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Message from the TPHA President

Elizabeth Cuevas, BS, MS, PhD, LP (2022-2023)

As the year is well underway, I continue to reflect upon what it means to be a leader. I want to share with each of you how the Texas Public Health Association (TPHA) leadership teams are working with steadfast determination to ensure we have a sustainable organization focused on the needs of our members. Progress is being made to ensure that the 2023 Annual Education Conference (AEC) with our partners at San Antonio Metro Health is a great success. This is the result of the dedication and perseverance of our team. What a privilege to work with, and lead, such motivated people in public health.

As leaders, it is incumbent upon each of us to train our replacements and those that will follow in our path. We are to influence and support our team to be effective and find success. We remove barriers, enable our teams to dream, and then achieve for the betterment of the population's health for the communities we serve.

As servant leaders, do we ask our teams, "how can I provide you excellent customer service" regularly? What does that mean for our perspective to support our teams? I recently participated in a course where this leadership concept was introduced - and I will challenge each of you to introduce this into your leadership repertoire. This is a daily reminder that, as leaders, we strive to be servant leaders and support our team to tremendous success.

Day, et. al describe five talents we must nurture in our profession to develop competent and capable leaders: "mentoring-nurturing, shaping-organizing, networking-connecting, knowing-interpreting, and advocating-impacting."[1] I challenge each of you to move forward through the year with a specific intention to develop talents in yourself and your teams to develop these leaders.

Our development of leaders is paramount to our ability to make meaningful and sustainable change to continue our mission to "improve the health and safety of Texas through leadership, education, training, collaboration, mentoring, and advocacy."

Dearest members, I beseech you to use your passion, seek mentors, learn more about our association, and start climbing the leadership ladder. If you have been a member for a while and want to help us move our organization forward, become a TPHA leader! Contact our Executive Director, Terri Pali, at txpha@aol.com to learn more. Please become active in the premier public health association in Texas, your TPHA!

Elizabeth

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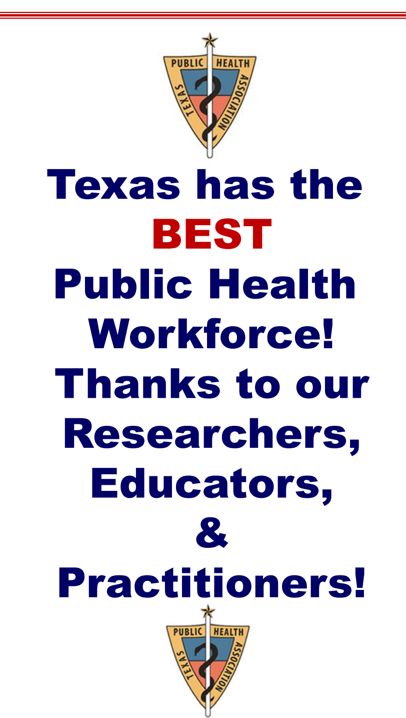


Commissioner's Comments

A Great Funding Opportunity: The Department of State Health Services Federally Qualified Health Center Incubator Program

by John Hellerstedt, MD
Commissioner, Texas Department of State Health Services

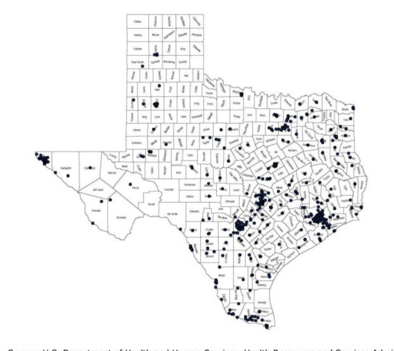
As a pediatrician, I know firsthand how critical primary care delivery is to the health of Texans. Federally Qualified Health Centers (FQHCs) (Figure 1), which provide medical services to Texans regardless of their ability to pay, are a key part of bringing the advantages of primary care to the largest number of people possible.

The Department of State Health Services (DSHS) is working to expand the number of FQHCs and the number of people they can serve. In last fall's special legislative session, DSHS received a total amount of $20 million from the Coronavirus State Fiscal Recovery Fund under the American Rescue Plan Act to restart the state's FQHC Incubator Program.[1] The program provides grants to existing FQHCs or FQHC look-alikes to expand existing health care services and access to care. The grants also support new non-profit organizations and public entities who are working to become FQHCs or FQHC look-alikes.

There are currently 72 FQHCs and one FQHC look-alike in Texas that provide comprehensive, high-quality primary care and preventive health care services in parts of the state designated as medically underserved areas or to medically underserved populations (Figure 2).[2] Together, the health centers cover 133 of Texas' 254 counties.[2] Increasingly, many FQHCs/FQHC look-alikes also provide other services along with medical care such as dental, mental health, and substance use disorder treatment. Healthcare services are provided to individuals regardless of their health insurance status and can be paid for on sliding fee scale. FQHCs can provide those services because they receive a reliable federal funding stream through grants from the Health Resources and Services Administration.[3] Adding new FQHCs will allow more clinics to access those funds and serve more people.

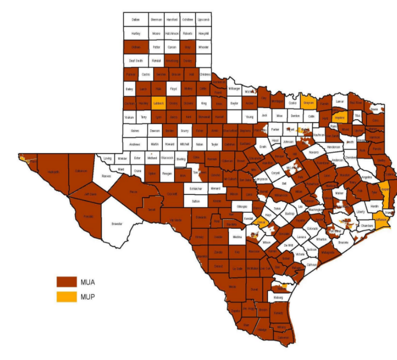
DSHS opened enrollment for the FQHC Incubator Program on June 30, 2022, that allows qualified organizations to apply for the state grants.[1] Applications are being processed on a first-come, first-served basis and will be accepted until December 31, 2022, or until the funding for the program is exhausted. Existing FQHCs and FQHC look-alikes can receive a maximum award amount of $500,000 to expand their services. Additionally, non-profit organizations or public entities providing at least 10 hours of primary care services per week who are working to become an FQHC or FQHC look-alike may qualify for a maximum amount of $1 million. Please see the Open Enrollment for the complete list of eligibility criteria.

Figure 1. Federally Qualified Health Centers, Texas, November 2020



Source: U.S. Department of Health and Human Services, Health Resources and Services Administration, Data Warehouse, November 2020.

Figure 2. Medically Underserved Areas and Medically Underserved Populations, Texas, November 2020



Source: U.S. Department of Health and Human Services, Health Resources and Services Administration, Data Warehouse, November 2020.

Activities eligible for grant funding include staffing, equipment, technical assistance and support, and capital improvement projects. Some examples of potential grant-funded activities include: education or training for staff, purchasing equipment and supplies to expand services (such as exam tables, dental equipment, computers), salary support for new staff, renovation costs to expand an existing clinical site, or building of a new clinical site.

For more information about the FQHC Incubator Program and how to apply, please visit dshs.texas.gov/fqhc-incubator.
If you're with an organization that may qualify for this additional funding, I invite you to apply. Otherwise, please share this important funding opportunity with qualifying organizations in your communities.

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Helium Inhalations Reported to Texas Poison Centers

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Helium, a colorless, odorless, and tasteless inert gas,[1] has a variety of uses, such as a coolant for superconducting magnets, a protective atmosphere in welding and manufacturing processes, and a buoyant gas for airships and balloons, including smaller party balloons. Helium is less dense than air and typically harmless because the gas is physiologically inactive. Inhaling helium from a balloon is well known to result in a temporary high-pitched, squeaky voice.[1] However, breathing pure helium can cause death by asphyxiation. As an asphysiant, helium displaces oxygen from the lungs and deprives the body of oxygen.[1,2] Helium inhalation from pressurized tanks can be fatal by barotrauma. Inhalation of helium can result in headache, nausea, dizziness, and fainting or loss of consciousness.[1-3] People may intentionally inhale helium to become intoxicated.[4,5] Deaths, both accidental and the result of suicide, have been reported after inhalation of helium.[1,6-12] Injuries due to helium inhalation have been reported to have increased in the United States (US) over the last several decades.[3]

During 2000-2021, a total of 266 helium inhalations were reported to the Texas Poison Center Network. By eleven-year periods, there were 125 (47.0%) cases during 2000-2010 and 141 (53.0%) during 2011-2021. The patient age distribution was 17 (6.4%) 0-5 years, 139 (52.3%) 6-12 years, 67 (25.2%) 13-19 years, 39 (14.7%) 20 years or older, and 4 (1.5%) unknown age; 136 (51.1%) of the patients were male, 127 (47.7%) were female, and for 3 (1.1%) the gender was unknown. A previous study of helium inhalations treated at US emergency departments (EDs) also found the majority of patients to be age 6-12 years and reported most patients to be male.[3]

The inhalation reason for 148 cases (55.6%) was reported to be intentional [103 (38.7%) intentional-misuse, 35 (13.2%) intentional-abuse, 8 (3.0%) intentional-suspected attempted suicide, 2 (0.8%) intentional-unknown], 117 (44.0%) were unintentional, and 1 (0.4%) was an adverse reaction. The inhalation site for 209 cases (78.6%) was the patient's own residence, 18 (6.8%) occurred at another residence, 10 (3.8%) at school, 10 (3.8%) in a public area, and for 19 (7.1%) the site was other/unknown. In the previous study of helium inhalations treated at US EDs, of those cases where the location of the incident was known, the majority occurred at home.[3]

The management site for148 (55.6%) of the cases was on site, 73 (27.4%) were already at or en route to a healthcare facility, 41 (15.4%) were referred to a healthcare facility, and 4 (1.5%) at an unspecified other site. The medical outcome was 21 (7.9%) with no effect, 42 (15.8%) had a minor effect, 53 (19.9%) a moderate effect, 7 (2.6%) a major effect, 9 (3.4%) were not followed or judged to be nontoxic, 88 (33.1%) were not followed because minimal clinical effects only seemed likely, 22 (8.3%) were unable to be followed but were thought to be potentially toxic, and 23 (8.6%) had an unrelated effect; 1 (0.4%) death was reported.

A clinical effect was reported in 209 (78.6%) of the cases, the most common being syncope (n=48, 18.0%), dizziness/vertigo (n=45, 16.9%), headache (n=43, 16.2%), nausea (n=23, 8.6%), vomiting (n=19, 7.1%), chest pain (n=14, 5.3%), and drowsiness/lethargy (n=11, 4.1%). The most frequently reported treatments were fresh air (n=136, 51.1%), oxygen (n=27, 10.2%), and dilute/irrigate/wash (n=25, 9.4%).

In conclusion, among helium inhalations reported to the Texas Poison Center Network, most patients were older children and adolescents. The majority of the inhalations were intentional, particularly misuse. Only eight of the 266 helium inhalations were intentional-suspected attempted suicide. Most patients were managed outside of a healthcare facility and did not experience serious outcomes. If a person experiences adverse effects after inhaling helium, the Texas Poison Center Network can be contacted at 1-800-222-1222.

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Hot Topic: Monkeypox Outbreak

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General Information
Monkeypox is classified as a viral zoonosis (animal virus that has been transmitted to humans) caused by infection with the monkeypox virus, which is in the same virus family as the variola virus that causes smallpox.[1] Historically, monkeypox has been primarily reported in central and western Africa,[2] and, until recently, monkeypox infections in humans were seldom reported outside of the African nations where it is endemic.[2,3] Starting in May 2022, thousands of monkeypox infections have been reported in dozens of countries outside of Africa.[4] In May 2022, cases of monkeypox began to be reported in various states in the United States (US),[5] with the number of cases increasing rapidly.[6] The first case of monkeypox was confirmed in Texas on June 7, 2022.[7] On August 4, 2022, the US Department of Health and Human Services declared the outbreak to be a public health emergency.[8]

Monkeypox is spread from person to person through close, skin-to-skin contact as well as direct contact with the rash, scabs, or bodily fluids of a person with monkeypox, touching objects (e.g., fabrics – clothing, bedding, towels) or surfaces used by someone with monkeypox, or contact with saliva or respiratory droplets from someone with monkeypox.[1,2,9] Current data suggest that men who have sex with men (MSM) comprise the majority of cases in the monkeypox outbreak.[6,10] However, anyone who has had close, personal contact with someone with monkeypox may become infected with the virus.[9,10]

Symptoms of monkeypox include a rash with the appearance of blisters or pimples that appear on the face, inside the mouth, or on other parts of the body; fever; chills; headache; muscle aches; backache; swollen lymph nodes; and respiratory symptoms (e.g., sore throat, nasal congestion, cough).[1,2,6,9] Sometimes people develop the rash before other symptoms or develop only the rash.[1] The incubation period (time from infection to symptoms) for monkeypox is usually 7−14 days but can range from 5−21 days. The rash typically begins within 5 days of the first symptoms.

Monkeypox typically lasts 2-4 weeks.[1] The type of monkeypox involved in the current outbreak is rarely fatal, with over 99% of the people infected likely to survive.[1] On August 30, 2022, the Texas Department of State Health Services confirmed the first death of a person diagnosed with monkeypox in Texas. This individual was an adult who was severely immunocompromised, and this case is being investigated to determine what role the monkeypox virus played in this death.[11]

A person with symptoms of monkeypox should avoid close contact with other people, pets, and other animals. People who think they are infected with monkeypox or have had close contact with someone who has monkeypox should consult a healthcare provider to help decide whether to be tested for monkeypox and/or be vaccinated against it.[1,9] Things everyone can do to prevent the spread of monkeypox include avoiding close, skin-to-skin contact with someone with a new, unexplained rash; avoiding close, skin-to-skin contact in large crowds where people are wearing minimal clothing (e.g., nightclubs, festivals, raves, saunas, bathhouses); not sharing cups, utensils, bedding or towels with someone who is sick; and staying home when they are sick.[11]

Antiviral drugs used to treat smallpox may be used to treat monkeypox.[1,2] Due to the similarity between the two viruses, vaccines used to prevent smallpox may be used to prevent monkeypox. The US also has two vaccines (JYNNEOS and ACAM2000) that can prevent monkeypox in people exposed to the virus.[1] Monkeypox vaccines are available in Texas. People should contact their local health department for information on the availability of the vaccines in their area.[9]

Additional Information for Healthcare Providers
Monkeypox can become a serious illness and may require hospitalization. The following information is provided by the Texas Department of State Health Services to assist healthcare providers. This disease may present differently in some patients. Monkeypox may be clinically confused with a rash related to chickenpox or shingles (varicella zoster virus). As well, often a sexually transmitted infection (STI) like syphilis or herpes may be suspected, and a monkeypox diagnosis may not be initially considered. It has been observed that, in those with a very weak immune system, symptoms may present differently.[12]

Testing: If you suspect monkeypox, check with your hospital lab, a commercial lab, or your local health department (https://dshs.texas.gov/idcu/investigation/conditions/contacts/) to

secure testing for your patient. More information on public health testing options may be found at https://dshs.texas.gov/IDCU/disease/monkeypox/Monkeypox-human-test-guidance081222.pdf.

Treatment: There is currently no Food and Drug Administration (FDA) approved treatment available specifically for monkeypox. However, depending on eligibility and other considerations, as described above, the Centers for Disease Control and Prevention (CDC) has a treatment protocol that allows TPOXX® (tecovirimat) to be used for the treatment of monkeypox virus in adults and pediatric patients. CDC's guidance on eligibility and treatment considerations can be found at www.cdc.gov/poxvirus/monkeypox/clinicians/Tecovirimat.html.

TPOXX® is available as oral capsules and vials for injection. Prescribing information may be found at https://www.accessdata.fda.gov/drugsatfda_docs/label/2022/214518s000lb.pdf. To request TPOXX®, healthcare providers should contact their local health department to request treatment. Once the medications have been received, the health care provider must complete the required forms and report to the CDC. These forms can be found on the CDC website at https://www.cdc.gov/poxvirus/monkeypox/clinicians/obtaining-tecovirimat.html and include an informed consent form, patient intake form, FDA Form 1572, and a MedWatch Form (Serious Adverse Event Report).

Additional Information for Daycare Centers, Schools, Dormitories and Congregate Facilities

As described above, the majority of reported cases of monkeypox have been confirmed in those aged 30 years and older. However, there have been cases reported in children and younger adults. As of September 2, 2022, the Texas Department of State Health Services reported 10 cases in those younger than 18 years and 493 in those age 18–29 years.[13] As with all infectious diseases, facilities should refer to their operational guidelines to reduce transmission. These guidelines should include strict instructions that children, staff, and volunteers stay home when sick, provision of adequate and accessible hand hygiene supplies (soap and water, hand sanitizer), performance of stringent cleaning and disinfection practices, and provision of private spaces for assessment of an ill child, away from others. As well, adequate and accessible personal protective equipment (PPE) for staff who care for students with infectious diseases must be available. If a monkeypox exposure is suspected, the local department of health should be contacted and will help in considering appropriate actions to prevent the spread of the virus.

Additional General Information

Data on the current monkeypox outbreak in the US can be found at the CDC website at https://www.cdc.gov/poxvirus/monkeypox/response/2022/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fpoxvirus%2Fmonkeypox%2Foutbreak%2Fcurrent.html.[10] According to the CDC website, as of August 22, 2022, there were 19,962 cases in the US. Texas had the fourth highest number of cases (n=1,730, 8.7%), after California (n=3,833, 19.2%), New York (n=3,403, 17.0%), and Florida (n=1,991, 10.0%). Data on the current outbreak specific to Texas can be found at the Texas Department of State Health Services website at https://www.dshs.state.tx.us/news/updates.shtm#monkeypox.[13] [Note that the Texas data provided on the CDC and Texas Department of State Health Services websites may differ due to different time periods covered or difference case definitions.] According to the Texas Department of State Health Services website, as of September 2, 2022, there were 1,695 monkeypox cases in Texas. The highest proportion of the patients were age 30-39 years (n=713, 42.1%), and the majority (n=1,652, 97.5%) were male.

Public Health Surveillance: To ensure that information on this outbreak is complete and accurate, it is essential that monkeypox cases be immediately reported, upon suspicion, to your local health department (https://dshs.texas.gov/idcu/investigation/conditions/contacts/). The Texas Department of State Health Services reminds us that several Texas laws (Tex. Health & Safety Code, Chapters 81, 84, and 87) require specific information regarding notifiable conditions to be provided to the Texas Department of State Health Services. Health care providers, hospitals, laboratories, schools, and others are required to report patients who are suspected or confirmed of having a notifiable condition (25 Tex. Admin. Code §97.2).

Information to Share

The following fact sheets are provided by the Texas Department of State Health Services for use by our members to educate their clients, patients, and other members of the general public. For further information on monkeypox, visit the Texas Department of State Health Services website at https://www.dshs.state.tx.us/IDCU/disease/monkeypox/Monkeypox/ or the CDC website at https://www.cdc.gov/poxvirus/monkeypox/about/faq.html.

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Monkeypox: What to Know

Monkeypox can spread to anyone, often through close, skin-to-skin contact, as well as:

- Direct, close contact with monkeypox rash, scabs, or body fluids from a person with monkeypox (kissing, cuddling, or sexual intercourse).
- Touching contaminated materials such as linens or clothing.
- Contact with saliva or respiratory droplets from a person with monkeypox (talking, sneezing, or coughing).

