unique opportunity for dialogue with expectant mothers about their prenatal care. Access to early and quality prenatal care remains a challenge for African American women.[1,2] As of 2019, African American women were 2.1 times more likely than White women to receive delayed or no prenatal care,[3] exposing them to a greater risk for infant morbidities and infant mortality.[1] Specifically, prenatal care reduces preterm birth and infant mortality rates, allows prenatal care providers to detect potential fetal abnormalities, and decreases stillbirth risks.[4,5] Expectant mothers who receive prenatal care tend to record better delivery outcomes because of the opportunity to engage in frequent monitoring.[6]

Racial and economic disparities persist in prenatal care access and utilization rates in the United States.[2,4,7] Along these lines, African American women, low-income women regardless of racial background, and specifically those receiving Medicaid are less likely to receive prenatal care during their pregnancy, especially during their first trimester.[8] Research suggests that income is a vital determinant in access to prenatal care.[4] Low-income women are less likely to receive timely and adequate prenatal care and are more likely to experience adverse pregnancy outcomes and inequities in receiving care.[9] Research also suggests that access to prenatal care is often impacted by type of insurance coverage, specifically Medicaid.[10] Navigating the Medicaid enrollment process, adhering to the rigid Medicaid eligibility requirements, and understanding eligibility criteria often hinder low-income women from receiving prenatal care.[10,11]

What's at Stake? Patient-Provider Communication Among Diverse Populations

Results of 1 study revealed that prenatal care providers were less likely to discuss recommended preventive services among low-income African American women with Medicaid compared to women who were privately insured.[12,13] African American prenatal women prefer prenatal care providers to know them as individuals opposed to being treated differently based on biases for being insured by Medicaid.[14] To summarize the literature mentioned above, stigma, implicit bias practices, and inadequate information provided to pregnant low-income African American women receiving Medicaid strongly suggests a continued need to improve prenatal care for this population.

When examining patient-provider communication, evidence indicates that patient-provider communication and health care utilization significantly predict whether pregnant women receive prenatal care.[15] Therefore, the aim of this study was to conduct semi-structured interviews to explore what African American women on Medicaid found to be meaningful during their interactions with their prenatal care provider.

Theory: Intersectionality

The term 'intersectionality' was coined by Kimberle Crenshaw to present how compounded oppression intersects demographic categories such as gender, race, and class.[16] Intersectionality assumes an individual is shaped by their compounding experiences; these experiences are affected by their multiple social identities and the interaction and interconnection between their identities.[17,18] Employing intersectionality theory enables researchers to conceptualize social inequalities and disparities in health care within a structural context and provides further directions in policy and intervention development to remedy health disparities.[19] Moreover, applying an intersectional lens in qualitative research allows researchers to clarify and analyze the complex and compound marginalized experiences within the intersectional oppression context, fully present experiences, and generate new knowledge.[20]

METHODS

Research Design

The study used a qualitative methodological approach which involved conducting semi-structured interviews with African American women born in the United States. The semi-structured approach allows researchers to ask follow-up questions and gather more detailed and descriptive data.[21] Before the interviews, the researchers prepared a script, but they also deviated from it when necessary to gain more insightful information regarding the selected topic.[22] Our data analysis approach was guided by thematic analysis. Thematic analysis, which involves identifying and interpreting underlying meanings within the data unit, was used for coding, analyzing, and presenting themes within data.[23]

Participants

Twenty low-income African American women (aged 18-45 years) receiving Medicaid in their second or third trimester of pregnancy were recruited. All participants resided in Ohio. Recruitment sites included various clinics and health care systems located in Ohio. Recruitment strategies included flyers posted at the various recruitment sites and referrals made by staff. Researchers decided to select women in their second or third trimester of pregnancy due to recommendations on routine prenatal care visits. For a normal pregnancy, it is suggested that pregnant women in weeks 4 to 28 have 1 prenatal visit a month, 2 visits a month in weeks 28 through 36, and weekly visits in weeks 36 to birth.[24] Low-income women receiving Medicaid were selected due to previously reported findings that low-income Medicaid recipients may be at greater risk from inadequate utilization of prenatal care.[25]

Procedure

Institutional review board approval was obtained from the first author's institution. Site approval was received prior to recruiting participants. Pregnant women interested in participating in the study completed an eligibility screening. Once eligibility to participate was determined, interviews were scheduled and conducted either face-to-face or by phone based on the participant's preference.

The first author conducted all interviews. Prior to the interviews, women were provided a copy of the informed consent and demographic questionnaire. All participants were given the opportunity to ask questions about study procedures, were reminded that interviews would be audio-recorded for later transcription, and were told that their answers would not be shared with their provider or affect their current or future care. Interviews lasted on average 20 to 30 minutes. At the end of the interviews, the participants were thanked for their time and given a pack of diapers. Each interview recording was assigned a number to protect participants' confidentiality.

Measures

A demographic questionnaire was used to assess age, educational attainment, household income, type of prenatal health care provider, length of prenatal health care provider relationship, gender of prenatal health care provider, type of prenatal health care facility, type of insurance, trimester status, and current relationship status.

A semi-structured interview guide derived through a literature review regarding prenatal care and patient-provider communication was used to guide the interview process. The interview guide is included in the Appendix. As deemed by the literature, the guide covered prenatal care decision-making.

Data Analysis

The first and second authors, both of whom are African American women, conducted data analysis for this study. The third author who is also an African American woman and the fourth author, who is Asian American, reviewed data for consistency. We remained mindful of our positionality. We know that our lived experiences as African American and Asian American women shape our understanding of the data. Combined, the first and second authors have over 15 years of first-hand experience collecting and analyzing data.

All interviews were transcribed via Nuance Dragon 15 Software[26] and checked by the first author for validity. In doing so, a multistep process was used to guide us through identifying recurring patterns, later classified into themes.[23,27] In the first step, we took the time to become familiar with the data. Each author separately read the interviews at least 2 times prior to beginning the coding process. The second step involved generating codes from the transcripts. To do so, the first and the second authors independently conducted line-by-line coding of each transcript and developed codebooks. In the third step, we categorized similar codes into broader themes. Subsequently, the authors discussed each code to reach a consensus. Independent coding enhanced the validity of findings by reducing the bias of individual coders and ensuring the consistency of thought.[28] Data were then compared and categorized to create a master codebook that represented all interview data. Next, in step 4, the first and second authors met to review and discuss the themes. Overall, we went through approximately 3 rounds of coding before reaching a consensus, an empirically validated approach.[29] As a team, we reached a consensus for all data before completing this step. In step 5, we defined each theme and extracted sample quotations to exemplify each of the themes[30,31] in preparation to report the findings.

To ensure data saturation, the first author was mindful to ask interview questions in the same way with each participant, during data collection.[32] Second, research suggests that there is a direct link between data triangulation and data saturation.[33] Therefore, we utilized investigator triangulation by developing a codebook and acquiring consensus at each stage through the thematic analysis coding process.[32]

RESULTS

Sample Characteristics

Participant demographics are shown in Table 1.

Thematic Analysis Findings

Findings demonstrated what pregnant African American women on Medicaid found to be meaningful during their interactions with their prenatal care provider. The utilization of the term "meaningful" is crucial as it empowers women to take into account and implement additional health care practices that are nonstandard, which has the potential to impact their own and their baby's health, and improve infant health outcomes.

Findings are based on 2 overarching themes: (1) conversations around my prenatal care and (2) equipping me with knowledge. The results reported are organized by themes and include supporting quotes, definitions for each, and the frequencies for each theme (Table 2).

Theme 1: Conversations around my prenatal care

Ninety percent of participants found “conversations around my prenatal care” to be meaningful during their interactions with their prenatal care providers. Interview data coded in this category indicated words or phrases that highlighted meaningful discussions and conversations such as listening, explaining, and providing information with prenatal care providers.

