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President’s Message
Carol M. Davis, MSPH, CPH

It has been nine years since a major hurricane had a direct hit on Texas. On August 25, 2017 Hurricane Harvey made landfall outside of Rockport, Texas. Unlike previous hurricanes, Harvey sat over Texas and then crawled across the southeast portion of our state dropping almost as much as a year’s worth of rain on communities in its wake. In the two weeks after landfall, public health professionals across the state assisted with local, regional, and state level responses to the disaster. Many of our public health colleagues were working long hours to help others while their own homes were being flooded. Much of the work done by public health was hidden from view unlike that of other responders.

As with many disasters, there was a rapid influx of emergency responders and disaster volunteers. We saw images of these responders and volunteers pulling people out of flood waters, offering food and supplies, working on power lines, and clearing debris. As the flood waters started receding and a second hurricane made landfall in Florida, the influx of responders and volunteers slowed. Fewer and fewer emergency actions such as rescues and evacuations were needed. The intense part of the disaster passed and with its passing much of the media attention shifted elsewhere as well.

Public health professionals across Texas had significant roles in responding to the disaster and will continue to fill critical roles throughout the lengthy recovery process. Every Texan feels the impact of our work even if they never get to see us in action. Today, I want to recognize all of the unsung public health professionals who worked the long shifts, picked up extra duties, spent restless nights worried about their communities, and worked to solve impossible problems all in the name of doing their job to protect the public’s health. Here are just a few of the roles public health professionals did in response to Harvey:

- Sanitarians and environmental health specialists worked to ensure food provided to evacuees, responders, and community members was safe to eat.
- Epidemiologists identified health concerns and monitored disease occurrence in shelters and communities.
- Public health administrators worked keep essential services available while re-assinging staff to work on response related tasks.
- Health educators wrote and delivered safety messages to impacted communities.
- Preparedness specialists worked with emergency managers, first responders, and healthcare professionals to limit disruptions in patient care.
- Social workers connected people with available resources.
- TB specialists ensured displaced clients still had access to their medications.
- Planners strategized how to best deliver services when existing infrastructure was impacted.
- Immunization specialists procured vaccine and coordinated delivery to locations in need.
- Nurses gave vaccinations and provided care to people.
- Disease investigators continued to investigate and limit the spread of infectious diseases.

This is just a snapshot of the work done by public health in response to Harvey that was on top of the critical services we provide every day. In the wake of a disaster, our role is even more critical. Everything we know about promoting healthy behaviors and environments, working with vulnerable populations, achieving health equity, and identifying long term health risks will be needed to ensure our communities not only return to normal but do so in a manner that leaves them in a healthier state.

As we transition from the fast-paced response mode to the more measure-paced recovery mode, find a chance to catch your breath and reflect on this disaster. What did we do really well? What could we have done better? What new public health challenges are facing our communities? What should we do to prepare for the next disaster? In a way our work is just beginning. Texas Strong. Public Health Strong.
Many folks inquired about TPHA’s response to Hurricane Harvey. Many of our members were of course heavily involved as part of their jobs. TPHA itself took an active role using social media. Members posted information on their own pages as it became available. TPHA also shared the information below with APHA.

We suggest you call ahead to inquire which items are most needed. Your donations will be greatly appreciated!

**At Any Relief Site** Ask the site coordinator about how you might provide assistance to folks applying for FEMA assistance. Some may not understand the system, have lost computers phones etc. or maybe cannot read or write. In the past, this has led to many not applying for assistance.

**Nueces County Health District** (Includes Corpus Christi and Rockport areas directly hit by Hurricane Harvey) Coastal Bend Community Foundation Monetary Donations for Harvey Relief
http://www.cbcfoundation.org/

**Nueces County Health District**

The Galveston County Health District has opened an emergency phone bank for Harvey recovery questions. The number is 409-938-7221. For more info. [http://www.gchd.org/harvey-flood-recovery](http://www.gchd.org/harvey-flood-recovery)

**Fort Bend County Social Services**

According to Texas Public Health Association member and the Deputy Director of the Fort Bend County Health Department, the greatest need will be for housing for displaced residents once the shelters close. Please contact them for ways to help.

Social Services | Rosenberg Annex
Address: 4520 Reading Rd., Suite A-900 Rosenberg, TX 77471
Telephone: 281-238-3502

**Houston**

1) **Mayor Sylvester Turner has set up a direct Go Fund Me site**

2) **Texans Football Player J. J. Watt’s Hurricane Harvey Relief Fund**
https://www.youcaring.com/victimsofhurricaneharvey-915053

**Food Banks in Hurricane Harvey and Flood Affected Areas**

Houston Food Bank
832-369-9390
http://www.houstonfoodbank.org

Galveston Food Bank
409-945-4232
http://www.galvestoncountyfoodbank.org

Food Bank of the Golden Crescent (Victoria)
361-578-0591
http://www.victoriafoodbank.org

Corpus Christi Food Bank
361-887-6291
http://www.foodbankcc.com

Southeast Texas Food Bank (Beaumont)
409-839-8777
http://www.setxfoodbank.org

Food Bank of the Rio Grande Valley (Pharr)
956-682-8101
http://www.foodbankrgv.com

Brazos Valley Food Bank (Bryan)
979-779-3663
http://www.bvfb.org

Central Texas Food Bank (Austin)
512-282-2111
http://www.centraletexasfoodbank.org

San Antonio Food Bank
210-337-3663
http://www.safodbank.org

As always, the Red Cross and United Way are accepting donations that are used more broadly.
Commissioner’s Comments

Turning the Tide on HIV

Dr. John Hellerstedt
Texas Department of State Health Services

It’s been approximately 37 years since the first cases of what would come to be known as HIV were reported in the Morbidity and Mortality Weekly Report. In the ensuing decades, medicine and public health have acquired powerful tools in the fight against this devastating infection.

Enhanced HIV testing technology can detect the virus earlier in the course of infection, allowing for more timely initiation of life-saving treatment and reduced likelihood of further transmission. Routine HIV screening in healthcare settings – recommended by the U.S. Centers for Disease Control and Prevention since 2006 – increases the availability and acceptability of HIV testing to patients who might not otherwise test until late in the course of infection. Pre-Exposure Prophylaxis, or PrEP, was approved by the Food and Drug Administration in 2012 as an important addition to the HIV prevention strategy. When taken consistently, PrEP reduces the risk of sexual transmission of HIV by 92 percent and the risk of transmission by injectable drug use by 70 percent.

Despite these advances, Texas continues to see disturbingly rapid HIV transmission among small pockets of various populations at risk. The CDC, DSHS, local health departments and community based organizations have been working together to identify active clusters of HIV transmission and bolster prevention efforts to slow – or ideally, stop – the expansion of these clusters. While robust public health follow-up continues to be essential to these efforts, molecular HIV surveillance provides a cutting-edge tool for identifying active clusters.

Molecular surveillance uses HIV genotype sequence data generated during drug resistance testing to analyze the prevalence of drug resistance in the population, the distribution of HIV-1 subtypes, and identify transmission clusters. Genetic sequencing has proven to be effective in public health investigations of other transmissible diseases, including food-borne illness and tuberculosis. It is important to note that while patterns of infection can be identified using these molecular techniques, they do not show the direction of transmission, meaning the data cannot be used to tell definitively if one person infected another.

As of March 2017, the CDC has identified 71 clusters nationally. Texas currently has 20 identified clusters, the most of any state, as well as having the single largest cluster. Texas is at the forefront of addressing these clusters by using molecular surveillance data and proven public health investigation techniques. The combined information provides state and local health officials with an enhanced picture of network transmission patterns, allowing for more focused prevention interventions.

To this end, DSHS staff are identifying people living with HIV who have fallen out of the medical care system and collaborating with local public health staff to re-engage them into care. Additionally, public health workers are offering repeat HIV testing to people who last tested HIV-negative but remain at higher risk for HIV acquisition due to connections to a growing transmission cluster. If they remain HIV-negative, they are offered access to PrEP. People who test positive are offered partner services and referred into HIV medical care.

The HIV drug resistance testing that facilitates molecular surveillance is part of the standard of care for people living with HIV. It should be performed when the patient enters HIV medical care, along with quantitative viral load and CD4 testing. Drug resistance testing examines the viral RNA for mutations that have resistance to anti-retroviral medication, allowing providers to develop an effective treatment plan.

In addition to following the standard of care for people with HIV, DSHS asks healthcare providers to consider adopting the following strategies to reduce HIV transmission:

- **Order HIV testing for patients with symptoms of possible acute HIV infection.** Acute HIV infection often causes symptoms such as fever, chills, rash, night sweats, muscle aches, sore throat, fatigue, swollen lymph nodes, and/or mouth ulcers. These symptoms can last several days to several weeks. People with acute HIV infection are highly infectious due to an elevated viral load.
- **Order NAAT or HIV RNA testing for patients with an indeterminate or negative supplemental HIV test result.** These tests can identify whether the virus itself is present in the blood before antibodies to the virus become detectable, allowing for earlier diagnosis of HIV infection.
- **Order HIV testing for all patients diagnosed with a sexually transmitted disease (STD).**
- **Ensure all HIV testing follows CDC’s HIV/AIDS Laboratory Testing Guidance.**
- **Discuss pre-exposure prophylaxis (PrEP) and other risk reduction measures with HIV-negative patients at increased risk of infection.**

We recognize the sensitivity of health related information collected for public health purposes and respect the importance of privacy. We comply strictly with Texas confidentiality law, including those detailed in Section 81.046 of the Communicable Disease Prevention and Control Act. It is important to note that health information gathered during the course of investigating communicable disease, including molecular HIV surveillance data, is not considered public information and is protected from release for any purpose that may compromise confidentiality.

