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Williamson County and Cities Health District

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www.WCCHD.org
February 2, 2012

The residents of Williamson County have reason to be proud of their local health department. Over the next two years, the Williamson County and Cities Health District (WCCHD) will embark on a journey with a goal of achieving national accreditation and performance excellence. The journey will involve a critical evaluation of public health services in Williamson County.

As part of this effort, the Board supports WCCHD efforts to build partnerships with academic and healthcare organizations. Collaboration is a vital ingredient for strengthening our public health system and establishing a center of excellence in epidemiology. The 2011 Epidemiology Report highlights the outstanding work that results from strong partnerships.

Community input is an essential ingredient for assessing community health. In 2011, the WCCHD Epidemiology Program created the Health Data Users Group to provide a venue for public health stakeholders to help inform public health policy in Williamson County. This group focuses on the epidemiology of our communities, working to improve data collection and analytics in support of ongoing community health assessment efforts throughout the county.

The prosperity and health of all our residents depend on a strong public health system focused on prevention and improving community health. One vital component of that system is the WIL-CO Wellness Alliance which for the last 3 years has successfully been our coalition for Community Health Improvement. To all of our partners, thank you for your efforts in keeping Williamson County on the list of the "most desirable" and healthiest places to live!

For more information on the Health Data Users Group, please contact the WCCHD Epidemiology Program at 512-248-7671.

Kerry Russell
Chair, Williamson County Board of Health

W.S. “Chip” Riggins, Jr., MD, MPH
Executive Director and Health Authority
Introduction

David Bastis, MPH, Assistant Deputy Director for Special Operations
W. S. Riggins Jr., MD, MPH, WCCHD Executive Director/Health Authority

When John Snow, the father of modern epidemiology, mapped cases during his investigation of a cholera outbreak in 1854 in the Soho district of London he found the majority of cases were clustered around the Broad Street pump. Snow was thorough in his investigation. In addition to interviewing cases that were clearly part of the cluster, he interviewed several households that, based on their location, likely did not use the Broad Street pump. He discovered that some of these “outliers” went out of their way to visit the tainted Broad Street pump because they liked the taste of the water. In other cases, the children of these families went to school near the Broad Street pump.

The practice of epidemiology often falls more in the realm of art than science, with many different factors influencing the investigatory process or publishing of results. Political and economic forces often influence decision making. Community leaders often struggle with an epidemiologist’s aggressive recommendations in the absence of absolute proof. When Snow met with the neighborhood council and recommended the removal of the handle from the water pump on Broad Street, many on the council were not convinced by Snow’s “evidence.” Epidemiologists provide the foundational data and analysis essential for formulating policies and making informed decisions during public health emergencies.

The Special Operations Branch has embarked on an exciting journey to build an epidemiology program from the ground up. As we develop complex systems to monitor and assess community health, we also follow John Snow’s example of practicing basic epidemiology and taking action to protect public health. Williamson County is fortunate to have highly qualified public health professionals practicing epidemiology, striving to make a difference in the health and well-being of all residents.

The 2011 Epidemiology Report is part of an ongoing collaborative community health assessment process, a vehicle for sharing the story of epidemiology in Williamson County. I hope the articles are informative and motivate you to ask questions and think about strategies for improving health in our communities.

Sincerely,

David G. Bastis, MPH
Assistant Deputy Director
Special Operations Branch
Our Vision
Healthy people thriving in healthy communities in Williamson County.

Our Mission
The Williamson County and Cities Health District, in partnership with communities, protects and promotes the health of the people of Williamson County.
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**Introduction**

Central Texas exceeds the state and the nation in the percentage of people reporting behavioral health conditions including drug or alcohol dependence (Central Texas: 8.8% vs. Texas: 7.8% and the U.S.: 7.7%) and serious psychological distress with at least one major depressive episode (Central Texas: 12.1% vs. Texas: 11.4% and the U.S.: 11.5%); however, Texas ranks 49th in the U.S. in per capita spending on mental health [Community Action Network, 2009; SAMHSA, 2004-2006].