The quotes from the participants in this study demonstrated that they received respectful and meaningful care, via communication, from their providers. For instance, 1 participant took gummy vitamins due to her provider informing her of that option. Another participant felt that communication from her provider helped her to decide what she needed to “keep them and their baby safe.”

A 29-year-old participant explained, “They usually just basically discuss it with you while you are there at your appointment with them.”

Some participants noted that based on the conversations about their prenatal care, they would decide what was needed throughout their pregnancy to keep them and their baby safe.

A 39-year-old participant mentioned, “Well basically it has just been she will tell me protocol. I will tell her my preference, and then we will discuss those, and basically it boils down to what is really needed.”

Similarly, a 25-year-old participant said, “I pretty much try to listen to the medical side of it. What are the risks? What are my risks? What am I looking at?”

Table 1. Demographic Characteristics of Participants (n = 20)

Characteristics	%	*n*
Hispanic origin (Ethnicity)		
No	100.0%	20
Race		
African American	100.0%	20
Level of education		
Some high school	10.0%	2
High school/general equivalency diploma	50.0%	10
Some college	40.0%	8
Annual household income		
Less than $10 000	70.0%	14
$10 000 to less than $15 000	5.0%	1
$15 000 to less than $20 000	15.0%	3
$20 000 to less than $25 000	0%	0
$25 000 to less than $35 000	0%	0
$35 000 to less than $50 000	5.0%	1
Length of primary prenatal health care provider relationship		
Less than 2 months	25.0%	5
2-4 months	15.0%	3
5-7 months	30.0%	6
8-10 months	20.0%	4
Was already provider	10.0%	2
Type of primary prenatal health care provider		
Medical doctor	30.0%	6
Physician assistant	5.0%	1
Midwife	60.0%	12
Multiple providers	5.0%	1
Gender of primary prenatal health care provider		
Male	10.0%	2
Female	90.0%	18
Location of care received		
Hospital	10.0%	2
Clinic	80.0%	16
Neighborhood clinic	5.0%	1
Other	5.0%	1
Type of insurance		
Medicaid/Medicare	100.0%	20
Trimester status		
Second	35.0%	7
Third	65.0%	13
Relationship status		
Single	90.0%	18
Married	10.0%	2

Table 2. Definitions and Examples of Themes (n = 20)

Theme	Definition	Example quote	Frequency of theme n (%)
Conversations around my prenatal care	Words or phrases that highlighted discussions and conversations such as listening, explaining, and providing information with prenatal care providers surrounding prenatal care decision-making.	"Really just discussing at and weighing the options about what is best and what is not about it and if it you know if it is good right off the bat which they usually do you go with that decision." [20-year-old participant]	18 (90.0%)
Equipping me with knowledge	Words or phrases that speak to about any written or web-based resources (such as handouts, papers, booklets, pamphlets) received from their prenatal care provider during their visit.	"I have pamphlets on breastfeeding I have pamphlets on the epidural, on medications, on mental health medications while pregnant, you know there is like getting the flu shot while pregnant, getting the shots they give you while you are pregnant, information about those." [20-year-old participant]	9 (45.0%)

Participants also mentioned that their prenatal care provider provided alternative options during conversations that would assist in their prenatal care.

A 20-year-old participant stated, "I can't take the prenatal pills so we have discussed the gummies and she has supported me on that because I really can't swallow pills. Especially those big, long nasty pills [prenatal pills]. We discussed the gummies and she told me that I could take them in and that's how I have been taking them."

Theme 2: Equipping me with knowledge

Forty five percent of participants found "equipping me with knowledge" meaningful during their interactions with their prenatal care provider. Interview data coded in this category indicated words or phrases that speak to any written or web-based resources (such as handouts, papers, booklets, pamphlets) that were received that equipped the women with knowledge. Several participants noted the importance of how supplemental resources equipped them with knowledge regarding their pregnancy and prenatal care. Additionally, the participants spoke about the types of supplemental resources they received from their prenatal care provider.

A 21-year-old participant noted, "She gave me a packet of stuff and then she had me sign something for information as far as help with anything, but so far she gave me a pamphlet and stuff to look through as far as breastfeeding and stuff."

Likewise, a 25-year-old participant mentioned, "She gave me, like, little pamphlets on stuff."

A 23-year-old participant said, "I have pamphlets on breastfeeding, I have pamphlets on the epidural, on medications, on mental health medications while pregnant, and the flu shot while pregnant."

Participants also noted the importance of being able to go back and review the information provided due to the abundance of information relayed during prenatal visits.

A 29-year-old participant stated, "Of course I don't want to be weighed down with papers about this stuff but I think it's good that I can refer back to it if I needed', they give you a lot of information, statistics, and options."

DISCUSSION

This study provides additional insight into providing low-income African American women on Medicaid with the opportunity to speak to what they found to be meaningful during their interactions with their prenatal care provider. Our findings provide a unique perspective of an understudied group of pregnant African American women receiving Medicaid. This is important because it allows health care systems and prenatal care providers to gain a better understanding of what this understudied group found to be meaningful in order to create programs and initiatives that can help reduce the risk of preterm birth and improve infant health outcomes.

The current study participants were exclusively drawn from the state of Ohio. Our study findings assume relevance to public health professionals, especially those working in areas with a large population of African Americans. In this study, we found the most salient theme rests on the importance of participants' conversations around their prenatal care. According to participants from this study, this was found to be the most meaningful experience during their interactions with their prenatal care provider. These findings align with previous work indicating that quality and respectful care from providers were factors impacting reproductive health for women of color.[34] Our findings also align with studies indicating that conversations with prenatal care providers may improve prenatal care by increasing the patient's knowledge and understanding of available options based on their prenatal care needs.[35] Therefore, prenatal care providers should be cognizant of the important role they play when assisting pregnant women with their prenatal care. Nevertheless, health care and government systems need to continue to work together to find solutions to provide equitable prenatal care for pregnant low-income African American women receiving Medicaid.

Lastly, participants considered equipping them with the knowledge to be meaningful during interactions with their prenatal care providers. Equipping patients with knowledge included any written or web-based resources (such as handouts, papers, booklets, and/or pamphlets) received from their prenatal care provider during their visit. Educational material can include additional resources for added support that may benefit themselves and their baby.[36] Further, resources may include in-depth information about specific genetic conditions and provide the most current testing and screening options.[37] Health care institutions should ensure that patients are equipped with knowledge that addresses the needs of their patients. Information from supplemental resources, together with patient-provider communication, may assist patients regarding their prenatal care.[23]

Our findings support previous research that suggests that patients who receive health care resources tend to speak more positively about their experience.[38] Along these lines, research suggested that providing resources to patients is crucial because it is an opportunity to discuss options with the provider, arrive at decisions based on the suitability of circumstances, and weigh the pros and cons of treatment approaches.[39] Therefore, it is recommended that prenatal care providers not only promote and provide supplemental resources to aid pregnant African American women receiving Medicaid but also review and highlight information that is relevant to the specific needs of each patient.

A unique contribution of this study is that we employed a thematic analysis approach to investigate the experiences of an especially medically underserved group of pregnant women: African American women receiving Medicaid.[40] This study is an important step

toward helping researchers better understand ways to improve patient-provider communication with medically underserved populations.

This study also expands our theoretical understanding of intersectionality by applying the tenets to the lives of pregnant African American women on Medicaid. Through the use of intersectionality, we provide African American women on Medicaid with the opportunity to speak to what they found to be meaningful during their interactions with their prenatal care provider and help promote social equality, address health and social inequality issues, and inform actions.[20]

Limitations

First, while our use of in-depth interviews provided an intimate look at what pregnant low-income African American women receiving Medicaid found to be meaningful during their interactions with their prenatal care provider, we acknowledge that our study results may not be generalizable to all African American women who are pregnant, low-income, and/or receiving Medicaid. Many participants responded to the interview questions with short answers and did not elaborate, limiting the richness of the data. There was no long-term follow-up to report if patient-provider communication and/or increased knowledge contributed to positive health outcomes.