For more information, healthcare providers can contact their local health department, the DSHS HIV/STD Program at 512-533-3000, or the National Clinicians Consultation Network at (800) 933-3413.

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Vitamin D Ingestions Reported to Poison Centers: A Consequence of the Vitamin’s Increasing Popularity

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Vitamin D has long been known to be essential to bone health, and most people get enough vitamin D simply by living their daily life. The traditional sources of vitamin D, fish, milk, and orange juice have now turned into people ingesting over the counter supplements and prescribed formulations to ensure they are getting adequate vitamin D. Vitamin D is essential for a vast number of physiologic processes, and as such, adequate levels are necessary or advantageous for optimal health. However, deficiency of vitamin D is now recognized as a pandemic with more than half of the world’s population currently at risk.1,2

Although vitamin D previously was thought to exert most of its benefit through calcium homeostasis and prevention of bone disease (e.g., rickets, osteomalacia, and osteoporosis), it also has been shown to induce cellular differentiation, inhibit angiogenesis, and possibly reduce the invasiveness and metastatic potential of tumors.3,4 Subsequent to the increased focus on potential benefits of vitamin D has been an increase in the use of its supplementation in adults and children, both by prescription and as a widely over-the-counter (OTC) vitamin supplement.5

It is critical to be aware of and understand the symptoms and diagnosis of vitamin D intoxication. Some symptoms of vitamin D intoxication include hypercalcemia, such as poor appetite, weight loss, abdominal pain, vomiting, constipation, polyuria, and polydypsia, and in severe cases, life-threatening dehydration.6 Because the complaints of hypercalcemia are nonspecific, symptoms can be present for prolonged periods before a patient worsens and seeks medical attention.

Awareness of the benefits of vitamin D has increased in both the medical community and the general population. As such, over the counter and prescribed vitamin D intake has followed suit. Unregulated supplements and formulations of vitamin D are readily available in pharmacies and health food stores alike. Because both under-dosing and overtreatment with vitamin D can have considerable consequences, the need to regulate the available formulations must be recognized. Furthermore, vitamin D intoxication has been reported after misunderstanding of physician instructions, emphasizing the need for improved communication regarding dosing.7

1. Health care providers should be aware of the various vitamin D preparations and counsel patients on both desirable doses and variability among formulations.
2. Vitamin D excess or intoxication should be included in the differential of children who present with hypercalcemia or hypercalciumia.

From 2000-2016, 2,251 exposures were reported to the Texas Poison Center Network involving ingestion of vitamin D alone. In Texas, over the past seventeen years, there has been a continual increase of exposures related to vitamin D from three cases in 2000 to 331 in 2016 (Figure 1). The majority (n=2,622, 96%) of the ingestions reported to Texas poison centers were unintentional. Of these ingestions, 38% (n=847) were attributed to therapeutic errors. Only 0.5% of ingestions were coded as suspected attempted suicide. Females comprised 57% (n=1,284) of patients while males represented 43% (n=961). The two largest age groups affected were patient ages 0-5 years, comprising 58% of ingestions, followed by adult ages 20 years and older (34%). Nearly all (n=2,800, 97%) of the patients ingested the vitamin D at home. Most (n=2,193, 88%) of the patients were managed safely over the phone and kept at home, 154 (7%) were already at or en-route to a healthcare facility when the poison center was contacted, 65 (3%) were referred to a healthcare facility by the poison center, and 38 (2%) were managed at an unspecified other location. Three percent of patients (n=63) experienced a serious medical outcome.

The distribution of patients by medical outcome was reported as no effect (n=486, 22%), minor effect (n=54, 2%), moderate effect (n=19, 1%), major effect (n=2, 0.1%), not followed but judged nontoxic (n=417, 19%), not followed but minimal effects possible (n=1,195, 53%), unable to follow but potentially toxic (n=42, 2%), and unrelated effect (n=35, 2%). No deaths were reported. The most frequently reported clinical effects were nausea (n=58, 3%), vomiting (n=40, 2%), abdominal pain (n=36, 2%), and headache (n=32, 1%). The most commonly reported treatments were dilution (n=814, 36%), food/snack (n=449, 20%), and activated charcoal (n=25, 1%). Activated charcoal would be recommended for exposures managed in a healthcare facility.

In summary, despite the increase in number of vitamin D ingestions that continue to be reported each year, very few patients experienced major medical outcomes. Evidence has shown that it remains vital for physicians and health professionals to counsel their patients and ensure adequate medication administration instructions to avoid a potential exposure. Your local poison center can safely manage the majority of potentially adverse exposures to vitamin D at home. If you have a potentially adverse...
exposure to vitamin D, remain calm and contact the poison center for recommendations. For questions or concerns regarding a vitamin D exposure, contact the Texas Poison Center Network at 1-800-222-1222.

REFERENCES

Analysis of Mushroom Ingestions in Texas
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Over 5,000 varieties of mushroom exist, of which 50-100 are known to be toxic. 1 Wild mushroom ingestions are relatively common. In 2015 alone, over 6,000 mushroom exposures were reported to United States poison centers. 2 This may be cause for concern because some mushroom species are toxic to humans. Nontoxic and toxic mushrooms may grow in the same area, and the wide variation in mushroom characteristics may make it difficult to distinguish between them. 3 The majority of the public may not be able to identify toxic mushrooms. 4 Furthermore, in potentially adverse mushroom ingestions, the species involved often is not identified. 5-7

Texas has approximately 200 species of wild mushrooms, some of which contain toxins. 1 The health outcomes following mushroom ingestions reported to the Texas Poison Center Network during 2000-2017 and retrospectively reviewed are described.

During 2000-2017, 5,924 mushroom ingestions were reported to the Texas Poison Center Network. Of these, 2,092 (35.3%) were reported in September-November, 490 (8.3%) in December-February, 1,498 (25.3%) in March-May, and 1,844 (31.1%) in June-August. In comparison, most mushroom-related calls to Florida poison centers occurred between June and October, 8 while pediatric exposures to mushrooms reported to California poison centers peaked in the autumn months. 9 One investigation found that mushroom exposures reported to the Washington poison center increased with decreasing rain/increasing temperature (spring) and increasing rain/decreasing temperature (autumn); the number of exposures was greatest in autumn. 9

The age distribution of patients was 3,040 (51.3%) 0-5 years, 465 (7.8%) 6-12 years, 1,020 (17.2%) 13-19 years, 1,325 (22.4%) 20 years or more, and 74 (1.2%) unknown age; 3,743 (63.2%) of the patients were male, 2,161 (36.5%) female, and 20 (0.3%) unknown gender. Most (n=4,090, 69.0%) of the ingestions were unintentional, 1,736 (29.3%) intentional, 57 (1.0%) adverse reactions, 18 (0.3%) unspecified other reasons, and 23 (0.4%) unknown reason. The most frequently reported exposures sites were the patient’s own residence (n=4,807, 81.1%), school (n=331, 5.6%), other residence (n=225, 3.8%), and public area (n=212, 3.6%). This pattern of patient demographics and circumstances of the exposure were consistent with previous studies in the United States of mushroom exposures using poison center data. 3,5-9

The highest proportion (n=2,607, 44.0%) of the patients were managed at site (outside of a healthcare facility), 1,942 (32.8%) were already at or en route to a healthcare facility when the poison center was contacted, 1,322 (22.3%) were referred to a healthcare facility by the poison center, 40 (0.7%) were managed at an unspecified other location, and 13 (0.2%) were managed at an unknown location. Similarly, the majority of mushroom exposures reported to California and Washington poison centers were also managed on site. 5,7 However, less than one-quarter of mushroom exposures reported to Florida poison centers were managed on site. 8

No or minor effects were known or expected in 4,284 (73.3%) of the ingestions, moderate or major effects in 1,564 (26.7%), and unrelated effects in 76 (1.3%); no deaths were reported. This pattern was similar to that reported in prior investigations. 3,5-9

The most commonly reported adverse clinical effects were vomiting (n=1,492, 25.2%), nausea (n=907, 15.3%), diarrhea (n=552, 9.3%), abdominal pain (n=517, 8.7%), hallucinations/delusions (n=388, 6.5%), tachycardia (n=255, 4.3%), agitation/irritability (n=212, 3.6%), drowsiness/lethargy (n=149, 2.5%), and confusion (n=148, 2.5%). This is consistent with the literature, which reports the most common symptoms with mushroom ingestions to be gastrointestinal or neurological in nature. 5,7,9 The particular clinical effects observed by the Texas Poison Center Network also were frequently reported among mushroom exposures in previous studies. 5,7,9

These results are similar to what has been observed in other parts of the United States. Although deaths due to wild mushroom ingestions have been reported in the United States, 5-7 the majority of ingestions are not fatal. 26-9 Most wild mushrooms ingestions, particularly those involving children and those involving mushrooms found in a tended yard, usually result in mild effects. 7,8,10,11

Nonetheless, if someone is concerned about a mushroom ingestion, they should immediately remove any remaining mushroom pieces from the mouth and save the other parts of the mushrooms for identification and so they can be accurately described over the telephone. The parts should be stored in paper,
not plastic bags. Contact the Texas Poison Center Network immediately at 1-800-222-1222 for assistance.