Currently, men who have sex with men (MSM) are most at risk for getting and spreading monkeypox.

- Anyone can get or spread monkeypox, and monkeypox will spread to populations outside of MSM.

Monkeypox symptoms usually start within 3 weeks of exposure to the virus.

- Symptoms can start with fever, headache, muscle aches, swollen lymph nodes, chills, or exhaustion. Next, a rash appears.
- Monkeypox can spread from when symptoms start until the rash is healed, which can take several weeks.

If you have monkeypox symptoms:

- Contact a doctor or health clinic for treatment.
- Avoid direct, close contact that can spread the disease.

Monkeypox vaccines are available for people who are eligible.

- People with a known or possible exposure to the monkeypox virus are the highest priority for vaccination.
- Please contact your local health department to learn more about vaccine availability in your area.

as of 8/31/22

For more information, visit bit.ly/3JUHhSc

as of 8/31/22

Monkeypox FAQs

What is monkeypox?

Monkeypox is a rare disease caused by infection with the monkeypox virus.

How is monkeypox spread?

Monkeypox can be spread through:

- Direct, close contact (kissing, cuddling, or sexual intercourse).
- Respiratory droplets and/or secretions during prolonged face-to-face contact released from the mouth (talking, sneezing, or coughing).
- Touching contaminated surfaces that have been touched by someone with monkeypox.
- Touching contaminated materials such as linens or clothing.

Who is most at risk for monkeypox?

Currently, men who have sex with men (MSM) is the population most at risk for getting and spreading monkeypox. Anyone can get or spread monkeypox, and monkeypox will spread to populations outside of MSM.

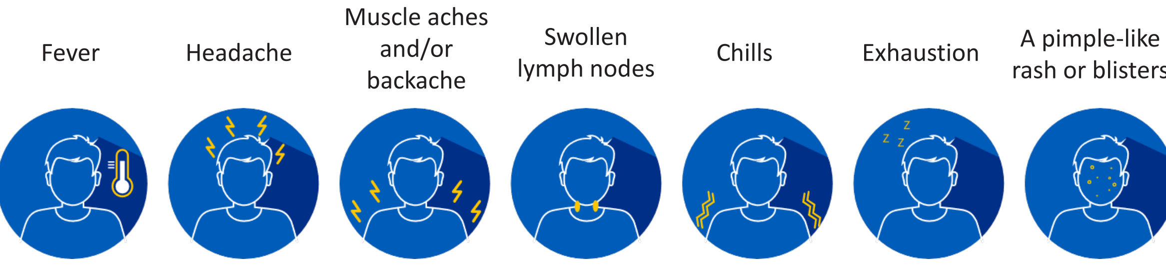
Where does monkeypox come from?

Monkeypox mainly occurs in the rain forest countries of Central and West Africa. It was discovered in 1958 when two outbreaks of a pox-like disease occurred in colonies of monkeys kept for research. However, African rodents and non-human primates (like monkeys) might harbor the virus and infect people.

What causes monkeypox?

Monkeypox is caused by the monkeypox virus, a species in the genus *Orthopoxvirus* and the *Proxviridae* family. Other Orthopoxviruses that cause infections in humans include variola (smallpox), vaccinia (used for smallpox vaccine), and cowpox viruses. There are two distinct strains of the monkeypox virus: The Central African strain and the West African strain.

What are the monkeypox symptoms?



Texas Department of State Health Services

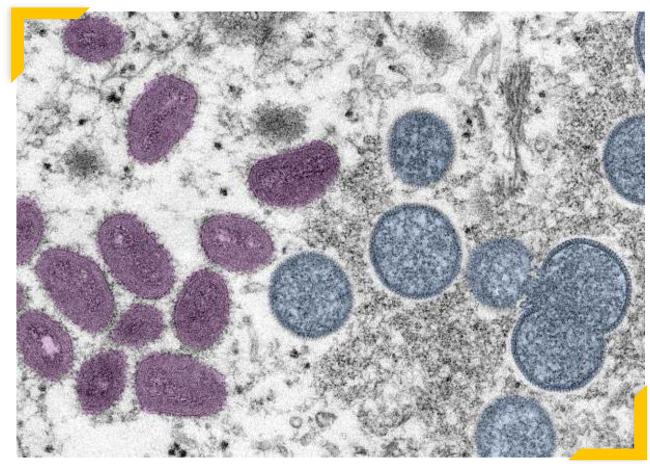
dshs.texas.gov

How long does monkeypox stay in your system?

The rash goes through different stages before healing completely. The illness typically lasts two to four weeks.

What should I do if I suspect I have the monkeypox virus or came into close contact with someone who is a carrier of the virus?

Contact your healthcare provider and avoid direct contact with others until you can be assessed.



Is there a monkeypox vaccine available?

Yes. Monkeypox vaccines are being delivered to local health departments and DSHS public health regions throughout Texas.

Who is eligible to receive the monkeypox vaccine?

Please contact your local health department to learn more about vaccine eligibility in your area.

People with a known or possible exposure to the monkeypox virus are the highest priority for vaccination.

Monkeypox vaccination may protect you from getting sick if given before or soon after your exposure.

Scan Me

For more information about monkeypox, visit:
https://bit.ly/3JUHhSc

Texas Department of State Health Services

dshs.texas.gov

Database Review:

Publicly Available Database: Federal Aviation Administration laser incident reports: Pattern of aviation laser incidents in Texas

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Attention Readers! *The TPHJ team knows we have many talented researchers out there and we want this column to be an opportunity for you to share what you know! Please take this opportunity to submit a short article about a public-use database you know of that can be used for public health research! Simply include components similar to those in the article below and submit it to* tphajournal@gmail.com *with the subject line: "Database Column". We are waiting to hear from you!*

Background

The United States (US) Federal Aviation Administration (FAA) collects reports on incidents of lasers aimed at aircraft. High-powered lasers can incapacitate pilots, distracting or temporarily blinding them and putting everyone on the planes they are flying at risk. Aiming a laser at an aircraft also violates federal law. The FAA accepts reports from victims and witnesses of laser incidents. Pilots and flight crew members, air traffic control, and the public can submit reports. The data from the reports are compiled into annual data sets.[1]

A search of PubMed did not find any articles that appeared to use the publicly available FAA laser incident reports. However, there was one article examining laser illumination of flight crewmembers using data from the FAA before the time period in the publicly available reports.[2]

Data availability and use

FAA laser incident data can be downloaded from the following website:

https://www.faa.gov/about/initiatives/lasers/laws

Each data file contains data for a single year from 2010 to the most recent year (except for the years 2010-2014, which are grouped together). The data are provided for individual reports and not aggregated. The data files are available in Microsoft Excel format.

The data available are:

Incident Date	Airport
Incident Time	Laser Color
Flight ID	Injury (Yes/No)
Aircraft	City
Altitude	State

FAA laser incident data are publically available and de-identified. Therefore, research using such data generally is exempt from institutional review board (IRB) approval. However, researchers should consult with their institution's IRB for confirmation.

Data Strengths

The FAA laser incident database includes data from the entire country and individual airports, cities, and states, so analyses of different geographic regions can be performed. Record-level data are available, so researchers can perform their own analyses.

Data Weakness or Limitations

Reporting of laser incidents does not appear to be mandatory, so the FAA laser incident database is not likely to provide data on all laser incidents affecting aircraft. The database only includes a small number of variables. For those records where an injury is reported, the database does not provide details on the type of injury or the person injured.

Data Analysis

Of the 67,558 laser incident reports in the FAA database for 2010-2021, 6,813 (10.1%) listed the state as Texas. This is second to California, which had 12,745 (18.9%) reports. Of the 6,813 Texas laser incident reports, the annual number increased from 239 in 2010 to 1,030 in 2021. There were 1,627 (23.9%) incidents in January-March, 1,352 (19.8%) in April-June, 1,635 (24.0%) in July-September, and 2,199 (32.3%) in October-December. The incidents varied by day of the week from a minimum of 8,649 (12.8%) on Monday to a maximum of 10,874 (16.1%) on Saturday. The most commonly reported laser colors were 6,269 (92.0%) green and 254 (3.7%) blue. The Texas airports reporting the most laser incidents were 828 (12.2%) George Bush Intercontinental Airport (Houston), 676 (9.9%) San Antonio International Airport (San Antonio), 639 (9.4%) El Paso International Airport (El Paso), 534 (7.8%) William P. Hobby Airport (Houston), 519 (7.6%) Dallas/Fort Worth International Airport (Dallas-Fort Worth), and 441 (6.5%) Austin-Bergstrom International Airport (Austin). The cities with the most incident reports were 1,697 (24.9%) Houston, 721 (10.6%) San Antonio, 639 (9.4%) El Paso, 588 (8.6%) Dallas-Fort Worth, 544 (8.0%) Dallas, 465 (6.8%) Austin, and 320 (4.7%) Fort Worth.

There were no reported injuries before 2015. Of the 244 total laser incident injuries reported during 2015-2021, 16 (6.6%) were reported from Texas. This is the third highest number of injuries after 50 (20.5%) California and 29 (11.9%) Florida. Of the 16 injuries reported from Texas, there were 2 (12.5%) injuries in January-March, 3 (18.8%) in April-June, 7 (43.8%) in July-September, and 4 (25.0%) in October-December. The number of injuries by day of week varied from 0 (0.0%) on

Monday to 6 (37.5%) on Saturday. The color of the laser was 14 (87.5%) green, 1 (6.3%) blue, and 1 (6.3%) unknown. The cities reporting laser incident injuries were 4 (25.0%) Houston, 3 (18.8%) San Antonio, 2 (12.5%) Austin, 2 (12.5%) Fort Worth, 1 (6.3%) El Paso, 1 (6.3%) Dallas, 1 (6.3%) Corpus Christi, 1 (6.3%) Midland, and 1 (6.3%) Victoria.

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Book Review

Breaking the Age Code, by Becca Levy, 2022.

Review by Carol A. Galeener, PhD

Pop Quiz: Think of the first five words or phrases that come to mind when prompted with "elderly," or "old people." If you conjured up, "sick," "failing," "disabled," "slow," "grumpy," "behind the times," or the like, you are like most Americans. Our culture values the young and has an abhorrence of the aged and the physical signs of aging. This is so pervasive that children as young as three can be determined to recoil in the mere presence of the elderly. This is not entirely new in American and European culture. The Grimm fairy tales do not treat the elderly kindly, nor frankly does the Disney franchise in their supposedly modern screen stories.

People from other cultures might well respond to the pop quiz with "wise," "experienced," "loving," "thoughtful," and similar words. Typically, in these cultures children are exposed to older people, often in multi-generational households. However, in America most of us grew up with limited exposure to older people. Today, in the United States the elderly increasingly live alone, often in poverty, or are warehoused in "senior citizens" complexes where they associate primarily with others like themselves. While they gain a valued form of connectedness, they lose out in another sense -- they lack the connectedness to the wider social environment that Putnam pointed to in *Bowling Alone* as necessary for a well-functioning society.

But they are not the only losers in this arrangement; the young grow up silently absorbing the message that they, too, are destined to become old, shriveled, distanced, and disdained. This belief may not surface to consciousness until about their fifth decade, when they eagerly begin to sign up for Botox treatments and lifts of assorted body parts. But the belief is planted early in the subconscious. And, as Yale sociologist Becca Levy, points out in Breaking the Age Code, her research and that of others demonstrate that, counterintuitively, it is less their genes than the beliefs that people hold about aging that are an independent causal factor in how long and how well people live. Societies that value the aged and the process of aging tend to live longer and healthier lives than those that do not. It is this key insight that makes Levy's book a worthwhile read.

What is the relevance to public health? Surely, we are making great strides in health care and the delivery of care to elderly populations. We are, in fact, inundated with elderly patients needing continuing health care. And we are growing in our knowledge – albeit slowly – of how to treat them. However, Levy references Irving Zola, a medical sociologist, in likening the situation to addressing a problem of saving drowning people downstream in a river while the upstream generating conditions continue unabated. She writes, "This is a classic challenge of public health: the dual need to address the pressing, urgent downstream problem…and the dangerous, structural upstream cause…"

We might expect that the focused attention to the Social Determinants of Health (SDH) being paid by the public health community makes sure that aging is covered, along with gender, race, ethnicity, income. However, as Louise Aronson observes in her Pulitzer-finalist book, *Eldercare*, scientists tend to focus primarily on those things that can be measured easily and, more or less, unambiguously. *Beliefs* about aging is not one of these; beliefs are time-consuming to capture and subject to change over a lifetime. At the same time, the elderly flail about in the downstream maelstrom of health care delivery, where, "Given that SDH—including socioeconomic conditions such as income, wealth, and education—are by definition outside the realm of standard medical care, what is the relevance to public health practitioners and medical care providers? Many public health practitioners have little experience in sectors outside public health-care delivery." (P. Braveman, L. Gottlieb, "The Social Determinants of Health: It's Time to Consider the Causes of the Causes." PHR, 2014 Suppl. 2, vol 129.) The time would seem to be past due.

Levy's book is well-written, interweaving her experiences as a scientist interested in the sociology of aging with the stories of the aged themselves. Perhaps there is a bit too much exposure to elderly individuals who take up running marathons as octogenarians and such, but at its core there is a strong signal: To achieve a society that is as healthy as possible throughout the entire life cycle, we must address the illness in society itself that relegates the elderly to second-class status. We must begin to value them and encourage them to value themselves.

To this end, the editorial team of the Texas Public Health Journal wishes to point out that TPHA has a section dedicated to issues related to aging, "Aging and Public Health". Please visit ww.texaspha.org/page/AboutSections. Other public health associations, such as the American Public Health Association, have similar groups.

Original Public Health Research

Environmental Dissemination of Carbapenem Resistant Enterobacteria in the Rio Grande River: A Public Health Concern?

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ABSTRACT

Antimicrobial resistant genes (ARG) are beginning to be recognized as contaminants of aquatic environments worldwide since they can be released through human activities and animal waste. Carbapenems are antibiotics used as a last resort in treating serious infections caused by multi-drug resistant bacteria. These bacteria produce enzymes that break down various antibiotics, such as penicillins and cephalosporins, rendering them ineffective. In the United States (U.S.), the most commonly found carbapenemase is the *Klebsiella pneumoniae* carbapenemase (KPC). The purpose of this pilot study was to analyze water samples, selected at three sites, from a segment of the Rio Grande River between El Paso, Texas, and Ciudad Juarez, Mexico, for the presence of KPCs using three different methods: first, chromogenic agar to screen for carbapenemase production and then polymerase chain reaction (PCR) and isothermal loop mediated amplification (LAMP) to confirm the presence of the KPC gene. Out of 28 bacterial isolates cultured in CHROMagar™ KPC, approximately a third (11/28) were positive for KPC production. Bacterial isolates included *Citrobacter freundii complex* (1 isolate), Klebsiella oxytoca (2 isolates), and *Klebsiella pneumoniae* (8 isolates). All 11 isolates that were screened through ChroMagar™ KPC also demonstrated the presence of KPC genes through PCR and LAMP. Most of the carbapenem resistant organisms were obtained from Site 3, where recreational activities occur during the summer months. The Rio Grande River runs between the border of the U.S. and Mexico. In the U.S., water from the river is used for irrigation and drinking water, whereas on the Mexican side, families use the river for recreational purposes. The presence of resistant bacteria in this segment of the river may represent a health concern. Public health programs need to be developed to prevent ARG transfer to humans and assess antibiotic resistance (AR) contamination in the ecosystem.

INTRODUCTION

Antibiotic resistance (AR) represents one of the major public health challenges around the world.[1] In the United States (U.S.), Carbapenem Resistant Enterobacteriaceae (CRE) is one of the top urgent AR health threats, as reported by the Centers for Disease Control and Prevention (CDC), requiring strict surveillance and immediate reporting once a case has been identified by health professionals.[2] In Texas, a CRE infection must be reported within one working day to the state health department.[3] CRE is usually associated with urinary tract, lower respiratory tract, and bloodstream infections; infected wounds; and medical devices such as catheters. Person-to-person transmission occurs in healthcare settings or by contact with infected/colonized individuals. Mortality rates from CRE infection range from 50% to 65% due to complications or the lack of therapeutic options.[3,4]

CRE infections are very difficult to treat, as bacteria causing these infections are resistant to nearly all antibiotics currently available, including the most powerful last-resort antibiotics.[2] Some CRE carry resistance genes in their chromosome or in plasmids. Plasmids are mobile genetic elements (circular pieces of DNA) that carry genetic information that confer AR.[5] Plasmid-encoded carbapenemases (enzymes that break down various antibiotics such as penicillins and cephalosporins), such as *Klebsiella pneumoniae* carbapenemase (KPC), are easily transferred between similar bacteria. KPC is the most common plasmid-encoded carbapenemase found in the United States.[2]

Monitoring of AR bacteria or antimicrobial residues in water is not currently a part of water quality control.[6] Furthermore, AR risk acquisition after exposure to water or food remains to be elucidated. Risk assessment for AR requires dose-response approaches, and currently these data are not available.[7]

Surface water from the Rio Grande River is the main source of potable water for many communities in the southern areas of Texas and New Mexico and is also frequently used for recreational purposes. Here, we report our findings on the screening and identification of KPC genes in the Rio Grande River, with the aim to understand to what extent the dissemination of CRE is reaching out to our natural water sources and ecosystem representing a possible health threat to the population in the near future.

METHODS

Water sampling sites were selected near highly urbanized areas along a 26 km segment of the Rio Grande River between Sunland Park, New Mexico, and El Paso, Texas. Surface water samples were obtained as previously described.[8] Bacterial isolates were identified by the MicroScan AutoSCAN 4 (Baxter International Inc.) automated bacterial identification system using NBPC 34 Microscan Panels for Gram negative bacteria (Beckman Coulter Life Sciences). This project was approved by the Institutional Biosafety Committee (IBC) at the University of Texas at El Paso (UTEP).

Chromogenic Agar Screening for Detection of CRE/KPC and DNA Isolation

Bacterial isolates recovered from surface water at selected sites[8] of the Rio Grande River were screened first by culturing the bacteria in a chromogenic agar, which detects bacteria with a reduced susceptibility to carbapenem antibiotics. We used CHROMagar™ KPC (DRG International USA Inc.) as the chromogenic medium. Bacterial isolates were incubated in CHROMagar™ KPC for 18 to 24 hours at 35°C and interpreted as indicated by the manufacturer. DNA extraction was performed by suspending a colony from an overnight grown culture on trypticase soy agar in 50 µl water and boiling at 100°C for 10 min. The integrity of the genomic DNA was assessed by electrophoresis in a 1.5% agarose gel in Tris-acetate-EDTA (TAE) buffer.