PUBLIC HEALTH IMPLICATIONS

The study's findings have several implications for research and clinical practice. This study highlights culturally specific knowledge of prenatal care practices among underserved women, particularly pregnant African Americans receiving Medicaid. These results highlight the need for prenatal care providers to continue working on culturally specific ways to develop rapport, build trust, and increase cultural knowledge of medically underserved communities. This study could enhance the practice of public health practitioners in Ohio by increasing their awareness of what is important to this population. Being attentive to what patients see as important could not only build trust in provider recommendations but also build patient's confidence in their decision-making during their pregnancy.

In many situations, providers have limited time with patients. If that is the case, then perhaps reviewing standard prenatal visit protocols to determine if it would be fruitful to alter how one follows up with patients, such as putting an emphasis on education and listening and responding to what is meaningful to the patient. This is a tough situation when pressed for time and may need to go to health care administrators to work toward policy change for sustainable impact, such as increasing the amount of time providers spend with patients per visit. Furthermore, this study highlighted the need for researchers who specialize in perinatal health care disparities and public health practitioners in Ohio to collaborate in order to deepen this area of research and to track and improve longer-term pregnancy health outcomes.

In the future, researchers should focus on continuing to disaggregate African American women's experiences to capture diverse perspectives within prenatal care. Future policies and prevention programs should assist pregnant low-income African Americans receiving Medicaid.

Author Contribution

The role of the first author (Dr. Na'Tasha Evans) in this study was to form the research questions and hypotheses, collect data, write the manuscript, and organize the literature. The role of the second author (Dr. Kamesha Spates) was to ensure data quality, analyze data, and write and edit the manuscript. The role of the third author (Dr. Danette Conklin) was to review data analysis, write, and edit the manuscript. The role of the fourth author (Yu-Lin Hsu) was to write and edit the manuscript.

REFERENCES

1. Yoder H, Hardy LR. Midwifery and antenatal care for black women: a narrative review. *SAGE Open*. 2018;8(1):2158244017752220. https://doi.org/ 10.1177/2158244017752220
2. Mazul MC, Salm Ward TC, Ngui EM. Anatomy of good prenatal care: perspectives of low income African-American women on barriers and facilitators to prenatal care. *J Racial Ethn Health Disparities*. 2017;4 (1):79-86. https://doi.org/10.1007/s40615-015-0204-x
3. US Department of Health and Human Services Office of Minority Health. Infant mortality and African Americans. Accessed July 8, 2021. https://minorityhealth.hhs.gov/infant-mortality-and-african-americans
4. Blakeney EL, Herting JR, Bekemeier B, Zierler BK. Social determinants of health and disparities in prenatal care utilization during the Great Recession period 2005-2010. *BMC Pregnancy Childbirth*. 2019;19(1): 1-20. https://doi.org/10.1186/s12884-019-2486-1
5. Novoa C. Ensuring healthy births through prenatal support: innovations from three models. Center for American Progress. Updated January 21, 2020. Accessed June 20, 2021. https://www.americanprogress.org/article/ensuring-healthy-births-prenatal-support/
6. Tunçalp Ö, Pena-Rosas JP, Lawrie T, et al. WHO recommendations on antenatal care for a positive pregnancy experience-going beyond survival. *BJOG*. 2017;124(6):860–2. https://doi.org/10.1111/1471-0528.14599
7. Vedam S, Stoll K, Taiwo TK, et al. The Giving Voice to Mothers study: inequity and mistreatment during pregnancy and childbirth in the United States. *Reprod Health*. 2019;16:77. https://doi.org/10.1186/s12978-019-0729-2
8. Loggins S, Andrade FCD. Despite an overall decline in US infant mortality rates, the Black/White disparity persists: recent trends and future projections. *J Community Health*. 2014;39(1):118-123. https://doi.org/10.1007/s10900-013-9747-0
9. Howell EA. Reducing disparities in severe maternal morbidity and mortality. *Clin Obstet Gynecol*. 2018;61(2):387-399. https://doi.org/10.1097/GRF.0000000000000349
10. Edmonds BT, Mogul M, Shea JA. Understanding low-income African American women's expectations, preferences, and priorities in prenatal care. *Fam Community Health*. 2015;38(2):149-157. https://doi.org/10.1097/FCH.0000000000000066

11. McMorrow S, Dubay L, Kenney GM, Johnston EM, Caraveo CA. Uninsured new mothers' health and health care challenges highlight the benefits of increasing postpartum Medicaid coverage. Urban Institute. Updated May, 2020. Accessed July 16 2021, https://www.urban.org/sites/default/files/publication/102296/uninsured-new-mothers-health-and-health-care-challenges-highlight-the-benefits-of-increasing-postpartum-medicaid-coverage.pdf

12. Taylor YJ, Liu TL, Howell EA. Insurance differences in preventive care use and adverse birth outcomes among pregnant women in a Medicaid nonexpansion state: a retrospective cohort study. *J Women's Heal*. 2020;29(1):29-37. https://doi.org/10.1089/jwh.2019.7658

13. McMorrow S, Long SK, Fogel A. Primary care providers ordered fewer preventive services for women with Medicaid than for women with private coverage. *Health Aff*. 2015;34(6):1001-9. https://doi.org/10.1377/hlthaff.2014.0907

14. Coley SL, Zapata JY, Schwei RJ, et al. More than a "number": perspectives of prenatal care quality from mothers of color and providers. *Women's Health Issues*. 2018;28(2):158-164. https://doi.org/10.1016/j.whi.2017.10.014

15. Ha JF, Longnecker N. Doctor-patient communication: a review. *Ochsner J*. 2010;10(1):38-43. https://pubmed.ncbi.nlm.nih.gov/21603354/

16. Crenshaw K. Mapping the margins: intersectionality, identity politics and violence against women of color. *Stanford Law Review*. 1991;43:1241–1299. https://doi.org/10.2307/1229039

17. Crenshaw K. Demarginalizing the intersection of race and sex: a black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. In: Karen JM, ed. Feminist Legal Theories. Routledge; 1997:23-51.

18. Hankivsky O, Christoffersen A. Intersectionality and the determinants of health: a Canadian perspective. *Crit Public Health*. 2008;18(3):271-283. https://doi.org/10.1080/09581590802294296

19. Kapilashrami A, Hankivsky O. Intersectionality and why it matters to global health. *Lancet*. 2018;391(10140):2589-2591. https://doi.org/10.1016/S0140-6736(18)31431-4

20. Abrams JA, Tabaac A, Jung S, Else-Quest NM. Considerations for employing intersectionality in qualitative health research. *Soc Sci Med*. 2020;258:113138. https://doi.org/10.1016/j.socscimed.2020.113138

21. Green J, Thorogood N. *Qualitative Methods for Health Research*. 4th ed. Sage; 2018.

22. Crabtree BF, Miller WL. A qualitative approach to primary care research: the long interview. *Fam Med*. 1991;23(2):145-151. https://pubmed.ncbi.nlm.nih.gov/2037216/

23. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77-101. https://doi.org/10.1191/1478088706qp063oa

24. Beckman CRB, Ling FW, Herbert WNP et al. *Obstetrics and Gynecology*. 7th ed. Lippincott Williams & Wilkins; 2014.

25. Green TL. Unpacking racial/ethnic disparities in prenatal care use: the role of individual-, household-, and area-level characteristics. *J Women's Heal*. 2018;27(9):1124-1134. https://doi.org/10.1089/jwh.2017.6807

26. Dragon Nuance Communications. Dragon NaturallySpeaking. Version 15. Burlington, MA: Nuance Communications; 2016.

27. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qual Res Sport Exerc Health*. 2019;11(4):589-597. https://doi.org/10.1080/2159676X.2019.1628806

28. Brink HI. Validity and reliability in qualitative research. *Curationis*. 1993;16(2):35-8. https://doi.org/10.4102/curationis.v16i2.1396

29. Creswell JW, Poth CN. *Qualitative Inquiry and Research Design: Choosing among Five Approaches*. 4th ed. Sage Publications; 2018.