**Integrated Behavioral Health**

In response to the community-wide need for accessible and affordable behavioral health services in Central Texas, Lone Star Circle of Care (LSCC), a nonprofit Federally Qualified Health Center (FQHC), developed a robust integrated behavioral health program. What began in 2004 as a social services-based mental health model utilizing case managers and licensed clinical social workers (LCSWs) has quickly evolved into a psychiatric integrated behavioral health model. In 2006, LSCC launched its integrated behavioral health program with the hire of a full-time adult psychiatrist. Services were expanded the following year to include children and adolescents and geriatric psychiatry services were integrated in 2009. Today, LSCC’s behavioral health department is the largest network of behavioral health providers in Williamson County and is one of the largest networks in the region, providing care to more than 4,000 patients annually.
foster coordinated patient-centered primary and behavioral health care. To reach as many patients as possible and expand the accessibility of behavioral health services in the community, LSCC not only operates stand-alone behavioral health clinics, but also stations behavioral health providers within its primary care clinics.

Behavioral health providers coordinate treatment plans with primary care providers (PCPs) to address patients’ overlapping physical and behavioral health needs, with the goal of stabilizing the patient’s presenting symptoms and improving their level of functioning. LSCC psychiatrists diagnose behavioral health disorders, assess co-morbidities, monitor symptoms, provide psychopharmacology services, assess patient adherence to treatment plans, and make recommendations to the patient’s PCP regarding potential side effects associated with medications. Behavioral health providers may also consult with pharmacists in one of LSCC’s two on-site pharmacies, if needed. Patients with mild or moderate behavioral health issues are provided behavioral health care in their PCP’s clinic by on-site therapists. Patients who present to primary care with severe or treatment-resistant mental health issues are referred by their PCP to a psychiatrist in one of the organization’s stand-alone behavioral health clinics. Behavioral health providers assist patients in establishing a medical home by referring them to a LSCC PCP if they currently do not have one.

Care integration is beneficial for both the patient’s physical and mental health as psychological factors complicate approximately 60% of all patients’ primary care conditions [Cummings, 1997]. The influence of physical and behavioral health on a patient’s overall health is bi-directional; unmanaged medical conditions can exacerbate behavioral health diagnoses and vice versa. Research has increasingly shown that certain behavioral health conditions tend to co-occur with chronic medical conditions; diabetes and depression and hypertension and bipolar disorder are two of the most common pairings. Because one condition often triggers or worsens the other, approaching both conditions holistically and treating them simultaneously is the most effective approach to improving the patients’ overall health. A graphical representation of the integrated behavioral health model is presented below.

Operating in an integrated behavioral health system helps PCPs to more easily recognize behavioral health issues in their medical patients. In an effort to identify behavioral health issues in youth ages 11-18 in a timely manner, LSCC implemented a nationally-recognized behavioral health screening...
tool, TeenScreen, in all of LSCC’s medical clinics that treat teens. The TeenScreen questionnaire is administered at a patient’s first visit and annually thereafter in an effort to identify adolescents suffering from mental illness or who are at risk for suicide. If deemed necessary, the PCP may then refer the patient to a therapist.

The close working relationship between psychiatrists/therapists and PCPs and the adoption of standardized screening tools has improved the ability of PCPs to detect behavioral health issues and to manage the ongoing care of these individuals. Having both intake mechanisms in place – direct behavioral health care and primary care-based behavioral health care – ensures the patient is able to seek care in a single, streamlined, patient-friendly system which reduces the stigma of seeking behavioral health services and enhances patient convenience.

Approximately 62% of LSCC’s behavioral health patients also access LSCC’s primary medical services, highlighting the significant overlap between these two areas. Research indicates that some PCPs may not be equipped to adequately address, diagnose, and treat the wide range of mental health disorders they regularly encounter with their patients. Since implementing the integrated model of care, LSCC has discovered that patients appreciate this approach not only because it is more convenient for them to receive all their care within one clinical system, but also because it truly helps them recover more quickly and effectively. Likewise, LSCC has learned that providers value the integrated model because it improves their clinic’s efficiency in addition to giving them the resources and ongoing support they need to more meaningfully help vulnerable populations in our community with co-occurring conditions.

