In This Issue

President’s Message 2
Commissioner’s Comments - Ebola Response Highlights Strength of Public Health 4
Ebola Goes Viral: Google Trends Pattern of Ebola Searches During Recent Ebola Outbreak in Texas 4
GIS Day, Texas Department of State Health Services, Austin, Texas, November 19, 2014 8
Development of a Comprehensive 12-Week Health Promotion Program for Houston Airport System 11
Frequent Flyer Analysis of Emergency Department Visits in Tarrant County: Integrated Healthcare Informatics in Public Health 14

Please visit the Journal page of our website at http://www.texaspha.org for author information and instructions on submitting to our journal.

Texas Public Health Association
PO Box 201540, Austin, Texas 78720-1540 phone (512) 336-2520 fax (512) 336-0533 Email: txpha@aol.com

“The articles published in the Texas Public Health Journal do not necessarily reflect the official policy or opinions of the Texas Public Health Association. Publication of an advertisement is not to be considered an endorsement or approval by the Texas Public Health Association of the product or service involved.”

Subscriptions: Texas Public Health Journal, PO Box 201540, Austin, Texas 78720-1540. Rates are $75 per year. Subscriptions are included with memberships. Membership application and fees accessible at www.texaspha.org. Please visit the journal page for guidelines on submitting to the Texas Public Health Journal.
President’s Message

James Swan, Ph.D.

New Opportunities with New Partnerships

At the APHA Conference in New Orleans, we were made aware of a funding opportunity to strengthen coalition building to improve public health in communities across the country. The announcement also went out electronically to affiliates leaders who may not have been at the Conference. The Centers for Disease Control and Prevention had given a grant to the American Planning Association (APA) “to bring support to local coalitions in efforts to reduce chronic disease in communities across the United States.” The program required collaboration of APA chapters with APHA state affiliates to lead coalitions to improve “the capacity of planning and public health leaders to work with community members to advance health-promoting built environments.” The purpose of the local projects was to be to: “improve the capacity of planning and public health professionals to advance community-based strategies providing for equitable access to healthcare and nutritious foods, opportunities for physical activity, and less exposure to and consumption of tobacco.” Any proposed project had to address at least one of these goals. Each coalition proposal was to involve a broad range of organizations in a defined community to plan strategies and develop public health-improvement activities reaching at least 50 percent of the targeted local population, aimed both at shorter-term health promotion and long-term integration of public health professionals and public health professionals aimed at improving public health in the four areas of healthcare access, nutrition, physical activity, and reduction of exposure to tobacco. Funding amounts per project were expected to fall in the range of $100,000 to $150,000. Up to two coalition projects could be funded per state.

This seemed like a wonderful opportunity for TPHA involvement in coalition with the APA and in developing local coalitions. However, funding cycles for the CDC imposed a very-short lead time: letters of interest from each local coalition were due December 2 and finished proposals by December 22. Luckily for TPHA, Melissa Oden, our First Vice-President, began immediately to contact the Texas APA Chapter and promoting local coalition development – before your president and your Governing Council representative had even returned from the Conference. The break-neck speed of the response meant that some local efforts could not be mounted. However, by December 2, eleven projects issued their letters of interest, accompanied by endorsements by and involvement of TPHA and the Texas APA chapter. These eleven proposals covered a diverse array of communities throughout the state. There is, of course, no promise that any of the Texas proposals will be funded; but it speaks well of the leadership of TPHA, Texas APA, and a wide assortment of local agencies and organizations that eleven projects went forward. Looking to the future, there is a likelihood that the same or similar funding opportunities will come from the CDC via the APA in the next two years. So TPHA members and local public health activists might start planning coalitions now to respond to further opportunities in the next year or two.

From the Editor: As our association president described, TPHA is an exciting, dynamic organization and growing more so every day through building new partnerships. Likewise, across the state, public health focused groups are partnering with local public health entities to make Texas healthier. In this issue you will read about some innovative ways communities are working together to keep Texas healthy. TPHA facilitates the following opportunities for you and your colleagues. Want to let your fellow public health professionals know about innovative partnering in your community? Submit your manuscripts, news briefs, opinion editorials and commentaries to the TPHJ! Want to learn about other community public health partnerships that you just might be able to use as models in your community? Come join us in Austin for our 91st annual education conference, February 23-25, 2015!
Please attend one of the sponsored pre-conference workshops Monday morning 9-11:30 (cost included in registration)

Session 1: Local Health Authority (LHA) Workshop Training
Session 2: Table Top Exercise: Public Health Response to a Disease Outbreak Emergency
Workshop Sponsored by the Texas Public Health Association
Session 3: Public Health and Academic Partnerships
Workshop-sponsored by the Department of Preventive Medicine and Community Health at the University of Texas Medical Branch
Session 4-Student Session (no CEU for this session)

The target audience includes physicians, nurses, health educators, academicians, epidemiologists, registered sanitarians/environmental health professionals, nutritionists/dietitians, social workers, community mental health professionals and others working in public health and related fields.

“Continuing education credit for multiple disciplines will be provided for this event”
Ebola Goes Viral: Google Trends Pattern of Ebola Searches During Recent Ebola Outbreak in Texas

Mathias B. Forrester1, Darien Hinson2

1Texas Department of State Health Services, Austin, Texas; mathias.forrester@dshs.state.tx.us
2Texas A&M University, College Station, Texas; darien8613@tamu.edu

Ebola viral disease is a hemorrhagic fever disease characterized by the sudden appearance of fever, malaise, myalgia, headache, vomiting, and diarrhea. The infection may lead to hepatic damage, renal failure, and central nervous system damage, resulting in shock and death.1 In the past, outbreaks were limited to Africa, primarily the central part of the continent.

In March 2014, an outbreak of Ebola virus was reported in Guinea.1 The outbreak subsequently spread to Liberia and Sierra Leone.1 In July 2014, Ebola virus was reported in Nigeria.2 In August 2014, an Ebola case was observed in Senegal.3 As of September 23, 2014, 6,574 Ebola cases had been reported in the five West African countries.4

On September 30, 2014, the Centers for Disease Control and Prevention (CDC) and Texas Department of State Health Services (DHS) announced the first case of Ebola to be diagnosed in the United States in Dallas, Texas. The person had traveled to Dallas from Liberia.5 The patient subsequently died on October 8, 2014.6 On October 12, 2014, a health care worker who provided care for that Ebola patient was reported to have Ebola.7 A second health care worker who provided care for the patient was reported to have Ebola on October 15, 2014.8 Subsequently, there has been widespread Ebola-related panic in the country, affecting businesses, schools, and air travel.9

Millions of people search for information on the Internet every day. Analyses of such searches can be a potentially useful source of information on public interest in health-related topics. Patterns of Internet search queries have been found to correspond with patterns of various diseases. A number of studies have demonstrated a strong correlation between Internet search queries relating to influenza and influenza activity.10,11 Seeking mental health information on Google
has demonstrated seasonal patterns similar to that for seasonal effective disorder. A positive association has been found between suicide rates and Google search volume. The pattern of searches for kidney stone disease was consistent with geographic and temporal variations in the disease. A peak in the number of Internet searches for the “cinnamon challenge,” a potentially hazardous attempt to swallow a tablespoon of cinnamon without water, coincided with a peak in cinnamon exposures reported to United States poison centers. Searches for information on carbon monoxide mirrored an outbreak of carbon monoxide poisoning in the Northeastern United States after Hurricane Sandy. Associations also have been found with head lice infestations and Lyme disease. Examination of Internet search queries also may be helpful in monitoring trends. Searches related to OxyContin® declined after the release of a diversion-resistant formulation while searches related to Opana® rose. There was an increase in searches relating to erectile dysfunction in Ireland associated with Internet media campaigns and the number of web pages on the topic in the country. A latitude-dependent correlation was found between searches for depression and temperature. Searches for Lipitor decreased and generic simvastatin increased after the patent for Lipitor expired. Searches concerning electronic nicotine delivery systems were observed to increase in association with stronger tobacco control and taxes.

Google Trends (www.google.com/trends) analyzes a portion of worldwide Google web searches from all Google domains. It computes how many searches have been done for the term that has been entered, relative to the total number of searches done on Google over time. This does not provide absolute search volume numbers. Instead, data are normalized, i.e., data are divided by a common variable to cancel out the variable’s effect on the data, e.g., search volume between populations of different size or Internet access. The data are scaled 0 to 100, e.g., the highest number is designated 100 and a number half as high is designated 50. The results are shown on a time graph and displayed graphically by geographic heat map. The time range can be adjusted. The geographic heat map area can be adjusted from worldwide to a specific country, state, or metropolitan area. Metropolitan areas are geographical areas defined by Arbitron that generally correspond to the United States federal government’s Metropolitan Areas. Data are not shown if the number of searches are below a certain threshold level.