Polymerase Chain Reaction (PCR) and Loop Mediated Amplification (LAMP) assays

For those isolates that screened positive for reduced susceptibility to carbapenems using chromogenic agar, we used two nucleic acid amplification techniques, PCR and LAMP, to verify the presence of the β-lactamase *Klebsiella pneumoniae* carbapenemase (*blaKPC*) gene. This gene encodes for the most common plasmid-encoded carbapenemase found in the U.S. and is associated with fast dissemination.[2,9]

Polymerase Chain Reaction for KPC Confirmation

PCR amplification was performed to confirm the presence of KPC genes among the isolates that screened positive by CHROMagar™ KPC. PCR conditions for KPC amplification on samples was performed according to the protocol by Samra et al.[10] The primers used for KPC detection by PCR were: KPC F (5'- CTT GCT GCC GCT GTG CTG -3') and KPC R (5'- GCA GGT TCC GGT TTT GTC TC-3').

Loop Mediated Isothermal Amplification for KPC Confirmation

Since LAMP is simpler and faster and has been reported to have higher sensitivity than PCR,[12] we corroborated our findings using these two techniques. Primers used in the LAMP reaction are shown in Table 1. The total reaction volume was 25 µl containing 1 µg of DNA template, 0.8 µM each of FIP and BIP primers, 0.2 µM each of F3 and B3 primers, 0.2 µM each of FL and BL primers, 12.5 µl of LavaLAMP™ DNA Master Mix (Lucigen), and nuclease free water (Promega). The reaction was carried out at 60ºC for 1 hour and inactivated on ice at 4ºC following the manufacturer's protocol. 1 µl of 1/10 SYBR® Green (Invitrogen) was added to the 25 µl reaction. Detection of LAMP products was done by fluorescence.

RESULTS

Chromogenic Agar KPC Screening

Out of 28 Gram-negative bacterial isolates cultured on CHROMagar™ KPC, about a third (11/28) demonstrated carbapenemase production. Bacterial isolates producing KPC included: *Citrobacter freundii complex* (1 isolate), *Klebsiella oxytoca* (2 isolates), and *Klebsiella pneumoniae* (8 isolates). Three of the carbapenemase-producing isolates were found in Site 2, Courchesne Bridge, and 8 were from Site 3, River Bend.[8] Table 2 shows all bacterial isolates including results for KPC and susceptibility to the carbapenems: Ertapenem, Imipenem and Meropenem.

PCR and LAMP KPC Results

All bacterial isolates that were positive for KPC production using chromogenic agar screening were confirmed to have KPC genes using PCR and LAMP. Figure 1 shows the amplification of the *blaKPC* gene by PCR. Figure 2 illustrates the detection of the *blaKPC* gene by LAMP method.

DISCUSSION

The results presented in this pilot study demonstrate the presence of CRE in surface waters of the Rio Grande River between El Paso, Texas, and Ciudad Juarez, Mexico. Approximately one-third of sampled bacterial isolates screened using chromogenic agar (11/28) were found to show carbapenemase production. Bacterial identification showed that all isolates belonged to the family Enterobacteriaceae (*Klebsiella species and Citrobacter freundii*), which are the most commonly reported organisms producing these enzymes.[12]

We were interested in determining how well PCR and LAMP detected *blaKPC*, compared with each other. Amplification by PCR utilizes thermal cycles whereas LAMP amplification is isothermal. The specificity of these techniques ranges between 94-98% but LAMP assays are reported to be more

Table 1: Specific oligonucleotide primers for the detection of KPC gene by LAMP

Primer	**Nucleotide sequence** (5' → 3')
KPC FIP	AAT GGT TCC GCG ACG AGG CTG TCT TGT CTC TCA TGG C
KPC BIP	GGA CTT TGG CGG CTC CAT GCG CGG TAA CTT ACA GTT
KPC F3	GTA TCG CCG TCT AGT TCT G
KPC B3	TGA ATG AGC TGC ACA GTG
KPC FL	GGC AGA AAA GCC AGC CAG
KPC BL	CGA TGG ATA CCG GCT CAG

KPC = *Klebsiella pneumoniae* carbapenemase. LAMP = isothermal loop mediated amplification

Table 2: Bacterial isolates, carbapenemase production and antibiotic susceptibilities to carbapenems

Sample	ID	*Organism*	Location	KPC (+)	Ertapenem	Imipenem	Meropenem
1	COR1	*V. fluvialis*	Courchesne	NEGATIVE	NR	R	S
2	RIV1	*A. hydrophilia*	Sunland Park	NEGATIVE	S	R	S
3	RBW2A	*Leminorella sp.*	Sunland Park	NEGATIVE	R	R	R
4	CW3A	*E. coli*	Courchesne	NEGATIVE	R	R	R
5	AW31	*E. coli*	Anapra	NEGATIVE	NR	S	S
6	AW33	*V. parahaemolyt*	Anapra	NEGATIVE	NR	R	R
7	AW36	*E. coli*	Anapra	NEGATIVE	NR	R	R
8	CW3C	*E. coli*	Courchesne	NEGATIVE	R	R	R
9	AW1C	*Cedecea davisae*	Anapra	NEGATIVE	R	R	R
10	AW30	*E. coli*	Anapra	NEGATIVE	NR	S	S
11	AW88B	*Citrobacter freundii complex*	Anapra	POSITIVE	NR	S	S
12	AW49A	*Klebsiella oxytoca*	Anapra	POSITIVE	NR	R	R
13	CW52A	*Klebsiella oxytoca*	Courchesne	POSITIVE	NR	R	R
14	AW51C	*Klebsiella pneumoniae*	Anapra	POSITIVE	NR	R	R
15	AW50A	*Klebsiella pneumoniae*	Anapra	POSITIVE	NR	R	R
16	AW4XD	*Klebsiella pneumoniae*	Anapra	POSITIVE	NR	R	R
17	AW47D	*Klebsiella pneumoniae*	Anapra	POSITIVE	NR	R	R
18	CW46A	*Klebsiella pneumoniae*	Courchesne	POSITIVE	NR	R	R
19	AW51A	*Klebsiella pneumoniae*	Anapra	NEGATIVE	NR	R	R
20	AW47B	*Klebsiella pneumoniae*	Anapra	POSITIVE	NR	R	R
21	CW46B	*Klebsiella pneumoniae*	Courchesne	POSITIVE	NR	R	R
22	AW47A	*Klebsiella pneumoniae*	Anapra	POSITIVE	NR	R	R
23	AW48A	*E. coli*	Anapra	NEGATIVE	NR	R	R
24	AW51B	*E. coli*	Anapra	NEGATIVE	NR	R	R
25	RBW94D	*E. coli*	Sunland Park	NEGATIVE	NR	R	R
26	RBW94E	*E. coli*	Sunland Park	NEGATIVE	NR	R	R
27	RBW94A	*E. coli*	Sunland Park	NEGATIVE	NR	R	R
28	RBW95A	*E. coli*	Sunland Park	NEGATIVE	NR	R	R

KPC = *Klebsiella pneumoniae* carbapenemase. R= Resistant, S= Sensitive, NR= Not reported

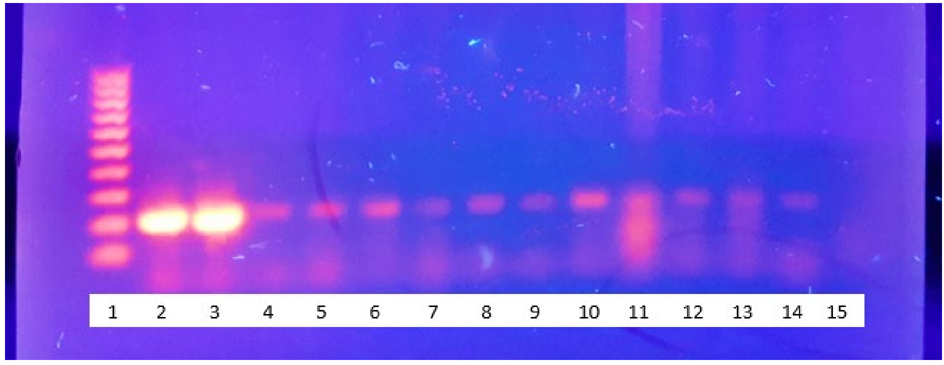

Figure 1: Detection of *bla*$_{KPC}$ genes by polymerase chain reaction (PCR).

Bottom row left to right: 1. DNA Ladder 110bp, 2. *Klebsiella pneumoniae* carbapenemase (KPC) positive control-1, 3. KPC positive control-2, 4. Sample ID AW88B, 5. Sample ID AW 49A, 6. Sample ID CW52A, 7. Sample ID AW51C, 8. Sample ID AW50A, 9. Sample ID AW4XD, 10. Sample ID AW47D, 11. Sample ID CW46A, 12. Sample ID AW47B, 13. Sample ID CW46B, and 14. Sample ID AW47A. 15. Negative control

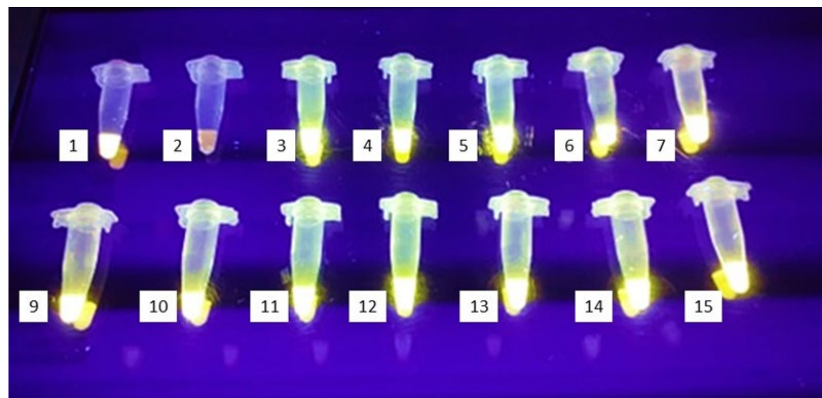

Figure 2: Detection of *bla*$_{KPC}$ genes by isothermal loop mediated amplification (LAMP).

Top row from left to right: 1. LAMP positive control, 2. negative control, 3. *Klebsiella pneumoniae* carbapenemase (KPC) positive control, 4. Sample ID AW88B, 5. Sample ID AW 49A, 6. Sample ID CW52A, 7. Sample ID AW51C. Bottom row left to right: 9. Sample ID AW50A, 10. Sample ID AW4XD, 11. Sample ID AW47D, 12. Sample ID CW46A, 13. Sample ID AW47B, 14. Sample ID CW46B, and 15. Sample ID AW47A.

sensitive than PCR.[11,13,14] In this study, we found that all 11 isolates that screened positive for KPC production carried the *blaKPC* gene and were equally detected by both methods, as evidenced by Figures 1 and 2.

Most of the carbapenem resistant organisms were obtained from Site 3 (Figure 3). In front of this sampling site, there is a public park on the Mexican side of the Rio Grande River. During the summer season, this area of the river is very popular for recreational activities, and families and children swim in the river. This may represent a potential public health concern. We believe that the presence of multi-drug resistant (MDR) bacteria is due to anthropogenic activities along the river such as agriculture and farming. A recent study conducted in the Rio Grande River in New Mexico[15] also reports the presence of multi-drug resistant bacteria carrying Extended Spectrum Beta-Lactamase (ESBL).

CRE genes detected by PCR

Strengths of our study include the use of different methods to detect KPCs: agar-based screening and two distinct nucleic acid amplification techniques. Our study was conducted in the border region, where boundaries between U.S. and Mexico interact, sharing a common source of water between El Paso, Texas, and Ciudad Juarez, Mexico. To our knowledge, this is the first study to report the presence of KPC in the Rio Grande River near the Texas-Mexico border.

Carbapenems are antibiotics used as a last resort in treating serious infections caused by MDR Gram negative bacteria. Production of carbapenemase enzymes results in resistance to various antibiotics including penicillins, cephalosporins, carbapenems, and aztreonam, making therapeutic treatment difficult.[16] The establishment of active environmental surveillance programs examining antibiotic levels and antibiotic resistant bacteria in surface waters is essential for the protection of the ecosystem, as well as human and animal health.[17] The identification and characterization of AR bacteria contaminating our natural water resources is necessary for infection control and prevention of potential health risk to the population.

Figure 3. Sampling site 3.
River Bend area near Sunset Heights in El Paso, Texas, located on the United States side of the Rio Grande River across from a public park located on the Mexican side, and selected for the high recreational activities of families and children on the river (Coordinates: 31.768277, -106.511933).

A better characterization of potential sources along with the identification of specific AR bacteria will help to more effectively perform surveillance, modeling studies, and risk assessment to prevent the spread of AR and health risk in our border communities.

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Association between Sociodemographic Factors and E-Cigarette Use among Texas Adolescents

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ABSTRACT
The use of electronic cigarettes (e-cigarettes) among adolescents has remained a major public health concern. Reports have shown that the adolescent brain is still growing and can be affected by nicotine and cancer-causing chemicals contained in e-cigarettes. The rising trend of e-cigarette use by adolescents has reportedly reached epidemic proportions, and there is a knowledge gap in the factors associated with this behavior and the provision of appropriate interventions for the at-risk population. This quantitative, cross-sectional design study investigated the association between sociodemographic factors and Texas adolescents' use of e-cigarettes by conducting secondary data analysis of the Texas Department of State Health Services Youth Tobacco Survey. The theory of planned behavior guided this study, and Pearson's Chi-Square and Logistic Regression analyses were conducted. The sociodemographic factors examined for potential association with e-cigarette use among Texas adolescents included age, gender, and race/ethnicity, while the covariates include socioeconomic status and area of residence. The results showed that age ($p < .001$) was significantly associated with adolescent e-cigarette use. Increasing age is associated with greater odds of e-cigarette use. The findings from this study may offer potential positive social change by providing a better understanding of how sociodemographic factors influence adolescent e-cigarette use. The results from this study might also guide public health practitioners in developing audience-targeted health promotion programmes for mitigating adolescent e-cigarette use.

INTRODUCTION
With increasing anti-smoking and awareness campaigns,[1,2] the use of conventional cigarettes has seen some decrease, but with the decrease in the use of conventional cigarettes arises a relatively new tobacco product, the electronic cigarette (e-cigarette), which has gained much attraction and increasing acceptance among the youth.[3,4] The results of the 2018 National Youth Tobacco Survey (NYTS) showed an overall tobacco use surge due to a rise in e-cigarette use.[5,6] E-cigarette use among adolescents in the United States (U.S.) is an emerging public health issue[7,8] and a global public health concern, with studies showing that e-cigarette is embraced by both cigarette users and non-smokers,[9,10] contrary to the original purpose of the product as an anti-smoking agent. According to the U.S. Food and Drug Administration (FDA), e-cigarette use is becoming an epidemic engulfing the youth.[11]

In February 2020, the FDA enforcement policy prohibiting the sale of flavored prefilled e-cigarette cartridges came into effect.[12] The recent 2020 NYTS consequently noted that e-cigarette use peaked in 2019.[13] The FDA enforcement policy, however, exempted flavored disposable devices and menthol and tobacco prefilled cartridges, thereby resulting in a decrease of market share of flavored prefilled cartridges (which were prohibited) while the market share of disposable devices (which were not prohibited) has remained on the rise, indicating the need for a comprehensive policy banning the access to all tobacco product by the youth.[12] This study examined the association of sociodemographic factors with e-cigarette use among adolescents using secondary data from the 2018 Texas Youth Tobacco Survey.

METHODS
The study participants are Texas adolescents age 11-18 years in grades 6 through 12. The data used for this study were originally collected using the 2018 Texas Youth Tobacco Survey (TYTS) conducted by the Texas Department of State Health Services (DSHS) and Public Policy Research Institute (PPRI) of the University of Texas A&M; therefore, this study was secondary data analysis. The original data collection involved a two-step sampling design and random recruitment of eligible participants from coalition and non-coalition areas of residence in Texas. All public schools in Texas were targeted. The process was described in detail elsewhere.[14]

Briefly, for two-step sampling design, the primary sampling units (PSU) were all the public school in Texas while the secondary sampling units (SSU) were the classes. To accurately reflect the general population of adolescents in Texas, schools were selected using probability sampling, followed by random selection of classrooms from participating schools. By using probability proportionate to size sampling, the probability of a school's selection was in proportion to the school size.[14] Finally, all students in selected classrooms were eligible to participate voluntarily as the students and/or their parents were invited to actively accept to participate or decline to participate without any negative implication on the students' academics.

The DSHS funded nine coalition areas in the state to ensure adequate community participation across the state. Coalition areas are funded to provide on-going tobacco prevention and control efforts in the state, thereby serving as a base with which to compare with the state (non-coalition) schools. These coalition areas were tasked with (a) conducting in-depth community tobacco needs assessments regarding the use of tobacco and illnesses related to tobacco use that affect Texas residents; (b) developing the capability needed to provide education that will address tobacco-related community needs; and (c) planning, implementing, and evaluating evidence-based tobacco prevention strategies.[14] This survey includes nine coalition areas comprising 80 school districts. Other school districts located at areas that are not part of the funded coalition areas comprise the non-coalition areas.

The Theory of Planned Behavior (TPB) is a social and behavioral science theory that predicts an individual's intention to engage in a behavior at a specific time and place. It posits

that individual behavior is driven by behavioral intentions, thus identifying the individual's intention as the immediate predictor of the behavior that follows.[15] According to the TPB, intentions are a function of three independent constructs,[16] which provide indications of how much effort and how willing people are to perform certain behaviors, in this case, to avoid e-cigarette use. In this construct, it is believed that the strength of the intention will determine the likelihood of using or avoiding e-cigarette use. These constructs include the individual's attitude toward e-cigarette use, the subjective norms that can influence the individual's action (including peers and family), and the perceived behavioral control that the individual can have over e-cigarette use (Figure 1). In applying the TPB, these constructs will therefore serve as points for intervention to guide the development of programs that will re-direct adolescents towards making behavioral change for ceasing e-cigarette use.

Except for the area of residence (AOR), all study data were obtained through self-reported written survey questionnaires. The dependent variable e-cigarette use refers to "lifetime e-cigarette use" and was assessed based on self-report of e-cigarette use by asking the question, "Have you ever tried using electronic cigarettes, also called e-cigarettes, vape pens, e-hookah, hookah pens, and e-cigarettes such as NJOY, Blu, or Logic?" The independent variable age was assessed from self-report of the participants and obtained by asking the question, "How old are you?" Participants were asked to put their exact age or round it to a whole number. To obtain information about race, students were asked to select from one of the following categories: American Indian or Alaska Native; Native Hawaiian or other Pacific Islander; Asian; White; Black or African American; or more than one race. Socioeconomic status (SES) was assessed based on self-report of eligibility for free or reduced-price school lunch using the question, "During the current school year, do you qualify for a free or reduced-price school lunch?" Qualifying for free or reduced-price school lunch was considered an indication of low SES. AOR was determined based on the school district from where the data was collected, either the coalition area or non-coalition area.