30. Patton MQ. *Qualitative Research & Evaluation Methods*. Sage; 2002.

31. Strauss AL, Corbin JM. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 2nd ed. Sage Publications; 1998.

32. Guest G, Bunce A, Johnson L. How many interviews are enough?: an experiment with data saturation and variability. *Field Methods*. 2006; 18(1): 59-82. https://doi.org/10.1177/1525822X05279903

33. Denzin NK. Critical qualitative inquiry. *Qual Inq*. 2017;23(1):8-16. https://doi.org/10.1177/1077800416681864

34. Hill L, Artiga S, Ranji U. Racial disparities in maternal and infant health: current status and efforts to address them. KFF. Updated November 1, 2022. Accessed October 7, 2023. https://www.kff.org/racial-equity-and-health-policy/issue-brief/racial-disparities-in-maternal-and-infant-health-current-status-and-efforts-to-address-them/

35. Oduyebo T, Polen KD, Walke HT, et al. Update: interim guidance for health care providers caring for pregnant women with possible Zika virus exposure—United States (including US territories), July 2017. *Morb Mortal Wkly Rep*. 2017;66(29):781. https://doi.org/10.15585/mmwr.mm6629e1

36. Marokakis S, Kasparian NA, Kennedy SE. Parents' perceptions of counseling following prenatal diagnosis of congenital anomalies of the kidney and urinary tract: a qualitative study. *BJU Int*. 2017;119(3):474-481. https://doi.org/10.1111/bju.13668

37. Allyse M, Aypar U, Bonhomme N, et al. Offering prenatal screening in the age of genomic medicine: a practical guide. *J Women's Health*. 2017;26(7):755-761. https://doi.org/10.1089/jwh.2016.6098

38. Woolf SH, Grol R, Hutchinson A, Eccles M, Grimshaw J. Potential benefits, limitations, and harms of clinical guidelines. *BMJ*. 1999;318 (7182):527-530. https://doi.org/10.1136/bmj.318.7182.527

39. Walker L V, Miller VJ, Dalton VK. The health-care experiences of families given the prenatal diagnosis of trisomy 18. *J Perinatol*. 2008;28 (1):12-19. https://doi.org/10.1038/sj.jp.7211860

40. Rabinowitz HK, Diamond JJ, Veloski JJ, Gayle JA. The impact of multiple predictors on generalist physicians' care of underserved populations. *Am J Public Health*. 2000;90(8):1225. https://doi.org/10.2105/ajph.90.8.1225

APPENDIX

Semi-Structured Interview Guide

Opening Statement: Thank you for taking the time to talk with me. My name is Na'Tasha Evans and I am interested in talking to you about your experiences with pregnancy and health care in order to improve the health care experiences of pregnant women. The information that you provide is very valuable and will help me make important recommendations that will improve health care for pregnant women. The interview will take about 20 to 30 minutes but feel free to let me know if you need a break at any time. Everything you say will stay private. I won't keep any information linking you to the things you tell me. I am going to record the interview so I can make notes later. The notes won't have your name on them so nobody will be able to match you to your responses. After I make my notes, I will delete all the recordings. Do you have any questions about the recordings? Is it ok for me to record you? If you want to stop the interview at any time, you can. Your participation in this study won't affect the services that you get. At the end of the interview, you will receive a pack of free diapers for your time. Do you have any questions before we start?

1. I am going to ask you a little bit about certain things that usually happen during your visits. I am interested to hear about how you and your primary prenatal health care provider talk to each other about your health care options. When I say health care options, I mean discussing services and options available such as pregnancy classes, delivery-related choices, lab work, etc.
    a. So, first, I want you to tell me about what health care options your primary prenatal health care provider talked about with you.
2. Tell me about the things that were most important to you when you were weighing your options?
    a. Was there anything specific that was most important?
3. Now, I am interested to hear about how you and your primary prenatal health care provider make decisions about your care. When I say making decisions, I mean providing you with information and support to help you make choices about your health care. Okay, I want you to tell me about how you make decisions about your prenatal health care.
    a. Tell me about the information that your primary prenatal health care provider gave you that helped you make your decisions?
    b. What kinds of things were most important to you?

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RESEARCH ARTICLE

Exposure Experiences of Area Residents Near a Chronic Environmental Contamination Site

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ABSTRACT

Background: The study aims to analyze and interpret the exposure experiences of local residents living within 5 miles of the Fernald Feed Materials Production Center, a former uranium processing site. The goal is to enhance public health efforts addressing psychological stress resulting from environmental exposure.

Methods: Semi-structured interviews were conducted from July 1998 to February 2001 as part of the Fernald Living History Project. The study focuses on 4 key phenomenological events: air releases of uranium by-products, Ohio Environmental Protection Agency public notifications of water contamination, a citizens' class action lawsuit against the US Department of Energy and National Lead of Ohio, Inc, and extensive media coverage. Researchers used descriptive inductive coding to analyze data from these events, involving 34 participants.

Results: The study identified 5 central themes in the residents' exposure experiences: disruptions to life, loss of trust, seeking answers, interpreting ambiguous threats, and adaptive responses. Participants recounted how these events affected their lives and triggered emotional responses.

Conclusion: This research provides valuable insights into the experiences of individuals living near environmentally contaminated sites and offers guidance for future prevention and mitigation strategies.

Keywords: Mental health; Rural health; Qualitative research; Environmental exposure; Chronic contamination

INTRODUCTION

Chronic environmental contamination (CEC) is the experience of living in a region where toxic substances are known or expected to be present in the air, water, and soil at elevated levels for a prolonged and unknown period of time.[1] Chronic environmental contamination sites are highly prevalent around the world and in the United States. Globally, hazardous waste is a public health concern as 300 to 500 million tons of hazardous waste are estimated to be produced annually, and improper transportation, storage, and disposal can lead to biological and environmental harm.[2]

In the United States, nearly one-fourth of the general population currently resides within 3 miles of a site listed on the US Environmental Protection Agency (EPA) National Priorities List (NPL) of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites, commonly known as "Superfund sites."[3,4] These sites result from improper hazardous waste management and require long-term, costly cleanup efforts aimed at implementing a permanent solution. The "chronic" contamination spans years, to even decades, encompassing initial toxic contamination, EPA discovery, NPL listing, remedial action, and cleanup completion.[5] Additionally, persistent organic pollutants with long half-

lives threaten human health, persisting in soils, sediments, and the human body over extended periods.[6]

A growing body of literature has evaluated associations between residential proximity to a CEC site and psychological distress in the form of general stress, anxiety, depression, and reduced health-related quality of life and has identified that mild-to-moderate relationships exist.[7] Proximity to various sources of environmental hazards, such as waste landfills, incinerators, factories, abandoned gas stations, and crops with excessive pesticide use has been shown to increase the risk of adverse health outcomes.[8] Residents living near CEC sites may experience increased stress due to reduced safe neighborhood space, increased cost and inconveniences related to managing their exposure to environmental pollutants, communication with government health officials, and the experience of daily hassles such as increased traffic, household, and social conflict.[9] Individuals living with psychological distress over time may be at an increased risk of chronic illnesses such as cardiovascular disease and obesity; they are also at an increased risk of taking up smoking tobacco and binge drinking, which can perpetuate chronic illness.[10,11] Additional research is needed to determine if area residents near a CEC site should be considered a vulnerable population at risk to adverse mental and physical health outcomes.