On October 21, 2014, a Google Trends search was performed for the term “Ebola.” The time range was limited to the “Past 30 days,” which corresponded to September 22-October 19, 2014. Figure 1 presents the heat map for the United States. Texas was highest on the scale. In the heat map for Texas (Figure 2), the Dallas-Fort Worth metropolitan area was highest on the scale, with Lubbock the next highest. Figure 3 shows the daily scale value for the United States, Texas, and the Dallas-Fort Worth metropolitan area during the 30-day period. For all three areas, relatively few searches occurred during September 22-29. The scale values increased greatly on September 30, the date the first person was diagnosed with Ebola. The searches increased for a day or two after that date then began to decline, only to increase once more on October 8, when the patient died. A smaller increase was observed October 12, when the first health care worker was reported to have Ebola. The highest increase was observed after the second health care worker was reported to have been diagnosed, October 15 or the day after; the searches declined after that. The scale values differed by geographic area: the peaks after the first patient was diagnosed and then after he died were lowest for the United States, higher for Texas, and highest for the Dallas-Fort Worth metropolitan area. Thus, during September 22-October 19, 2014, Google searches for Ebola were relatively highest in Texas - and within the state highest in the Dallas-Fort Worth metropolitan area. This is not surprising, considering that the first Ebola cases diagnosed in the United States were in Dallas. It is unclear why, within Texas, the metropolitan area next highest on the scale was Lubbock. It might be expected that regions adjacent to the Dallas-Fort Worth metropolitan area or those with larger populations, like Houston, San Antonio, or Austin, would have higher relative numbers of searches.

The searches increased almost immediately after major Ebola-related events - the diagnosis or death of persons with Ebola. This is probably related to media reports about these events. As media reports declined, or did not include news of such comparable importance, the relative number of searches would also likely decline. In fact, this is what was observed. Why the highest relative number of searches were observed after the second health care worker was diagnosed with Ebola is unclear. It may be because reporting that a second person had been infected by the original case might have given the impression that Ebola was spreading in the United States. Although data such as these might be of limited value for predicting the occurrence of Ebola in the United States - searches increased after cases were reported - they may indicate geographic areas where the population is greatly concerned about the disease. This information might prove useful for focusing education and prevention activities.

REFERENCES

TPHA Journal Volume 67, Issue 1


Death is the floozy aunt of every family. She is simply an embarrassment. Most of the time she is relegated to the basement and ignored. The adults mention her only in oblique terms, covering the ears of the children lest they be exposed to the single real fact of life: Death dances beside us as a constant, if silent, companion and will be there waiting for us at the end. For some she comes all too soon; for others she is the welcome end of the long tail of life. But for the physician she represents the obscene failure of the medical arts, overpowering and mocking all that medicine can do.

Dr. Atul Gawande, a surgeon, holds appointments at both Harvard Medical School and the Harvard School of Public Health. He is a frequent contributor to The New Yorker magazine. In his latest bestseller, Being Mortal, he challenges our society to reconsider what the objectives of the physician should be in treating the aging and the dying. Gawande first covers the statistics and circumstances that bring increasing saliency to the issue: the large fraction of Medicare spending that occurs in the last few months of life; the sterile environments into which we consign those who need progressively more care as they age and the costs and effects of those environments. All of this is in what is purported to be the patient’s best interests – the remote possibility of cure, primacy of physical safety and life extension at the expense of dignity and autonomy.

In an insightful way Gawande then explores the societal changes that over the course of the 20th and early 21st centuries have made care of the terminally ill and the aging ultimately the responsibility of the collective rather than of the family. Women flocked to the workplace; families became smaller, leaving no spare “youngest daughter” to be caregiver to aging parents, a role that was traditionally hers. At the same time medical knowledge and scope of medical capabilities grew exponentially. Medicine seemed to promise so much, including health until the very end. Yet in fact too many of us spend the last months and moments of our lives tethered to machines in intensive care units in the shadow of that unfulfilled promise. As the ranks of the elderly and infirm swelled in the second half of the century, facilities for “assisted living” and eventual nursing home care proliferated, the latter largely supported by Medicaid funding. Only recently have there been experiments in design and operation of these facilities to take cognizance of the aspirations of those who live in them to realize a sense of control over their lives.

The catalyst that pushes the discussion on care for the aged and the dying forward at this juncture is that we no longer have the demographics going for us. The demographic profile has morphed from a pyramid with many young at the bottom and relatively few aged at the top, to a rectangular arrangement of equalizing cohorts at different stages of life. All industrialized nations, including the United States, are challenged by the simple fact that we are aging faster than we are reproducing. Who will bear the burden of the responsibilities for the aging and the dying?

Gawande’s response is that there are deeper issues involved and more possibilities than simply a cheaper way of aging and dying. He holds that as humans we are best served when the medical profession actively helps the patient author the final chapter in life. This is in stark contrast to purely medical goals of keeping blood flowing, the oxygen level high, the infection at bay. The questions that should be asked are not just about feeding tubes and circumstances for resuscitation. What is needed is a discussion about what makes life worthwhile for the individual patient and how the medical community can help the patient achieve those life goals. The role of the physician should be weighted toward listening, rather than speaking. For some there will be affairs to be settled or relationships to be affirmed or rebuilt. Some may opt for travel or visiting with family. Some will wish to avoid pain at all costs while others will prefer to remain alert as long as possible. This process represents a remarkable re-visioning of the role of the physician and will require developing skills that are not common in the physician community today. Gawande frames the issues poignantly by recounting actual stories, including the death of his own father, a physician himself. The story of his father’s passing illustrates the challenges encountered even by those who are most knowledgeable about what to expect at the end of life.

If one is to find fault with the book it might be that a more complete discussion of the hospice movement would have been appropriate. Those of us who have walked with a loved one on that final journey in hospice can only have the greatest admiration for those who choose care for the dying as a vocation. On a positive note Gawande observes that in very recent years there has been a trend away from dying in hospital to passing at home, under hospice. Hopefully this book will precipitate a broad discussion of how we want to live and die at the end – before we dance with the Floozy Aunt.
On November 19, 2014, the Department of State Health Services (DSHS) in Austin, Texas, hosted GIS Day, where presentations were given and posters displayed that described the importance and utility of GIS (Geographic Information Systems) analyses in public health.

Following is a list of presentations from GIS Day. For more information on particular presentations, please contact Leon Kincy at leon.kincy@dshs.state.tx.us.

1. ArcGIS Pro (a new application for ArcGIS for Desktop)
   Karen Lizcano - ESRI

2. What GIS Can Do For You
   Leon Kincy - DSHS

3. Health Risk Assessment using GIS
   Mesfin Bekalo - DSHS

4. Transition from Static Maps to Web Map Applications
   Jeff Jordan - UTSA; Saloni Rajput - Office of the State Demographer

5. Geospatial Guidance for First Responders during Natural Disasters
   Teresa Howard - UT Center for Space Research

6. Coastal Resiliency Study
   Phil Hampsten and Shawn Strange - General Land Office

7. Geocaching competition

Following are abstracts of some of the posters from GIS Day. For more information on particular abstracts, please contact the corresponding author at the email provided.

1. Epidemiology of Chagas Disease in Texas, 2013
   Nicole Evert, MS; Bonny Mayes, MA; Dawn Hesalroad, MED; Pat Hunt, BS; Edward J. Wozniak*, DVM, PhD, MPH
   Texas Department of State Health Services, Health Service Region 8, Uvalde, TX; *Texas Department of State Health Services, Austin, TX
   Email: nicole.evert@dshs.state.tx.us

Chagas disease is caused by the flagellate parasite \textit{Trypanosoma cruzi}. Animals and humans generally contract the disease when exposed to an infected Triatomine (“kissing bug”) vector. The \textit{T. cruzi} parasite can also be transmitted congenitally or via blood transfusion or organ transplant. Chagas disease consists of an acute and chronic phase. The acute phase is often asymptomatic, but mild flulike symptoms and swelling at the inoculation site may occur. Approximately 20-30\% of untreated individuals will develop symptoms of chronic infection, consisting of serious cardiac and/or digestive disorders.

Chagas disease is endemic throughout much of Mexico, Central America, and South America where an estimated 8 million people are infected. Chagas disease is not a nationally notifiable condition, but the Centers for Disease Control and Prevention (CDC) estimates more than 300,000 persons with \textit{T. cruzi} infection live in the United States (US). Although it is believed that most people with Chagas disease in the US acquired their infections in endemic countries, there have been a few reports of autochthonous transmission in the US from Texas, California, Louisiana and Tennessee. The results of these investigations suggest the presence of the parasite, competent vectors and wildlife reservoirs.