A total of 15,096 students who were enrolled in public schools across Texas completed the survey. The entire sample of 15,096 available from the survey was used for the data analysis. The original survey received approval from the Internal Review Board of the University of Texas Tobacco Prevention and Cessation Coalition (TPCC) evaluation team, DSHS and Texas A&M University.[14] This secondary data analysis utilized a de-identified dataset from the original survey, and permission to conduct this study was obtained from the Institutional Review Board of Walden University, Minneapolis, Minnesota. The de-identified data were analyzed using the Statistical Package for Social Sciences version 25.[17] For preliminary data analysis, univariate descriptive statistics provided background information about the participants, while bivariate (uncontrolled) analysis using simple logistic regression were used to determine whether an association existed between each independent variable and the dependent variable. Inferential statistics was undertaken with Binary Logistic Regression (BLR) to examine odds of the association between the independent variables (age, gender, race/ ethnicity, SES, AOR) and the dependent variable, e-cigarette use.

RESULTS

A total of 15,096 adolescents attending public schools in Texas participated in this study. From univariate analysis, the mean age of participants was 14.28 years +/- 2.0 (mean +/- standard deviation [SD]) (Table 1), and approximately 50.8% were male. The age range was 11–18 years. Prevalence of e-cigarette use and bivariate (uncontrolled) analysis are presented in Table 2. Findings showed that the prevalence of e-cigarettes ever-use (life-time use) increased as the participants' age increased, ranging from an average of 4.8% at age 11 years to an average of 42.1% at age 18 years. Findings showed a statistically significant association between age and adolescent e-cigarette use (P<0.01). About 20.4% of the students reported life-time e-cigarette use, of which a slightly higher prevalence of lifetime e-cigarette use was reported by males

Figure 1. ***Model of the Theory of Planned Behavior constructs for predicting e-cigarette use behavior***.

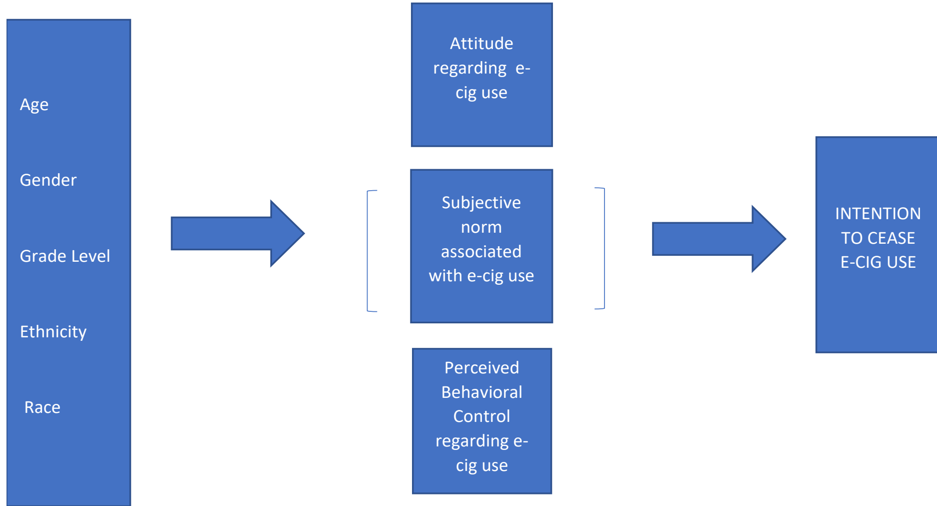

Table 1: ***Univariate Descriptive Statistics of the Study Participants (n = 15,096)***

Variable		Frequency	Percent
E-cigarette use:	No	12014	79.6
	Yes	3082	20.4
Age:	11 years old or younger	880	5.8
	12 years old	2487	16.5
	13 years old	2919	19.3
	14 years old	2364	15.7
	15 years old	1952	12.9
	16 years old	1756	11.6
	17 years old	1691	11.2
	18 years old	1047	6.9
Gender:	Male	7664	50.8
	Female	7432	49.2
Grade level:	6th grade	2582	17.1
	7th grade	2991	19.8
	8th grade	2740	18.2
	9th grade	1954	12.9
	10th grade	1740	11.5
	11th grade	1703	11.3
	12th grade	1386	9.2
Ethnicity:	No, I am not Hispanic	9047	59.9
	Yes, I am Hispanic	6049	40.1
Race:	White	9113	60.4
	American Indian or Alaskan Native	657	4.4
	Asian	281	1.9
	Black or African American	1324	8.8
	Native Hawaiian or other Pacific Islander	97	0.6
	More than one race	3624	24.0
SES:	No, not qualified for free/reduced lunch	4755	31.5
	Yes, qualified for free/reduced lunch	10341	68.5
AOR:	Coalition area	8576	56.8
	Non-coalition area	6520	43.2

SES = socioeconomic status. AOR = Area of residence.

Table 2: ***Participant Characteristics - Differences in E-cigarette Use and Bivariate Analysis - Simple Logistic Regression***

Characteristic		E-cigarette use (%)	p	OR(95% C.I.)
Age:	11 years old or younger	42 (4.8%)	.000	
	12 years old	150 (6.0%)	.167	1.281(.901, 1.819)
	13 years old	360 (13.3%)	.000	2.807(2.020, 3.900)
	14 years old	428(18.1%)	.000	4.411(3.180, 6.118)
	15 years old	531(27.2%)	.000	7.456(5.384, 10.325)
	16 years old	518(29.5%)	.000	8.348(6.023, 11.571)
	17 years old	612(39.2%)	.000	11.317(8.173, 15.669)
	18 years old	441(42.1%)	.000	14.520(10.404, 20.264)
Gender:	Male	1612(21.0%)	.000	
	Female	1470(19.8%)	.056	926(.855, 1.002)
Race:	White	2044(22.4%)	.000	
	American Indian or Alaskan Native	125(19.0%)	.043	.813(.665, .993)
	Asian	31(11.0%)	.000	.429(.294, .625)
	Black or African American	196(14.8%)	.000	.601(.512, .705)
	Native Hawaiian or Pacific Islander	20(20.6%)	.671	.898(.548, 1.473)
	More than one race	666(18.4%)	.000	.779(.706, .858)
SES:	No, not qualified for free/reduced lunch	1130(23.8%)	.000	
	Yes, qualified for free/reduced lunch	1952(18.9%)	.000	.746(.687, .811)
AOR:	Coalition area	1812(21.1%)	.000	
	Non-coalition area	1270(19.5%)	.013	1.107(1.022, 1.200)

SES = socioeconomic status. AOR = Area of residence.

than by females (21.0% versus 19.8%), but gender difference was not statistically significant (P>0.05) (Table 2). The prevalence of e-cigarette use was highest among Whites (22.4%) in comparison with other races, and the lowest prevalence was among Asians (11%). A higher prevalence of adolescents who were not of low SES, that is, not qualified for free/reduced school lunch (23.8%) reported e-cigarette use in comparison to adolescents with low SES (18.9%), and the association between SES and e-cigarette use was statistically significant (P< 0.05). Adolescents residing in the coalition area (21.1%) are more likely to use e-cigarettes than adolescents residing in non-coalition areas (19.5%), and there was statistically significant association between AOR and e-cigarette use (P<0.05). Overall, bivariate (uncontrolled) analysis revealed an association between e-cigarette use and age, race/ethnicity, SES, and AOR, while only a slight association (P=0.056) was found for gender.

Multivariate analysis using Binary Logistic Regression investigating whether age, race/ethnicity, SES, and AOR are associated with e-cigarette use when controlling for each variable further validated that the sociodemographic factors of age, race/ethnicity and the covariate SES were significantly associated with e-cigarette use among Texas adolescents (P<0.05), while gender and the covariate AOR were found to be not significant (P>0.05) (Table 3). At a .05 criterion of statistical significance, increasing age is associated with greater odds of e-cigarette use. The odds ratio for age indicates that, when holding all other variables constant, a 13-year-old Texas adolescent is 2.735 times more likely to use e-cigarettes than an 11-year-old (reference group), while a 15-year-old is 7.299 times more likely to use e-cigarettes than an 11-year-old. For race, an Asian adolescent is 0.524 times less likely to use e-cigarettes than a White (reference group). Similarly, a Black or African American adolescent is 0.626 times less likely to use e-cigarettes than a White adolescent. Students with poor SES were also less likely to use e-cigarettes than other students.

DISCUSSION

The purpose of this study was to examine how e-cigarette use by Texas adolescents is affected by the sociodemographic factors of age, gender, and race/ethnicity, as well as the association between e-cigarette use and the covariates SES and AOR. The study provided descriptive and inferential data for the participants of the 2018 TYTS. According to this study, the sociodemographic factor of age showed the most significant association with e-cigarette use. As the age of the adolescents increased, they were more likely to use e-cigarettes. The age of the adolescent is therefore a major contributing factor to e-cigarette use among adolescents. The association of increasing age with higher likelihood of using e-cigarette could be attributed to the higher exposure of older adolescents to e-cigarette advertisements as well as peer pressure.[18-20] Health communications should aim to counter the product advertisements by tobacco companies and provides health facts about negative implications from e-cigarette use.

Table 3. ***Variables in the Equation***

		S.E.	p	Odds Ratio (OR)	95% CI for OR Lower	Upper
Step 1a	11 years old or younger		.000			
	12 years old	.179	.194	1.262	.888	1.794
	13 years old	.168	.000	2.735	1.968	3.801
	14 years old	.167	.000	4.310	3.106	5.980
	15 years old	.166	.000	7.299	5.269	10.113
	16 years old	.167	.000	8.105	5.843	11.242
	17 years old	.166	.000	10.968	7.914	15.199
	18 years old	.171	.000	14.024	10.040	19.590
	Female	.042	.103	.933	.859	1.014
	White		.000			
	American Indian or Alaskan Native	.108	.622	1.055	.853	1.304
	Asian	.199	.001	.524	.355	.774
	Black or African American	.085	.000	.626	.530	.740
	Native Hawaiian or other Pacific Islander	.266	.951	1.017	.604	1.712
	More than one race	.053	.686	.979	.882	1.086
	Yes, qualified for free/ reduced lunch	.045	.003	.872	.798	.954
	Non-coalition area	.043	.904	1.005	.923	1.094
	Constant	.165	.000	.061		

Variable(s) entered on step 1: AGE, GENDER, RACE/ ETHNICITY RECODED, SOCIOECONOMIC STATUS RECODED, AREA OF RESIDENCE.

CI = confidence interval.

The findings also showed significant association between e-cigarette use and race/ ethnicity, as well as between e-cigarette us and SES. Although the bivariate analysis showed an association with AOR, the multivariate modeling did not detect any association between e-cigarette use and AOR. This suggests that adolescent e-cigarette use was not influenced by where they resided.

The findings from the current study were consistent with findings in the literature. In national population surveys,[21,22] it was found that non-Hispanic Whites were more likely to use e-cigarettes than Hispanics, an observation also noted in the current study. Similarly, earlier data from the Centers for Disease Control and Prevention (CDC) reported a lower smoking prevalence for Hispanics in contrast to non-Hispanic whites (11.2% versus 18.2%),[23] while another study also reported higher prevalence of e-cigarette among non-Hispanic Whites in comparison to Hispanics (14.2% versus 10.1%).[24] In their study, Park and associates noted a significant positive association between increasing age and greater odds of e-cigarette use,[25] which is consistent with the finding from the current study. Like this study, in the 2018 National Youth Tobacco Survey,[26] e-cigarette use prevalence was found to be higher among high school students (27.5%) and lower in the middle school (10.5%).

This study found associations between the sociodemographic factors of age, race/ethnicity and SES with e-cigarette use among Texas adolescents. Students who are not qualified for free/reduced lunch, which is an indication of being from an economically advantaged family, were noted to have higher odds of using e-cigarette. This finding can be attributed to access to money (pocket money) with which to purchase e-cigarettes. In a study that modeled smoking behavior using the theory of planned behavior (TPB),[27] the authors reported that receiving a high amount of pocket money was associated with increased smoking behaviors and intention. Therefore, public health practitioners should develop health promotion programs that include social norms such as peers and family, a construct in the TPB, as a point of intervention for mitigating e-cigarette use.

FUTURE IMPLICATIONS

The findings from this study were consistent with other similar studies and have also validated the association of e-cigarette use with sociodemographic factors in a population of Texas adolescents. Public health education for mitigating e-cigarettes should be intensified at all schools and facilities where adolescents can be located. Noting that the findings from this study showed that the odds of using e-cigarette use is higher among the White race, it would be relevant to develop cultural-focused interventions and health campaigns involving facilitators who will connect to the target audience as well as utilizing health communications that would be appealing to the target audience. Another strategy would be to utilize community-based participatory research to develop collaborative programs that would be effective for utilization in the target population. Incorporating the use of social media in providing education about adverse effects of e-cigarettes can further enhance the information reaching the target population of adolescents. Considering that behavioral problems occur among peers, it is also recommended that the health promotion should include peer-led programs that can help to increase the participation of other adolescents as well as improve the sustainability of the health promotion program. In addition to quantitative research, it would also be important to utilize a qualitative approach to understand the adolescent perspective regarding e-cigarette use.

CONCLUSION

E-cigarette use is a behavioral issue[25,28] which can be precipitated by several characteristics of the individuals including socio-demographic factors such as age and race/ethnicity,[16,29] as investigated in this study. This study has the potential for positive social change among adolescents and the prevention of e-cigarette use as it has provided information that would be useful for developing targeted interventions to mitigate adolescent e-cigarette use. Preventing the initiation of e-cigarette use in the first place is paramount and should be the focus for developing evidence-based interventions for the adolescent population. Policy changes that will target adolescent health promotion would further help to motivate the adolescents to make behavioral change towards avoiding e-cigarette use. The findings from the current study have contributed to the knowledge base pertaining to the association of sociodemographic factors with e-cigarette use among adolescents in Texas, and the approach can be applicable to similar studies. The findings will help public health professionals in developing appropriate audience-targeted health education materials and intervention programs including community-based participatory research, peer-led/ facilitator intervention programs, and community outreach programs.

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Investigating the Experiences and Effects of Synthetic Cannabinoid (kush/K2/Spice) Use Among Individuals Experiencing Homelessness in Houston, Texas

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ABSTRACT

Background: Synthetic cannabinoids (SC), colloquially known as kush, K2, and Spice, are low-cost substances with serious side effects. Their growing popularity has resulted in an increase in SC-related emergency department visits over recent years, particularly among people experiencing homelessness.

Purpose: The present field survey study explored the connection between homelessness and SC use to describe the characteristics of SC use among this population.

Methods: Individuals aged 18 years or older residing in homeless encampments in Houston, Texas, with experiences of SC use were eligible to participate. Participants completed an interviewer-administered survey about their SC use.

Results: The majority of participants (N=65) were Black/African American (n=46, 65.7%) and male (n=58, 82.9%). Over half of study participants reported symptoms associated with dependence, such as increased tolerance (n=40, 61.5%). Participants reported a variety of serious physical side effects following SC use, including catatonia (n=35, 50%), seizures/convulsions (n=13, 18.6%), and heart palpitations/increased heart rate (n=35, 50%). A small proportion of participants reported instances of self-harm (n=8, 12.3%) and violence toward others (n=9, 13.8%) following SC use. Participants also reported emergency department use, vehicular accidents, being victims of robberies/theft, and sexual assault.

Conclusions: The symptoms following SC use could lead to serious consequences for people experiencing homelessness, including criminal justice involvement, severe illness, hospitalization, victimization, and death. Further information about SC toxicity and potentially serious complications is needed for adequate clinical and community response, as well as to provide individuals experiencing homelessness with knowledge that can allow them to protect themselves when using SC and minimize its harms.

INTRODUCTION

Synthetic cannabinoids (SC), also known as K2, Spice, and 'kush,' in some regions, are manmade chemicals that are marketed as an alternative to marijuana.[1,2] These substances of abuse are widely accessible, affordable, and may pose a significant threat to human health.[3] Sprayed onto products such as incense[4] and marketed as a 'legal high,' SC are often packaged with appealing characters (e.g., cartoons), can be purchased without identification, and are often undetectable in a urinalysis, making them appealing to youth and adults.[5-9] As a result, the literature on SC has primarily focused on studying its effects and trends among adolescents and college students.[8,10-14] However, recent studies document a shift in the demographics of SC users, with a notable increase among individuals experiencing homelessness.[15]

In cities with high emergency department (ED) or psychiatric services use due to SC, homelessness was the characteristic most commonly correlated with SC use.[16,17] As a result of SC usage, people experiencing homelessness have reported being victims of crimes, losing consciousness, experiencing psychosis, and requiring emergency medical services (EMS).[9,18-20]

In Houston, Texas, the majority of individuals who utilized EMS following SC use identified as Black/African American and male with a mean and median age of 37 years.[21] Previous literature also established that individuals between the ages of 45 to 54 years make up a significant number of ED visits following SC use.[4]

Despite growing concern about the use of SC among individuals experiencing homelessness, research with this population is limited. Current literature focuses more on individual factors than the context in which use occurs and how the realities of homelessness influence SC usage. Furthermore, substance use trends can be localized in terms of the chemical composition of substances and the sociopolitical climate in which use occurs. In Houston, Texas, EMS reported nearly 2,500 calls related to SC (locally known as 'kush') between 2015 and 2016.[21] Houston also had the highest number of SC-related ED calls between 2010 and 2015 and an increase in the number of people utilizing the ED following SC intoxication.[21] The current mixed-methods study was designed to learn about the experiences of people experiencing homelessness in Houston who currently or previously used SC with the goal of elucidating the relationship between homelessness and SC use.

Population and Methods

This study was guided by Community Action Research prin-

ciples with a research team including members of the community, healthcare professionals, and academic researchers. Recruitment and data collection took place at two Houston homeless encampments identified by community team members as areas with frequent SC use. The team visited the encampments with outreach workers well known to the residents in order to increase trust among participants. Using a purposive sampling strategy, data collectors approached individuals with a hygiene kit and invited them to participate in an anonymous survey about their experiences around SC use. Eligible participants (individuals aged 18 years or older with SC use experience) provided informed consent, and those who completed the survey received $5 upon completion. Approval for this study was granted by the University of Texas Health Science Center at Houston (UTHealth) Institutional Review Board (IRB).

Trained data collectors administered the survey over several weeks in October 2018. The 15-minute survey contained open- and close-ended questions about demographics and SC use. The instrument was a modified version of a survey used with young adults.[7] In order to best capture the responses to the open-ended items, responses were recorded using pseudonyms.

Recorded, open-ended survey responses were transcribed by UTHealth graduate students. Dominant categories and topics in these responses were identified using the responses to close-ended items in the survey data. This review of open-ended responses deepened our understanding of participant experiences. Based on the dominant categories in the survey and those in the open-ended responses, representative quotes were selected to further describe participant lived experiences. Quantitative data included descriptive statistics and Fisher's Exact Use with an adjusted p-value cut-off of 0.01 to account for multiple comparisons. Data were analyzed using IBM SPSS Statistics (version 27).[22,23]

RESULTS

Characteristics of Participants and their SC Use

As shown in Table 1, participants were predominantly male, Black/African American, and ranged in age from 20 to 65 years (Mean=39.57 years, Standard Deviation=9.74 years). Most participants were current SC users at the time of data collection, and the remaining were past SC users. The majority of individuals reported last use of SC within the past seven days. The frequency of SC use was most often reported as "everyday" or between two and six times weekly. There were no significant sociodemographic differences between current and past SC users.