One example of the resources that providers find most useful in providing integrated care is electronic health records (EHRs). The appropriate use of EHRs saves time, reduces errors, and dramatically improves patients’ continuity of care. Through EHR utilization, both teams of providers are able to access a patient’s medical history, current health status, current medications, and patient compliance - providing the entire health team with the crucial information they need to effectively manage patients whose treatment plan includes a medication regimen. This improved ability to coordinate care between behavioral health and medical teams is an invaluable asset in an integrated health care delivery system. Having a centralized electronic system of chart management eliminates the time that would need to be taken for a behavioral
health provider to request and retrieve a patient’s paper medical chart or vice versa. The presence of an EHR also allows many processes to be automated, which results in both time savings and reduction in errors. The system may be programmed to remind a provider when a certain test is due for their patient or to provide an alert when a patient is prescribed a new medication that may interact with an existing allergy or current medication. The EHR allows for a seamless flow of information between providers in LSCC’s patient-centric environment.

**Collaborations**

LSCC’s commitment to patients with behavioral health diagnoses and an overarching mission to provide integrated medical and behavioral health care has attracted the interest of local medical schools and community organizations with aligned and complementary goals. For example, LSCC collaborates with local hospitals to provide consult/ liaison psychiatry services to acutely ill hospitalized patients requiring psychiatric care.

LSCC is also committed to the training of the next generation of health care providers through its partnerships with Texas A&M College of Medicine (providing clinical rotations in LSCC psychiatry clinics for medical students); Seton/UT Southwestern (providing training sites for Psychiatry Residents); and UT School of Social Work (providing therapy training to advanced MSW practicum students).

Community partnerships have also been crucial. LSCC has become the referral site of choice for the clients and patients of many other organizations. For example, LSCC has an executed Memorandum of Understanding with Bluebonnet Trails to permit the seamless transition of patients. LSCC is also the referral resource for the following foster care agencies and court system: Texas Baptist Children’s Home; STARRY; Central Texas Children’s Home; Caring Family Network; and Williamson County Juvenile Court Services. Through these partnerships, LSCC provides both individual and group therapy to children and families in crisis and to those who have been neglected and abused, preventing patients from having to travel over 40 miles to receive services.

LSCC also maintains ties to local school districts. Teachers provide input to LSCC providers though behavioral health assessment tools and students may be referred to LSCC’s behavioral health program by the school. Teachers, nurses and other school personnel learn about the LSCC behavioral health program and its services through
presentations given by LSCC providers at staff development days. Local school staff have also received tours of LSCC’s facilities. Additionally, LSCC participates in community resource fairs hosted by local school districts to disseminate information about services to parents in the region.

**Services**

LSCC currently operates five stand-alone behavioral health clinics and has therapists stationed throughout LSCC’s other clinics. LSCC’s Department of Psychiatry and Behavioral Health is comprised of four divisions: Adult, Child/Adolescent, Addictions, and Geriatric Psychiatry. As of January 2012, LSCC employed 34 behavioral health professionals, including licensed and board certified/board eligible psychiatrists (MD), LCSWs, Licensed Professional Counselors (LPCs) and a Child Psychologist, PhD. In 2011, LSCC provided 37,219 visits to 6,897 patients and is projected to provide over 51,000 behavioral health visits in 2012. Given our patients often have severe behavioral health issues that require long-term monitoring, the number of behavioral health visits a patient can receive is not limited. Figure 1 demonstrates the dramatic growth in our behavioral health program over the last seven years.

LSCC’s behavioral health department provides comprehensive, high-quality behavioral health and substance abuse/addiction services to patients of all ages, regardless of their ability to pay. Individual, couple, family, and/or group counseling is provided by all behavioral health providers. Figure 2 below presents the distribution of behavioral health diagnoses among our behavioral health patient panel. The most common diagnoses are mood disorders, including depression and bipolar disorder, disruptive behavior disorders (ADHD, conduct disorder, oppositional defiant disorder), and anxiety disorders.

Figures 3-5 present the distribution of behavioral health diagnoses among specific age groups. The most common diagnoses by age group are
disruptive behavior disorders in children, mood disorders in adults, and dementia in geriatric patients. Common primary diagnoses categories will differ slightly in each figure due to the prevalence of the diagnoses by age group.

**OUTCOMES**

LSCC’s integrated behavioral program is effective in improving patient outcomes. One example of this is the decrease in patients’ depression scores, as measured on the Patient Health Questionnaire-9 (PHQ-9) tool, after three months of treatment. (The PHQ-9 is utilized by providers to assess symptoms and functional impairment in order to make a tentative depression diagnosis and produces a score that providers can use to help select and monitor the appropriate treatment plan for patients) [MacArthur Initiative, 2011]. The average initial PHQ-9 scores for LSCC adult patients of 16.14 (considered to be moderately severe depression) dropped significantly (26.2 %), after participation in the LSCC integrated behavioral health program, to 11.91 (considered moderate depression) [Watt, 2009]. The degree of these changes was highest around 3-4 weeks, but was maintained for up to 24 months after follow-up.