REFERENCES

Book Review: Kindling Curiosity for Public Health
Carol A. Galeener, PhD, MPH

Why? What Makes Us Curious by Mario Livio. (2017) Every parent who has answered a two-year old’s incessantly curious “Why” questions can find consolation in the fact that the child is striving to understand things that are not immediately evident, a defining trait of humanity. Without that curiosity, the human species would not have removed the handle on the Broad Street pump, discovered the Higgs boson, or found that sticking cheese on a hamburger made it special.

Livio, an Israeli-American astrophysicist who worked for decades on the Hubble telescope project, has a long track record of writing science for the lay public through accessible books and blog posts. His most recent book looks not to the stars but to the inner workings of the human mind to illuminate why people ask why --- and why do some people ask this question more persistently and more effectively than others do.

Livio proposes the artist Leonardo da Vinci and the Nobel prize-winning physicist Richard Feynman as archetypes of minds with interests in a number of domains and deep expertise in several. Using these as models, Livio interviews people who share these characteristics today and who have made significant contributions to their fields. He then addresses the findings of scientists who are mapping how the brain functions when aroused by curiosity and of scientists who identify how people respond to novel situations and questions.

These researchers have identified two primary types of curiosity. One type, dubbed “perceptual,” is triggered by a surprise, a novel experience, a complex or uncertain situation, or conflicting information. This is the kind of curiosity that drives us out of bed in the depths of night at the sound of an unusual noise, with heart racing and mind focused on ferreting out the source of the noise. Our bodies have been prepped for effort under stress. The gap between what we know and what we need to know demands closure. The “reward” for this effort is the extinguishing of the anxiety and distress that perceptual situations cause. The physician working to diagnose a particularly troublesome case and the epidemiologist hunting down the source of an outbreak are both acting to eliminate the distress of not knowing.

While the book falls somewhat short as a “how to” guide for those like parents and teachers who are concerned with stimulating curiosity, there are nevertheless some valuable take away points that can be gleaned from the interviews and anecdotes. For example, the author points out that researchers have found that the cycle of igniting and resolving perceptual curiosity has a valuable side effect: memory and the learning process are notably strengthened, particularly if the student erred in initial trials. Similarly, the physician and the epidemiologist are more likely to remember the solution to a vexing problem if presented with the same fact situation at some future point. As a health educator, if you wish to educate students or the public more effectively stimulate their perceptual curiosity. Construct a surprise that can be resolved with reasonable effort. Curiosity is piqued neither by a trivial challenge nor that which is equivalent to attempting to master quantum mechanics in an afternoon. The “sweet spot” for maximum learning lies somewhere in between.

The second type of curiosity is termed “epistemic.” It is the state of mind that seeks knowledge simply because it is there to be sought. While perceptual curiosity provides mental reward by extinguishing the unpleasant situation of not knowing, the epistemic variety provides its own reward. It is a pleasurable exercise simply in the doing. It is why we read non-fiction books like, Why, and it is what drives us to explore solutions to problems of disease, dysfunction, and social ills.

To foster epistemic curiosity Livio advises parents and educators to pose questions, but to have patience while students frame their answers. Then require that the students develop the way they would test those answers. This is the process of teaching the scientific method that Feynman’s father followed with the young Richard. One can hardly argue with the results.

At some point in his or her development, the child who was obsessively asking “why” just may discover the new phrase that will begin a lifetime of inquiry: “I wonder ….”
Vaccination of Patients with Influenza and Pneumococcal Vaccines Prior to Discharge from a University Hospital

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2Professor, Division of Infectious Diseases, Department of Internal Medicine, University of Texas Medical Branch, Galveston, Texas
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ABSTRACT
Objective: To determine the effect of a standing orders program (SOP) for administration of pneumococcal and influenza vaccines on vaccination rates of patients from four adult medical wards at a major academic medical center.

Methods: Patient medical records were reviewed to gather information on patient’s vaccination eligibility and status prior to discharge. Patients from the four medical wards were assessed over a three-week period.

Results: One hundred sixty-four patients were analyzed, and 35 patients were vaccinated, receiving 39 vaccines in total. Of all 399 indicated vaccines, 162 (41%) were administered prior to admission - 33% influenza, 54% 23 valent pneumococcal polysaccharide vaccine (PPSV23), and 34% 13 valent pneumococcal conjugate vaccine (PCV13). When accounting for vaccines that were previously administered, 237 vaccines (110 influenza, 63 PPSV23, 64 PCV13) were indicated for administration just prior to discharge; only 16% of these vaccines were administered (12% influenza, 4% PPSV23, 0% PCV13).

Conclusion: Discharge vaccinations may be improved with provider education and an outline of the current pneumococcal vaccines administration recommendations.

INTRODUCTION
Pneumococcal infections and influenza can be life threatening. This is particularly true for patients with diseases that cause immunosuppression and the elderly. It would not be possible for public health departments to vaccinate for prevention of pneumococcal diseases and influenza for most of the high-risk patients in the community. Thus, healthcare providers should work to ensure that all patients have received the two vaccines that provide protection against pneumococcal infections, based on age and risk.4-6 In addition, influenza vaccine should be administered on an annual basis during each influenza season.4-6

In this quality-assurance project, we chose to assess vaccine administration prior to discharge for four units in one hospital. The objectives of this project were to understand the strengths and weaknesses of our standing orders program (SOP) for vaccination of patients prior to discharge. We also wanted to understand how to improve physician and provider education to effectively target those patients for whom pneumococcal and influenza vaccines are indicated prior to discharge.

METHODS
We assessed a group of patients upon discharge from the Jennie Sealy Hospital, a teaching hospital on the main campus of the University of Texas Medical Branch in Galveston, Texas. The SOP was initiated in 2001-2002 and was entered into the hospital’s EPIC software system in 2009. Nurses were trained in a classroom on the screening process, standing orders, and the evidence supporting vaccination of patients during their hospitalization. Four internal medicine wards, including one geriatric ward (10A, 10B, 10C, and 11D) were recruited for the project. Each ward has a faculty attending physician, a second or third year resident, and two interns. Patient records were accessed via the EPIC electronic medical record (EMR) system for patients discharged between November 15, 2016, and December 2, 2016. It was expected that all adults who had not been vaccinated against influenza this season (or did not recall receiving an influenza vaccine) would be vaccinated prior to discharge.5 Standing orders for 23 valent pneumococcal polysaccharide vaccine (PPSV23) and 13 valent pneumococcal conjugate vaccine (PCV13) were based on current recommendations by the Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices.1 A flow chart was developed based on CDC recommendations and was used in the project while assessing a patient’s vaccine needs for pneumococcal vaccines prior to discharge. Medical records were reviewed for the patient’s discharge date, discharge diagnosis, other diagnoses for which the vaccines were indicated, age, vaccines received, vaccines not received, and the reasons vaccines were not administered. The “reason vaccine was not received” was determined by documentation in the EMR. Taken into account was whether or not a given vaccine was indicated for the patient, what vaccines were documented to have been given previously, and the reasoning stated on the discharge summary by the discharging physician as to why a patient received or did not receive a given vaccine. If a vaccine was refused by a patient, the nurse noted a reason for refusal. Neither patients nor medical staff were interviewed. Approval by the Institutional Review Board was not required as this was considered a quality improvement project.

RESULTS
During the project period, 164 patient charts were analyzed. Fifty patients were discharged from ward 10A, 35 from ward 10B, 43 from ward 10C, and 36 from ward 11D. The age range of these patients was 20-96 years with a mean age of 61.3 years and a median age of 62 years. Two hundred thirty-two diagnoses pertinent to pneumococcal vaccine administration were identified in the patient population (Tables 1 and 2). Only 39 vaccines were administered (29 influenza, 10 PPSV23, 0 PCV13) to 35 patients receiving one or more vaccines (9 in ward 10A, 7 in ward 10B, 20 in ward 10C, and 3 in ward 11D) (Table 3). A total of 399 immunizations were indicated based on age and related chronic illnesses (164 influenza, 138 PPSV23, 97 PCV13). After accounting for vaccines
that were previously received, 237 vaccines (110 influenza, 63 PPSV23, 64 PCV13) were indicated and could have been administered to patients prior to discharge. Of these, only 16.4% of the vaccines were administered (12.2% of influenza, 4.2% of PPSV23, 0% of PCV13).

Of those applicable vaccines that were not administered, 45.0% (n=162) had been previously received (prior to admission), 4.2% (n=15) were declined by the patients, and 46.1% (n=166) were not given despite being applicable to the patients based on CDC recommendations. Seventeen (4.7%) were not given for miscellaneous reasons. These reasons included: applicable, but deferred to outpatient/Primary Care Provider (n=6), hospice care (n=5), indicated, but not given (n=1), patient unable to receive dose before discharge (n=1), applicable, but alternate pneumococcal vaccine given (n=2), not given due to febrile illness (n=1), and not given due to terminal disease (n=1).

For influenza immunization, 82.3% (n=135) of indicated vaccines were not received before discharge. Of those not received, 40.0% (n=54) were previously received, 5.2% (n=7) were declined by the patient, 4.4% (n=6) were not given for the above miscellaneous reasons and 50.4% (n=68) were not given despite being applicable to the patients based on CDC recommendations.