The most common sources for participants' last SC use were a dealer or friend, and most smoked using a blunt (SC mixed with tobacco). When asked about whether they knew other people who use SC, all participants responded affirmatively. Under half (41.5%) of participants used SC with others and 35.3% primarily used SC alone. Although the majority of participants indicated that they did not combine SC with other substances, a quarter of participants reported mixing SC with other substances, including alcohol, cocaine, crack cocaine, methamphetamines, marijuana, methylenedioxymethamphetamine (MDMA), paint thinner, and "water" (embalming fluid).

The majority of participants acknowledged that SC are harmful for health (85.0%) and that they would not use SC if marijuana were legal (61.5%). Participants reported SC use to avoid positive drug tests related to criminal justice involvement or employment (75.4%). One participant who was on probation, shared that, "Nah…I just didn't want to get no dirty piss test, that was the problem..." Participants shared that they use SC to sleep (70.8%) and to control irritability (58.5%).

Table 1. Participant Characteristics

Category	%	Number
Sex		
Female	13.8	9
Male	86.2	56
Sexual Orientation		
Heterosexual/straight	96.9	63
Gay	3.1	2
Race/Ethnicity		
Black/African American	66.2	43
Hispanic/Latinx	9.2	6
White	4.6	3
Native American/Alaska Native	1.5	1
Native Hawaiian/Other Pacific Islander	1.5	1
Asian	1.5	1
More than one race/ethnicity	9.2	6
Other	6.2	4
Current Employment Status		
Full-Time	9.2	6
Part-Time	21.5	14
Unemployed	69.2	45
Education		
Less than high school	18.5	12
Completed high school or equivalent	49.2	32
Taken college classes	26.2	17
Completed college	4.6	3
Other (i.e., trade school)	1.5	1

Participants also said SC were easy to find, cheaper than their drug of choice, and stronger than their drug of choice. Other reasons included managing stress, depression, and promoting relaxation (n=6). Participants (n=5) also added pain management and increased appetite as reasons why they use SC. One participant stated, "it helps me eat, like medicine". Another participant shared, "I use it for pain management because Norcos [Norco, a brand name for hydrocodone with acetaminophen], I can't afford them. I had surgery on my back and broken toes, and SC is cheaper and helps with the pain. Pain pills are just as addictive." A few participants stated that they use SC to pass the time, get through the day, and escape reality. One participant stated that he used SC because, "I am bored. Nothing else to do."

Symptoms and Experiences Associated with SC Use

Participants reported physical, mental, and social outcomes following SC use (Table 2). The top reported symptoms included relaxation, dry mouth, and increased appetite. Although reported less frequently than other symptoms, participants did report serious symptoms following SC use, including catatonia, seizures/convulsions, coma, and increased heart rate. Participants also reported symptoms of psychosis (e.g., paranoia, agitation, and hallucinations). Other reported symptoms included dehydration and thirst, changes in bowel movements, fatigue and tiredness, decreased appetite, and changes in vision (one participant said, "vision got dark").

Six dominant categories emerged from the analysis of experiences associated with SC use (Table 3), including hospitalization, robbery, violence toward self/others, vision problems, vehicular accidents, and sexual assault/rape. A small proportion of male participants reported physical violence to self and others following the use of SC. One participant recalled that they, "thought the world was trying to kill me, so I tried to kill the world." Incidents of self-harm appeared unintentional and the result of psychosis. One participant recalled that SC, "… had me hallucinating to where I thought I was being chased by

Table 2. Symptoms of Synthetic Cannabinoids Use

Symptom	%	Number
Anxiety	61.5	40
Panic attack	56.9	37
Paranoia	64.6	42
Depression	50.8	33
Trouble thinking clearly	58.5	38
Headache	40.0	26
Dry mouth	81.5	53
Increased appetite	73.8	48
Catatonia	52.3	34
Nausea (with or without vomiting)	66.2	43
Seizures/convulsions	20.0	13
Hallucinations	33.8	22
Coma	10.8	7
Relaxation	84.6	55
Physical violence to self	12.3	8
Physical violence to others	13.8	9
Diarrhea	41.5	27
Changes in body temperature (i.e., fever, feeling cold)	60.0	39
Passed out/nonresponsive	55.4	36
Heart palpitations (increased heart rate)	50.8	33
Sweating	67.7	44
Cough	67.7	44
Euphoria (intense excitement/happiness)	63.1	41
Numbness/tingling	53.8	35
Increased tolerance	61.5	40
Irritability if unable to use for a day or more	63.1	41
Suicidal thoughts	13.8	9
Drowsiness	60.0	39
Fainting/dizziness	49.2	32
Agitation	55.4	36

Table 3. Experiences Following Synthetic Cannabinoid Use

Category	Participant Experiences
Hospitalization/Emergency Department visit	"…3-day coma woke up in hospital with tubes in throat blacked out, anxious, gasping for air, can't breathe, then blacked out and woke up in hospital." "About a month ago, I had some very bad panicking and anxiety attack. I had to go to the hospital. I thought I was going to stop breathing, I was panicking, and I couldn't stay put." "Hermann Park. I smoked a blunt and thought I had seen the devil. I ran to Ben Taub Psych Center NPC [NeuroPsychiatric Center], was banging on the door saying the devil was after me." "I fell forward while sitting on a brick. I had a seizure and hit my head. I had to go to the ER. I'm an asthmatic too, so that is why I say that I have to regulate what I do."
Victims of robbery	"A couple years ago, I passed out and got robbed and all my stuff got stolen." "I fell asleep, and somebody went in my pockets and took everything out of my pockets." "I got my things stolen here because I passed out." "I smoked some kush [SC], passed out, puked everywhere, and I had gotten robbed. This was a couple of years ago."
Violence toward self/others	"I was sleeping under the bridge way in the back. I had some mace and put it down, and some got on my hands. I went to scratch myself and felt like a snake climbed between my legs because of the burning from the mace. I spent a few minutes punching myself in the groin, hollering and screaming thinking I was trying to kill a snake that had bit me in the groin." "I got concussion from fighting under the influence." "I was inside my home (I just lost my house) and I had a female friend over. Kush [SC] made her look like someone else. I ran down and pushed her down the steps. Her whole face and everything changed to a different person that I did not know. She was my girlfriend, but I did not know her. She knew my name, my whole government name. I was talking to her from inside my closet." "I woke up in a parking lot in a puddle of water and I had beat up my spouse." "With my brother, I almost killed him…" "I sat in a tent, smoked a blunt, then did 2 lines of cocaine…I tripped, thought someone grabbed me (I got caught by the tent). I swung at myself, and broke my own jaw."
Vision Problems	"I couldn't see anything…everything went black, I went to sleep then woke up and had my vision back."
Vehicular Accidents	"I have crashed cars while smoking kush [SC], then I ran off. I felt like wasn't in my body anymore…"
Sexual assault/rape	"Someone broke into my apartment and raped me."

something." Another participant stated, "I was sleeping under the bridge way in the back. I had some mace and put it down, and some got on my hands. I went to scratch myself and felt like a snake climbed between my legs because of the burning from the mace. I spent a few minutes punching myself in the groin, hollering and screaming thinking I was trying to kill a snake that had bit me in the groin."

One participant shared that, in order to keep him and others safe, he stays away from pregnant women and children when using SC. He recalled that, on one occasion after using SC, he experienced paranoia and hallucinations and, as a result, assaulted a longtime female friend. "… I was inside the house. And I had a female friend over, and kush [SC] made her look like somebody else. So I went up to her and threw her down the stairs, and said I didn't know who she was…"

In an additional open-ended item about previous negative experiences with SC, participants commonly shared experiences about hospitalizations and ED visits as well as being victims of robberies/theft. Less common were experiences with vehicular accidents, vision problems, and being victims of rape/sexual assault. As one participant shared, "I have crashed cars while smoking kush [SC], then I ran off. I felt like wasn't in my body anymore…"

More than half of study participants also reported symptoms associated with dependence, including increased tolerance and irritability if unable to use SC for a day or more. Individuals with recent experiences of SC use were significantly more likely to report dependency on SC including increased tolerance (X^2=10.02, p=0.002) and irritability without SC (X^2=7.41, p=0.006). No side effects were significantly related to their expressed interest in stopping SC use (69.2%, n=45).

DISCUSSION

The accessibility, affordability, and intense high associated with SC make them an appealing choice for individuals experiencing homelessness.[3] Participants in this study primarily smoked SC using a joint or blunt, which have been documented as common ways of using SC.[9] For many individuals, SC were used as a way to pass time and cope with their living conditions, mental illness, and stress. SC allowed employed individuals and individuals on parole or probation to avoid

a positive drug test, which they are unable to do with other substances.[4]

The findings suggest that many individuals experienced severe side effects from SC use and were knowledgeable of the potential adverse outcomes of SC. Still, there was not a significant difference in use or intentions to use based on their experience of adverse side effects, suggesting that individuals weighed the challenges and fear associated with quitting more heavily than they did the potential for the adverse potential outcomes of use. As such, it is anticipated that knowledge-based campaigns regarding the harms associated with SC use may not be the most effective way to reduce SC use within this population. Instead, tailored treatment options and campaigns are needed to highlight treatment options, benefits of treatment, and harm reduction strategies. Participants noted unique barriers to treatment, including concerns about mental health and social determinants of health (e.g., housing), which may be heightened without the distraction of SC use. Participants may find sobriety daunting given their daily life challenges. Further, more than 60% indicated that they would use marijuana if it was a legal alternative.[2] Given the reduced likelihood of adverse events from marijuana use, if legal, the downgrading of SC use to marijuana use may be one possible harm reduction strategy for individuals experiencing homelessness who are actively engaged in SC use but are not in a position to enter recovery.

Previously reported neurobiological effects of SC on pain, appetite, and mood align with self-report data in the present study.[21] Symptoms documented in the literature and reported by the participants of this study include agitation, anxiety, nausea, seizures, increased heart rate, hallucinations, paranoia, and nonresponsiveness.[4] Individuals experiencing homelessness engaged in SC use in Houston, Texas, are particularly vulnerable to serious consequences following SC use as they are often using SC outdoors and exposed to extreme temperatures common in the region. These conditions also leave unsheltered SC users vulnerable to victimization (e.g., theft).

This study has several limitations. Self-reported data are subject to several types of biases, including recall bias, which may be elevated among individuals engaged in substance use. Reliance on a small sample and subset of the population limits generalizability. In spite of these limitations, the community-engaged and mixed methods design adds to the scant research on SC use among individuals experiencing homelessness in a city that has experienced an increase in SC-related ED use.[21] SC use could lead to serious consequences for people experiencing homelessness, including criminal justice involvement, illness, and death. Information about the manifestations of SC toxicity, its addictive nature, withdrawal symptoms, and complications must be disseminated to allow clinicians, EMS, and community organizations to respond effectively. People experiencing homelessness could benefit from knowledge about SC side effects and how to protect themselves when using SC, minimizing potential criminal justice involvement, serious injury, or death.

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Increasing firearm fatality among Texas school-age children (5-18 years) – 1999-2020.

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ABSTRACT

Background: Data are sparse about firearm fatalities among Texas schoolchildren.

Purpose: Explore firearm fatalities among children ages 5-18 years from 1999 to 2020.

Key Methods. We utilized publicly available Multiple Cause of Death Files from the National Center for Health Statistics (NCHS) and International Classification of Diseases (ICD) Codes (10th Edition) Accident (W32-W34), Suicide (X72-X74), Assault (X93-X95), and Undetermined Intent (Y22-Y24) to identify firearm fatality as an underlying or contributory cause. We used Annual Percent Change (APC) as a measure of the magnitude of effect and 95% confidence intervals (CIs), p values, and joinpoint regression analyses to test for statistical significance.

Key Results: From 1999 to 2020 there were 4,090 firearm fatalities among Texas school-age children. Following significant declines from 1999 to 2013, firearm fatality rates significantly increased. The APC from 2013-2020 was 12.6 (95% CI 9.7, 15.6 $p<0.001$). The APCs were statistically significant for boys; non-Hispanic Black, non-Hispanic White, and Hispanic children; residents of Large Central Metropolitan areas, Medium Metropolitan, Large Fringe Metropolitan, and smaller areas; for residents of the Texas-Mexico Border and non-Border areas; and for residents of counties with a military base. From 2013 to 2020, rates were highest among non-Hispanic Black children, followed in order by non-Hispanic White, Hispanic, and Asian and Pacific Islander children.

Public Health Significance: There are alarming increases in firearm fatalities among Texas school age children (5-18 years). Analytic epidemiologic studies designed *a priori* to do so are necessary to test hypotheses generated by these data. In the meanwhile, the data pose clinical and public health challenges.

INTRODUCTION

In the United States (US), mortality from firearms among school-age children is a major public health issue.[1] Firearm-related mortality is the second leading cause of death among US school-age children. Of these, 59% are from homicide and 35% from suicide.[2] In the US, older teenagers (15-19 years) were 82 times more likely to die from firearms than older teens in other wealthy nations from 2001 to 2010.[3] Moreover, firearm injuries have the highest case-fatality rate among pediatric trauma-related deaths.[4]. In a nation-wide study, one out of every five US children who were wounded by a gunshot died.[4] Further, firearm violence in children is significantly more lethal than motor vehicle crashes.[5] Finally, the burden of pediatric firearm injuries is borne unequally, with boys and African-American children being most severely affected[4,6-8] although Hispanic children have also been found to be at increased risk.[9]

Data are sparse about firearm-related mortality among Texas school-age children.[10-13] In this report we explore firearm mortality among Texas school-age children (ages 5-18 years) according to time, person, and place from 1999 to 2020.

Population and Methods

We used the publicly available Multiple Cause of Death[14] and Multiple Cause of Death with US-Mexico Border Regions[15] Files from the National Center for Health Statistics (NCHS) on the US Centers for Disease Control and Prevention (CDC) Wide-ranging ONline Data for Epidemiologic Research (WONDER) internet site.[14,15] International Classification of Diseases (ICD) Codes (10th Edition) for firearm-related Accident (W32-W34), Suicide (X72-X74), Assault (X93-X95), and Undetermined Intent (Y22-Y24) were used to identify firearm-related mortality as the underlying or contributory cause of death. Exclusions included: (a) firearm deaths classified under ICD Code U01.[4] (terrorism);[14,15] (b) firearm deaths due to legal intervention since death certificates are not considered valid for this code;[16] and (c) deaths due to sequelae of assault, since sequelae are not classified as to weapon.[14,15] The WONDER files provided age-, race-, sex-, and ethnicity-specific mortality rates, 95% confidence intervals (CIs) and standard errors according to time, person, and place descriptors for death certificate data.

Specifically, time was described, in part, by year to estimate trends. We chose to start with 1999 since that is the first year for which NCHS states that rates became reliable among Hispanic populations (excluding race-specificity).[17] Trends were described with Joinpoint regression analyses as recommended by NCHS for death certificates (in part, because death certificate data are not samples).[18] We used Annual Percent Change (APC) as a measure of effect size and Joinpoint regression to test for statistical significance and to obtain p values and 95% CIs.[19,20] Crude rates were compared with conditional maximum likelihood estimates and mid-p confidence intervals[21] using StatsDirect software, version 3.3.4.[22]

With respect to time by season of the year or days of the week, results from previous studies of violence have shown inconsistent results.[23-25] In this report, means and standard deviations as well as Friedman testing were used to compare occurrence by season of the year (January-March, April-June, July-September, October-December),[26] and unpaired t-tests were used to compare weekend days and week days.[27] StatsDirect software, version 3.3.4 was used for these analyses as well.[22]

Persons were described as follows: (a) School age children were identified as 5-18 years of age in accordance with Texas Education Association definition of kindergarten entry age as between 5 and 6 years[28] and the corresponding age range in the twelfth grade (17-18 years); in addition to overall rates, stratification by age was done (for 5-14 and 15-18 years) because ages 15-18 years have been described as the starting age for highest youth risk.[29] (b) Significant differences in school age firearm fatality previously identified by gender, race, and ethnicity[30] were described according to the terminology and definitions of the US Census Bureau: male and female; non-Hispanic Asian and Pacific Island people (Asian-Pacific Island people), non-Hispanic Black and African American people (Black people), non-Hispanic White people (White people), and Hispanic people.[14,15]

Place was described by urbanization, residence in the Texas-Mexico Border or non-Border area, and presence or absence of a US Air Force, Navy, and/or Army military base within a county. Specifically, urbanization has been identified as an important determinant of firearm fatality risk,[31] and was classified using NCHS-2013 definitions of large central metropolitan and large fringe metropolitan, each with populations of >1,000,000, medium metropolitan (250,000-999,999 population), and small metropolitan (<250,000 population) or micropolitan (non-metropolitan) (10,000-49,999), and non-core, non-metropolitan. Some categories were collapsed when needed to obtain reliable rates (at least 20 deaths) per NCHS standards.[14,15] Groups of counties (that is, Border versus non-Border counties and counties with and without a military base) were used since only 16 of Texas' 254 counties had reliable rates.[14,15] The Texas-Mexico Border area is part of land defined by international agreement as 100 kilometers to the north and south of the US-Mexico boundary.[32] Despite its high level of poverty,[32] crime along the Border has been reported to be lower than that of the rest of the US.[33] Regarding proximity to military bases, in a previously published manuscript,[34] we identified 66 of 1,341 United States counties with reliable mortality rates for Black people in 1999-2007. In these counties, non-Hispanic Black males ages 25-64 years had significantly lower overall, age-adjusted mortality than that of non-Hispanic White males of the same age. Further, these Black people had less poverty and greater educational attainment as well as higher income, a larger percentage of elderly civilian veterans, and they resided in greater proximity to military bases. For the present report, we identified counties in which one or more US Air Force, Army, and/or Navy military bases were located using a public internet web site.[35] This site also indicated the mission of each base. National Guard bases and bases used primarily for storage or reserve training were not included.

The Baylor College of Medicine Institutional Review Board considered this work exempt.

RESULTS

Figure 1 shows a statistically significant increase in firearm fatality among school age (5-18 years) Texans beginning in 2013, which reversed an earlier decline.

Table 1 shows trends in firearm-related mortality from 2013 to 2020 according to age (5-14 years and 15-18 years); ethnicity and race (except for Asian-Pacific Island people, which are unavailable due to unreliable rates); gender; urbanization; and place (Texas-Mexico Border and non-Border areas; counties with and without an Air Force, Army, or Navy military base). Counties with military bases included: Bell (Fort Hood Army Base); Bexar (Lackland [and Randolph] Air Force Base, Martindale Army Airfield, and Fort Sam Houston); Bowie (Red River Army Depot Army Base); El Paso (Fort Bliss Army Base and Briggs Army Airfield); Kleberg (Naval Air Station Kingsville Navy Base); Nueces (Naval Air Station, Corpus Christi); Tarrant (Joint Reserve Base Fort Worth Navy Base); Taylor (Dyess Air Force Base); Tom Green (Goodfellow Air Force Base); Val Verde (Laughlin Air Force Base); and Wichita (Sheppard Air Force Base). All APC's are positive and are statistically significant except among females.