Given the constant human migration from Mexico and Central America, presence of parasites in vectors, availability of competent wildlife reservoirs and potential risk to the blood supply, Chagas disease in animals and humans was made reportable to the Texas Department of State Health Services (DSHS) on January 1, 2013. This report describes the epidemiology of Chagas cases reported in animals and humans in the first year of surveillance. In addition, we report on the prevalence and geographic distribution of \textit{T. cruzi} infection in Triatomines submitted to DSHS for testing at the CDC.

   Prakash S. Patel, MD MPH; Christopher Drucker, PhD; John Villanacci, PhD NREMT

   1Injury Epidemiology and Surveillance Branch, Department of State Health Services;
   2Environmental Epidemiology and Disease Registries Section, Department of State Health Services
   Email: Prakash.Patel@dshs.state.tx.us

Objective: To understand the burden of Pedal Cycle Injuries and the Pediatric Injuries related to Motor Vehicle (Traffic & Non-Traffic) Accidents in Texas and to identify Counties with more injuries.

Background: MV traffic crashes are the leading cause of unintentional injury related death in the United States. In 2012, vehicles on Texas roads struck more than 30000 pedestrians and 2000 bicyclists resulting in serious injuries and fatalities. 2012 saw increase by 13.2\% in pedestrian fatalities and 19.1\% in bicyclist fatalities compared to previous year. Methods: Texas has an EMS/Trauma Registry (ETR) that collects reported data on injuries from EMS providers and hospitals. For Pediatric and Pedal cycle injuries, the hospitalization data from ETR were reviewed, rates per 1000 hospitalizations for Counties were calculated and maps with color-coding were prepared. Results: 2013 Data review revealed 5169 Pedestrian Injuries related to MV accidents with 2923 hospitalizations (rate of 25.2 per 1000). 86 Counties had no reported hospitalizations for pedestrian injuries and of Counties with reported Hospitalizations, three Counties (Terrell, Kennedy and Jim Hogg) had highest rate of 101 to 200 per 1000. Whereas 2013 data review revealed total of 868 Pedal Cyclist Injuries related to MV accidents with 535 hospitalizations (rate of 4.6 per 1000). 177 Counties had no reported hospitalizations for pedal cyclist injuries and of counties with reported Hospitalizations, three Counties (Presidio, Schleicher and Wichita) had highest rate of 26 to 50 per 1000. Conclusion: The hospitalization for Pedal Cycle Injuries related to MV (Traffic & Non-Traffic) Accidents is occurring more in the East part of Texas whereas hospitalizations for Pediatric Injuries related to MV (Traffic & Non-Traffic) Accidents are occurring throughout Texas. It is important to raise awareness of Pedestrian & Pedal Cyclist Safety and Safe Driving to prevent further increase in the number of these injuries.

   Pat Hunt, BS; Bradley Hicks, BS
   Email: patrick.hunt@dshs.texas.gov

Since its inception in 1995, the Texas Oral Rabies Vaccination Program (ORVP) has used Geographical Information Systems (GIS) as a core method to accurately distribute millions of rabies vaccine/bait units across the state. In order to administer the ORVP in the most accurate and cost-effective manner, the program combines the use of several GIS data sources including imagery, raster, and vector data sets. The Zoonosis Control Branch has historically used the geo-
graphic location or point data, to track the occurrence of rabies in all of its animal case investigations. The latitude and longitude of the rabid animal is determined by using either Global Positioning System (GPS) or by address geocoding. These locations are then used to construct the vaccine/bait distribution areas for the year. Vaccine/bait unit distribution areas are designed using AutoCAD, which provides infinite accuracy for constructing the grids and transect lines which comprise the vector data. Satellite imagery or remotely-sensed data is utilized to study the distribution area for any possible natural or man-made obstructions, including large bodies of water or impermeable cover. Raster data sets used in the project include the National Land Cover Database (NLCD) and Federal Aviation Administration (FAA) aeronautical sectional maps. Each cell in a raster file represents a unit or area of the value of interest. Vector data sets, such as those depicting international boundaries, county lines, and river basins, are used extensively to determine the extents and legal limits of the bait distribution zones within the state. Vector data sets include points, lines, and polygons. The flight grids and flight lines, which are also vector data sets, are drawn to exact specifications in order to optimize flight efficiency and safety. Geographical Information Systems have brought many old technologies into the modern age and created a boom in many existing trades, including utility companies, mapping services, health and human services as well as in the ever-expanding travel industry. The world would definitely be a different place without the advantages GIS and related technologies provide.

Kenzi Guerrero, MPH; Barbara Vassell, MD; Erin Gardner, MPH; Lucille Palenapa, MS
Email: Erin.Gardner2@dshs.state.tx.us

In order to prevent the spread of disease in all populations, several immunizations are recommended for people over age 18 and throughout their adult life. There are nearly 5,000,000 uninsured adults in Texas. The goal of the Adult Safety Net (ASN) program of the Texas Department of State Health Services (DSHS) Immunization Branch is to increase immunization levels among uninsured adults by providing vaccines at no cost to enrolled providers. This spatial analysis aimed to use a GIS environment to: 1) visualize areas in Texas with limited access to ASN services, and 2) emphasize areas that have a high proportion of uninsured adults in addition to limited access. Proximity analysis was used to create buffer areas around ASN provider locations, revealing that large areas in West Texas and the panhandle of Texas do not have convenient access to ASN providers. In addition, mapping percentage of uninsured adults by county shows that many of these areas with gaps in access also have a high proportion of uninsured adults. The Immunization Branch will use this data to target areas of particular need for increased provider recruitment into the ASN program.

5. Economic Characteristics of School Districts with High Rates of Vaccine Refusal
Kenzi Guerrero, MPH; Erin Gardner, MPH; Lucille Palenapa, MS
Email: Erin.Gardner2@dshs.state.tx.us

During the 2013-2014 school year, there were 38,647 students in Texas with a conscientious exemption on file at their school for one or more of the required vaccines. Research has shown that geographic clustering of such exemptions can lead to outbreaks of vaccine-preventable diseases in communities. Based on previous studies that show exemptions tend to be more common among affluent populations, the goal of this spatial analysis was to visualize and compare a school district’s exemption percentage with socioeconomic characteristics of the student population. Using ArcGIS versions 10.1/10.2, hot spot analyses were used to see where there were clusters of school districts with high rates of conscientious exemptions as well as clusters of school districts with large percentages of students who were not economically disadvantaged. Areas in the Hill Country of Texas and in the Dallas-Fort Worth Metroplex show high levels of exemption clustering that coincides with high percentages of students who are not economically disadvantaged. Alternatively, areas near the southernmost tip of Texas show low rates of exemptions coinciding with high percentages of economically disadvantaged students. The Texas Department of State Health Services (DSHS) Immunization Branch will use these maps to gain a better understanding of the characteristics of school districts that have a large percentage of exemptors so that programs can be developed to increase immunization coverage.

Mathias B Forrester, BS
Texas Department of State Health Services, Austin, Texas, United States
Email: mathias.forrester@dshs.state.tx.us

Background: Analysis of Internet searches may be a useful source of information concerning public interest in health-related topics. Google Trends (www.google.com/trends) analyzes a portion of Google web searches to calculate how many searches were done for a certain term relative to the total number of searches. Data are normalized and scaled 0-100. Results are shown as a time graph and as geographic heat map (world, specific country, state, metropolitan area).

Methods: The 2012 West Nile virus outbreak in the US resulted in the highest number of reported cases since 2003. A high proportion of the cases were reported from North Texas. As a result, aerial insecticide spraying was conducted in Dallas County in August 2012. A Google Trends search was performed using “West Nile virus” as the key phrase and the time period limited to 2012. Results: Worldwide, the country with the highest search score was the US (100), followed by Canada (27). In the US, Texas had the highest search score (100), followed by Oklahoma (76). In Texas, the metropolitan areas with the highest search scores were Dallas/Fort Worth (100), Austin (55), and Houston (55). In Texas, the search scores peaked in August. Discussion: Google Trends indicates that West Nile virus searches in 2012 were focused in Texas, particularly in the Dallas-Fort Worth Metro area, the area with the highest proportion of reported West Nile virus cases. Since people may have searched Google for West Nile virus information after they had already heard about the outbreak, this suggests Google Trends may be of limited utility in predicting the time and location of West Nile virus outbreaks. But it might be useful for targeting education and prevention activities. Limitations of Google Trends include absolute numbers not being provided and dependence on the number of searches performed on a topic.