For PCV13, none of the indicated vaccines were received. Of these, 34.0% (n=33) were previously received, 6.2% (n=6) were declined by the patient, 4.1% (n=4) were not received for miscellaneous reasons, and 55.7% (n=54) were not given despite being applicable to the patients based on CDC recommendations.

When accounting for those applicable pneumococcal vaccines that had been received prior to admission, 198 (49.6%) of the indicated vaccines were not given to patients prior to discharge. Similarly, 49.4% of all possible indicated influenza vaccines were not administered (81 out of 164). For PPSV23, 38.4% of all possible indicated PPSV23 vaccines were not administered (53 out of 138). For PCV13, 66.0% of all possible indicated PCV13 vaccines were not administered (64 out of 97) (Table 4).

**DISCUSSION**

Overall, our results show that our SOP was not very effective, particularly when accounting for the number of vaccines that were indicated and not received prior to discharge. Influenza vaccination rates were notably higher, likely due to the administration of a single vaccine. However, pneumococcal vaccine administration is considerably more complicated, be-

### Table 1. Diagnoses of Patients with an Indication for Immunization with PPSV23

<table>
<thead>
<tr>
<th>DIAGNOSES</th>
<th>NUMBER</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>53</td>
<td>31.7</td>
</tr>
<tr>
<td>Cigarette Smoker</td>
<td>14</td>
<td>8.3</td>
</tr>
<tr>
<td>Congestive Heart Failure/Cardiomyopathy</td>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>Alcoholism</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>COPD/Emphysema/Asthma</td>
<td>34</td>
<td>20.4</td>
</tr>
<tr>
<td>Chronic Liver Disease/Cirrhosis</td>
<td>19</td>
<td>11.4</td>
</tr>
<tr>
<td>Total</td>
<td>167</td>
<td>100</td>
</tr>
</tbody>
</table>

PPSV23: 23 valent pneumococcal polysaccharide vaccine

### Table 2. Diagnoses of Patients with an Indication for Immunization with PCV13 and PPSV23

<table>
<thead>
<tr>
<th>DIAGNOSES</th>
<th>NUMBER</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobinopathy</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Chronic Renal Failure</td>
<td>44</td>
<td>66.7</td>
</tr>
<tr>
<td>Generalized Malignancy</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>AIDS</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Nephrotic Syndrome</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Iatrogenic Immunosuppression</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>HIV</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Total</td>
<td>65</td>
<td>100</td>
</tr>
</tbody>
</table>

PCV13: 13 valent pneumococcal conjugate vaccine
PPSV23: 23 valent pneumococcal polysaccharide vaccine
Table 3: Vaccines administered

<table>
<thead>
<tr>
<th>Vaccines</th>
<th>Overall</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>29</td>
<td>8</td>
<td>5</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>PPSV23</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>PCV13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>39</strong></td>
<td><strong>9</strong></td>
<td><strong>7</strong></td>
<td><strong>20</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>

PCV13: 13 valent pneumococcal conjugate vaccine
PPSV23: 23 valent pneumococcal polysaccharide vaccine

Table 4: Reasons vaccines not received: Overall

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Total</th>
<th>Influenza</th>
<th>PPSV 23</th>
<th>PCV 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previously received</td>
<td>162</td>
<td>54</td>
<td>75</td>
<td>33</td>
</tr>
<tr>
<td>Patient declined</td>
<td>15</td>
<td>7</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Applicable, but not ordered</td>
<td>166</td>
<td>68</td>
<td>44</td>
<td>54</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>17</td>
<td>6</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>360</strong></td>
<td><strong>135</strong></td>
<td><strong>128</strong></td>
<td><strong>97</strong></td>
</tr>
</tbody>
</table>

PCV13: 13 valent pneumococcal conjugate vaccine
PPSV23: 23 valent pneumococcal polysaccharide vaccine

cause two vaccines must be administered in the appropriate order, and could be improved with provider education. This is especially implied by the observation that no PCV13 vaccine was given to any of the patients during our quality improvement project. Although PCV13 is routinely recommended to be administered to patients at 65 years, PPSV23 was often the default vaccine administered. Recommendations for pneumococcal vaccinations have been changed fairly recently, and many healthcare providers do not understand the sequence and indications for each vaccine. In addition, providers seem to be often unaware if a patient may require a second dose of PPSV23.

SOPs have been shown to be the most effective program for providing pneumococcal and influenza vaccines to patients prior to discharge from the hospital. Education of physicians and nurses about the current recommendations for pneumococcal vaccination may increase the pre-discharge immunization rates for these two vaccines. In addition, providing a chart for pneumococcal administration, such as the chart published recently by the CDC, may also be beneficial.

Of note, there are often extenuating circumstances that unavoidably influence vaccine administration prior to discharge. This was noted for those vaccines not received for “miscellaneous” reasons, and this may account for some reasons that were not documented in the EMR. Due to the limited time often available for hospital discharges, many patients may choose to forgo vaccinations when they are in a hurry to be discharged. A good example of this is that one PCV13 vaccine was ordered during the time of our project, but the patient’s ambulance arrived for transport before the vaccine arrived from the pharmacy. Clinical decision-making also plays a role. Although arguments could be made to administer vaccines to hospice patients, patients with terminal illnesses, and patients with febrile illnesses, physicians and patients alike may prefer not to administer or receive vaccines in these conditions. Some physicians may also feel more comfortable deferring the vaccines to the Primary Care Physician (PCP) for administration as an outpatient. This is possibly due to the desire to have good follow-up, but also could be due to lack of knowledge of indications for the administration of these vaccines, as well as limited time to ensure that patients are receiving the correct vaccines.

Due to the nature of a medical record-based quality improvement project, a few notable issues arose that may have affected the results of our project. In general, clinical decision-making that is not documented in the EMR may have played an unknown role in the vaccination rates. Although patients frequently had reliable vaccination records in the EMR, many had no history documented or may have had vaccine histories that were not up-to-date. Relatedly, some important chronic conditions may be unreported, undocumented, or unknown. In addition, if a patient declined a vaccine or claimed to have previously received a vaccine, but a nurse or physician did not note it in the discharge summary or EMR, we were not able to know that this occurred. The umbrella term “applicable, but not ordered” may have included many of these instances. In cases where either pneumococcal vaccine was indicated but neither was given, “Applicable, but not ordered” was assigned to both vaccines. Similarly, when a patient needed vaccination with either of the pneumococcal vaccines but declined the one that was to be given to him/her, “Patient declined” was listed for both vaccines. This may have inflated some of the negative results for the “not received” vaccines and should be considered when interpreting the results of this project. Other limitations of our study include the small population of patients and
the limited period during which we collected the data.

Plans for improving the SOP at our institution include meeting with nursing leadership to review the program and receive feedback on problems nurses have encountered when trying to provide influenza and pneumococcal vaccinations prior to discharge of patients. A program will be developed to educate nurses on the proper use of pneumococcal vaccines, including the correct sequencing of vaccines administration.

REFERENCES
In this paper, we will present the burden of chronic diseases profile in the Galveston County, TX. We will discuss the burden by describing the socio-demographics profile of Galveston residents, comparing the prevalence rates of chronic diseases in Galveston with those in Texas and the US (chronic disease profile), discussing the risk factors profile, and finally providing few recommendations to address the issue.

**Socio-demographics profile**

Galveston, Texas, is a county in the South-Eastern part of the state of Texas along the coast of the Gulf of Mexico. Approximately 320,000 residents live in Galveston County.³ The population density is 851.64 pop/sq mile. Table 1 presents the socio-demographics profile of the Galveston County population in comparison to the state of Texas and the US. The mean age of Galveston residents (37.5 years) is similar to that of US population (34.4 years). ⁹ The racial/ethnic profile of Galveston County residents is similar to Texas and the US predominantly dominated by Caucasians (80.1%). In comparison to Texas, Hispanics contribute to a quarter of the population distribution (23.7%). ⁹ The mean household income is significantly higher than Texas and US, yet still, the income-inequality ratio appears to be high. ¹¹ Approximately 14% of the population live in poverty, and only 10% of the population has access to Medicaid benefits. ¹² The percentages of residents who have completed at least bachelor’s degree in education (28.3%), and those who did not complete high school (14.3%) is better in Galveston than the state. About 19% of residents are unable to access healthcare professionals due to high healthcare costs compared to 15% of US general population. ¹³

**Chronic disease profile**

Figure 1A and 1B illustrate the chronic diseases profile of Galveston residents in comparison to Texans and the US population. Prevalence of diabetes in Galveston (10.6%) and Texas (10.6%) is higher than the US general population (9.3%). ¹⁴ In contrast, the cancer incidence rates are lower in Galveston (428.1 per 100,000 population) and Texas (410.2 per 100,000 population) with high rates reported in Galveston County residents. Interestingly the prevalence of obesity is lower in Galveston (24.9%) compared to Texans (28%) and US populations (31%). ¹⁴ Similar patterns of chronic-disease epidemiologic surveillance and prevention strategies in the state of Texas have been developed for individual Public Health Regions rather than for county-specific. ³ Public health has always supported the idea of enacting policies first at the local or county level, i.e., the bottom-to-top approach of developing population-specific policies/programs at the county level, and subsequently extending them to higher bureaucracy levels. It is thus important to address the burden of chronic diseases at the county level, where the burden might be possibly different at the state and national levels.
Table 1. Socio-demographics profile- Populations in Galveston county, Texas and the United States