Table 2 presents firearm-related mortality rates per 100,000 population for ages 5-18 years according to person (ethnicity, race, and gender). The total rate for Asian and Pacific Island people is significantly lower than those for Black, White, and Hispanic people. The highest rate occurred among Black people, and rates for both Black and White people are significantly greater than those for Hispanic people. Among all ethnic and racial groups with available data, rates for males are significantly greater than those for females, with the greatest gender-specific relative risk occurring among Black people (Mortality Rate Ratio [MRR]=9.4; 95% CI=6.9, 13.1; $p<0.001$).

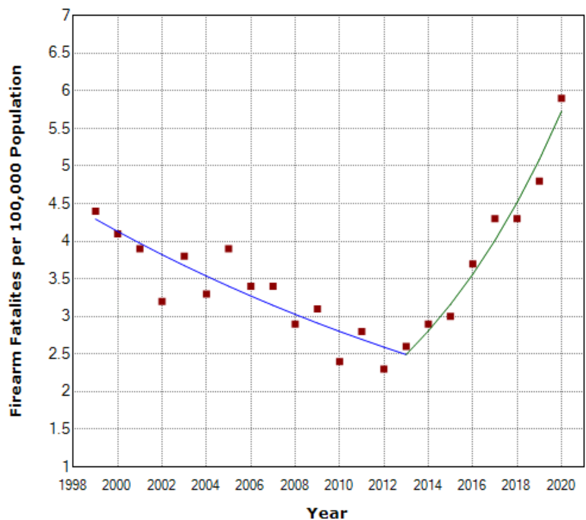
Table 3 describes firearm-related mortality from 2013 to 2020 according to place (urbanization, counties on and not on the Texas-Mexico Border, and counties with and without a US military base). Rates according to urbanization are highest at the extremes (Large Central Metropolitan and Non-Core, Non-Metropolitan areas) and lowest in Medium Metropolitan areas. The rate along the Texas-Mexico Border is lower than that of Texas' non-Border areas, and the rate in counties with a military base is higher than that for counties without such a base.

Table 4 includes MRRs according to person and place. Highest MRRs are found for all other groups relative to Asian-Pacific Island people. Male:Female MRRs are consistently higher for males, especially among Black people. The MRR for the Texas-Mexico Border area versus the non-Border area is significantly below the null (that is, 1.0), while the MRR for counties with versus counties without a military base is significantly above 1.0.

Table 5 shows rates and percentages within ethnic-racial groups with respect to homicidal or suicidal intent. Homicide accounted for most deaths among Black and Hispanic people while suicide predominated for White people. Data are unavailable for Asian-Pacific Island people for reasons of confidentiality.

No statistically significant differences were found for average numbers of deaths occurring on a weekend day versus a week-

Figure 1. Firearm Fatality Rates and Joinpoint Regression Analysis. Among Persons of School Age (5-18 Years). Texas, United States. 1999-2020.



Segment	Lower Endpoint	Upper Endpoint	APC	Lower CI	Upper CI	Test Statistic (t)	Prob > |t|
1	1999	2013	-3.8	-4.9	-2.7	-7.3	< 0.001
2	2013	2020	12.6	9.7	15.6	9.6	< 0.001

CI = confidence interval.

Table 1. Annual Percent Change (APC) and Joinpoint Regression. Firearm Fatality According to Ethnicity, Race, Sex, Urbanization, and Place Among Persons of School Age (5-18 years). Texas, United States. 2013-2020.

Ethnicity and Race, Sex, and Urbanization	APC (95% Confidence Interval)	p
Age		
5-14 years	11.4 (2.8, 20.7)	0.02
15-18 years	12.2 (10.0, 14.5)	<0.001
Ethnicity and Race		
Non-Hispanic Black and African American	14.0 (8.4, 19.8)	0.001
Non-Hispanic White	9.6 (5.6, 13.7)	0.001
Hispanic	14.2 (7.5, 21.3)	0.002
Sex		
Boys	12.7 (10.7, 14.7)	<0.001
Girls	7.6 (-1.8, 18.0)	0.10
Place -- Urbanization		
Large Central Metropolitan	11.9 (10.9, 12.9)	<0.001
Large Fringe Metropolitan	12.5 (4.4, 21.1)	0.01
Medium Metropolitan, Small Metropolitan; Micropolitan and Non-Core Non-Metropolitan (collapsed to obtain reliable rates (at least 20 deaths per year)	13.1 (8.1, 18.2)	0.001
Place – Texas-Mexico Border and Non-Border Areas		
Border	Not Available (N/A)	N/A
Non-Border	11.9 (9.6, 14.3)	<0.001
Place – Counties With and Without a US Air Force, Army, or Navy Base		
With (Bell, Bexar, Bowie, El Paso, Kleberg, Nueces, Tarrant, Taylor, Tom Green, Val Verde, Wichita)	18.8 (12.4, 25.5)	<0.001
Without	10.0 (7.9, 12.2)	<0.001

Table 2. Firearm Fatality Rates per 100,000 Population Among Persons of School-age (5-18 Years) According to Ethnicity, Race, and Sex. Texas, United States. 2013-2020.

Ethnicity and Race	Sex	Deaths	Population	Mortality Rate (95% Confidence Interval)
Asian-Pacific Island People	Female	12	1,026,107	Unreliable rate
	Male	28	1,060,826	2.6 (1.8, 3.8)
	Total	**40**	**2,086,933**	**1.9 (1.4, 2.6)**
Black People	Female	42	2,812,739	1.5 (1.1, 2.0)
	Male	408	2,909,171	14.0 (12.7, 15.4)
	Total	**450**	**5,721,910**	**7.9 (7.2, 8.6)**
White People	Female	117	7,439,266	1.6 (1.3, 1.9)
	Male	530	7,832,018	6.8 (6.3, 7.3)
	Total	**647**	**15,271,284**	**4.2 (3.9, 4.6)**
Hispanic People	Female	112	10,920,183	1.0 (0.8, 1.2)
	Male	543	11,312,271	4.8 (4.4, 5.2)
	Total	**655**	**22,232,454**	**2.9 (2.7, 3.2)**

Table 3. Firearm Fatality Rates Among Persons of School Age (5-18-years) According to Place (Urbanization, Texas-Mexico Border and non-Border Areas, and Counties with and Without a US Air Force, Army, or Navy Base). Texas, United States. 2013-2020.

2013 Urbanization	Deaths	Population	Crude Rate per 100,000 Population (95% Confidence Interval)
Large Central Metropolitan	974	21,486,360	4.5 (4.2, 4.8)
Large Fringe Metropolitan	293	8,765,044	3.3 (3.0, 3.7)
Medium Metropolitan	234	7,861,945	3.0 (2.6, 3.4)
Small Metropolitan	110	2,370,175	4.0 (3.3, 4.8)
Micropolitan (Non-metropolitan)	99	2,531,593	3.9 (3.2, 4.8)
Non-Core (Non-metropolitan)	87	2,079,018	4.2 (3.4, 5.2)
United States – Mexico Border and Non-Border Areas			
Border	93	5,184,547	1.8 (1.4, 2.2)
Non-Border	1704	40,269,588	4.2 (4.0. 4.4)
Counties With and Without a US Air Force, Army, or Navy Base			
With	443	9,890,333	4.5 (4.1, 4.9)
Without	1354	135,563,802	3.8 (3.6, 4.0)

Table 4. Mortality Rate Ratios of Firearm Fatality According to Person (Race, Ethnicity, Sex) and Place (Texas-Mexico Border and non-Border Areas; Counties With and Without A US Air Force, Army, or Navy Base) Among Persons of School Age (5-18 years) Texas, United States. 2013-2020.

Total Population		
Comparison Groups of School age Children	**Mortality Rate Ratio (95% Confidence Interval)**	**P**
Race and Ethnicity		
Black:Asian-Pacific Islander	4.1 (3.0, 5.7)	<0.001
Black:Hispanic	2.7 (2.4, 3.0)	<0.001
Black:White	1.9 (1.6, 2.1)	<0.001
White:Asian-Pacific Island	2.2 (1.6, 3.1)	<0.001
White:Hispanic	1.4 (1.3, 1.6)	<0.001
Hispanic:Asian-Pacific Island	1.5 (1.1, 2.2)	0.01
Sex Specific		
Black male: Black female	9.4 (6.9, 13.1)	<0.001
Hispanic male: Hispanic female	4.7 (3.8, 5.8)	<0.001
White male: White female	4.3 (3.5, 5.3)	<0.001
Asian-Pacific Island male:Asian-Pacific Island female	Not available	
Place		
Texas-Mexico Border:Non-Border Counties	0.4 (0.3, 0.5)	<0.001
Counties With:Counties Without a Military Base	1.2 (1.1, 1.3)	0.003

Table 5. Firearm-related Suicide and Homicide Rates Among Persons of School Age (5-18 years) According to Race and Ethnicity. Texas. United States. 2013-2020.

Ethnicity-Race of School age Children	Intent	Deaths	Population	Rate (95% Confidence Interval)
Asian-Pacific Islander	--		2,086,933	
Black	Suicide	56	5,721,910	1.0 (0.7, 1.3)
Black	Homicide	373	5,721,910	6.5 (5.9, 7.2)
White	Suicide	445	15,271,284	2.9 (2.6, 3.2)
White	Homicide	163	15,271,284	1.1 (0.9, 1.2)
Hispanic	Suicide	220	22,232,454	1.0 (0.9, 1.1)
Hispanic	Homicide	397	22,232,454	1.8 (1.6, 2.0)

day (p=0.3) or by season (January-March mean + standard deviation = 59±2; April-June = 58±6; July-September 58±11; October-December = 60±9 and Friedman test p=0.9).

DISCUSSION

These data demonstrate alarming increases in firearm-related mortality among persons of school age (5-18 years) in Texas from 2013 to 2020. Within sub-groups, statistically significant increases in APC were found for younger (5-14 years) and older (15-18 years) children; Black, White, and Hispanic people; males; all levels of urbanization for which reliable data were available; both the Texas-Mexico Border area and the non-Border area; and in counties with and without a military base. The results were significant for male but not female children.

The increasing rates from firearm mortality among persons of school age are not unique to Texas. Such rapidly increasing rates have been noted across the entire US[18] as well as local areas.[36,37] It is intriguing to note that the Texas Youth Risk Behavior Survey shows that the percentages of high school students who carried a gun, carried a weapon, carried a weapon on school property, or were threatened with a weapon on school property all declined from 2013 to 2019.[38] In contrast, the percent of such students who did not attend school because they felt unsafe at school or on their way to or from school on one or more of the past 30 days increased from 7.7% (95% CI 6.0%, 9.8%) to 12.1% (9.0%, 16.7%).[38] Analytic research is needed to address the issue of whether school age firearm fatality rates in Texas are increasing primarily because of events occurring in school or out of school. If so, this could have important implications for future policies and programs.

In terms of existing law and policy, one way that politicians have attempted to address firearm mortality among children is found in a 1995 Texas law designed to restrict children's access to firearms. Such laws have been effective in other states,[39] but in Texas, concern has been expressed about weak enforcement.[40] Specifically, from 1995 to 2015, there were only 288 arrests, 141 prosecutions, and 117 convictions under this law.[40] Additional research is needed to address the question of whether stronger enforcement policies might help to reverse trends observed in the present data.

In these data, overall firearm fatality rates are highest among Black followed by White, Hispanic, and Asian and Pacific Islander children. There was no overlap in the 95% CI from one group to the next. As noted above,[4,6-8] The high rate among Black children is consistent with previous nation-wide reports about the US.[30] Nonetheless, statistically significant upturns in firearm fatality rates are also found for White and Hispanic children in these data, with 95% CIs overlapping for the rate at which increases are occurring. Although demonstrating pervasive increases, the present data lack specific socioeconomic and geographic information (including geographic distinctions between where the decedent resided and where the fatality occurred). As such, there are many sources for potential confounders and/or interaction. Rather than speculating about possible reasons for the many observed differences, the present results support the need for future research based on data having more detailed information, such as the Texas Violent Death Reporting System, which pools more than 600 unique data elements from multiple sources into a usable, anonymous database for all types of violent deaths for all age groups.[41] This system includes all types of violent deaths, including homicides and suicides, in all settings for all age groups.[41] This may provide an opportunity to address a primary limitation of these descriptive and population-based data, namely the inability to test hypotheses. Analytic epidemiologic research designed a priori to do so is therefore needed.[42,43] Additionally, the possibility must be considered that the findings on ethnicity could, at least in theory, be attributable to some artifact in the way this variable is recorded and tabulated on death certificates. We are reassured, however, that this is not the case because the NCHS has completed their own validation studies and concluded that, since 1999, the race and ethnicity categories used by the US Census Bureau as well as for these data can be considered valid.[17] Less reassuring are observations that death certificate classifications as to whether a firearm fatality was accidental or due to suicide or homicide are less valid than classifications within the National Violent Death Reporting System,[44] although the question of whether classification errors differ according to race and ethnicity remains open.

Despite these and other limitations, these data demonstrate alarming increases in firearm-related mortality among Texas children of school age (5-18 years). Analytic epidemiologic studies designed a priori to do so are necessary to test hypotheses generated by these data. In the meanwhile, the data pose clinical and public health challenges.

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COVID-19 Per Capita Fatality Rate: A Path Analysis Model

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ABSTRACT
Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has infected millions globally, causing pandemic coronavirus disease 2019 (COVID-19). At the time of writing, approximately 940,000 COVID-19 deaths have occurred in the United States, with over 84,000 deaths in Texas. This study hypothesized that an interconnected model with county-level variables related to income, insurance rates, rurality, health status, and 2020 presidential voting behaviors would cumulatively predict the county-level COVID-19 Fatalities per Capita rate in Texas. The path analysis conducted found strong support for the proposed model structure ($R^2 = 37.6\%$) with the strongest total effects on COVID-19 Fatalities per Capita from socioeconomic (Median Income) and political (Percent 2020 Democrat Vote) factors. Increased county-level Median Income and Percent 2020 Democrat Vote were both negatively related to COVID-19 Fatalities per Capita. These results can, in part, be explained by the politicization of the pandemic and the relevance of increased monetary resources that might allow a county's population some protection from the most severe effects of COVID-19. The findings of this study introduce robust analyses regarding some of the major contributing factors of the county-level COVID-19 Fatalities per Capita rate and demonstrate an important contribution of knowledge regarding public health disparities across Texas counties.

Keywords: COVID-19, Path Analysis, Fatality Rate, Risk Factors, Social Determinants

INTRODUCTION

Many scholars have proposed that variations in income, location, insurance, health, and politicization may impact COVID-19 fatality rates,[1-5] but there has been little research that looked at the effect of these variables interconnectedly. This study theorized that these factors reside in a framework, cumulatively predicting COVID-19 Fatalities per Capita.

First, research found that those who resided in higher-income zip codes, compared to lower-income zip codes, were less likely to be hospitalized as a result of COVID-19,[6,7] suggesting that higher income affords safeguards against its most severe effects. Second, researchers have noted a connection between median household income, increased COVID-19 fatalities, and reduced access to healthcare in rural areas.[8] Texas rural populations are also more likely to have higher median age, lower median income, and less access to care, which might affect preexisting chronic health conditions[9] and contribute to an increased risk of COVID-19 fatalities. In addition, researchers discovered that rural residents were less likely to have worn a mask, practiced good sanitation habits, avoided dining out, or worked from home during the pandemic.[10]

Third, a lack of health insurance is associated with higher mortality rates[11] and may be associated with lower median family incomes.[12,13] Moreover, a lack of health insurance may affect the ability to obtain preventative or acute care, leading to overall poor health. Fourth, poor initial health, such as hypertension or diseases of the heart and kidney, can be related to increased COVID-19 fatality rates.[14,15] Another study found a lack of insurance was not only connected to increased mortality but also related to lifestyle factors such as poor diet, lack of exercise, obesity, and smoking and alcohol use,[16] which may contribute to a higher fatality risk in COVID-19 patients.

Finally, the politicization of the COVID-19 pandemic was also considered in this work. Previous research learned that, as the proportion of votes for Donald Trump from the 2016 United States presidential election increased in a particular area, there were decreased internet searches for COVID-19 information, minimal changes in visitation rates to businesses relative to before the pandemic, and an increase in COVID-19 case rates, indicating a lack of adherence to proper public health practices.[17,18] In addition, research has found a relationship between conservative media consumption, reductions in physical distancing, and increased case and fatality rates within a given area.[19]

In the current work, data were collected from all Texas counties and examined via path analysis, which assesses the direct and indirect dependencies among a set of variables in an a priori structure.[20] Although this technique does not test for causality, it examines the tenability of such a model for future causal research. It was hypothesized that county-level, median household income, uninsured rate, residents' health status, rurality, and voting trends would cumulatively predict COVID-19 fatality rates within Texas' 254 counties. Of the given variables, this study posited that the strongest overall effects on COVID-19 Fatalities per Capita would derive from two county-level variables, median household income and voting behavior, considering the resources needed for adequate healthcare and the politicization of the COVID-19 pandemic, respectively.

METHODS

The data analyzed were available online for public use, and thus an institutional review board evaluation was not needed. As this study analyzed public data, there were no human subjects, and therefore no informed consent was necessary. Data collected were available for all 254 Texas counties and analyzed using SPSS Amos.

The University of Wisconsin's County Health Rankings' 2020 dataset provided county-level data for Texas on median household income (Median Income), uninsured rate of those

under 65 years (Uninsured), and the percentage of adults considered to be in poor or fair health (Poor/Fair Health).[21] Rural-Urban Continuum Codes (RUCC) data from the United States Department of Agriculture measured the degree of rurality.[22] Texas county-level 2020 presidential election data was obtained from NBC News (Percent 2020 Democrat Vote and Percent 2020 Republican Vote).[23] *The New York Times'* county-level COVID-19 fatality data was retrieved on February 23, 2021,[24] and all pandemic fatality data starting from March 1, 2020, up to the data retrieval date was summed and adjusted to a per 100,000 rate (COVID-19 Fatalities per Capita) and analyzed as this study's primary dependent variable.

The five independent variables in our analysis were Uninsured, Median Income, Poor/Fair Health, RUCC, and Percent 2020 Democrat Vote. The dependent variable was COVID-19 Fatalities per Capita. These variables were inserted into our hypothesized path structure (Figure 1) and analyzed.

RESULTS

Assumptions prior to path analysis were met. An exploratory factor analysis and a Harman's one-factor test found that all variables loaded onto more than one factor and constraining the analysis to one factor resulted in less than 50% of explained variance, and thus there were no issues with common method variance.[25,26] Multicollinearity was not an issue as Variance Inflation Factor < 5, Tolerance >.2, and no correlations above $r = |.90|$ between all bivariate correlation variable combinations.[27-29] Multivariate normality was met as Variable Skews < 2 and Coefficients of Kurtosis < 7.[20,30]

Model structure, standardized direct path estimates, and R^2 values are shown in Figure 2. Table 1 details all total, direct, and indirect standardized and non-standardized effects on COVID-19 Fatalities per Capita. The fit indices used were Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI). Good model fit is indicated by $X^2 < 2$, $RMSEA < .06$, $CFI > .95$, and $TLI > .95$.[27,31,32]

The analyzed path model showed strong fit, X^2 (1) = .33, $p = .57$, $RMSEA < .001$, $CFI = 1.00$, $TLI = 1.02$, and it predicted 37.6% of the variance in COVID-19 per Capita Fatalities between counties in Texas. For all direct path effects, p-values were below .001 except for the effect of Median Income on Percent 2020 Democrat Vote path ($p = .013$) and the effect of RUCC on COVID-19 Fatalities per Capita path ($p = .078$).