7. Geographic Distribution of Oil Production Worker Exposures Reported to Texas Poison Centers
Mathias B Forrester, BS
Texas Department of State Health Services, Austin, Texas, United States
Email: mathias.forrester@dshs.state.tx.us

Background: Oil production is increasing in the United States, particularly in Texas. Injuries, including exposures to potentially hazardous substances, may occur among oil production workers. Methods: This study used data collected by Texas poison centers during 2003-2012. All records with any of the following terms in their notes fields were identified: oil field, oil rig, oil drill, oil work. These records then were reviewed to identify those that appeared to relate to exposures that occurred to workers while they were involved in oil production. The distribution of the exposures was determined with respect to
geographic groupings based on caller location: caller county, Public Health Region (clusters of counties), and counties grouped into rural or urban based on US Office of Management and Budget definitions of metropolitan and non-metropolitan. Rate per 1,000,000 population was calculated based on the 2010 Census. Results: There were 432 exposures. Calls were received from throughout the state (115 of 254 counties). Counties with the highest rates were Reagan (1,485), Andrews (1,217), and Upton (1,192), all counties in Public Health Region 9. Public Health Region 9 had the highest rate (244.8), followed by Public Health Regions 2 (54.5) and 3 (33.3). The rate was 74.8 in rural counties and 9.2 in urban counties. Discussion: The oil production worker exposure rate varied greatly throughout the state, being much higher in Public Health Region 9 than any other region. Geographic location of the exposures was likely related to the location of oil and its production in the state. The Permian Basin, much of which is located in Public Health Region 9, is a significant oil-producing area in the state. A major limitation of this study is that it depended on the occupation or industry related to the exposure being recorded in the record notes, which was not standard practice.

8. Geographic Distribution of Electronic Cigarette Exposures Reported to Texas Poison Centers
Mathias B Forrester, BS
Texas Department of State Health Services, Austin, Texas, United States
Email: mathias.forrester@dshs.state.tx.us

Background: Electronic cigarettes are battery-powered devices that heat a solution of nicotine, flavorings, and other chemicals. Users inhale the vapors that result. Their use in the United States is increasing. Little is known about the impact of electronic cigarettes on public health; exposures may be dangerous because the nicotine solutions are highly concentrated. Differences in potentially adverse electronic cigarette exposures have been reported between the states. This study describes the geographic distribution of electronic cigarette exposures reported in Texas. Methods: Cases were electronic cigarette exposures reported to Texas poison centers during January 2009-August 2014. Exposures where the caller county was unknown were excluded. The number of exposures and rate per 1,000,000 population was determined for caller county and 11 Public Health Regions (PHRs, clusters of counties). Rates were calculated based on the 2010 Census. Results: 391 exposures were reported from 85 of 254 counties. Counties with the highest number of cases were Tarrant (43), Dallas (36), Harris (33), Denton (29), Bexar (19), and Travis (18). The number and rate of exposures by Public Health Region were PHR 1 (26, 31.0), PHR 2 (12, 21.8), PHR 3 (170, 25.2), PHR 4 (20, 18.0), PHR 5 (6, 7.8), PHR 6 (46, 7.6), PHR 7 (50, 17.0), PHR 8 (30, 11.5), PHR 9 (16, 28.0), PHR 10 (8, 9.7), and PHR 11 (7, 3.3). Discussion: Electronic cigarette exposure calls were received from throughout Texas. However, the calls were not evenly distributed. The highest number of exposures were reported from PHR 3 (counties around Dallas-Fort Worth), accounting for 43.5% of the exposures. Three of the counties in PHR 3 (Tarrant, Dallas, Denton) accounted for 27.6% of the total exposures. The exposure rate was highest in the northwest (PHR 1) and declined toward the east and south. The reason for this geographic pattern is unclear.

9. Using MODIS Land Surface Data to Interpret West Nile Virus in Texas Department of State Health Services
Leon Kincy
Texas Department of State Health Services, Austin, Texas, United States
Email: leon.kincy@dshs.state.tx.us
West Nile Virus (WNV) was first isolated in the West Nile District of Uganda in 1937. Fortunately, most people infected with WNV will have no symptoms. About 20% of infected people will develop a fever and other flu-like symptoms. Less than 1% of infected people develop a more serious, sometimes fatal, neuroinvasive illness such as encephalitis or meningitis.

Birds act as a reservoir host for the virus, and mosquitoes are a vector for the virus. The virus amplifies in birds. Both humans and horses are incidental hosts unable to amplify the virus and transmit it. In 2012, West Nile cases were at their highest across the U.S., and Texas had the most cases and deaths. Forty six sets of files representing 8 day ranges of LST data are downloaded from NASA ECHO Reverb web site for each year from 2003 to 2012. The tif files are projected from sinusoidal to Lambert Conformal Conic using the MODIS projection tool. The files are then imported into ArcGIS. The tifs are clipped to the DFW study area and then converted to polygons so that an attribute table containing the 8 day average temperatures can be extracted. The average temperature of these pixels is calculated to obtain one temperature per 8 day range. A final table of all ten years and all 46 8 day ranges was created. It appears that a threshold for the mosquito population to proliferate is reached at around 90°F. And once this threshold is exceeded, a window for the West Nile Virus to amplify in the local bird population widens. By August the virus is in full force and able to be spread throughout the human population. Whenever temperatures exceed 90°F in early May the public and public health officials should prepare for a rise in WNV exposure.

10. Locating Health Vulnerability: Where are the Most Health-Related Risk Locations? A GIS-based Analysis, Case of Texas
Mesfin T Bekalo
Texas Department of State Health Services, Austin, Texas, United States
Email: Mesfinbekalo@gmail.com

The advent of geospatial tools has great potential to long term monitoring and assessment of the epidemiology of disease trends and pattern over various spatio-temporal conditions. In this study Geographic Information System (GIS) is shown to be an efficient tool to bring all datasets under one umbrella for the analysis of the health trend of the study area and relative vulnerability level of counties in the region. This work generated a composite measure of health risk areas by rescaling and overlaying various health-related, social resilience, and population density indicators. The objective of this study was to capture health risk and social vulnerability indices in a single integrated composite measure rather than a series of maps each documenting different facets of a problem. Thus, this study included around 26 health indicators, 12 social vulnerability indicators and population density variables to produce an overall composite model of the study area. All indicators were normalized on a scale from 0 to 1 using percent rank (a version of dispersion between the minimum and maximum) or percentiles method. The researcher converted 39 different indicators into the percent rank to show where a given value is in percentage terms between the minimum and maximum score as represented by the equation MinMax = 1 - (Value-min)/(Max-Min). A low score approaching 0 represented maximum health vulnerability and higher score approaching 1 represented no vulnerability (high overall resilience). Then, all indicators were joined to the county polygons, converted into raster format and summed up on raster calculator tool of map algebra to have the final health-vulnerability composite model. The model revealed that overall vulnerability level is high around Border Counties, North Western and West central Texas. By contrast, North and East central Texas have lowest overall health vulnerability.
Development of a Comprehensive 12-Week Health Promotion Program for Houston Airport System

Ebun O. Ebunlomo, PhD, MPH, MCHES, PHR1, 2, Nicole Hare-Everline, DHSc, MS, CHES1, 2, Ashley Weber, MPH, CHES2, Jessica Rich, BS2

1Human Resources Department, City of Houston
2University of Texas School of Public Health, Houston, Texas

Address correspondence to:
Dr. Nicole Hare-Everline
Employee Wellness and EAP Director
City of Houston, Human Resources Department, Wellness Connection
611 Walker Street - 4th Floor
Houston, TX 77002
Phone: 832-393-6123
E-mail: Nicole.hare-everline@houstontx.gov

ABSTRACT

Background: In 2012, the City of Houston was named the fattest city in America according to the Centers for Disease Control and Prevention (CDC), which prompted initiatives such as the Mayor’s Wellness Council (MWC) to encourage Houstonians to make wise choices regarding healthy eating and regular physical activity through education and activities. The City of Houston employee health risk appraisal data indicated that 62% of its employee population was overweight or obese. Given these statistics and the well-established importance of the workplace as an effective setting for health promotion and disease prevention, the City of Houston’s Employee Wellness Program, Discover Health with the Wellness Connection, emerged. Discover Health with the Wellness Connection has focused its efforts through tailored, evidence-based approaches to promoting weight management among its employees.

Methods: The 12-week Balanced Living Program was implemented as a pilot comprehensive health promotion program to address healthy eating, physical activity, and stress management to reduce obesity among 235 diverse employees within the Houston Airport System (HAS). Partnerships were cultivated with organizations such as the American Diabetes Association and Novo Nordisk, Inc., to provide interactive one-hour weekly educational sessions to the employees. The developed curriculum was designed based on the Diabetes Prevention Program (DPP), a major research study which found that diet and exercise could prevent or delay the onset of type 2 diabetes. Results: Employees lost a total of 345 pounds, and over 90% of participants were satisfied with the program’s contents, delivery, format, and usefulness of the program.