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Galveston county</th>
<th>Texas</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in mean), years</td>
<td>37.5</td>
<td>34.4</td>
<td>37.8</td>
</tr>
<tr>
<td>Sex, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>49.4</td>
<td>50.4</td>
<td>49.2</td>
</tr>
<tr>
<td>Female</td>
<td>50.6</td>
<td>49.6</td>
<td>50.8</td>
</tr>
<tr>
<td>Race, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>80.1</td>
<td>79.7</td>
<td>77.1</td>
</tr>
<tr>
<td>African-American</td>
<td>13.6</td>
<td>12.5</td>
<td>13.3</td>
</tr>
<tr>
<td>Asian</td>
<td>3.4</td>
<td>4.7</td>
<td>5.6</td>
</tr>
<tr>
<td>Other</td>
<td>2.9</td>
<td>3.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Ethnicity, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>23.7</td>
<td>38.6</td>
<td>17.4</td>
</tr>
<tr>
<td>Median Household Income (in thousand US dollars)</td>
<td>61.7</td>
<td>52.6</td>
<td>53.5</td>
</tr>
<tr>
<td>Income inequality ratio</td>
<td>5.07</td>
<td>4.9</td>
<td>4.4</td>
</tr>
<tr>
<td>Living in poverty, %</td>
<td>14.3</td>
<td>17.2</td>
<td>14.8</td>
</tr>
<tr>
<td>&lt; High School Education, %</td>
<td>13</td>
<td>18</td>
<td>13.7</td>
</tr>
<tr>
<td>≥ At least bachelor’s degree, %</td>
<td>28.3</td>
<td>27.1</td>
<td>29.3</td>
</tr>
<tr>
<td>Insurance Status, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uninsured</td>
<td>19.9</td>
<td>24.8</td>
<td>11.9</td>
</tr>
<tr>
<td>Medicaid</td>
<td>10.4</td>
<td>14.5</td>
<td>26.9</td>
</tr>
<tr>
<td>Unable to access healthcare professional because of costs, %</td>
<td>19</td>
<td>19.1</td>
<td>15.1</td>
</tr>
</tbody>
</table>

Figure 1A-1B. Chronic disease profile- Galveston county, Texas and United States

Figure 2. Risk factors profile- Galveston county, Texas and United States
associated mortality rates are found in Galveston in comparison to Texas and US. The all-cause mortality rate is higher in Galveston (782 per 100,000 populations) than Texas (749.2 per 100,000 populations) but lower than the US (821.5 per 100,000 populations).13 Deaths from heart disease and stroke are high in Galveston compared to those in Texas and the US. In contrast, diabetes-specific mortality is lower among Galveston County residents.

**Risk factors profile**
As indicated earlier, four risk factors including lack of exercise or physical activity, poor nutrition, tobacco use, and drinking too much alcohol, play a significant role in chronic diseases. The current burden of chronic diseases reflects the past exposures to these risk factors, and the future burden will be determined by current exposures or our ability to address the past exposures. Thus, it is important to understand the risk factors profile of populations at the county level for policy or intervention development. Figure 2 illustrates the risk factors profile of Galveston County residents in comparison to Texans and US general populations. The percentage of heavy alcohol consumers in Galveston (17.1%) is similar to that in Texas (17%) and the US (17%).14,16 Compared to the nation’s smoking rates (18.1%), smoking prevalence is lower in Galveston (14.6%) and Texas (15%).14 Approximately 27% of Galveston residents reported less than adequate physical activity, rates of which are higher than Texas (24%) but lower than the US general population (29.6%).14 Overall, the Galveston risk factors profile is more or less similar to that of Texas. In addition to the four risk factors profile, Galveston residents face additional challenges that contribute to increasing chronic diseases burden. These challenges include social determinants (low education status, high income-inequality ratio, greater proportion of residents below poverty line etc.) and healthcare disparities (less access to healthcare benefits, less access to fresh food produce, zoning and less access to transportation etc.) that need to be addressed and incorporated into policies’ or strategies’ development.

The data presented in this paper is compiled from various data sources. The sources are largely nationally representative surveys (US Census Bureau,10,12 American Community Survey,11 and CDC’s Chronic Disease Prevention System)2 that included information about Galveston County residents, state-level surveys (Behavioral Risk Factor Surveillance System,16 Youth Risk Behavior Surveillance System,17 Hospital Discharge Data18 and Texas Center for Health Statistics vital statistics data19), and few local/county-based sources (Community needs assessment performed by the Department of Preventive Medicine and Community Health at the University of Texas Medical Branch). The data should be interpreted in the context of limitations to external validity of the information and might not be absolutely be representative of semantics of the populations from which the sample is drawn. Overall the profile of chronic diseases and risk factors in Galveston is similar to Texas, with few differences identified with the US general population. Few interesting points can be drawn comparing the three profiles. Although the average household income in Galveston is significantly higher than the state and national average, the percentage of individuals living in poverty is similar among the three groups. This suggests a population with a substantial income gap. Additionally, with this household income, it is expected that the chronic diseases’ and risk factors’ profile would be improved in this population, but this is not the case. Notably, Galveston is the same as or worse when compared to Texas or US as illustrated in Figures 1 and 2, except for obesity. Another possible explanation for this observation might be due to influx of healthy emigrant’s population (Galveston being a college and vacation town) contributing to the higher socioeconomic status than the state and the country in general. It is thus unclear why a community of socioeconomic status higher than the state and the US has similar chronic diseases and risk factors profile.

To address the increasing burden of chronic diseases in the US and optimize public health efforts, efficiency and effectiveness in prevention and control, comprehensive interventions must be utilized. An appropriate approach would utilize Himmelman’s working together strategies that involve networking, collaboration, coordination and cooperation of stakeholders at the individual, county, state and the nation level.20 The CDC’s National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) has proposed four key domains for chronic disease prevention.1 These include: a) Epidemiology and Surveillance domain to monitor trends and progress of chronic diseases and associated risk factors, b) Environmental approaches domain to promote health and support healthy behaviors, c) Healthcare systems intervention domain to improve the effective delivery and use of clinical and preventive health services, and d) Effective community programs linked to clinic services to improve and sustain management of chronic conditions.21 Currently, there is limited evidence of effective implementation of these four domains at the county level and thus calls for action at the local community organizations or health departments are needed. Although Galveston has numerous non-profit organizations and a comprehensive healthcare infrastructure (such as the University of Texas Medical Branch), the ability to address the burden of chronic diseases is still lacking because of the lack of holistic and coordinated approaches among these organizations. Additionally, the focus has been more on cost-effective primary care prevention, like vaccines, and reactive care to address immediate health needs of high risk individuals. Although there are few community efforts to improve the residents’ access to care, these have often failed to address the four predominant causal risk factors of chronic disease development, and the disparities and social determinants that further aggravates the chronic disease burden in Galveston.

Given the high burden of chronic diseases in Galveston despite overall higher socioeconomic status, it is important to address the issue by strategies of working together at the county level.20,22 As a first approach, we need to monitor the trends and progress of chronic diseases by conducting local surveys in the Galveston county (epidemiology and surveillance domain), followed by promoting healthy behaviors
(environmental approaches domain), effective healthcare delivery and community health programs targeted at addressing risk factors of populations residing in the Galveston County.

REFERENCES
Background: Substance abuse is a leading cause of preventable morbidity and mortality. While there is prior literature on mortality associated with abuse of major drug classes, relatively less literature exists regarding risks of mortality experienced by patients after they complete substance abuse treatment.

Methods: The study was a retrospective cohort record-linkage study of patients aged 18-64 who enrolled in and were discharged from substance abuse treatment provided by the Texas Department of State Health Services during 2006-2013. These records were matched to DSHS vital statistics death records. Patients were classified by type(s) of drugs patients reported using, including alcohol, central nervous system (CNS) depressants, marijuana, opioids, and stimulants. Age was classified into five categories (18-24, 25-34, 35-44, 45-54, and 55-64 years). Crude mortality rates (CMRs) and standardized mortality ratios (SMRs) were calculated for deaths occurring up to 5 years after discharge. Manner of death was examined for each drug category.

Results: The study sample included 199,225 patients, of whom 6537 (3.3%) died. Among patients who reported substance use disorder of a single drug type, the highest post-discharge SMRs were associated with opioids (7.1), CNS depressants (6.8), and alcohol (5.1), relative to the expected number of deaths in the general Texas population. High SMRs were observed among women ages 18-34 with opioid use disorder (range 14.3-17.7), women ages 25-34 with alcohol use disorder (SMR 12.3), and patients ages 25-34 with CNS depressant use disorder (14.7). Lower SMRs were observed for stimulants (3.0) and marijuana (2.4). Fifty-three percent of deaths were natural and 31 percent were accidental; drug overdoses caused most accidental deaths.

Conclusions: Patients retain elevated risks of mortality after discharge from substance abuse treatment. Additional programs should be considered to reduce potentially avoidable deaths among those at highest risk, including young women with a history of abusing opioids, CNS depressants, or alcohol. Future research should examine manners and causes of deaths among these high-risk patient cohorts.