Approximately 42% of LSCC patients diagnosed with major depression, (PHQ-9 scores of 10 or higher) had at least a 50% reduction in their depression scores after three months, compared to 29% of patients who received treatment through usual care [Simon, 2001; Bruce, 2004; Bieling, 2007]. The 42% decrease also exceeds
the Institute for Health Care Improvement’s goal of 40% for integrated behavioral health programs [HRSA, 2005].

In addition to improvements in behavioral health, patients also experienced improvement in physical health and functioning. Primary care provider visits declined significantly after the shift to the integrated behavioral health model. Patients also reported significant improvements in their pain, ability to do chores, perform daily activities, and socialize [Watt, 2009].

**CHALLENGES**

Implementation of an integrated system requires consensus among medical professionals in multiple disciplines that have traditionally worked independently. Behavioral health and primary care providers must determine how they can best work together to provide optimal care to the patient without hindering the operations of either discipline. For example, LSCC providers worked together to decide which screening tools would be adopted in the medical clinics, weighing which would be meaningful for the behavioral health providers and also practical for primary care providers to administer.

The most critical challenge in providing integrated behavioral health is barriers related to funding and reimbursement. In general, payers do not reimburse for clinical care management functions, such as consultation between primary care providers and psychiatrists [Lopez, 2008]. As a designated FQHC in Texas, LSCC experiences additional challenges in billing for services. Although Medicaid billing codes exist that would reimburse for such behavioral health consultations, these codes are not available for use by FQHC’s in Texas [Hogg, 2011]. A lack of funding also exists for other important behavioral health services, including case management and telemedicine.

**RECENT GROWTH AND FUTURE GOALS**

Based on the continually growing need for behavioral health services and the program’s proven efficacy in improving health outcomes, LSCC expanded into Bell County in 2011 with the addition of a dedicated behavioral health clinic. Additionally, LSCC added more than 7,000 square feet to existing space at the Ben White Health Clinic in 2011 to increase psychiatry and behavioral health capacity and also added more space for primary care. This
expansion will allow the clinic's capacity to increase by more than 60%.

LSCC understands that integrated behavioral health services must also include the aggressive pursuit of alternative methods of providing access to psychiatrically-based therapeutic and medication management services in areas like telehealth (a service incredibly well-suited to behavioral health programs). Leveraging technology innovation creates opportunities for patient access. LSCC’s EHR system, patient navigation software, decision support, and modeling analytics further support our ability to coordinate integrated care to patients in more remote/rural areas. In 2011, LSCC added telepsychiatry services which are targeted towards patients who do not have convenient (or in some cases any) access to behavioral health services, including patients seen at local safety net providers and patients living in rural areas where behavioral health resources are extremely scarce.

**Cost Effectiveness**

Behavioral health factors, including depression and anxiety, can lead to the over-utilization of primary care services and the emergency department (ED). Studies have shown that the health care costs for patients with depression/anxiety can be 50-75% higher than those without mental health disorders [Simon, 1997] and that patients who suffer from psychiatric conditions have higher ED utilization rates [Kne, 1998]. Receiving care from a behaviorally-enhanced, patient-centered health home is a cost-efficient approach for delivering care as it allows and encourages patients to obtain comprehensive care from their provider, rather than through costly ED visits.

There is evidence that integrated behavioral health leads to cost savings. Results from Colorado Access, a non-profit Medicaid health plan formed by a large number of safety net providers in the state, demonstrated annual medical cost savings of $754,800 for 370 Medicaid patients participating in their integrated behavioral health program [Mauer, 2006]. These savings took into account ED utilization, inpatient admissions and length of stay, and office visits. Colorado Access' integrated behavioral health model is similar in many respects to the integrated behavioral health model adopted by LSCC – both models feature psychiatrists and other behavioral health clinicians in collaboration with the patient’s primary care provider to provide holistic care. Colorado Access demonstrated annual savings of $2,040 per Medicaid patient; assuming these results would be realized with LSCC’s similar integrated behavioral health model, it can be estimated that LSCC saves Texas Medicaid $2,288,880 annually due to the participation of Medicaid patients in LSCC’s integrated behavioral health program. An additional $2,388,840 in savings are realized for LSCC’s uninsured integrated behavioral health patients.