Area residents near the Feed Materials Production Center (FMPC), the CEC site of interest in this phenomenological study, were directly exposed to toxic materials, mainly radon and uranium waste and by-products, that were generated and stored at the site through surrounding air and water contamination. The FMPC was located in Fernald, Ohio, nearly 20 miles northwest of Cincinnati, Ohio. It produced 500 million pounds of pure uranium metal and thorium products for the nation's defense program from 1952 until its closure in July 1989 in order to refocus resources on environmental restoration.[12] The FMPC was operated by the site contractor, National Lead Company of Ohio, Inc (NLO), under the management of the US Atomic Energy Commission, now known as the US Department of Energy (DOE).

The Fernald Living History Project organization was established in 1997 with the goal of recording and preserving all aspects of Fernald's history.[13] Participants were recruited using a purposive sampling technique by seeking individuals from the community who were considered representative based on their exposure to the phenomena and who expressed interest in the site. Participants were ages 18 years and older, resided near the Fernald FMPC borders during its operation, were willing to participate in on-camera interviews, and voluntarily engaged in an informed consent process to participate in the interviews. To document the oral history of Fernald, Ohio, residents, in-depth, one-on-one interviews were conducted between July 15, 1998, and February 22, 2001, at the Fernald visitor's site private reading room or in participants' homes by trained interviewers and members of the Fernald Community Alliance. Each interview lasted an average of 90 to 180 minutes and was recorded using a single digital video recording system. The interviewers completed the in-person interviews that were recorded on video and then later transcribed verbatim by trained graduate students within the University of Cincinnati Department of Environmental Sciences. In-depth, semi-structured interviews were conducted, with the interviewer tailoring their questions according to how the interview was progressing, while also having standard questions prepared for each participant. General probes were introduced into the interview (eg, "Can you tell me more about that?").

The purpose of the present study is to explore the lived exposure experiences, the personal, embodied, and unique understanding of chronic exposure among nearby residents, using a qualitative phenomenological approach.[14] This qualitative phenomenological research presents an opportunity to identify themes of exposure experiences by local residents of the FMPC. This analysis may help explain underlying causes of mental health diagnoses and chronic illnesses among the participants presented later in life.[15] This qualitative study synthesizes and interprets the exposure experiences to 4 main phenomena of interest: (1) air releases of uranium by-products from various plants within the FMPC first detected in 1984, (2) Ohio Environmental Protection Agency public notification of potential water contamination in 1985, (3) litigation between Fernald Citizens versus National Lead of Ohio, Inc initiation in 1985 and settlement awarded in 1989, and (4) excessive exposure to local and national media attention. Additionally, this study seeks to advance prevention and mitigation strategies for environmental stressors by public health officials by raising awareness and understanding of contamination from the perspective of local area residents. A thematic analysis was performed to answer the overarching research question, "What were the exposure experiences of local community residents near the FMPC between 1984 and 1989?"

METHODS

The present study aimed to depict the experiences of residents in the area, with the goal of enhancing public health initiatives for communities residing near environmental contamination. The underpinning philosophy of the study is the direct investigation and description of phenomena as consciously experienced.[16] The philosophical assumption of the study was based upon ontology, the nature of reality, described as "reality is subjective and multiple, as seen by participants in the study."[17] The interpretive framework, or worldview, that was used to shape the interpretation of themes is social constructivism; as a result, the researchers sought to understand the world in which they lived and worked near the FMPC. Therefore, the goal was to rely, as much as possible, on the participants' views of the phenomena.[17] The descriptive methodology and use of inductive coding methods in the study allowed for the exploration of the residents' exposure experiences without any pre-assumptions in order to reveal how living near an environmental contaminated site affected their lives.[18]

The University of Cincinnati institutional review board determined the study is not considered human subjects research. All transcripts are available publicly online through the Fernald Community Alliance website. Informed consent was secured from all participants.

Procedure

The current study conducted secondary descriptive analysis using publicly available transcripts from the Fernald Community Alliance website (fernaldcommunityalliance.org).

The present study's focus is to understand 4 primary events of interest. Discussion topics, such as land acquisition and plant closure, at the time of the interview that did not pertain to air releases of uranium by-products from various plants within the FMPC, the Ohio Environmental Protection Agency's public notification of potential water contamination, class action litigation and settlement, or resident exposure to local and national media were excluded from the analysis.

Inductive coding was used where each uniquely coded description was carefully read and reread in every transcript by the 2 reviewers assigned to coding to increase the researchers' robust familiarity and recognition of subtleties within the text.[19] The individual codes were assessed for completeness by the primary author. Each unique code was compared under each of the 4 phenomena of interest and assessed for patterns as part of the thematic cluster analysis methodology.[20] Next, the 2 researchers met to discuss patterns observed from the data to generate sub-themes. Subthemes consisted of 2 or more codes that were similar in topic and were used to generate holistic patterns from the list of codes. Finally, the research team grouped sub-themes to form the final overarching themes from the analysis. Discrepancies between the researchers' interpretation of the participant codes and theme development were reviewed by an expert in qualitative analysis.

To support the validity of the study, the themes were triangulated with the senior author of the study, a subject-matter expert in the events of interest and the Fernald Community Cohort. The expert researcher concluded the themes identified were comprehensive and congruent with previous studies elicited from the cohort.

Participant Recruitment and Selection Criteria

The present study focused exclusively on analyzing the experiences of local area residents, including both current and former residents. Consequently, individuals including researchers, journalists, former FMPC employees, EPA regulators, physicians, and trustees were not included in the analysis, despite their participation in the oral history project interviews available on the Fernald Living History Project website. A total of 139 interviews were conducted for the project, with 41 of them involving area residents. Six of these interviews were excluded from the current analysis as the participants were both area residents and former employees of the FMPC. One resident interview was excluded as it focused on a university professor's research role rather than the individual's resident experience.

As the interviews were lengthy and semi-structured in nature, the investigators chose to extract data codes from the 34 participants as part of the analysis, as each interview provided new insights into the events of interest. Each individual contributed to the study uniquely, and participant's direct quotes are included in the findings.

Reflexivity

Before commencing the study, the 2 researchers assigned to read and code the participants' transcripts engaged in a phenomenological reduction exercise known as bracketing. The purpose of this exercise was to synthesize the conventional knowledge of the phenomena under study and to mitigate any unacknowledged preconceptions that could potentially skew the data collection and reporting process.[21,22] The researchers agreed they had a basic understanding of the events that occurred at the FMPC, but neither fully understood the collective and varied realities of exposure experiences within the local community. The researchers did not report conflicts of interest, including reason for bias, and both agreed to honest coding and maintaining the integrity of the research as core values in their personal belief system.

RESULTS

Participant Characteristics

A total of 34 Fernald area residents aged 43 to 92 years (M = 61.7, SD=13.3, missing data=8) were included in the analysis. There were an equal number of males and females in the study (n=17 each). The majority of residents were participants in the medical monitoring program which was created in the aftermath of the 1989 class action settlement; the program ran for 18 consecutive years through 2008 (n=26). All participants were White (N=34), which is representative of the source population residing within 5 miles of the FMPC borders in Butler and Hamilton counties (Table 1).[23] To address the research question of interest, 5 overarching themes and 19 sub-themes were developed from 294 unique participant codes (Table 2).