INTRODUCTION
Substance use disorder is a leading cause of preventable morbidity and mortality in the United States. Overdose from prescription and illicit drugs more than tripled during 1999-2014 to an annual rate of over 47,000 deaths.1 Over 1.6 million individuals aged 12 and older were admitted to substance abuse treatment in 2014.2 Economic costs of substance use disorders (SUD) have been estimated at nearly $500 billion annually, including $249 billion from excessive alcohol use, $193 billion from illicit drug use, and $55 billion from prescription opioid misuse and abuse.3-5

Extensive literature exists regarding mortality associated with alcohol and opiate use disorders, while somewhat less research is available for other drug classes. Patients with alcohol use disorder die at a rate approximately 3.5 times higher than the general population,6 and a large meta-analysis found higher risks for suicide (10.1 times higher) and accidental deaths (8.7 times higher).7 Mortality associated with opioid use disorders has been shown to be 13-14 times higher than the general population.8,9 A meta-analysis on marijuana-associated risks was unable to draw any firm conclusions on all-cause mortality, primarily due to the small number of primary studies.10 Individuals who use stimulants (e.g., amphetamine, methamphetamine, and cocaine) have elevated mortality risks, but inconsistent data reporting in primary studies precluded calculation of standardized death rates.11,12 The current study examines mortality among patients following discharge from substance abuse treatment for these drugs.

The Texas Department of State Health Services (DSHS) administers the federal block grant for substance abuse treatment services and through contracted providers serves over 40,000 indigent patients annually. Objectives of this study are to examine mortality among patients following discharge from DSHS substance abuse treatment programs, describe mortality trends of different drug classes, and identify leading manners and causes of death among these patients. These findings can provide valuable insights for physicians, mental health providers, and state policymakers regarding patterns of substance abuse and mortality among these patients. Review of mortality data may reveal potentially preventable deaths that could be amenable to intervention.

POPPULATION AND METHODS
Study Design and Population
We conducted a retrospective cohort record-linkage study of patients aged 18-64 who enrolled in and were discharged from substance abuse treatment services provided by DSHS during 2006-2013. To identify mortality-related trends, these records were matched to DSHS vital statistics death records. The study received approval from the Texas DSHS Institutional Review Boards.

Data Sources
Using SAS (SAS Institute; Cary, NC), substance abuse treatment records and DSHS death records were linked by a proba-
bilistic matching algorithm on five variables: first name, last name, birthdate, gender, and Social Security Number (SSN).\textsuperscript{13} Exact matching was first performed with all five variables. For the remaining unmatched records, three additional rounds of matching were conducted. First, records were linked as a “fuzzy match” if four variables were exact matches and the fifth variable had minimal dissimilarity, measured as generalized edit distance (a measure of dissimilarity between text strings) for birthdate and SSN variables or by soundex (a phonetic algorithm which encodes similar-sounding words) for either name variable. Second, records were linked if three variables were exact matches and two variables (both numerical string variables or both name variables) were fuzzy matches. Third, due to disproportionately higher rates of missing SSN variable data, records were linked if they had exact matches on all non-SSN variables. Individual patient records were unduplicated by summing data into a single record.

Upon each admission to DSHS treatment programs, patients are asked to report up to three drug classes they had misused or abused; patients could report different drugs on subsequent admissions, in which case the patient’s record in this data set could reflect more than three drugs. The five major categories of drugs include alcohol, marijuana, stimulants, opioids, and central nervous system (CNS) depressants (e.g., benzodiazepines, barbiturates). Patients could report abuse of other drugs (e.g., inhalants), but these reports were rare and were excluded from analysis. Manner of death (MOD) was categorized as accidental, natural, homicide, suicide, or undetermined/pending, as reported on death certificates. Primary cause of death (COD) was reported as noted in the DSHS death records.

**Statistical Analysis**

Crude mortality rates (CMRs) and standardized mortality ratios (SMRs) were calculated for deaths occurring up to 5 years after discharge or until the end of calendar year 2013, whichever came first. Outcomes were calculated by age- and gender-specific subgroups for most drug classes, but due to low patient numbers the results for CNS depressants were age-stratified only. Age was classified into five categories (18-24, 25-34, 35-44, 45-54, and 55-64 years). CMRs were reported per 1,000 person-years. SMRs were calculated in comparison to average Texas mortality rates during 2006-2013, which were gathered from CDC WONDER.\textsuperscript{14} To illustrate differences in COD among drug cohorts, CMRs were also reported for selected COD categories including drug overdose (ICD-10 T39, T40, T42.3x, T42.4x, T43, T50.9x, T51) and diseases of the circulatory system (I00-I99).

Data were analyzed using SAS, Stata 13.1 (StataCorp; College Station, TX) and Microsoft Excel (Microsoft Corporation; Redmond, WA). Continuous data are presented as means with standard deviations. Categorical data are presented as proportions. SMR confidence intervals and p-values were calculated with OpenEpi using Fisher’s exact test with mid-p modification for cohorts with fewer than 100 expected deaths; other cohorts used Chi-square approximation.\textsuperscript{15}

**RESULTS**

The patient sample consisted of 199,225 unduplicated records of clients who received substance abuse treatment during 2006-2013. Patient characteristics are shown in Table 1. A majority (60%) of patients were men and nearly half were non-Hispanic white. One-third of patients (34%) had two or more treatment admissions. Nearly two-thirds of patients (64.3%) completed their most recent substance abuse treatment. Of the remaining 35.7% patients who did not complete treatment, 13.1% were terminated by the treating facility for...
noncompliance, 11.4% left against professional advice, 3.0% were transferred to a non-DSHS treatment program, 1.2% were incarcerated, and 6.9% were discharged for other unspecified or unknown reasons. Overall mortality among study participants was 3.28% (6,537/199,225). Across all study participants, those who successfully completed substance abuse treatment had a 3.28% mortality rate during the study period, whereas patients discharged without completing treatment had a mortality rate of 3.55% (absolute difference 0.28%). Of the 6537 patients linked to DSHS death records, 78% had 5-variable exact matches and 22% had fuzzy matches.

Table 2 displays demographic and mortality data for cohorts of patients who reported a single SUD category. The highest proportion of deaths were noted among cohorts who used alcohol (5.5%), opioids (5.1%), and CNS depressants (5.0%). Supplemental Table 1 displays similar data for all patients by type(s) of SUD, but patients may be reported in multiple categories if they reported more than one SUD.

**Mortality Rates**

Standardized mortality ratios are displayed in Table 3; Supplemental Table 1 contains corresponding crude mortality rates. Patients with opioid and CNS depressant use disorders had the highest SMRs (post-discharge mortality rates were 7.1 and 6.8 times higher than expected among the general Texas population, respectively), with markedly higher SMRs observed among young patients who had substance use problems with either of these drug classes. Women ages 18-24 and 25-34 with opioid use disorder had SMRs of 17.7 (95% CI 10.3-31.0) and 14.3 (95% CI 1.0-19.6), and patients ages 25-34 with CNS depressant use disorder had a SMR of 14.7 (95% CI 7.5-26.2); the youngest cohort (ages 18-24) of patients treated for misuse or abuse of CNS depressants was too small for meaningful statistical conclusions.

Alcohol use disorder had an overall SMR of 5.1 (95% CI 4.8-5.4), and stimulant use was associated with significantly elevated post-discharge mortality (SMR=3, 95% CI 2.7-3.3) for misuse or abuse of CNS depressants was too small for meaningful statistical conclusions.

**Manner and Cause of Death**

Figure 1 demonstrates that the highest CMRs were observed for natural causes of death, followed by accidental deaths. Raw CMR values for this Figure can be found in Supplemental Table 2. Crude rates of natural death were highest among patients with alcohol use disorder (11.2/1,000) or opioid use disorder (9.7/1,000). Crude accidental death rates were highest among patients who misused or abused CNS depressants (7.5/1,000) or opioids (6.9/10,000), and most accidental deaths resulted from overdose.

**DISCUSSION**

This study utilized a record linkage approach to examine mortality trends among nearly 200,000 individuals who received publicly-funded substance abuse treatment in Texas during 2006-2013. In general, CMRs were higher for men, whereas SMRs were higher for women; these results reflect differences in mortality across genders and are consistent with prior research. The study has four major findings:

1. High mortality rates with opioid use disorder, especially for young patients. Across drug categories, the highest post-discharge mortality rates were observed for opioids (CMR = 18.5 per 1,000 and SMR = 7.1). This CMR is similar to results from a systematic review of opioid mortality, which reported a pooled CMR of 17.0/1,000 (95% CI 10.9-23.0) from six North American studies. Mortality rates associated with opioids were especially high among young patients; for women aged 18-24, the post-discharge CMR associated with opioid use disorder was nearly five times higher than the corresponding rates for similarly aged women who misused or abused only alcohol, marijuana, or stimulants. For men ages 18-34, CMRs associated with opioid use disorder were nearly twice as high for any other drug class. Prior research in substance abuse mortality has noted the inability to calculated pooled SMRs for specific age cohorts due to a lack of age-specific data reporting in many primary studies, and this study adds to the literature by illustrating the profoundly elevated risk among young patients.

2. Post-discharge mortality associated with CNS depressants. This study finds that patients who misuse or abuse CNS depressants have elevated mortality risks after treatment discharge.