The provision of high quality and truly integrated behavioral health services to the uninsured and underinsured creates substantial costs outside of the direct provision of a traditional face-to-face visit. In fact, the emerging trends and data-driven studies all indicate that it is equally important to develop and expand a comprehensive set of
“enabling” and “extending” services to augment the direct care provided by behavioral health providers. More than 70% of all long term behavioral health patients require some form of medication management and continual access to appropriately prescribed and controlled prescription drugs. The cost of these wrap-around, case management type services, along with the cost of a long-term regimen of psychotropic drugs, are often left unsupported in traditional grant-based funding from foundations as the focus is usually on direct provider costs.

It is counterproductive and a sub-optimal use of precious financial resources to view what are undoubtedly integrated services (dental, behavioral health and medical, etc.) as discrete and disconnected investments when the patient-centered health home model has proven to be far more effective and efficient at creating positive patient outcomes, especially for the most vulnerable populations. The most effective investments (including the methodologies being employed by major payers) view patient needs in their entirety and in an integrated delivery and management model heavily enabled by technology and true health home processes (like those offered and supported at LSCC). Funding should be provisioned based on the whole continuum of services instead of applied in the obsolete “silos” of traditional health care models.

CONCLUSION

LSCC offers a unique and valuable response to the extensive and growing gap between those who need behavioral health care and the resources that are available. As a behaviorally-enhanced health home, LSCC provides comprehensive, coordinated, and culturally and linguistically appropriate care that is responsive to individual needs. In the past seven years, LSCC has grown its behavioral health program into the largest network of behavioral health providers in Williamson County and one of the largest networks in the region, providing a wide range of behavioral health services for children, teens, adults, and seniors. These services are integrated with primary medical care to provide seamless, holistic care that is more effective, both in terms of cost and treatment outcomes. LSCC continues to expand and enhance its robust behavioral health program in Williamson County and beyond to further increase access to comprehensive health care for the uninsured and underserved in our region.

REFERENCES


4. The MacArthur Initiative on Depression Primary Care [Internet]. Hanover (NH): Patient Health Questionnaire; cited September 4, 2011. Available from: http://www.depression-primarycare.org/clinicians/toolkits/materials/forms/phq9/


A generous grant from the Williamson County & Cities Health District funded a comprehensive performance improvement project to identify opportunities to improve the detection, investigation and management of outbreaks of severe respiratory tract infection (SRTI), including those due to H1N1 and other influenza viruses, in Central Texas. This report summarizes our methods, findings, conclusions and recommendations.

Methods: This project included the following steps:

1. A review of the medical literature to evaluate applications, best practices and value of using defined syndromes in the diagnosis, treatment, surveillance and reporting of SRTI including H1N1 influenza;

2. A survey of available laboratory testing capabilities relevant to the definitive diagnosis of SRTI at major Williamson County healthcare facilities;

3. A gap analysis between practices identified in medical literature and current practices in Williamson County;

4. The preparation of written recommendations; and

5. A series of educational presentations designed to increase awareness of key healthcare professionals regarding the risk, detection, investigation and management of SRTI outbreaks in Williamson County.

Syndromic Surveillance for Severe Respiratory Tract Infection Outbreaks: Subsequent to the distribution of anthrax spores through the mail in 2001, federal funding became available to design, implement and test systems of automated syndromic surveillance for the early detection of outbreaks, whether natural or perpetrated by terrorists. Many of these systems used chief complaint data from emergency department
visits, because the chief complaint was often the only clinical information available in electronic form. The National Bioterrorism Syndromic Surveillance Demonstration Program (NSSDP) used diagnoses derived from primary care visits and included large healthcare systems employing electronic health records in four states. In spite of substantial public funding and the participation of nationally recognized infectious disease physicians and biostatisticians, the overall results were disappointing. Among the obstacles to effective automated syndromic surveillance are the limited market penetration of electronic health records, timeliness of data transfers from healthcare systems and low “signal to noise” ratios for common disease syndromes. For example, the background level of respiratory disease in the community precludes detection of small outbreaks of SRTI unless public health is willing to investigate large numbers of “false positive” signals due to random variation in respiratory disease occurrence in order to detect the occasional “true positive” pointing to a real SRTI outbreak. Specificity can be improved by only investigating very strong, and hence, very unusual signals, but this comes at the price of decreased sensitivity. And, large outbreaks become clinically obvious, precluding the need for complex automated syndromic surveillance systems.