An alternative model with the path between RUCC and COVID-19 Fatalities per Capita removed was analyzed, but fit and explanatory variance was reduced relative to the original model, X^2 (1) = 3.42, $p = .18$, $RMSEA = .053$, $CFI = 1.00$, $TLI = .98$, $R^2 = 36.8\%$. Another model used Percent 2020 Republican Vote in place of Percent 2020 Democrat Vote, but beta coefficients remained the same, but with inverse beta weights, $b = .32$ versus $b = -.32$. Thus, our final analyzed model (Figure 2) is derived from the original hypothesized model (Figure 1).

All direct effects of our final model were statistically significant at $p < .001$ unless otherwise noted. Median Income ($b = -.24$) and Percent 2020 Democrat Vote ($b = -.32$) were negatively related to COVID-19 Fatalities per Capita. As the Median Income and the Percent 2020 Democrat Vote in a county increased by one unit, COVID-19 Fatalities per Capita were decreased by .24 and .32, respectively. In comparison, as RUCC ($b = .12$, $p = .078$) and Poor/Fair Health ($b = .42$) increased by one unit within a given county, COVID-19 Fatalities per Capita increased by .12 and .42, respectively. Of all the direct pathways to COVID-19 Fatalities per Capita, Poor/Fair health showed the strongest direct relationship followed by Percent 2020 Democrat Vote.

All total indirect effects were statistically significant at $p < .01$. Indirect effects are those that occur through a mediatory variable. The total indirect effect of a particular independent variable on a dependent variable is the sum of all single indirect effects, which are the product of all serial path coefficients to a dependent variable. Median Income ($b = -.18$) and Poor/Fair Health ($b = -.24$) both had negative total indirect effects on COVID-19 Fatalities per Capita. In comparison, RUCC ($b = .11$) and Uninsured ($b = .12$) had positive total indirect effects on COVID-19 Fatalities per Capita. The strongest total indirect paths were Poor/Fair Health followed by Median Income.

All total effects were statistically significant at $p < .01$. The sum of a variable's direct effect and total indirect effects equals the total effect. The factors that had the strongest total effects on COVID-19 Fatalities per Capita were Median Income ($b = -.41$) followed by Percent 2020 Democrat Vote ($b = -.32$), which satisfied our prediction. The next three strongest total effects in order were RUCC ($b = .23$), Poor/Fair Health ($b = .18$), and Uninsured ($b = .12$).

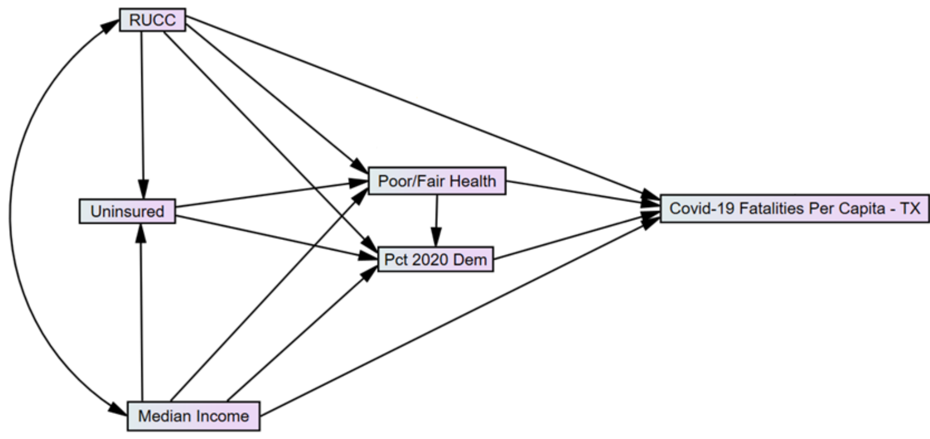
DISCUSSION

The five-predictor path model explained considerable variability in the COVID-19 Fatalities per Capita between Texas counties. When observing the strongest direct effects onto county-level COVID-19 Fatalities per Capita, counties with higher levels of Poor/Fair Health or lower levels of Percent 2020 Democrat Vote had higher rates of COVID-19 Fatalities per Capita.

The model's strongest direct relationship found that counties with higher levels of Poor/Fair Health were more were likely to favor the 2020 presidential Democratic candidate, Joe Biden. When considering all other preceding variables (RUCC, Uninsured, Median Income) within the path model, counties that were more likely to vote for Joe Biden were less likely to have increased COVID-19 Fatalities per Capita rates. The effect of these preceding relationships thus reduced the total effect of the Poor/Fair Health factor on the COVID-19 Fatalities per Capita rate. Further, the total indirect effect of Poor/Fair Health negatively predicted COVID-19 Fatalities per Capita as mediated by Percent 2020 Democrat Vote.

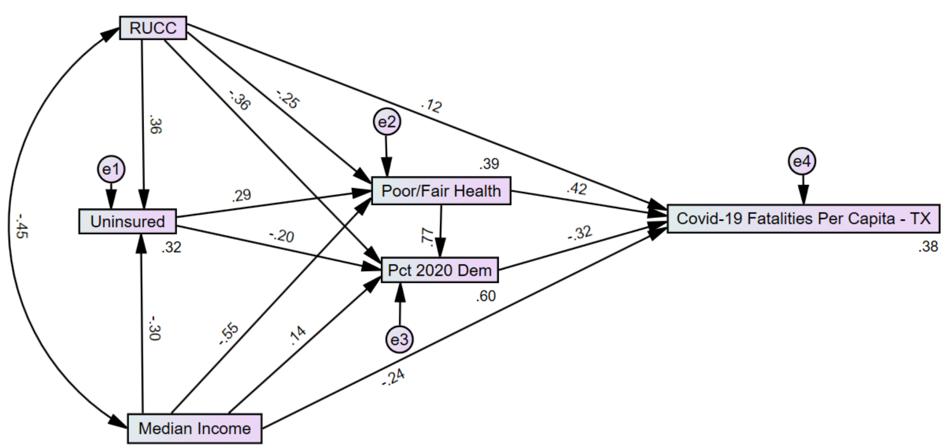
One potential reason for this phenomenon is that areas that lean Democrat tend to center or surround more urban clusters where access to care is more readily available, and the opposite is true for rural clusters.[33] In contrast, county-wide poor

Figure 1. Hypothesized COVID-19 Path Model Structure. Rural-Urban Continuum Codes



RUCC = Rural-Urban Continuum Codes

Figure 2. COVID-19 Per Capita Fatalities Model: Total and Indirect Standardized Effects in Texas.



Note: Path estimates are found along path lines and R^2 values are located at bottom right or top left of endogenous variables.
RUCC = Rural-Urban Continuum Codes

Table 1. Total, Direct, and Indirect Standardized and Unstandardized Effects on COVID-19 Fatalities per Capita in Texas.

Effect Type on Dependent Variable	Median Income	RUCC	Uninsured	Poor/Fair Health	Percent 2020 Democrat Vote
Total Effect on COVID-19 Fatalities per Capita	-.413 (-3.812)	.226 (9.737)	.116 (322.523)	.180 (411.794)	-.319 (-254.775)
Direct Effect on COVID-19 Fatalities per Capita	-.237 (-2.184)	.115 (4.964)	.000 (.000)	.424 (971.706)	-.319 (-254.775)
Indirect Effect on COVID-19 Fatalities per Capita	-.176 (-1.628)	.111 (4.774)	.116 (322.523)	-.244 (-559.913)	.000 (.000)

Note: Standardized (Unstandardized) coefficients between path analysis independent variables on the dependent variable, COVID-19 Fatalities per Capita. Coefficients are estimates of strength of associations with effects categorized as Total, Direct, or Indirect. All variables are at the county-level, N = 254 counties. Median Income is the median income of a county. Uninsured is county-level percent uninsured under 65. Poor/Fair Health refers to the percentage of adults in a county who consider themselves to be in poor or fair health. Percent 2020 Democrat Vote is the percentage of the total countywide vote that went to the 2020 U.S. presidential candidate, Joe Biden, during the 2020 U.S. General Election.
RUCC = Rural-Urban Continuum Codes

health by itself was found to positively predict the COVID-19 Fatalities per Capita rate according to the path model.

All other total indirect effects successfully predicted COVID-19 Fatalities per Capita. The total indirect effect of Median Income was found to be negatively related to COVID-19 Fatalities per Capita when considering all available mediation paths. In comparison, the total indirect effects of RUCC and Uninsured were positively related to COVID-19 Fatalities per Capita when considering all their respective mediating paths. Regarding total effects, which considers direct effects and all prior mediating effects, a county's Median Income followed by their Percent 2020 Democrat Vote were the strongest COVID-19 Fatalities per Capita predictors. Research has shown that politically conservative attitudes were associated with decreased adherence to public health guidelines such as reduced social distancing and mask-wearing adherence as well as beliefs of decreased vulnerability to COVID-19, decreased perception of COVID-19 severity, and a belief that the virus' effects have been exaggerated.[34-38] Lastly, income is important as it provides resources for preventative and acute care for a community which may directly and indirectly safeguard against COVID-19 fatalities.

CONCLUSION

For future work, a similarly structured fatality rate model that assesses other infectious diseases may help further gauge the model's accuracy and generalizability. It is reasonable that a less politicized public health matter such as the influenza fatality rate may result in a weaker overall effect in an updated path structure. Further, researchers should replicate this model with other states to see what factors may be most relevant in differing geographic areas. This work was also concluded prior to the widescale distribution of COVID-19 vaccinations in the United States and the Delta and Omicron variant surges in mid-2021 and early-2022, respectively. Future researchers may assess if vaccine distribution and variant surges affect this path structure or if other factors need to be considered.

In sum, variables related to health and income contributed to the COVID-19 fatality rate as expected, but there was also a strong relationship between COVID-19 fatalities and political behaviors. Efforts to lessen public health misinformation due to politicization may help reduce pain and suffering for all future and current health crises. Although voting trends were a strong predictor of COVID-19 per Fatalities per Capita, the strongest predictor was county-level Median Income. Income affords a community the time and resources to take care of their physical and mental health. A county's median income may be difficult to change, but improving access to care, such as increased telemedicine resources, may help alleviate some of the strain of low-income counties.

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TPHA Remembers…

A longtime Texas Public Health Association member, Alvin B. Williams passed away peacefully on October 26, 2020 at age 95. Known as "Daddo" to his family and "Al" to his TPHA family, Alvin was born December 23, 1924, in West, Texas, he attended Corsicana schools and graduated from Waxahachie High School in 1941. He served in the United States Marine Corps in WWII from March 1943 to November 1945. He was recalled as an inactive reservist for the Korean Conflict and served in California supporting the troops. He attended the University of Texas from 1946 to 1949, graduating with a Bachelor of Journalism. Alvin was a Life Member, University of Texas Ex-Students Association.

Alvin worked for the Texas Department of Health from 1968 until his retirement in 1987 where he promoted many health programs, particularly heart, cancer, and the United Way. He served on the Travis County American Red Cross public information committee for 27 years and was a former member of the statewide board and member of the Texas Public Health Association's health education section. Alvin was a Life Member of the Veterans of Foreign Wars and a member of the American Legion Post 87. He was also a member of numerous professional organizations, including the Texas Sportswriters Association and Texas Press Club. He was a member and former President of Chapter 28 of the Texas Public Employees Association. A member of Covenant Presbyterian Church, Alvin was a volunteer for many causes to help others. https://www.legacy.com/us/obituaries/statesman/name/alvin-williams-obituary?id=7999960

Awareness and Use of Pre-Exposure Prophylaxis among Men who have Sex with Men in Dallas, Texas, 2017: Prevalence, Associated Factors and Predictors

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ABSTRACT

Background: Gay, bisexual, and other men who have sex with men (MSM) are at high risk of acquiring human immunodeficiency virus (HIV). Taking pre-exposure prophylaxis (PrEP) daily reduces the risk of acquiring HIV through sexual contact by up to 99%. This study aimed to assess the prevalence of PrEP awareness and use, and the associated factors among HIV-negative, sexually active MSM in Dallas, Texas.
Methods: Data from 406 HIV-negative, sexually active MSM recruited through venue-based sampling in 2017 and obtained from the National HIV Behavioral Surveillance project in Dallas, Texas, were analyzed. We used descriptive and inferential statistics that included bivariate and multivariate regression models to explore the associations between self-reported PrEP awareness and use, and the sociodemographic characteristics and high-risk sexual behaviors.
Results: Prevalence of PrEP awareness and use in the past 12 months were 83.7% and 18.2%, respectively. PrEP awareness was significantly ($p \leq 0.05$) less common among Black and Hispanic/Latino MSM (80.0% and 77.2% respectively) and among those with a high school diploma/General Educational Development (GED) or less (65.3%) or five or less male sexual partners in the past 12 months (80.4%). It was also lower among those with a household income of less than $20,000 (55.4%) and persons experiencing homelessness (57.7%) or incarceration (61.3%). PrEP use was significantly ($p \leq 0.05$) lower among Black and Hispanic/Latino MSM (11.7% and 13.8% respectively) as well as those without health insurance (12.3%), with a high school diploma/GED or less (9.2%), and with household income lower than $20,000 (7.1%). PrEP awareness was 13% less common among Black MSM (adjusted prevalence ratio [aPR]=0.87, 95% confidence interval [CI]: 0.79-0.97) and 15% less common among Hispanic MSM (aPR=0.85, 95% CI: 0.78-0.93) compared to White MSM. In contrast, PrEP awareness (aPR: 1.12, 95% CI: 1.02-1.22) and use (aPR:2.02, 95% CI: 1.42-2.88) were significantly ($p \leq 0.05$) associated with participation in HIV behavioral interventions.
Conclusion: The positive association of HIV behavioral interventions with both PrEP awareness and use suggests that this approach may enhance PrEP rollout in Dallas and also serve as a model for statewide campaigns in the MSM communities. In addition, efforts to increase PrEP awareness and use should target Black and Hispanic MSM and MSM with lower socioeconomic status (SES).
Key words: human immunodeficiency virus (HIV), men who have sex with men (MSM), Sexual Behavior, Pre-Exposure prophylaxis (PrEP), Dallas, Texas

INTRODUCTION

HIV disproportionately affects gay, bisexual, and other men who have sex with men (MSM). In 2018, MSM accounted for 70% of people with new HIV diagnoses in Texas and 74% of those with new HIV diagnoses in the Dallas Metropolitan Statistical Area (MSA).[1] The estimated population rate (per 100,000 people) of people newly diagnosed with HIV was approximately 30 times higher among MSM compared to the general population in both Texas (486.5 vs. 15.7) and the Dallas MSA (567.3 vs. 20.8).[1] In addition, Black and Hispanic MSM have higher HIV diagnosis rates (per 100,000) than White MSM (46.0 and 16.0 vs. 7.6) in Texas, respectively.[1]

People at risk for HIV can benefit from taking daily pre-exposure prophylaxis (PrEP), which reduces the risk of HIV from sexual contact by up to 99% and reduces the risk for injection drug users by more than 70%.[2] Several studies have shown the effectiveness of PrEP in preventing HIV infection.[3-7] The Centers for Disease Control and Prevention (CDC) recommends PrEP for people at high-risk of acquiring HIV, including MSM who have multiple male partners, those who engage in condomless anal sex, have sexually transmitted diseases (STDs), or have a male partner who is living with HIV.[8]

Prior studies indicate sociodemographic factors and socioeconomic status (SES) are related to PrEP awareness and use.[9-11] A cross-sectional study among young MSM found PrEP awareness was more common among participants who were older, more educated, and those with health insurance coverage.[9] Similarly, among substance-using Black MSM and transgender women, higher PrEP awareness was noted among younger and more highly educated participants.[10] Research shows that unstable housing, cost of PrEP, and lack of health insurance coverage for PrEP were common barriers for PrEP use.[11-13] Texas has the highest uninsured rate in the United States (U.S.),[14] which may also play a part in PrEP intake. Another study of Hispanic MSM showed PrEP use was less common among those with lower SES.[15] Additionally, previous studies indicated that a variety of factors, but most importantly stable housing and having insurance, were associated with PrEP use among people at risk of HIV.[12, 16, 17] With Texas' high HIV morbidity, it is important to understand the characteristics associated with PrEP awareness and use among MSM to inform public health practitioners and clinicians so that they can better promote PrEP and encourage its use among high-risk individuals. This study aimed to assess factors associated with PrEP awareness and use among MSM in the Dallas MSA.

METHODS

Data Source

Data used for this study were collected from MSM participants in the Dallas MSA between August and November 2017

as part of the National HIV Behavioral Surveillance (NHBS) project. Participants were recruited using a venue-based, time-space sampling (VBS) method. Details about the NHBS protocol and the methodology are available in the CDC's report.[18] The eligibility criteria for MSM participants in NHBS included: cisgender male, aged ≥18 years old, able to complete the interview in English or Spanish, current Dallas MSA resident, and reported oral or anal sex with at least one male partner in the past 12 months. The study population comprised of 406 (77.6%) MSM who tested negative for HIV out of the 524 sexually active eligible MSM.

Measures

The outcome variables were self-reported PrEP awareness and use in the past 12 months. PrEP awareness was measured by responses to *"Pre-exposure prophylaxis, or PrEP is an antiretroviral medicine, such as Truvada, taken for months or years by a person who is HIV-negative to reduce the risk of getting HIV. Before today, have you ever heard of people who do not have HIV taking PrEP?"* with the response options: *"Yes"* or *"No"*. PrEP use was measured by responses to *"In the past 12 months, have you taken PrEP to reduce the risk of getting HIV?*" with the response options: *"Yes"* or *"No"*. Characteristics assessed by the NHBS survey and used in the current study are outlined in the accompanying results tables.

Data Analyses

We conducted bivariate and multivariate regression analyses to explore the associations between the above-mentioned covariates and PrEP awareness and use within the past 12 months. Separate bivariate models were built for each covariate and PrEP awareness and use. We applied a modified Poisson regression model with the log link function and robust error variances clustered on the recruitment chain[19] to determine the associations between PrEP awareness and use and covariates and generate unadjusted and adjusted prevalence ratios (PRs and aPRs) and 95% confidence intervals (CIs). Covariates with p<0.25 in the bivariate analyses were included in the multivariate regression models. Backward elimination was used to reduce the multivariate models to retain the covariates with p<0.10 to ensure the multivariate model adjusted for all potential confounders. All tests performed were two-tailed, with a probability value of 0.05 used as the threshold for declaring statistical significance. Data management and statistical analyses were conducted using SAS 9.4 (SAS Institute, Cary, North Carolina, USA).