Table 1. Demographic Characteristics of Study Participants

Sample Demographics	N=34
Age (years) at the time of interview	Count
40 – 50	7
51 – 60	6
61 – 70	5
71 – 80	6
81 – 90	1
91+	1
Unknown	8
Sex	Count
Female	17
Male	17
Enrollment Characteristics	Count
Enrolled in the Fernald medical monitoring program	26

Table 2. Thematic Analysis of the Fernald Living History Project Study Participants' Experiences

Participant Descriptions	Sub-themes
Theme #1: Disruptions to Life	
"One of the telltale signs as I look back was that we were not getting the repeat campers. We were filling the camp and getting the campers every summer but with each new splash of information, we were losing more folks." – Participant #1, male, age 48	Fear, loss of security
"Nobody would buy this property. Would you buy my house?" – Participant #26, male, age 50	
"You don't know because you're not educated and it's not your field. And you feel very helpless. And we went home that night, and we, you know, talked to our families. And, you know, what do you say to a 7-year-old? You don't, you can't say anything to a 7-year-old because I, I knew he wouldn't understand." – Participant #22, female, age 43	Processing distressing information
"We just felt bad about it. There wasn't anything that we could physically do about that, you know. It was a problem that had been created, and um, there was just nothing that we could do." – Participant #11, male, age 63	
"Well, I think the whole thing was a bad situation. Looking back, you know, I mean, now that we're, we're told how harmful it is, and releases come out in the paper how much more likely we are to get cancer, and I think it's a real bad deal now. But you know hindsight is 20-20 I guess." – Participant #13, male, age 49	Assessing the damage
"I think as time went on it was well proven you know that it did result in a lot of damage. Not only the people on plant but the people probably off the plant. And there again, it's one of those situations that is very difficult to prove." – Participant #7, male, age 67	
"We were asked at one time to have a family picture of my brothers and all of our family and kids sitting around the kitchen table looking sad. We were all supposed to sit there and look like we were all dying, and they wanted to take a picture." – Participant #4, female, age unknown	Discovering the new reality
"It was a very traumatic time. It I, was sort of like we didn't have a Christmas, because we were always being interviewed, and meetings." – Participant #26, male, age 50	
Theme #2: Loss of Trust	
"You trust the government and trust that they know what they're doing, and you expect them to do the right thing." – Participant #14, female, age 49	Expectation to be protected
"It seems to me that perhaps they just weren't as, as sensitive to the type of material that they were dealing with." – Participant #24, male, age unknown	
"I think probably one of the thoughts that crosses your mind is up until then [is] the government had been a little less than honest with reporting what was going on because I think that they didn't have very much community contact." – Participant #6, female, age 74	Mismanaged disaster
"Uh, I'll choose a nice word, MAD, uh, DECEIVED. And I think that the deceit was the biggest thing because I don't really like to be lied to…And here, you know, your own government who would do that to somebody else had been doing that for years and they were in a denial stage too." – Participant #10, female, age 45	
"My opinion of the whole thing: they should have never given anybody any money; they should have come in here and put water in our whole area. The water that they contaminated." – Participant #17, male, age 71	Settlement Dissatisfaction
"I think that the little, few little measly bucks that we got out of the settlement was not satisfactory." – Participant 32, male, age 61	
Theme #3: Seeking Answers	
"If one something like that [a tornado] was to come through the area and those lids on there were lifted, what would happen to the community? You know, if that stuff got spilled out into the air too far and with the heavy concentration of it would, you know, our concerns are for that." – Participant #30, male, age 77	Searching for truth
"But, uh, that worries me you know, is it hereditary? I mean nobody-my mother didn't have it…my grandmother didn't have it. Is it something in the environment or am I just that unlucky?" – Participant #27, female, age unknown	
"Well, back then, at that time I really didn't believe it. I thought it was overblown by the media and I didn't think there was any real danger for us." – Participant #2, female, age 57	Making sense of mixed messaging
"I think a lot o' times, the news releases over there that are purely informational, are intended to be sensationalized." – Participant #21, male, age 52	

Table 2 (continued). Thematic Analysis of the Fernald Living History Project Study Participants' Experiences

Theme #4: Interpreting Ambiguous Threats	
Participant Descriptions	Sub-themes
"To be honest with ya, we didn't pay any attention to it. It was just another article in the news, uh we just didn't pay any attention to it." – Participant #23, female, age 62	Indifference to the media
"I don't know that I actually processed enough of the information to remember it." – Participant #8, female, age 52	
"It was never an issue." – Participant #6, female, age 74	Perception of safety
"I got a well. My water's good and I'm not worried. I'm on the safe side of it." – Participant #9, male, age 81	
"Um, I didn't react to it at all. I mean, it never bothered me or affected me or anything else. I just thought at the time, if somebody intentionally knew that dust collector was leaking and let it leak, then they should be punished." – Participant #5, male, age unknown	Perceived to be unaffected
"At that time, I didn't have any emotional distress. I filled out everything; oh, I'm fine. Everything's fine… I didn't think there was real danger." – Participant #2, female, age 57	
Theme #5: Adaptive Responses	
Participant Descriptions	Sub-themes
"And at that point I said, "We'll stay, and we'll fight." – Participant #22, female, age 43	Developing autonomy
"We educated ourselves very quickly." – Participant #22, female, age 43	
"I'm concerned about my family's health and safety. And I wanted their health and safety to be secure. And then, too, if my community's health and safety isn't well, my family's health and safety isn't well. I only want my family to have a better quality of life." – Participant #18, female, age 56	Motivation
"I was very angry, and that's why I got involved with FRESH, to see if through them I could ah, find out any more." – Participant #16, female, age 67	
"Ten thousand dollars is a good chunk of money but it doesn't buy you a life. And it doesn't buy my kids a life. And I mean I appreciate the money but there is only so much that money can buy." – Participant #29, female, age 43	It's not about the money
"I go over to the examinations I think every 2 years now. So, I think it's a wonderful thing that people can do that." – Participant #20, female, age 79	
"We did it by sitting at the table, too. Sitting at meetings and help designing the public water system. The ground was contaminated also. We made sure the pipes were certain kind of pipes formed. We made decisions in that area also. So again, we all worked together." – Participant #18, female, age 56	Community action
"The government tries to protect everybody, and you can't do it. People have got to protect themselves." – Participant #19, male, age unknown	
"I was terrified, um, because I was afraid they were going to find cancer." – Participant #3, male, age 56	Resilience in the face of conflict
"We were really tired of our lives kind of being an open book and being splashed everywhere." – Participant #22, female, age 43	

Disruptions to Life

The greatest threat to the participants' well-being and quality of life was the emotional distress caused by living in close proximity to the FMPC. Initial emotional responses to the revelation that their community's water may be chronically impacted by persistent pollutants were wide-ranging, with a primary focus on concerns for personal and familial health and safety. Additionally, residents found some of the scientific language used to describe the contamination to be 'technical' and 'difficult' to understand. One example given was the reporting of radioactivity levels in picocuries, which can be challenging to interpret. Many participants used phrases such as 'frightened,' 'scared,' 'felt bad,' 'upset,' 'helpless,' and 'powerless.' One mother reflected on her experience explaining the situation to her young son:

"You don't know because you're not educated and it's not your field. And you feel very helpless… And, you know, what do you say to a 7-year-old? You don't, you can't say anything to a 7-year-old because I, I knew he wouldn't understand." —Participant #22

Participants described the day-to-day disruptions to their daily life by simply living near the FMPC. Multiple participants recalled the loss of security felt when they were notified of the potential contamination of pollutants to the ground and surface water. The residents recalled their use of bottled water to suffice their daily needs for drinking, cooking, cleaning, and bathing. The concern for

ground and surface water contamination extended to nearby business owners.

Other disruptions that reduced quality of life included fear of property devaluation of their homes, business properties, and farmland. One resident expressed her concerns about her and her brother's lost inheritance of the family farm if they would be unable to sell it. Another worried about the negative effects of media attention on selling their property. One resident said, "Nobody would buy this property. Would you buy my house?"

Loss of Trust

Participants were distressed by the actions of the DOE and the site contractor, NLO. Many expressed an expectation that the authorities and operators should have protected the community from contamination, but they ultimately failed to do so. One participant stated, "You trust the government and expect them to know what they're doing and to do the right thing." Another resident said she didn't think the uranium oxide release was dangerous because, "Surely they would let us know and try to help us settle someplace away from it." Other residents suspected that they were being taken advantage of because they lived in a rural Midwest community, using words such as 'rural no-man's land' and 'lack of community knowledge.' One resident, who had lived on her grandfather's family-owned farm for her entire life, described her initial expectations regarding the role of the authorities:

"Because we'd lived there all our life and we had a sort of opinion that they were kind of going to take care of us and they were going to do things right and that's why they sent us the letter to let us know." —Participant #4

Residents echoed their experiences of the disaster events being mismanaged by the authorities regarding cooperation, communication, transparency, and knowledge sharing.