Discussion: Overall, this program was successfully implemented and yielded positive measurable outcomes. This program has implications for other worksite wellness initiatives as program planners can gain knowledge about how to develop comprehensive initiatives to improve in the health and well-being of diverse employee populations. We anticipate future implementation of a modified version of this program across other City of Houston departments with comparable health risk profiles.

INTRODUCTION

Obesity is a global epidemic that has resulted in increased rates of chronic health conditions and rising healthcare costs.1, 2 More than one-third (35.7%) of U.S. adults are obese.3, 4 Obesity-related health conditions include heart disease, stroke, type 2 diabetes, and certain types of cancer. Obesity prevalence in Texas is 30.4% of the population.5 Harris County reports that 1,900,000 adults (approximately 30%) are overweight/obese.4 Furthermore, the City of Houston employee health risk appraisal data indicate that 62% of employees are overweight or obese.

In an effort to reduce obesity and obesity-related health conditions among City of Houston employees, the City of Houston Discover Health with the Wellness Connection, the City of Houston’s wellness team, sought to implement a program that would encourage employees to take control of their health. The Discover Health with the Wellness Connection vision is to create a healthy culture throughout the City of Houston that positively affects employee productivity and morale, leading to the city being an “employer of choice.” It encourages healthy lifestyles and provides opportunities for all employees to take charge of their health. Ultimately, employees’ behavioral changes that impact healthy living will contain/reduce cost, decrease absenteeism, and increase work productivity and job satisfaction.6-8

This mission is to enhance the personal and professional lives of city employees by promoting health and well-being through customized wellness programs. In partnership with its third-party administrator and internal and external collaborative partnerships, it operates a holistic strategic goal of improving the health and wellness behaviors and practices of City of Houston employees through evidence-based, results-oriented, and innovative worksite wellness programs.

One of the efforts to improve the health of City of Houston employees was the Balanced Living Program. The City of Houston’s Balanced Living Program encouraged 235 HAS employees to improve their nutrition, physical activity, and stress management and to lose weight. The program aimed to improve participant’s healthy lifestyles in order to improve employee biometric numbers (e.g., weight loss, lower blood pressure, etc.). The Balanced Living Program’s curriculum was primarily modeled after the evidence-based Diabetes Prevention Program (DPP), a program which has been very successful at reducing risk for developing diabetes. The DPP found that participants who lost a moderate amount of weight by improving nutrition habits and increasing physical activity greatly reduced their chances of developing diabetes in the future.7, 8 Weight loss and physical activity improves the body’s ability to use insulin and process glucose, therefore reducing the risk of diabetes.

This study describes the systematic process of planning, implementation, and evaluation of the 12-week Balanced Living Program among Houston Airport System employees. We conducted both process and outcome evaluation to assess how the program was received by the employees and changes in biometric measurements pre- and post-program implementation. This study contains strategies employed to promote participation in the program and retain engagement throughout the 12-week time period. It also discusses the process of leveraging partnerships to provide a more comprehensive curriculum to employees.

METHODS

The Balanced Living Program was designed in collaboration with the Houston Airport System management team and employee stake-
holders who approved implementation and evaluation of the program and assisted in accommodating scheduling preferences for 235 employees. The program was grounded in socio-behavioral theories of change such as the Health Belief Model and the Social Cognitive Theory. Participants were enrolled in 12 weeks of one-hour interactive sessions in a group setting with topics such as healthy eating, active living, stress management, and disease prevention/management. Knowledge, skills, attitudes, outcome expectations, and self-efficacy were the primary determinants targeted in this program. Content was derived from the Diabetes Prevention Program Lifestyle Change Program materials, which showed that participants in the lifestyle intervention group - those receiving intensive individual counseling and motivational support on effective diet, exercise, and behavior modification - reduced their risk of developing diabetes by 58%. We implemented this program between October 2012 and February 2013. Program objectives included the following: (1) To provide knowledge and tools for reaching a “lifestyle balance” between healthy eating, physical activity, and stress management; (2) To support employees with resources that will promote health and prevent disease through balanced living; and (3) To improve biometric measurements such as weight loss, lower blood pressure, etc.

Recruitment strategies were grounded in some of the benchmarks described by the Wellness Councils of America for effective results-oriented worksite wellness programs: capturing senior management, creating cohesive wellness teams, and collecting data to drive efforts and providing a supportive environment. Flyers were produced by the City’s communications team in collaboration with the City’s wellness team and distributed across the department (Figure 1). Program registration was coordinated internally by the supervisors and Houston Airport Department-specific Wellness Coordinator to ensure that the department’s operational effectiveness was still maintained. We also received approval from the Houston Airport System Management prior to implementing this program.

In partnership with both internal and external organizations such as the Houston Airport Department-specific Wellness Coordinator, Novo Nordisk, Inc., American Diabetes Association, and the Employee Assistance Program, we implemented the one-hour interactive sessions. Throughout the program, employees also tracked their miles walked/ran and hours of exercise using a free online portal provided by Shape Up Houston, an organization that helps Houstonians lose weight and get in shape. Incentives for employee participation included free access to pre- and post-biometric screening panels; a free t-shirt for utilizing an online portal to track their physical activity, sleep patterns, and food intake; a free instructional pamphlet on how to effectively use the onsite gym; and ancillary free wellness resources (telephonic coaching, 24/7 nurse line, online lifestyle management programs) available through the City of Houston’s third-party administrator, Cigna.

A pre-, mid-, and post-program evaluation was conducted to assess any changes in the following biometric data: weight, body mass index, blood pressure, body fat, and waist circumference. A 19-question knowledge test based on the Michigan Diabetes Research and Training Center’s Brief Diabetes Knowledge test was administered at the end of the program. Additionally, a participant satisfaction survey was administered to elicit employees’ feedback on the content, format, delivery, and usefulness of the program.

RESULTS
Table 1 illustrates the overall program outline based on implementation dates, times, and topics covered. Overall, this program was well-received by Houston Airport System employees and management. Table 2 provides a summary of both process (development and implementation results) and outcome (biometric results) evaluation findings.

Through the Balanced Living Program, participants reported a total of 2,653 miles walked/ran and a total of 2,763 exercise hours. Also, program participants lost a combined total of 345 pounds equaling a 251.1% body fat reduction (average of 1% body fat reduction per participant). Extrapolating these results out and comparing them to results from the DPP, we can expect that those participants who lost a moderate amount of weight to have decreased their risk for developing diabetes by about 58%. In addition to the improvement noted in biometric measurements, participants were satisfied with the program and provided insightful feedback on how to refine its content and format to better meet specific personal health and wellness goals.

DISCUSSION
Given the positive outcome (weight loss of 345 pounds and body fat percentage reduction total of 251.1% overall) of this program as well as participants’ high satisfaction ratings, we anticipate future implementation of a modified version of this program across other City of Houston departments comparable in health risk profile to the HAS. Since the culmination of the Balanced Living program, its process and outcome evaluation results have informed the development and implementation of other lifestyle management programs and worksite wellness challenges in other City of Houston departments such as the Municipal Courts, Legal Department and Public Works & Engineering Department. In the spring of 2014, the Discover Health with the Wellness Connection team implemented several lifestyle management programs focused on healthy eating and weight management. Additionally, based on responses received in the process evaluation, the Discover Health with the Wellness Con-
The Balanced Living program’s implementation, Discover Health with the Wellness Connection allowed City of Houston employees to collect wellness points, redeemable for a discount on the subsequent years’ medical benefits contributions, for participating in disease management programs. Beyond the addition of similar programming, the City of Houston and its third party provider began offering free generic diabetes management medications in order to encourage a higher adherence to disease management programs. We hope to continue our efforts in providing programs such as the Balanced Living Program to other City of Houston departments as an opportunity for education, engagement, empowerment, and promotion of sustainable lifestyle changes. Ultimately, a healthier workforce will aid in our efforts to contain and reduce healthcare costs and enhance the efficiency of city-wide operations through lower rates of absenteeism and a more productive employee population.31,16,17

REFERENCES


Table 2: Biometric Improvements/Process Evaluation Results

<table>
<thead>
<tr>
<th>Biometric Screening Results</th>
<th>Overall</th>
<th>Participants</th>
<th>Weight (lbs lost)</th>
<th>Body Fat (% change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>325</td>
<td>345</td>
<td>251.1</td>
<td></td>
</tr>
</tbody>
</table>

Process Evaluation Results

GROUP A

<table>
<thead>
<tr>
<th>Overall Satisfaction</th>
<th>Average Score</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>3.60/4.00 (90%)</td>
<td>&quot;Great class, I’ve lost weight and have implemented this into my lifestyle.&quot;</td>
</tr>
</tbody>
</table>

GROUP B

<table>
<thead>
<tr>
<th>Overall Satisfaction</th>
<th>Average Score</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>3.71/4.00 (93%)</td>
<td>&quot;Very good information!&quot;</td>
</tr>
</tbody>
</table>

GROUP C

<table>
<thead>
<tr>
<th>Overall Satisfaction</th>
<th>Average Score</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>3.62/4.00 (91%)</td>
<td>&quot;Very good job. I am very pleased.&quot;</td>
</tr>
</tbody>
</table>

GROUP D

<table>
<thead>
<tr>
<th>Overall Satisfaction</th>
<th>Average Score</th>
<th>Additional Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>3.56/4.00 (89%)</td>
<td>&quot;Excellent training.&quot;</td>
</tr>
</tbody>
</table>

Figure 1: Recruitment Flyer

HAS employees - join the 12-week Balanced Living Program

The Balanced Living Program is a free unique opportunity for you to learn how to lead a balanced life and improve your health and well-being. Topics include: Stress Management, Healthy Eating, Managing Diabetes, Mental Activity and many more.