### Table 2: Demographic, Treatment, and Mortality Characteristics of Patients with one Substance Use Disorder

<table>
<thead>
<tr>
<th>Substance Use Disorder</th>
<th>Patients</th>
<th>% of study sample</th>
<th>Sex</th>
<th>% male</th>
<th>Race</th>
<th>% Black, non-Hispanic</th>
<th>% Hispanic</th>
<th>% White, non-Hispanic</th>
<th>% Other</th>
<th>Age at Enrollment Mean (SD)</th>
<th>Treatment Duration (Days) Mean (SD)</th>
<th>Total Time at Risk (Years)</th>
<th>Deaths in group</th>
<th>% died in this group</th>
<th>% of total deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Patients</td>
<td>199,225</td>
<td>100%</td>
<td>59%</td>
<td>18%</td>
<td>31%</td>
<td>49%</td>
<td>2%</td>
<td>34 (11)</td>
<td>91 (130)</td>
<td>542,272</td>
<td>6537</td>
<td>3%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients with one reported SUD</td>
<td>85,296</td>
<td>42.8%</td>
<td>59%</td>
<td>17%</td>
<td>33%</td>
<td>48%</td>
<td>2%</td>
<td>36 (11)</td>
<td>85 (126)</td>
<td>232,388</td>
<td>3173</td>
<td>4%</td>
<td>49%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>30,538</td>
<td>15.3%</td>
<td>70%</td>
<td>9%</td>
<td>34%</td>
<td>54%</td>
<td>2%</td>
<td>40 (11)</td>
<td>75 (82)</td>
<td>80,947</td>
<td>1681</td>
<td>6%</td>
<td>26%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNS Depressants</td>
<td>800</td>
<td>0.4%</td>
<td>31%</td>
<td>15%</td>
<td>19%</td>
<td>64%</td>
<td>3%</td>
<td>34 (11)</td>
<td>67 (88)</td>
<td>2,242</td>
<td>39</td>
<td>5%</td>
<td>1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marijuana</td>
<td>16,567</td>
<td>8.3%</td>
<td>61%</td>
<td>34%</td>
<td>34%</td>
<td>30%</td>
<td>2%</td>
<td>26 (8)</td>
<td>91 (78)</td>
<td>45,079</td>
<td>171</td>
<td>1%</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opioids</td>
<td>14,692</td>
<td>7.4%</td>
<td>56%</td>
<td>7%</td>
<td>40%</td>
<td>50%</td>
<td>3%</td>
<td>36 (11)</td>
<td>114 (242)</td>
<td>34,896</td>
<td>756</td>
<td>5%</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stimulants</td>
<td>22,699</td>
<td>11.4%</td>
<td>40%</td>
<td>22%</td>
<td>26%</td>
<td>50%</td>
<td>2%</td>
<td>36 (10)</td>
<td>76 (85)</td>
<td>69,222</td>
<td>526</td>
<td>2%</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Among 800 patients who reported substance use disorder of CNS depressants only, the CMR was 13.4/1,000 (95% CI 8.2-18.6) and the SMR was 6.8 (95% CI 4.5-9.8). Literature on mortality from CNS depressants is rather limited. Bachhuber et al. reported that benzodiazepine-related overdose deaths occurred at a rate of 3.07/100,000 (0.03/1,000) among 13.5 million US adults who filled benzodiazepine prescriptions. The substantial difference in these results reflects the underlying patient populations (e.g., adults with any benzodiazepine prescriptions vs. adults discharged after substance abuse treatment) and types of deaths examined (overdose deaths vs. all-cause mortality). Increased duration of benzodiazepine use has been linked with higher mortality among patients who also use opioid analgesics.

Practitioners should be conscious of risks associated with CNS depressants; during 1996-2013, the number of adults filling benzodiazepine prescriptions grew 67% and the total quantity dispensed more than tripled. In this study cohort, 95% of patients who reported misuse or abuse of CNS depressants also reported substance use disorder of other drug classes. Concurrent use of benzodiazepines and opioids has been associated with increased mortality. Practitioners should consider screening for misuse or abuse of CNS depressants.

Among 800 patients who reported substance use disorder of CNS depressants only, the CMR was 13.4/1,000 (95% CI 8.2-18.6) and the SMR was 6.8 (95% CI 4.5-9.8). Literature on mortality from CNS depressants is rather limited. Bachhuber et al. reported that benzodiazepine-related overdose deaths occurred at a rate of 3.07/100,000 (0.03/1,000) among 13.5 million US adults who filled benzodiazepine prescriptions. The substantial difference in these results reflects the underlying patient populations (e.g., adults with any benzodiazepine prescriptions vs. adults discharged after substance abuse treatment) and types of deaths examined (overdose deaths vs. all-cause mortality). Increased duration of benzodiazepine use has been linked with higher mortality among patients who also use opioid analgesics.

Practitioners should be conscious of risks associated with CNS depressants; during 1996-2013, the number of adults filling benzodiazepine prescriptions grew 67% and the total quantity dispensed more than tripled. In this study cohort, 95% of patients who reported misuse or abuse of CNS depressants also reported substance use disorder of other drug classes. Concurrent use of benzodiazepines and opioids has been associated with increased mortality. Practitioners should consider screening for misuse or abuse of CNS depressants.

Table 3. Standardized Mortality Ratios for Patients in Each Substance Use Disorder Category.

<table>
<thead>
<tr>
<th>Age</th>
<th>Alcohol</th>
<th>CNS Depressants</th>
<th>Marijuana</th>
<th>Opioids</th>
<th>Stimulants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women</td>
<td>Women</td>
<td>Women</td>
<td>Women</td>
<td>Women</td>
</tr>
<tr>
<td>18-24</td>
<td>3.5 (0.9-9.6)</td>
<td>3.5 (1.8-6.9)*</td>
<td>17.7 (10-31)*</td>
<td>3.6 (1.8-6.6)*</td>
<td></td>
</tr>
<tr>
<td>25-34</td>
<td>12.3 (8.8-16.9)*</td>
<td>4.4 (2.6-7.1)*</td>
<td>14.3 (10-19.6)*</td>
<td>3 (1.9-4.6)*</td>
<td></td>
</tr>
<tr>
<td>35-44</td>
<td>11.6 (9.3-14.4)*</td>
<td>4.3 (2.1-8.4)†</td>
<td>13 (9.3-17.2)†</td>
<td>3.9 (2.8-5.2)*</td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>6.9 (5.7-8.4)*</td>
<td>1.4 (0.2-4.4)</td>
<td>5.5 (3.8-7.7)</td>
<td>3.9 (2.8-5.2)*</td>
<td></td>
</tr>
<tr>
<td>55-64</td>
<td>5 (3.7-6.7)*</td>
<td>1.7 (0.1-8.2)</td>
<td>4.2 (2.5-6.7)*</td>
<td>2.9 (1.4-5.3)†</td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>7.8 (6.9-8.8)*</td>
<td>3.5 (2.5-4.8)*</td>
<td>8.6 (7.2-10.1)*</td>
<td>3.6 (3.4-3.8)*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>Men</td>
<td>Men</td>
<td>Men</td>
<td>Men</td>
</tr>
<tr>
<td>18-24</td>
<td>3.8 (2.4-5.6)*</td>
<td>2 (1.4-2.7)*</td>
<td>9.2 (6.2-13.4)*</td>
<td>4.9 (3-7.9)*</td>
<td></td>
</tr>
<tr>
<td>25-34</td>
<td>4.7 (3.7-5.9)*</td>
<td>2.7 (18-3.8)*</td>
<td>9.1 (6.9-11.6)*</td>
<td>2.5 (1.6-3.6)*</td>
<td></td>
</tr>
<tr>
<td>35-44</td>
<td>5.8 (4.9-6.7)*</td>
<td>2 (1-3.6)</td>
<td>7.4 (5.4-9.9)*</td>
<td>3.3 (2.5-4.2)*</td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>4.7 (4.2-5.3)*</td>
<td>1.3 (0.8-2.7)</td>
<td>6.7 (5.5-8)*</td>
<td>2.3 (1.8-2.9)*</td>
<td></td>
</tr>
<tr>
<td>55-64</td>
<td>3.7 (2.2-4.2)*</td>
<td>1.3 (0.3-3.6)</td>
<td>4.8 (3.6-5.7)*</td>
<td>2.5 (1.8-3.5)*</td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>4.5 (4.2-4.9)*</td>
<td>2 (1.6-2.5)</td>
<td>6.5 (5.8-7.3)*</td>
<td>2.7 (2.4-3.1)*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Both Sexes</td>
<td>Both Sexes</td>
<td>Both Sexes</td>
<td>Both Sexes</td>
<td>Both Sexes</td>
</tr>
<tr>
<td>18-24</td>
<td>2.7 (0.1-13.3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-34</td>
<td>14.7 (7.5-26.2)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35-44</td>
<td>6.9 (2.5-15.2)†</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>5.3 (2.3-10.4)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-64</td>
<td>3.4 (0.6-11.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>5.1 (4.8-5.4)*</td>
<td>6.8 (4.5-9.8)*</td>
<td>2.4 (2.2-8)*</td>
<td>7.1 (6.4-7.7)*</td>
<td>3 (2.7-3.3)*</td>
</tr>
</tbody>
</table>

* p<0.001 † p<0.01

TPHA Journal Volume 69, Issue 4
among patients who have a history of substance use disorder involving other drug classes (e.g., opioids, alcohol) or who receive frequent benzodiazepine prescriptions.

3. Elevated SMRs for young patients after treatment for marijuana use disorder. Prior literature has shown inconsistent results regarding mortality associated with marijuana use disorder. These results demonstrate a statistically significant elevation in all-cause mortality after discharge among young women (ages 18-44) and men (ages 18-34) with marijuana use disorder. Future investigation may examine associated manners and cause of death.