Seeking Answers

A common thread in participant responses was their search for the truth. Residents desired to be equipped with knowledge and the power to make informed decisions to support their families' health and well-being. Because they felt they were not receiving transparent information from authorities, it fell upon them to ask the necessary questions to uncover the truth about their exposure to toxic pollutants. The extensive media coverage of the events was one important source of information for area residents as they too were learning about their potential risk of exposure from news outlets.

One resident mentioned feeling 'vindicated' upon learning what the FMPC produced because she had suspected her husband's premature death was caused by his employment with FMPC. However, the messaging from different sources was often confusing and conflicting. Residents believed it to be exaggerated so it was not treated as a trustworthy source of information. Residents used the terms 'extreme,' 'sensationalized,' and 'somewhat real' to describe the news reports. A local business owner expressed his frustration with the media coverage:

"There's lots of frustration on both, both sides o' this... I just don't understand why we can't do a quicker job? Or at least a better public relations job on getting this figured out?" —Participant #21

Participants reflected on questions to which they may never have answers such as the true health effects caused by living near the FMPC. Residents expressed guilt related to their children's health, wondering if they caused endangerment to their kids by living near the FMPC. Multiple residents described loved ones who had experienced health problems but also expressed uncertainty about whether these issues were related to exposure from the FMPC. One participant described her daughter who had died from cancer, but she did not know if the site was to blame. Another resident described her fear of going to the doctor, where routine appointments always seemed to lead to cancer screenings.

Interpreting Ambiguous Threats

Many participants in the community did not immediately express negative emotional responses to the events, especially when the threat to their health was not clearly conveyed by the local health authorities or media coverage of the events. Some residents stated, "I guess I wasn't interested enough" and "I don't remember that I was afraid or worried or anything." Others admitted that they didn't acknowledge the media coverage, "I may have read it, but I don't even remember it."

Under these circumstances, residents may have been overwhelmed by the media coverage, felt the information they were given was untrustworthy, were too young to remember a first-hand account of the events, or did not perceive themselves to be as significantly impacted by the events as their neighbors. One resident stated, "I hate to admit that I was ignorant, but I was only a kid." Another resident described why she did not immediately react to the news of contamination:

"Well, back then, at that time I really didn't believe it. I thought it was overblown by the media and I didn't think there was any real danger for us. I was not at all concerned." —Participant #2

Some residents reported feelings of safety and security because they did not believe their water, property, emotions, or quality of life were adversely impacted at the time. Residents used the phrases 'wasn't involved,' 'wasn't interested,' 'not upset,' 'not worried,' and 'never an issue' to describe their responses to the events. The residents' perceptions may have been influenced by their lack of perceived exposure to the events.

The various mentalities of the residents represented a broad spectrum of psychological impacts that a community faces and how these impacts change over time as new mental and physical health conditions arise in themselves or their loved ones.

Adaptive Responses

Participants were growing increasingly 'alarmed' and 'frustrated' with the authority figures who were responsible for managing the

risk to the community. Residents described many reasons to get involved with the class action lawsuit from feeling 'angry' and using the legal system to demand answers to simply seeking a transparent share of knowledge so they can be better equipped to protect their families. One resident described her motivation to get involved:

"I think one of the main reasons was trying to gain the information because they weren't really forthcoming..." —Participant #10

Many noted that their motivations were not based solely on financial restitution but other grounds that were important to the residents. One resident described her experience with the lawsuit as 'having no other option' because 'nobody would answer our questions.'

The community began to act autonomously. They attended public meetings and described the meetings as 'mobbed' and 'packed,' where they began to ask questions directly to the authorities face-to-face. Collectively, they mailed letters to the DOE and 'worked together' to 'gather as much information' as they could about their situation. One resident said, "The first book I got was about how to hire an attorney." Members of a community organization described how they 'educated themselves quickly' and made a commitment that 'this will not happen again, not here.'

Although the lawsuit was ultimately a success for the area residents, their exposure to the class action lawsuit took an emotional toll on many of the participants. One resident says that he took 'flak from people' who did not want to attract attention to the area that would further devalue their properties if they did not win the case. He went on to describe how this fractured some of his relationships within the community, stating, "We found out that people we thought were our friends, aren't our friends at all."

DISCUSSION

Ultimately, the exposure experiences of the area residents are characterized by the belief that the authorities mismanaged the Fernald, Ohio, FMPC operations and failed to protect their community from environmental contamination of toxic pollutants. Residents expected to be protected by the US federal government, and many felt that there was a duty from the operators who worked for the NLO to prevent contamination. The residents felt a wide range of emotions to learning that their community had been polluted by the federal government including helplessness, frustration, anger, concern, and fear. Interestingly, the residents seemed to focus more on water contamination than the airborne exposure which was subsequently found to contribute over 80% of the body burden.[24] The media propagated confusing, contradictory, or exaggerated messages and, concurrently, health authorities did not tailor or limit the excessive coverage to promote a singular truthful account that may have had positive benefits for the community.[25] The residents channeled these emotional responses into organized community action by attending public meetings, communicating independently with officials, initiating a grassroots community organization group, and suing the NLO and DOE for $300 million. The lawsuit was eventually settled in 1989 for $78 million on the grounds of property devaluation and emotional distress.[26]

There were 2 important subsequent events not covered in the current study that improved the relationship between the Fernald area residents and the US government: (1) closure of the FMPC in 1989 that refocused resources on the remediation of the site and (2) conversion of the site to a nature preserve in 2008.[27] The Fernald FMPC was deemed a Superfund site in 1990 by the EPA and the cleanup date predictions for the groundwater under the waste storage area onsite is 2045.[28,29] Additionally, the restoration project returned indigenous animals and plants to the area and transformed the site to a green space with wetlands, ponds, and forest. The DOE Office of Legacy Management manages the preserve to monitor the ongoing groundwater cleanup activities and status of ecological restoration.[27] In addition, the experiences of these residents led to the creation of 3 educational modules which inform community members of the best practices for addressing hazardous waste cleanup, with Fernald being 1 of the 3 example communities (Lessons Learned on the Road to Environmental Cleanup https://www.med.uc.edu/depart/eh/centers/ceg/lessons-learned).

This study presents limitations. First, the exposure experiences drawn from the Fernald participants of this study are not transferable and, therefore, do not represent the varied experiences of local residents near all environmental waste sites in the United States or globally. The goal was not to transfer the results to the broader population but instead to understand the unique perspectives of the local community residents in relation to the nearby CEC site. Secondly, we chose an exclusive time period for the present study. Additional topics discussed as part of the interviews that were not covered within the scope of this project include the government seizure of property from local landowners to build the site, relationships with FMPC employees, and ongoing environmental remediation. Transcripts of the FMPC former employees are available on the Fernald Living History website for public viewing but were not included in the present study, as the aim was to gain an understanding of the specified phenomenological events from the lived experiences of the local community members.

PUBLIC HEALTH IMPLICATIONS

Residents surrounding the Fernald FMPC experienced various mental and emotional burdens simply due to their proximity to the uranium processing facility during a tumultuous period in American history, marked by the Cold War. This study focuses on events from the late 1980s, and its findings hold relevance for contemporary public health audiences. On February 8, 2023, in East Palestine, Ohio, 20 railcars carrying the human carcinogen vinyl chloride, used in the production of polyvinyl chloride plastic and vinyl products, derailed, releasing hazardous substances into the surrounding soil, streams, and air.[30,31] Since the incident, community members have reported experiencing headaches, sore throats, and difficulty breathing, along with expressions of distrust

and challenges in interpreting official environmental sampling records.[32] The findings of this study underscore the importance of a centralized, clear, and timely response from health officials. They also advocate for the inclusion of a robust mental health mitigation plan in emergency response toolkits to enhance the emotional well-being and long-term quality of life for local residents.