Four class schedules to choose from:

• Group A - Mondays at 10 a.m.
• Group B - Mondays at 6:30 p.m.
• Group C - Wednesdays at 5 a.m.
• Group D - Wednesdays at 7 a.m.

Classes run from Monday, October 29 - Wednesday, January 30 at the Admin Auditorium, 16501 I-10 Boulevard. Participants must attend all 12 classes and complete a pre-program, mid-program and post-program evaluation to get Wellness Engagement credit.

Register with your supervisor by Monday, October 22.
INTRODUCTION
The inappropriate use and/or misuse of emergency department (ED) services is one of the common problems leading to overcrowding in the ED. The Emergency Medical Treatment and Labor Act (EMTALA) establishes protection for patients who present to the ED seeking evaluation and treatment but also creates a regulatory environment that inhibits most hospitals from providing urgent care at less costly alternative locations. Socioeconomic, demographic, cultural, and environmental disparities have been reported as determinants of non-urgent use and/or misuse of emergency services. ED utilization and total charges for ED services continue to rise, making emergency care a significant financial burden for patients as well as to the system.

Lack of an integrated healthcare database has been recognized as a major barrier to future planning of healthcare-related areas as well as public health research. The Dallas Fort Worth Hospital Council (DFWHC) Foundation has a comprehensive patient data registry that is capable of providing information regarding ED usage, patient charges, and demographic characteristics of the patients from the North Texas region. Tarrant County is the second most populated county in the North Texas region after Dallas County. In Tarrant County, Fort Worth is the most populated city with a rapidly increasing population and changing demographics. A report published by “Dallas-Fort Worth (DFW) International” a nonprofit organization, highlighted the diversification of population in the DFW area with 43% white, 34% Latino, 18% African American, and 4% Asian residents. This report also suggested that approximately 21% of residents in Fort Worth were new Americans (foreign-born population). In addition, for 32% of the population, English is not their primary language. In Tarrant County, approximately 16% of the population live in poverty. Moreover, a greater percentage of individuals in Tarrant County (24%) lacked health insurance compared to the nation as a whole (15%).

Geographic Information System (GIS) mapping and spatial analysis have been very effective tools for healthcare and public health research to identify disparities and to critically examine the issues, strengths, and challenges inherent in disease prevalence and current public health and/or hospital-based healthcare. Recognizing the need to investigate ED utilization and underlying disparities in Tarrant County, we explored the use of GIS methodology to analyze the data from zip code levels to high ED visit “residential blocks, i.e., hot blocks” for high frequency patients.

Frequent Flyer Analysis of Emergency Department Visits in Tarrant County: Integrated Healthcare Informatics in Public Health
Richa Bashyal,1 Sushma Sharma,1* Ed Schmitt,1 Kristin Jenkins1
1Dallas-Fort Worth Hospital Council Research and Education Foundation

*Corresponding Author
Dr. Sushma Sharma
Director Public and Population Health
Dallas-Fort-Worth Hospital Council Research & Education Foundation
250 Decker Drive, Irving 75062, TX
Email: ssharma@dfwhcfoundation.org
Phone: 469-648-5031
Fax: 972-791-0284

List of abbreviations: ED: Emergency Department, EMS: Emergency Medical Services, REMPI: Regional Enterprise Master Patient Index, GIS: Geographic Information System, CPT: Current Procedural Terminology, NYU algorithm: New York University emergency department visit severity algorithm, DFWHC: Dallas Fort Worth Hospital Council, Hot Blocks (also known as hot spots): the identified residential blocks representing the highest ED visits with in a zip code, High Frequency Patients’ (also known as “hot spotters”): patients who made more than one visit to the ED in one calendar year, CHIP: Children’s Health Insurance Program, HIPAA: Health Insurance Portability and Accountability Act, PHI: Protected Health Information.

None of the authors report any conflicts of interest.

ABSTRACT
Objective: Socioeconomic, demographic, cultural, and environmental disparities have been reported as determinants of non-urgent use of the emergency department (ED). This study aimed to quantify the utilization characteristics of ED visits in Tarrant County and to develop a “High Frequency Patient Analysis” of Tarrant County ED utilization including zip codes and “hot blocks” analysis.

Methods: This study uses the out-patient ED data for Tarrant County from the Dallas-Fort Worth Hospital Council Foundation’s database. Spatial analysis using Geographic Information System (GIS) mapping with the ED data was used for the “hot spot” and frequent flyer analysis to identify the patients with the most ED visits (frequent flyers) and their characteristics like age, ethnicity, race, reasons of ED visits (primary diagnosis based on ICD9 codes), payer status, and total charges filed by the hospitals.

Results: In 2012, the total number of ED visits in Tarrant County hospitals was 667,736 by 386,786 patients. The total charges of the ED visits in 2012 were $1,920,854,981. Only 12% of the visits were not preventable emergency visits. Four percent of the visits were made by patients with mental health, substance abuse, and alcohol related problems. Two zip codes with the highest ED visits were selected for further “hot spot” analysis. Acute upper respiratory infections, asthma, pain, chest pain, headache, abdominal pain, and bronchitis were the most common primary diagnoses in frequent flyer patients.

Conclusion: This study identifies disparities associated with high ED usage in Tarrant County. These results have major significance in terms of public health planning. With the identification of health disparities in the high ED visit areas, public health efforts addressing disease prevention and management can be more efficiently targeted and appropriately implemented. In the future, we encourage healthcare data-sharing in order to coordinate care between different healthcare providers and for individual case management. Health-care policies and information protection laws may need to be revised to facilitate the personalized and targeted care to these high-frequency patients and for continuity of care and care management outside the hospital.
The objectives of our research were to:
1. Quantify utilization characteristics, demographics, and charges of emergency department visits in Tarrant County.
2. To provide a “Frequent Flyer Analysis” of Tarrant County ED utilization including zip codes and “hot blocks” analysis.

METHODS
The DFWHC Foundation securely houses the combined data warehouse created in 1999 by North Texas hospital systems. This contains information for over 9.8 million regional patients and their more than 38 million hospital encounters. This warehouse collects claims data from 85 hospitals in the North Texas region. With the regional enterprise master patient index (REMPI), the Foundation assigns a unique ID to all patients, allowing the Foundation researchers to track any patient over time by hospital and by payer. For the study, the data for all patients who visited an ED during 2010-2012 were extracted from the DFWHC Foundation’s data warehouse based on ICD9 codes. Only 2012 out-patient data were used for high frequency patient analysis. This research study was approved by the North Texas Health Information and Quality Committee (NTHIQC), who approves the research methodology and the patient/hospital confidentiality protection for all research projects supported by the DFWHC Foundation. A validated New York University Emergency Department (NYU) visit severity algorithm was used to classify visits to the ED in Tarrant County based upon diagnosis during 2010-2012.11 This algorithm classifies the ED diagnosis in different categories, namely, Emergent: [not preventable (for example: acute chest pain, severe headache with nausea, back injury, severe bleeding) / preventable (for example: asthma, urinary tract disorders, pain, moderate fever)]. Emergent- Primary care treatable (Bu, fever, fractures), Non-Emergent (pain, mild headache, cold, small cuts/injuries), Injury, Mental Health, Alcohol, Substance abuse, Intermediate, Others/unclassified (none of above).14 In this study, we used the Arc GIS mapping system (ArcInfo version 10.0, ESRI, Redlands, CA) to combine ED visits with their corresponding zip codes. Zip code information from zip Atlas (http://zipatlas.com/us/texas.htm) and 2012 census data were used for the analysis. For high frequency patient analysis, the top two zip codes with the highest ED frequencies were selected for further “hot block” analysis. The “hot block” analysis allowed us to identify areas in selected zip codes representing the highest ED utilization. Hot blocks (also known as hot spots) in this study refer to the identified residential blocks representing the highest ED visits within a zip code. The combination of our data and GIS analysis also pinpointed individual high frequency patients’ (also known as “hot spotters” and “frequent flyers”) defined as patients who made more than one visit to the ED in one calendar year. Data were analyzed using software SPSS19 (IBM SPSS Inc., Chicago IL).