Human Subject Protection

The Dallas NHBS study protocol was reviewed and approved by the Texas Department of State Health Services' Institutional Review Board (IRB), and all activities were carried out in consonant with the CDC guidelines and codes of federal regulation for the protection of human subjects.[20, 21]

RESULTS

Of the 406 HIV-negative, sexually active MSM, 83.7% (n=340) were aware of PrEP before the survey, while 18.2% (n=74) reported using PrEP. Table 1 shows the association of characteristics of HIV-negative and sexually active MSM and PrEP awareness in the past 12 months. Significantly higher proportions of White MSM (93.8%) and MSM of other races (88.9%) reported PrEP awareness compared to Black (80.0%) and Hispanic (77.2%) MSM (*p*<0.001). PrEP awareness was more prevalent among participants who were currently covered by health insurance (88.4%, *p*<0.001), had greater than a high school diploma/ General Educational Development (GED) (89.6%, *p*<0.001), had an annual household income of ≥$20,000 (88.5%, *p*<0.001), were not homeless (85.5%, *p*<0.001), were not incarcerated (85.6%, p<0.001), and had more than 5 male sex partners (89.1%, *p*=0.02).

The association between the characteristics of HIV-negative, sexually active MSM and PrEP use status in the past 12 months is presented in Table 2. PrEP use was more common among White (27.1%) and participants of other races (22.2%) compared to Black (11.7%) and Hispanic MSM (13.8%) (*p*=0.01). PrEP use was also more common among people who hadhealth insurance (20.8%, *p*=0.04), had a greater than high school diploma/GED (21.1%, *p*=0.01), had a household income of ≥$20,000 (20.1%, *p*=0.02), were diagnosed with a bacterial STD (29.0%, *p*=0.01), had condomless casual anal sex (30.4%, *p*<0.001), had more than 5 male sex partners (28.8%, *p*<0.001), and participated in HIV behavioral intervention (30.3%, *p*<0.001).

The results of the multivariate Poisson regression models for PrEP awareness and use are shown in Table 3. The prevalence of PrEP awareness was 8% less among MSM ≥ 45 years old compared to MSM aged 18-29 years (aPR=0.92, 95% CI: 0.84-1.00). PrEP awareness was 13% less common among Black MSM (aPR=0.87, 95% CI: 0.79-0.97) and 15% less common among Hispanic MSM (aPR=0.85, 95% CI: 0.78-0.93) compared to White MSM. PrEP awareness was 24% more prevalent among MSM with an educational status greater than high school diploma/GED (aPR=1.24, 95% CI: 1.12-1.38) compared to those with a high school diploma/GED or less. PrEP awareness was 43% higher among MSM with a household income of ≥$20,000 (aPR=1.43, 95% CI: 1.12-1.83) compared to their lower income counterparts. Additionally, PrEP awareness was 12% (aPR=1.12, 95% CI: 1.02-1.22) more common among participants who participated in an HIV behavioral intervention compared to those who did not.

PrEP use among Black MSM (aPR=0.48, 95% CI: 0.25-0.94) and Hispanic MSM (aPR=0.56, 95% CI: 0.38-0.83) was almost half of the prevalence of PrEP use among White MSM. PrEP use among MSM who had condomless anal sex with casual male partners was 2.7 times greater compared to MSM who did not (aPR=2.70, 95% CI: 1.54-4.73). Similarly, PrEP use among MSM who participated in an HIV behavioral intervention was twice (aPR=2.02, 95% CI: 1.42-2.88) that of MSM who had not.

DISCUSSION

Our study found more than 80% of HIV-negative, sexually active MSM participants in the Dallas MSA were aware of PrEP, but less than 20% had used it. The proportion of participants who were aware of PrEP was similar to national data reported by the CDC (83.7% vs. 84.8%). However, the proportion of participants who reported PrEP use in the past 12 months was

Table 1. Characteristics of HIV Negative, Sexually Active[a] Men Who Have Sex with Men by Pre-Exposure Prophylaxis (PrEP) Awareness in the National HIV Behavioral Surveillance System, Dallas, 2017

Characteristics	Heard of PrEP		Not heard of PrEP		P-value
	N (Col%)	Row%	N (Col%)	Row%	
Overall	340 (83.7)	----	66 (16.3)	----	
Age group (years)					0.53 ns
18 - 29	188 (55.3)	85.5	32 (48.5)	14.5	
30 - 44	100 (29.4)	82.6	21 (31.8)	17.4	
≥45	52 (15.3)	80.0	13 (19.7)	20.0	
Race/ethnicity [b]					<0.001***
White	121 (35.6)	93.8	8 (12.1)	6.2	
Black	48 (14.1)	80.0	12 (18.2)	20.0	
Hispanic	146 (42.9)	77.2	43 (65.2)	22.8	
Other[c]	24 (7.1)	88.9	3 (4.5)	11.1	
Current health insurance					<0.001***
No	89 (26.2)	73.0	33 (50.0)	27.0	
Yes	251 (73.8)	88.4	33 (50.0)	11.6	
Education					<0.001***
High school diploma/GED or less	64 (18.8)	65.3	34 (51.5)	34.7	
More than high school diploma/GED	276 (81.2)	89.6	32 (48.5)	10.4	
Annual household income [b]					<0.001***
<$20,000	31 (9.1)	55.4	25 (37.9)	44.6	
≥$20,000	308 (90.6)	88.5	40 (60.6)	11.5	
Homeless, past 12 months					<0.001***
No	325 (95.6)	85.5	55 (83.3)	14.5	
Yes	15 (4.4)	57.7	11 (16.7)	42.3	
Incarcerated, past 12 months					<0.001***
No	321 (94.4)	85.6	54 (81.8)	14.4	
Yes	19 (5.6)	61.3	12 (18.2)	38.7	
Used non-injection drug, past 12 months					0.73 ns
No	157 (46.2)	83.1	32 (48.5)	16.9	
Yes	183 (53.8)	84.3	34 (51.5)	15.7	
Bacterial STD, past 12 months					0.43 ns
No	280 (82.4)	83.1	57 (86.4)	16.9	
Yes	60 (17.6)	87.0	9 (13.6)	13.0	
Condomless casual anal sex, past 12 months					0.08 ns
No	182 (53.5)	80.9	43 (65.2)	19.1	
Yes	158 (46.5)	87.3	23 (34.8)	12.7	
No. of male sex partners, past 12 months					0.02*
1-5	201 (59.1)	80.4	49 (74.2)	19.6	
>5	139 (40.9)	89.1	17 (25.8)	10.9	
Participated in HIV behavioral intervention, past 12 months [d]					0.06ns
No	251 (73.8)	81.8	56 (84.8)	18.2	
Yes	89 (26.2)	89.9	10 (15.2)	10.1	

[a] Men who had oral or anal sex with at least one male partner in the past 12 months.
[b] Missing values in the variables were not included in the Chi-square tests.
[c] Includes American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, other race, or multiple races.
[d] Includes a one-on-one conversation with an outreach worker, counselor, or prevention program worker or participation in any organized session(s) involving a small group of people to discuss ways to prevent HIV.
Significance Level: *=p<0.05; ***=p<0.001; ns=not significant (p>0.05).
HIV = human immunodeficiency virus. GED = General Educational Development. STD = sexually transmitted disease.

Table 2. Characteristics of HIV negative, Sexually Active[a] Men Who Have Sex with Men by Pre-Exposure Prophylaxis (PrEP) Use in the Past 12 Months in the National HIV Behavioral Surveillance System, Dallas, 2017

Characteristics	Used PrEP		Did not use PrEP		P value
	N (Col%)	Row%	N (Col%)	Row%	
Overall	74 (18.2)	----	332 (81.8)	----	
Age group (years)					0.06[ns]
18 - 29	40 (54.1)	18.2	180 (54.2)	81.8	
30 - 44	28 (37.8)	23.1	93 (28.0)	76.9	
≥45	6 (8.1)	9.2	59 (17.8)	90.8	
Race/ethnicity[b]					0.01**
White	35 (47.3)	27.1	94 (28.3)	72.9	
Black	7 (9.5)	11.7	53 (16.0)	88.3	
Hispanic	26 (35.1)	13.8	163 (49.1)	86.2	
Other[c]	6 (8.1)	22.2	21 (6.3)	77.8	
Current health insurance					0.04*
No	15 (20.3)	12.3	107 (32.2)	87.7	
Yes	59 (79.7)	20.8	225 (67.8)	79.2	
Education					0.01**
High school diploma/GED or less	9 (12.2)	9.2	89 (26.8)	90.8	
More than high school diploma/GED	65 (87.8)	21.1	243 (73.2)	78.9	
Annual household income[bd]					0.02*
<$20,000	4 (5.4)	7.1	52 (15.7)	92.9	
≥$20,000	70 (94.6)	20.1	278 (83.7)	79.9	
Homeless, past 12 months[d]					1.00[ns]
No	70 (94.6)	18.4	310 (93.4)	81.6	
Yes	4 (5.4)	15.4	22 (6.6)	84.6	
Incarcerated, past 12 months[d]					0.23[ns]
No	71 (95.9)	18.9	304 (91.6)	81.1	
Yes	3 (4.1)	9.7	28 (8.4)	90.3	
Used non-injection drug, past 12 months					0.36[ns]
No	38 (51.4)	20.1	151 (45.5)	79.9	
Yes	36 (48.6)	16.6	181 (54.5)	83.4	
Bacterial STD, past 12 months					0.01**
No	54 (73.0)	16.0	283 (85.2)	84.0	
Yes	20 (27.0)	29.0	49 (14.8)	71.0	
Condomless casual anal sex, past 12 months					<0.001***
No	19 (25.7)	8.4	206 (62.0)	91.6	
Yes	55 (74.3)	30.4	126 (38.0)	69.6	
No. of male sex partners, past 12 months					<0.001***
1-5	29 (39.2)	11.6	221 (66.6)	88.4	
>5	45 (60.8)	28.8	111 (33.4)	71.2	
Participated in HIV behavioral intervention, past 12 months[e]					<0.001***
No	44 (59.5)	14.3	263 (79.2)	85.7	
Yes	30 (40.5)	30.3	69 (20.8)	69.7	

[a] Men who had oral or anal sex with at least one male partner in the past 12 months.
[b] Missing values in the variables were not included in the Chi-square tests.
[c] Includes American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, other race, or multiple races.
[d] Fisher's exact test was used due to low expected cell counts.
[e] Includes a one-on-one conversation with an outreach worker, counselor, or prevention program worker or participation in any organized session(s) involving a small group of people to discuss ways to prevent HIV.
Significance Level: *=p<0.05; **=p<0.01; ***=p<0.001; ns=not significant (p>0.05).
HIV = human immunodeficiency virus. GED = General Educational Development. STD = sexually transmitted disease.

Table 3. Factors Associated with Pre-Exposure Prophylaxis (PrEP) Awareness and PrEP Use in the Past 12 Months among HIV negative, Sexually Active[a] Men Who Have Sex with Men in the National HIV Behavioral Surveillance System, Dallas, 2017

Characteristics	PrEP Awareness		PrEP Use	
	Unadjusted PR (95% CI)	**Adjusted PR (95% CI)[b]**	**Unadjusted PR (95% CI)**	**Adjusted PR (95% CI)[c]**
Age group (years)				
18 - 29	Ref	Ref	Ref	Ref
30 - 44	0.97 (0.88-1.06)	0.96 (0.88-1.04)	1.26 (0.88-1.81)	1.15 (0.79-1.68)
≥45	0.93 (0.84-1.04)	0.92 (0.84-1.00) *	0.50 (0.21-1.20)	0.60 (0.26-1.41)
Race/ethnicity				
White	Ref	Ref	Ref	Ref
Black	0.85 (0.74-0.97) *	0.87 (0.79-0.97) *	0.42 (0.20-0.89) *	0.48 (0.25-0.94) *
Hispanic	0.82 (0.76-0.89) **	0.85 (0.78-0.93) **	0.51 (0.34-0.75) **	0.56 (0.38-0.83) **
Other[d]	0.96 (0.85-1.09)	0.97 (0.86-1.11)	0.82 (0.42-1.58)	0.77 (0.36-1.66)
Current health insurance				
No	Ref	Ref	Ref	Ref
Yes	1.22 (1.10-1.35) **	1.05 (0.96-1.15)	1.70 (1.02-2.83) *	1.21 (0.77-1.90)
Education				
High school diploma/GED or less	Ref	Ref	Ref	Ref
More than high school diploma/GED	1.39 (1.20-1.61) **	1.24 (1.12-1.38) **	2.30 (1.25-4.23) **	1.53 (0.91-2.58)
Annual household income				
<$20,000	Ref	Ref	Ref	Ref
≥$20,000	1.61 (1.23-2.10) **	1.43 (1.12-1.83) **	2.91 (0.94-9.05)	2.14 (0.71-6.43)
Homeless, past 12 months				
No	Ref	Ref	Ref	Ref
Yes	0.67 (0.48-0.94) *	0.89 (0.66-1.20)	0.84 (0.34-2.05)	1.58 (0.60-4.18)
Incarcerated, past 12 months				
No	Ref	Ref	Ref	Ref
Yes	0.71 (0.54-0.94) *	0.82 (0.64-1.05)	0.51 (0.18-1.45)	0.48 (0.18-1.29)
Used non-injection drug, past 12 months				
No	Ref	Ref	Ref	Ref
Yes	1.01 (0.93-1.09)	1.03 (0.96-1.11)	0.83 (0.56-1.23)	0.83 (0.59-1.16)
Bacterial STD, past 12 months				
No	Ref	Ref	Ref	Ref
Yes	1.06 (0.94-1.18)	1.05 (0.93-1.17)	1.81 (1.07-3.05) *	1.30 (0.76-2.21)
Condomless casual anal sex, past 12 months				
No	Ref	Ref	Ref	Ref
Yes	1.08 (0.99-1.17)	1.02 (0.95-1.09)	3.60 (2.06-6.28) **	2.70 (1.54-4.73) **
No. of male sex partners, past 12 months				
1-5	Ref	Ref	Ref	Ref
>5	1.11 (1.02-1.22) *	1.06 (0.99-1.14)	2.63 (1.63-4.24) **	1.53 (0.94-2.48)
Participated in HIV behavioral intervention, past 12 months[e]				
No	Ref	Ref	Ref	Ref
Yes	1.10 (1.00-1.20) *	1.12 (1.02-1.22) *	2.12 (1.44-3.11) **	2.02 (1.42-2.88) **

[a] Men who had oral or anal sex with at least one male partner in the past 12 months.
[b] Poisson regression models adjusted for race/ethnicity, education, annual household income, incarceration history, and participation in the HIV behavioral intervention.
[c] Poisson regression models adjusted for race/ethnicity, education, annual household income, incarceration history, condomless anal sex with casual male partners in the past 12 months, number of male sex partners in the past 12 months, and participation in the HIV behavioral intervention.
[d] Includes American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, other race, or multiple races.
[e] Includes a one-on-one conversation with an outreach worker, counselor, or prevention program worker or participation in any organized session(s) involving a small group of people to discuss ways to prevent HIV.
Significance Level: *=p<0.05; **=p<0.01
HIV = human immunodeficiency virus. GED = General Educational Development. STD = sexually transmitted disease. PR = Prevalence Ratio. CI = confidence interval.

lower than the national average (18.2% vs. 25.0%).[18] Our findings that both PrEP awareness and use were more common among White MSM and other race groups than among Black and Hispanic MSM were consistent with that of national studies.[18, 22] This confirms the need for more targeted PrEP promotion in the Black and Hispanic MSM populations, particularly since these groups experienced a disproportionate burden of HIV.[1]

PrEP awareness was less common among MSM who were homeless or incarcerated in the past 12 months. This indicates the need to increase PrEP awareness among these subpopulations who are vulnerable and at high-risk of HIV infection. Fortunately, participation in HIV behavioral intervention was positively associated with both PrEP awareness and use. Consequently, this offers a good opportunity to introduce PrEP to people at high-risk of HIV who may not be aware of it and encourage them to use PrEP to prevent HIV. Our study also found disparities in PrEP awareness by educational attainment and annual household income. PrEP awareness was lower among MSM with high school diploma/GED or less and those with < $20,000 annual household income. This finding is consistent with other studies that confirmed that more resources are needed to promote PrEP among MSM with lower SES.[22,23]

According to CDC's guidelines, elevated sexual activity is an indicator for PrEP use.[8] The national NHBS analyses reported associations between more active sexual behaviors and PrEP use, where the more active sexual behaviors included having sex with casual male partners, having multiple sex partners, and having condomless sex with casual male partners.[23] This study showed a significant association between PrEP use and behavior variables such as condomless anal sex with casual male partners, bacterial STD infection, and the number of male sex partners. However, following adjustments for the other covariates, these significant findings were attenuated. This implies that PrEP use in Dallas is more impacted by sociodemographic factors such as race/ethnicity, education, and income level among MSM.

Although current health insurance was initially associated with PrEP awareness and use in the unadjusted models, the associations were attenuated when controlling for SES in the adjusted models. Similarly, household income was not associated with PrEP use after controlling for other factors. Our results show that disparities in PrEP awareness and use are related to factors other than current health insurance or household income.

The current study has several strengths. For instance, data were produced from a structured face-to-face interview on a wide range of variables such as sociodemographic characteristics and high-risk sexual behaviors. This allowed for measurement and adjustment for various confounding variables. Also, the VBS sampling method applied had also been found effective for recruiting large and diverse samples of hard-to-reach populations.[24, 25]

This study also had several limitations. First, the study was a cross-sectional study, so no temporal relationships could be determined. Second, the participants were recruited at venues such as bars and clubs that were frequented by MSM, therefore this sample may not be representative of the MSM population in the Dallas MSA. Third, the survey data were self-reported behaviors by the respondents, and thus, the data might be subject to social desirability or recall biases. Lastly, the data were not weighted to compensate for potential over or under-sampling of subpopulations. For the above reasons, cautious interpretation of the current study findings and their applicability is advised.

CONCLUSION

PrEP awareness in the Dallas MSA was similar to the national average, but PrEP use was lower than the national average.[18] Participation in HIV behavioral intervention was positively associated with both PrEP awareness and use, suggesting that it may offer the means for PrEP rollout among MSM population at risk of HIV. To eliminate disparities in HIV acquisition, efforts to increase PrEP awareness and use in Dallas should target Black and Hispanic MSM and MSM with lower SES.

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National Suicide Prevention Lifeline Moves to 3-Digit Dialing Code

988 SUICIDE & CRISIS LIFELINE

The telephone number for the National Suicide Prevention Lifeline is now 988.

What do you need to know? 988 has been designated as the new three-digit dialing code that will route callers to the National Suicide Prevention Lifeline. The new dialing code IS NOW AVAILABLE!

Callers will be connected to trained counselors that are part of the existing National Suicide Prevention Lifeline network. These trained counselors will listen, understand how their problems are affecting them, provide support, and connect them to resources if necessary. The previous phone number (1-800-273-8255) will continue to connect callers to 24/7 help.

Need help? View more information at 988lifeline.org and on the Substance Abuse and Mental Health Services Administration website at https://www.samhsa.gov/find-help/988/faqs#about-988.

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