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No declarations of interest.

Author Contribution

Sara Burcham: conceptualization, methodology, investigation, formal analysis, writing–original draft, project administration. Daniella Saul: investigation, formal analysis. Rachael Nolan: conceptualization, methodology, writing-review and editing, supervision. Susan M. Pinney: conceptualization, writing-review and editing, validation, supervision, funding acquisition.

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REFERENCES

1. Sullivan D, Schmitt HJ, Calloway EE, et al. Chronic environmental contamination: a narrative review of psychosocial health consequences, risk factors, and pathways to community resilience. *Soc Sci Med*. 2021;276:113877. https://doi.org/10.1016/j.socscimed.2021.113877
2. Martínez JH, Romero S, Ramasco JJ, Estrada E. The world-wide waste web. *Nat Commun*. 2022;13(1):1615. https://doi.org/10.1038/s41467-022-28810-x
3. Environmental Protection Agency. Population Surrounding 1877 Superfund Remedial Sites. Published 2022. Accessed March 1, 2023. https://www.epa.gov/system/files/documents/2021-10/superfund.pdf
4. Wolfe AK, Schweitzer M. Anthropology and Decision Making about Chronic Technological Disasters: Mixed Waste Remediation on the Oak Ridge Reservation. *Oak Ridge Natl Lab TN U S*. Published online 1996.
5. Couch SR, Coles CJ. Community stress, psychosocial hazards, and EPA decision-making in communities impacted by chronic technological disasters. *Am J Public Health*. 2011;101(S1):S140-S148. https://doi.org/10.2105/AJPH.2010.300039
6. Jones KC, de Voogt P. Persistent organic pollutants (POPs): state of the science. *Environ Pollut*. 1999;100(1-3):209-221. https://doi.org/10.1016/S0269-7491(99)00098-6
7. Schmitt HJ, Calloway EE, Sullivan D, et al. Chronic environmental contamination: a systematic review of psychological health consequences. *Sci Total Environ*. 2021;772:145025. https://doi.org/10.1016/j.scitotenv.2021.145025
8. Brender JD, Maantay JA, Chakraborty J. Residential proximity to environmental hazards and adverse health outcomes. *Am J Public Health*. 2011;101(S1):S37-S52. https://doi.org/10.2105/AJPH.2011.300183
9. McIntyre E, Prior J, Connon ILC, Adams J, Madden B. Sociodemographic predictors of residents worry about contaminated sites. *Sci Total Environ*. 2018;643:1623-1630. https://doi.org/10.1016/j.scitotenv.2018.06.261
10. Abdalla MMI, Azzani M, Atroosh W, Anbazhagan D, Kumarasamy V. The association between mental health and obesity in postmenopausal women: a systematic review. *Endocr Regul*. 2022;56(4):295-310. https://doi.org/10.2478/enr-2022-0032
11. Mendelsohn CP, Kirby DP, Castle DJ. Smoking and mental illness. An update for psychiatrists. *Australas Psychiatry*. 2015;23(1):37-43. https://doi.org/10.1177/1039856214562076
12. Pinney SM, Freyberg RW, Levine GH, et al. Health effects in community residents near a uranium plant at Fernald, Ohio, USA. *Int J Occup Med Environ Health*. 2003;16(2):139-153.
13. Fernald Community Alliance. Fernald Community Alliance. Fernald Living History Project Interview Transcripts. Published 2021 2014. Accessed January 30, 2023. http://www.fernaldcommunityalliance.org/interviews.html
14. Adams C, Brown P, Morello-Frosch R, et al. Disentangling the exposure experience: the roles of community context and report-back of environmental exposure data. *J Health Soc Behav*. 2011;52(2):180-196. https://doi.org/10.1177/0022146510395593
15. Wones R, Pinney SM, Buckholz JM, Deck-Tebbe C, Freyberg R, Pesce A. Medical monitoring: a beneficial remedy for residents living near an environmental hazard site. *J Occup Environ Med*. 2009;51(12):1374-1383. https://doi.org/10.1097/JOM.0b013e3181c558f1
16. Husserl E. *Ideas: General Introduction to a Pure Phenomenology*. Vol ll. Martinus Nijhoff Publishers; 1983.
17. Creswell JW, Poth CN. *Qualitative Inquiry and Research Design. Choosing Upon Give Approaches*. Fourth Edition. SAGE Publications, Inc.; 2017.
18. Sokolowski R. *Introduction to Phenomenology*. Cambridge University Press; 1999.
19. Guest G, McLellan E. Distinguishing the trees from the forest: applying cluster analysis to thematic qualitative data. *Field Methods*. 2003;15(2):186-201. https://doi.org/10.1177/1525822X03015002005
20. Thomas E, Magilvy JK. Qualitative rigor or research validity in qualitative research. *J Spec Pediatr Nurs*. 2011;16(2):151-155. https://doi.org/10.1111/j.1744-6155.2011.00283.x
21. Ahern KJ. Ten tips for reflexive bracketing. *Qual Health Res*. 1999;9(3):407-411. https://doi.org/10.1177/104973239900900309
22. Tufford L, Newman P. Bracketing in qualitative research. *Qual Soc Work*. 2012;11(1):80-96. https://doi.org/10.1177/1473325010368316
23. Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, Federal Facilities Assessment Brand: Energy Section. *Public Health Assessment: Feed Materials Production Center (USDOE)*.; 1999. Accessed June 20, 2023.

https://www.atsdr.cdc.gov/hac/pha/feedmaterials081704-oh/feedmaterials081704-oh-pt1.pdf

24. Killough GG, Case MJ, Meyer, KR, et al. *Radiation Doses and Risk to Residents from FMPC Operations from 1951-1988*. Radiological Assessments Corporation; 1998:149. Accessed March 1, 2023. https://www.cdc.gov/nceh/radiation/fernald/fernald_dose__reconstruct_task/task-6_-killough.final-report.pdf
25. Terayama T, Shigemura J, Kobayashi Y, et al. Mental health consequences for survivors of the 2011 Fukushima nuclear disaster: a systematic review. Part 2: emotional and behavioral consequences. *CNS Spectr*. 2021;26(1):30-42. https://doi.org/10.1017/S1092852920000115
26. Gerhardstein BG, Brown P. The Benefits of Community Medical Monitoring at Nuclear Weapons Production Sites: Lessons From Fernald. Published online 2005:9.
27. US Department of Energy Office of Legacy Management. Fernald Preserve, Ohio, Site Fact Sheet. Published online May 2020. Accessed March 27, 2023. https://www.energy.gov/sites/prod/files/2020/05/f75/FernaldPreserveFactSheet.pdf
28. Ohio Environmental Protection Agency. Fernald Site. Site Chronology. Published 2023. Accessed March 27, 2023. https://epa.ohio.gov/divisions-and-offices/environmental-response-revitalization/cleanup-and-investigation/doe-fernald-site
29. US Department of Energy Office of Legacy Management. *Fernald Preserve 2021 Site Environmental Report*.; 2022:110. Accessed March 27, 2023. https://www.energy.gov/sites/default/files/2022-08/s37811-fernald_preserve_ser%202021.pdf
30. Schooling CM, Jones HE, McDermott S. East Palestine, Ohio, railroad derailment—lessons to learn, actions to take. *Am J Public Health*. 2023;113(8):841-843. https://doi.org/10.2105/AJPH.2023.307353
31. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Vinyl Chloride, Draft for Public Comment. Published online January 2023. Accessed December 27, 2023. https://www.atsdr.cdc.gov/ToxProfiles/tp20.pdf
32. Lenharo M. Ohio train derailment: scientists scan for lingering toxics. *Nature*. Published March 20, 2023. Accessed December 27, 2023. https://doi.org/10.1038/d41586-023-00820-9

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