RESULTS
NYU case count trends during 2010-2012 indicated stable statistics with an average of only 12% not preventable emergency visits. On average, 4% of ED visits were made by patients with mental health, substance abuse, and alcohol related problems, and 21% were made by injury-related cases during 2010-2012 (Table 1).

Statistics for 2012 indicated that Tarrant County had 1,720 ED cases per 1000 patients (Table 2). In Tarrant County in 2012, the highest proportion of ED visits were made by insured visitors (32%), followed by uninsured (31%), Medicaid (27%), and Medicare (9%). The average age of ED visitors was 43 years for adults and 7 years for children with most visits made by Whites of Not Hispanic or Latino origin. The total charges of the ED visits in 2012 were $1,920,854,981.

Based on highest ED visits, zip codes 76119 and 76112 were selected for the frequent flyer analysis. These zip codes had higher diabetes prevalence in ED visitors than the national average (8.3%) (Table 2). Based on the census information in zip code 76119, 50% of the total population is Black race and 31% White race. With respect to ethnicity, 23% of the population is of Hispanic or Latino ethnicity. Based on our data for 2012, 56% of ED visits were made by Blacks and 23% by Whites in zip code 76119. In 2012, based on ethnicity, 20% of the Hispanic or Latino population visited the ED in zip code 76119. In the zip code 76112, 47% of the total population is Black race and 43% Whites. With respect to ethnicity, 10% of the population is of Hispanic or Latino ethnicity. Likewise, based on our data for ED visits for 2012, 57% of ED visits were made by Blacks and 24% by Whites in zip code 76112. In 2012, based on ethnicity, 12% of the Hispanic or Latino population visited the ED in zip code 76112.

Payer information indicated that zip code 76119 had 35% Uninsured and 39% Medicaid patients whereas in zip code 76112 had 36% Uninsured and 35% Medicaid patients (Table 2).

Hot Blocks Analysis: Block analysis identified the “blocks” within these zip codes with high ED visits using the database. ED visits from these blocks represented 41% of total ED visits from zip code 76119 and 56% of total visits from zip code 76112 (Map 1).

Table 3 explains the characteristics of the high ED visitors (frequent flyers) living in identified blocks in two selected zip codes. Percentages of pediatric ED visitors in these hot blocks ranged from 16% in “5800 Block LINCOLN MEADOWS CIR” in zip code 76119 to 57% “4800 Block VIRGIL ST” in zip code 76112. Hot blocks indicated significantly higher ED visits by patients with Black race (p=0.031) and not Hispanic or Latino ethnicity (p=0.027) even after adjusting for the population based on census data.

Table 4 shows the detailed information of frequent flyers (Patients who visited ED frequently) in zip codes 76119 and 76112. The number of ED visits by these frequent flyers ranged 29 to 60 visits to 4-5 hospitals in year 2012. Pain (chest pain, headache, and abdominal pain), bronchitis, and diabetes-related complications were the most common primary diagnosis of their ED visits.

DISCUSSION
This study provides the first detailed analysis of ED utilization in Tarrant County based on the data registry from the DFWHC Foundation. Based on the Centers for Disease Control and Prevention (CDC) safety-net emergency department definition,14 Tarrant County in year 2012 served 31% Uninsured and 27% Medicaid ED patients (combined 58%), which is 18% higher than the safety net target (40%) .

Zip code as well as high frequency patient analysis confirms that Uninsured and Medicaid were the top two payer groups in high ED visit areas. More ED visits were made by people with low socioeconomic status in these zip codes, indicating the economic disparity related to increased ED visits. In high ED visit zip codes such as 76119, there is only one community health center, which leaves them with...
Table 2: Statistics, demographics, charges and payer information for emergency department (ED) visits in Tarrant County and high ED visit zip codes (76119 and 76112) in 2012.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Tarrant County</th>
<th>Zip code 76119</th>
<th>Zip code 76112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Patients*</td>
<td>386,786</td>
<td>5,716</td>
<td>4,711</td>
</tr>
<tr>
<td>ED cases**</td>
<td>665,347</td>
<td>19,163</td>
<td>16,622</td>
</tr>
<tr>
<td>ED cases per 1,000 patients</td>
<td>1,720</td>
<td>3,352</td>
<td>3,528</td>
</tr>
<tr>
<td>Diabetes Prevalence in ED visitors (number of cases with Diabetes)</td>
<td>54,021 (8)</td>
<td>2108 (11)</td>
<td>1706 (10)</td>
</tr>
<tr>
<td>Dialysis/end stage kidney complications</td>
<td>7,924 (1)</td>
<td>169 (1)</td>
<td>117 (1)</td>
</tr>
<tr>
<td>Adult (≥18 years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Age</td>
<td>43 years</td>
<td>41 years</td>
<td>39 years</td>
</tr>
<tr>
<td>Cases</td>
<td>483,635</td>
<td>13,971</td>
<td>13,241</td>
</tr>
<tr>
<td>Average Age</td>
<td>7 years</td>
<td>5 years</td>
<td>5 years</td>
</tr>
<tr>
<td>Pediatric (≤17 years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Age</td>
<td>181,712</td>
<td>5,192</td>
<td>3,421</td>
</tr>
<tr>
<td>Cases</td>
<td>156,260 (24)</td>
<td>10,597 (55)</td>
<td>9,440 (57)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>7,801 (1)</td>
<td>213 (1)</td>
<td>51 (0)</td>
</tr>
<tr>
<td>Black</td>
<td>152,588 (23)</td>
<td>3919 (21)</td>
<td>3,195 (19)</td>
</tr>
<tr>
<td>Other***</td>
<td>133,119 (20)</td>
<td>3,821 (20)</td>
<td>1,962 (12)</td>
</tr>
<tr>
<td>White</td>
<td>346,949 (52)</td>
<td>4,399 (23)</td>
<td>3,928 (24)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>1,505 (0)</td>
<td>35 (0)</td>
<td>8 (0)</td>
</tr>
<tr>
<td>American Indian / Eskimo / Aleut</td>
<td>244 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>133,119 (20)</td>
<td>3,821 (20)</td>
<td>1,962 (12)</td>
</tr>
<tr>
<td>Not Hispanic or Latino</td>
<td>531,793 (80)</td>
<td>15,334 (80)</td>
<td>14,656 (88)</td>
</tr>
<tr>
<td>Unknown</td>
<td>435 (0)</td>
<td>8 (0)</td>
<td>4 (0)</td>
</tr>
<tr>
<td>Emergency****</td>
<td>210,784 (32)</td>
<td>6,631 (35)</td>
<td>5,528 (33)</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>135,095 (20)</td>
<td>4,394 (23)</td>
<td>3,644 (22)</td>
</tr>
<tr>
<td>Injury</td>
<td>137,269 (21)</td>
<td>2,614 (14)</td>
<td>2,432 (15)</td>
</tr>
<tr>
<td>NYU*****</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-emergent</td>
<td>73,269 (11)</td>
<td>2,246 (12)</td>
<td>2,085 (13)</td>
</tr>
<tr>
<td>Other</td>
<td>108,930 (16)</td>
<td>3,277 (17)</td>
<td>2,933 (18)</td>
</tr>
<tr>
<td>Payer Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insured</td>
<td>212,911 (32)</td>
<td>3,014 (16)</td>
<td>2,841 (17)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>179,644 (27)</td>
<td>7,408 (39)</td>
<td>5,829 (35)</td>
</tr>
<tr>
<td>Medicare</td>
<td>59,881 (9)</td>
<td>1,979 (10)</td>
<td>1,903 (12)</td>
</tr>
<tr>
<td>Uninsured</td>
<td>206,258 (31)</td>
<td>6,605 (35)</td>
<td>5,992 (36)</td>
</tr>
<tr>
<td>Charges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Charge</td>
<td>$1,920,854,981</td>
<td>$45,301,906</td>
<td>$41,567,840</td>
</tr>
<tr>
<td>Average Charge</td>
<td>$2,887</td>
<td>$2,364</td>
<td>$2,501</td>
</tr>
</tbody>
</table>