4. Accidental deaths were most associated with use of CNS depressants and opioids. The largest share of deaths (53%) were reported as natural (including drug-related natural deaths), followed by accidental deaths (31%). Accidental deaths were most common among patients who reported misuse or abuse of CNS depressants (56%) or opioids (37%); overdoses were the cause of most accidental deaths. Suicide (8.7%) and homicide (4.5%) were responsible for fewer deaths, although the CMRs for these manners of death were 25-30% higher than reported in a similar record-linkage study of patients who received substance abuse treatment in Scotland during 1996-2006.23

Limitations
Our analysis has several limitations. As a retrospective study, the observed associations may be due to unmeasured confounding. Differences in mortality may reflect unmeasured differences in substance abuse treatment across drug cohorts, and patients may not accurately report all substance use disorders. There are limitations to record linkage studies, such as potential failure of a matching algorithm to identify all DSHS patients in the vital statistics data. Former patients may have left Texas and thus their deaths may not be captured by DSHS data. However, these limitations would produce more conservative estimates (underestimation) of death rates. Demographic characteristics and mortality trends may vary within drug cohorts by age or race strata. In addition, our findings are not representative of all individuals receiving substance abuse treatment in Texas; treatment resources are not distributed uniformly across the state, and the data set did not include patients in private treatment programs, VA treatment programs, or other (non-DSHS) public programs.

Conclusions
Patients who receive publicly financed substance use treatment in Texas retain elevated mortality risk following discharge. Patients with a substance use disorder involving opioids, CNS depressants, or alcohol had the highest risks of post-discharge death, and within these groups the highest SMRs were typically observed among patients under age 35. Just over half of deaths were natural and nearly one-third of deaths were accidental, with overdoses causing most accidental deaths. Future research should examine differences in manner and cause of death by age- and sex-specific strata.

References
Supplemental Table 1. Characteristics of Patients who Reported One or More Substance Use Disorders.

<table>
<thead>
<tr>
<th>Substance Use Disorder</th>
<th>Patients</th>
<th>% of total</th>
<th>Sex</th>
<th>Male (%)</th>
<th>Black, non-Hispanic</th>
<th>Hispanic</th>
<th>White, non-Hispanic</th>
<th>Other</th>
<th>Mean (SD)</th>
<th>Number</th>
<th>% died in this group</th>
<th>% of total deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>199,225</td>
<td>100%</td>
<td></td>
<td>58.6%</td>
<td>17.7%</td>
<td>31.2%</td>
<td>49.2%</td>
<td>2.0%</td>
<td>34.3 (10.9)</td>
<td>6,537</td>
<td>3.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Alcohol</td>
<td>106,213</td>
<td>53.3%</td>
<td></td>
<td>65.4%</td>
<td>16.1%</td>
<td>33.2%</td>
<td>48.9%</td>
<td>1.8%</td>
<td>36.1 (11.0)</td>
<td>3,901</td>
<td>3.7%</td>
<td>59.7%</td>
</tr>
<tr>
<td>CNS depressant</td>
<td>17,036</td>
<td>8.6%</td>
<td></td>
<td>45.1%</td>
<td>10.4%</td>
<td>20.4%</td>
<td>67.7%</td>
<td>1.5%</td>
<td>30.9 (10.0)</td>
<td>606</td>
<td>3.6%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Marijuana</td>
<td>82,411</td>
<td>41.4%</td>
<td></td>
<td>60.3%</td>
<td>22.3%</td>
<td>31.2%</td>
<td>44.7%</td>
<td>1.8%</td>
<td>30.1 (9.6)</td>
<td>1,615</td>
<td>2.0%</td>
<td>24.7%</td>
</tr>
<tr>
<td>Opioid</td>
<td>46,196</td>
<td>23.2%</td>
<td></td>
<td>54.9%</td>
<td>8.4%</td>
<td>30.3%</td>
<td>59.4%</td>
<td>1.9%</td>
<td>34.3 (10.8)</td>
<td>2,100</td>
<td>4.5%</td>
<td>32.1%</td>
</tr>
<tr>
<td>Stimulant</td>
<td>102,248</td>
<td>51.3%</td>
<td></td>
<td>53.5%</td>
<td>19.8%</td>
<td>29.3%</td>
<td>49.2%</td>
<td>1.6%</td>
<td>34.6 (10.1)</td>
<td>2,780</td>
<td>2.7%</td>
<td>42.5%</td>
</tr>
</tbody>
</table>

Patients who reported multiple substance use disorders were counted in multiple categories.

Supplemental Table 2. Crude Mortality Rates for Patients with Only One Reported Substance Use Disorder.

<table>
<thead>
<tr>
<th>Substance Use Disorder</th>
<th>Age</th>
<th>CMR (95% CI)</th>
<th>CNS Depressants</th>
<th>Marijuana</th>
<th>Opioids</th>
<th>Stimulants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CMR (95% CI)</td>
<td>CMR (95% CI)</td>
<td>CMR (95% CI)</td>
<td>CMR (95% CI)</td>
<td>CMR (95% CI)</td>
</tr>
<tr>
<td>All patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNS depressant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marijuana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opioid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stimulant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CMR: crude mortality rate per 1,000 person-years
Cl: confidence interval

Supplemental Table 3. Crude Mortality Rates by Manner of Death.

<table>
<thead>
<tr>
<th>Substance Use Disorder</th>
<th>All Deaths (95% CI)</th>
<th>Natural Deaths (95% CI)</th>
<th>Cardiovascular Disease</th>
<th>Accidental Deaths (95% CI)</th>
<th>Suicide Deaths (95% CI)</th>
<th>Homicide Deaths (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients with one SUD</td>
<td>9.5 (9.2-9.7)</td>
<td>5 (4.8-5.3)</td>
<td>1.4 (1.2-1.5)</td>
<td>2.9 (2.7-3.1)</td>
<td>1.8 (1.6-1.9)</td>
<td>0.8 (0.7-0.9)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>16.4 (15.4-17.4)</td>
<td>11.2 (10.4-12.0)</td>
<td>2.7 (2.3-3.1)</td>
<td>2.9 (2.5-3.3)</td>
<td>1.3 (1.0-1.6)</td>
<td>1.4 (1.1-1.7)</td>
</tr>
<tr>
<td>CNS depressant</td>
<td>13.4 (8.2-18.6)</td>
<td>3.2 (0.6-5.8)</td>
<td>1.1 (0-2.6)</td>
<td>7.5 (3.6-11.4)</td>
<td>5.4 (2.0-8.7)</td>
<td>1.6 (0-3.4)</td>
</tr>
<tr>
<td>Marijuana</td>
<td>3.1 (2.6-3.7)</td>
<td>1.3 (0.9-1.6)</td>
<td>0.4 (0-2.6)</td>
<td>1.3 (0-9.6)</td>
<td>0.5 (0-3.0)</td>
<td>0.3 (0-1.0)</td>
</tr>
<tr>
<td>Opioid</td>
<td>18.5 (16.8-20.2)</td>
<td>9.7 (8.4-10.9)</td>
<td>2.4 (1-7.3)</td>
<td>6.9 (5.8-8.0)</td>
<td>5.8 (4.8-6.7)</td>
<td>0.9 (0.5-1.3)</td>
</tr>
<tr>
<td>Stimulant</td>
<td>6.2 (5.5-6.9)</td>
<td>1.7 (1-3.2)</td>
<td>1.2 (0-9.5)</td>
<td>1.7 (1-3.2)</td>
<td>0.9 (0-6.1)</td>
<td>0.5 (0-3.0)</td>
</tr>
</tbody>
</table>

CMR: crude mortality rate per 1,000 person-years
Cl: confidence interval
Texas Public Health Journal Focused Issue

Unlike Jimmy Stewart’s silent rabbit partner in the old movie of the same name, the recent natural disaster, Harvey, roared through our state wreaking havoc. We observed widespread coverage of first responders ensuring immediate safety of Texas communities affected. Well-deserved accolades have been bestowed on those who worked tirelessly.

The Texas Public Health Association (TPHA), wishes to take this opportunity to pay tribute to those behind the scenes. Thank you to the many hard-working, talented public health professionals who ensured the public’s health and safety once the winds, rain and flood waters receded. Their role, while not publicized, is vital to rebuilding efforts and getting communities back up and running.

The Editorial Board of the Texas Public Health Journal invites accounts of these efforts in the form of short papers. We want to highlight the dedication of these Texas heroes who continually safeguard food and water, maintain sanitary conditions and identify and control potential disease threats, even in the face of adversity. Please submit your stories about prevention, preparedness and response when faced with challenges such as the recent natural disaster.

Please submit a 1-2 page summary of efforts you were involved in or observed. We hope to make this a proactive publication that can be used as a reference in future planning. Please conclude your summary by addressing the following: 1) Lessons learned and 2) How might TPHA be more effective in the future?

Include your name and agency and obtain approval from any businesses or agencies mentioned. Please submit to TPHAJournal@gmail.com


DEADLINE for SUBMISSION is December 1, 2017
SAVE THE DATE

TPHA 94th Annual Education Conference

March 5-7, 2018
Waco Convention Center & Hilton Hotel

(Continuing education credit for multiple disciplines will be provided for this event)

Information coming soon at www.texaspha.org
TPHA HONORARY LIFE MEMBERS

- Minnie Bailey, PhD
- Ned V. Brookes, PE
- Oran S. Buckner, Jr., PE, RS
- Burl Cockrell, RS
- Gordon Green, MD, MPH

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- Sam Marino
- Annie Lue Mitchell
- Laurance N. Nickey, MD

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*deceased