*Number of out patient emergency department patients during 2012
** Number of ED visits made by these unique patients during 2012
*** Patients other than black or white race/mixed race/ not known or not reported
**** Including preventable and non-preventable as well as primary care treatable emergent visits.
 ***** A validated New York University Emergency Department (NYU) visit severity algorithm was used to classify visits to the ED based on diagnosis\textsuperscript{13}.\textsuperscript{13}
Table 4: Review of high emergency department (ED) visits patients (Frequent Flyer analysis) from Zip codes 76119 and 76112 in Tarrant County (2012)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%)</th>
<th>76119</th>
<th>76112</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top Patients Review</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED Visits in 2012</td>
<td>Patient 1</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Patient 2</td>
<td>61</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td><strong>NYU</strong>**</td>
<td>131</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>Emergent***</td>
<td>103</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Indeterminate</td>
<td>53</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Non-emergent</td>
<td>44</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Injury</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>52</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td><strong>Total Charge</strong></td>
<td>881</td>
<td>754</td>
</tr>
<tr>
<td></td>
<td><strong>Average Charge</strong></td>
<td>2,535</td>
<td>1,871</td>
</tr>
<tr>
<td><strong>ED Visits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospitals Visited</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of visits</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospital 1/ 24</td>
<td>Hospital 2/ 23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospital 3/ 3</td>
<td>Hospital 4/ 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospital 5/ 3</td>
<td>Hospital 5/ 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Top 5 Primary Diagnosis Codes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emergent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indeterminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-emergent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Injury</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Charge</strong></td>
<td>$270,238</td>
<td>$110,606</td>
</tr>
<tr>
<td></td>
<td><strong>Average Charge</strong></td>
<td>$4,504</td>
<td>$3,687</td>
</tr>
<tr>
<td></td>
<td>Payer Information</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NYU****</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emergent</td>
<td>49</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Indeterminate</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Non-emergent</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Injury</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total Charge</strong></td>
<td>$270,238</td>
<td>$110,606</td>
</tr>
<tr>
<td></td>
<td><strong>Average Charge</strong></td>
<td>$4,504</td>
<td>$3,687</td>
</tr>
<tr>
<td></td>
<td>Payer Information</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*number of out patient emergency department patients during 2012
** number of ED visits made by these unique patients during 2012
*** Patients other than black or white race/mixed race/ not known or not reported
**** Including preventable and non-preventable as well as primary care treatable emergent visits.
***** A validated New York University Emergency Department (NYU) visit severity algorithm was used to classify visits to the ED based on diagnosis13.
limited options. Likewise, in zip code 76112, there is one community health center and two senior assisted living communities. There were a number of physicians’ offices in these zip codes, but many of these providers do not accept uninsured patients and accept only a limited number of Medicaid and Medicare patients. These results highlight the need to develop community-based healthcare venues which are easily accessible for extended hours, affordable, and culturally competent. Our results (Table 3) support the findings published by Carret et al, 2007, reporting that inappropriate ED use was higher in the younger age group (15–49 years).

In the underserved population, children and the elderly are generally covered by some kind of public and private healthcare coverage (Children’s Health Insurance Program (CHIP), Medicaid, or Medicare) but young adults and the middle-aged in Texas often have limited options available to them. Significant associations were observed between race and ethnicity at the county level. These results are consistent at the hot block level also. Black patients of not Hispanic or Latino origin made signifi-
cantly more visits to the ED. Based on census data for race and ethnicity, our results are consistent for zip code 76119 and 76112. But, the county level data indicate predominantly White and of not Hispanic or Latino origin population. These results indicate racial and ethnic disparities associated with higher frequency ED visits. Health, socioeconomic, racial, ethnic, cultural, and environmental disparities have previously been reported as determinants of non-urgent/ excessive use of the ED.\textsuperscript{1,3,5} Cultural, linguistic, and health literacy competence is widely recognized as a fundamental aspect of quality healthcare (including mental health), particularly for a diverse patient population like in Fort Worth, which is home to 21% foreign-born residents and where English is not the first language for 32% of the population.\textsuperscript{10,17}

Table 4 indicates that the number of visits by these most frequent patients ranged between 29-60 visits in 2012. Pain (chest pain, headache, and abdominal pain), bronchitis, and diabetes-related complications were the most common primary diagnosis of their ED visits.
Evidences suggest that the sickest 5% of patients account for over half of healthcare costs. Therefore, efforts aimed at the “super-utilizers” (including sickest patients) providing intensive outpatient care management to high-need, high-cost patients need to be developed and implemented.

Conclusion and Future Implications

With the identification of the contributing disparities in the high frequency ED utilization, public health efforts and resources can be more efficiently targeted and focused from zip code to blocks to the patient level for prevention and management of identified health conditions and disparities contributing to high ED usage. In the future, we support improvements in healthcare data-sharing in order to coordinate care between different healthcare providers and, more importantly, to be able to perform case management like the New Jersey-based Camden study. In addition, healthcare policies and information protection laws, i.e., Health Insurance Portability and Accountability Act (HIPAA) and Protected Health Information (PHI), may need to be revised in order to facilitate the more personalized and targeted care to these high frequency patients and for continuity of care and care management outside the hospital.

Acknowledgements

Authors dedicate this publication to Dr. Ron J Anderson for his guidance and supervision for this study. We are grateful to the 85 partner hospitals in North Texas for sharing their claims data with the DFWHIC Foundation. We are indebted to the members of DFWHIC Foundation board and Mr. W. Stephen Love, CEO and President of DFW Hospital Council, for their support and encouragement. We gratefully acknowledge the contribution of the members of North Texas Health Information and Quality Collaborative (NTHIQC) for approving this study. The authors thank Carol Young and Jaylene Jones for their help with GIS mapping.

REFERENCES

1948 V. M. Ehlers*
1949 George W. Cox, MD*
1951 S. W. Bohls, MD*
1952 Hubert Shull, DVM*
1953 J. W. Bass, MD*
1954 Earle Sudderth*
1956 Austin E. Hill, MD*
1957 J. V. Irons, ScD*
1958 Henry Drumwright
1959 J. G. Daniels, MD*
1960 B. M. Primer, MD*
1961 C. A. Purcell*
1962 Lewis Dodson*
1963 L. P. Walter, MD*
1964 Nell Faulkner*
1965 James M. Pickard, MD*
1966 Roy G. Reed, MD*
1967 John T. Warren*
1968 D. R. Reilly, MD*
1969 James E. Peavy, MD*
1970 W. Howard Bryant*
1970 David F. Smallhorst*
1971 Joseph N. Murphy, Jr.*
1972 Lola Bell*
1972 B. G. Loveless*
1973 Barnie A. Young*
1974 Ardis Gaither*
1975 Herbert F. Hargis*
1975 Lou M. Hollar*
1976 M. L. McDonald*
1977 Ruth McDonald
1978 Maggie Bell Davis*
1978 Albert Randall, MD*
1979 Maxine Geeslin, RN
1979 William R. Ross, MD*
1980 Ed L. Redford*
1981 W. V. Bradshaw, MD*
1981 Robert E. Monroe*
1982 William T. Ballard*
1983 Mike M. Kelly, RS
1983 Hugh Wright*
1984 Hal J. Dewlett, MD*
1984 C. K. Foster
1985 Edith Ehlers Mazurek
1985 Rodger G. Smyth, MD*
1986 Helen S. Hill*
1986 Henry Williams, RS*
1987 Frances (Jimmie) Scott*
1987 Sue Barfoot, RN
1988 Jo Dimock, RN, BSN, ME
1988 Donald T. Hillman, RS*
1989 Marietta Crowder, MD
1990 Robert Galvan, MS, RS
1991 Wm. F. Jackson, REHS*
1992 Charlie Norris*
1993 T. L. Edmonson, Jr.*
1994 David M. Cochran, PE
1995 JoAnn Brewer, MPH, RN*
1996 Dan T. Dennison, RS, MT, MBA
1997 Mary McSwain, RN, BSN
1998 Robert L. Drummond
1999 Nina M. Sisley, MD, MPH
2000 Nancy Adair
2001 Dale Dingley, MPH
2002 Stella Flores
2003 Tom Hatfield, MPA
2004 Janet Greenwood, RS
2005 Charla Edwards, MPH, RN
2006 Janice Hartman, RS
2007 Jennifer Smith, MSHP
2008 Catherine D. Cooksley, DrPH
2009 Hardy Loe, M.D.
2010 John R. Herbold, DVM, PhD
2012 Bobby D. Schmidt, M.Ed
2013 Sandra H. Strickland, DrPH, RN
2014 Jacquelyn Dingley, RN, BSN, MPH, MBA
*deceased

TPHA HONORARY LIFE MEMBERS

Minnie Bailey, PhD
Ned V. Brookes, PE
Oran S. Buckner, Jr., PE, RS
Burl Cockrell, RS
Gordon Green, MD, MPH
Exa Fay Hooten
Robert MacLean, MD
Sam Marino
Annie Lue Mitchell
Laurence N. Nickey, MD
Eduardo Sanchez, MD, MPH
David R. Smith, MD
Kerfoot P. Walker, Jr., MD
Alice V. White

TPHA Life Members

Non-Profit Org.
US Postage
PAID
Permit No.
1291
Austin, TX

Texas Public Health Association
PO Box 201540
Austin, Texas 78720-1540