Although routine automated syndromic surveillance has not lived up to early expectations, there are several applications of syndromic surveillance, whether automated or not, that appear to have value. These include the following:

- Reactive syndromic surveillance should be an established part of outbreak investigation when a single case of an unusual infection is reported or a positive signal is received from environmental biosurveillance. Also, syndromic surveillance should be initiated during disasters with increased risk for infectious disease outbreaks such as floods, mass evacuations, or mass gatherings.
- Monitoring the incidence of Community Acquired Pneumonia (CAP) might be an effective tool for the early detection of SRTI outbreaks and is, by definition, a form of syndromic surveillance.
- Clinicians need to be especially vigilant for clinical syndromes consistent with SRTI due to unusual organisms, such as patients presenting with SRTI and...
  - history of foreign travel;
  - history of exposure to animals;
  - hemoptysis; or
  - widened mediastinum.

Trends in Clinical Practice Relevant to SRTI: Earlier this year, Bartlett published a thoughtful review of trends in diagnostic testing for CAP over time. He laments the decline in identification of a specific etiologic agent from >90% of cases in the pre-antibiotic era to <10% of cases in 2009. The implications for public health surveillance of zoonotic and potential agents of bioterrorism are obvious: physicians cannot report what they do not diagnose. Bartlett attributes the currently dismal state of definitive diagnosis to the following realities:
- Pressures to reduce costs in diagnostic evaluations;
CMS performance standards requiring initiation of antimicrobial therapy within six hours of admission;

Demise of “house staff laboratories” as a consequence of the Clinical Laboratory Improvement Act (CLIA);

Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults published in 2007 by the Infectious Diseases Society of America and American Thoracic Society that classify sputum and blood culture as “optional” for most cases of CAP; and

Clinical evidence supporting empiric therapy.

Survey of Diagnostic Laboratory Capabilities: Based upon the premise that accurate diagnosis supports outbreak recognition, we sought to identify any significant gaps in clinical laboratory capabilities that might negatively impact the ability of physicians to recognize disease outbreaks due to new or emerging respiratory pathogens by conducting a survey of relevant diagnostic laboratory capabilities at Williamson County acute care hospitals. We found that the diagnostic laboratory tests needed to identify specific etiologic agents in patients presenting with SRTI are readily available at all Williamson County acute care hospitals. Hence, the ability of clinicians to recognize outbreaks of SRTI due to specific respiratory tract pathogens does not appear to be impaired by any deficiencies in laboratory support.

Gap Analysis: After searching the relevant English language medical literature for best practices, we compared our knowledge of clinical, laboratory, and surveillance practices within Williamson County to proven and promising innovations elsewhere. The results of this gap analysis are discussed below.

Conclusions and Recommendations to Improve Detection of SRTI Outbreaks:

1. The earliest possible recognition of small SRTI outbreaks (1-9 cases) is a critically important public health surveillance objective at the local level.

2. At present, automated syndromic surveillance systems contribute little to achieving this objective because the “signals” cannot be distinguished from the perennial background “noise” of community respiratory infections.

3. Hence, the earliest possible recognition of small SRTI outbreaks (1-9 cases) is entirely dependent upon effective human surveillance which is comprised of three components: clinical suspicion, definitive diagnosis and timely reporting. We found opportunities to improve each of these three components of human surveillance.

4. To expect busy clinicians, seeing huge numbers of patients with common illnesses, to reliably recognize, or at least suspect, the occasional exotic disease is like asking them to find the proverbial “needle in a haystack.” Yet, we must ask them to do so and we need to do what we can to make their task easier. Two specific options follow:

a. WCCHD might collaborate with Texas A&M HSC College of Medicine to offer an annual continuing medical and nursing education program on public health issues with
routine inclusion of material designed to enhance clinical suspicion of CDC Category A agents of bioterrorism, emerging respiratory pathogens and unusual clusters or patterns of illness. While the format would need to be tailored to the target audience, this endeavor would build upon WCCHD’s highly successful annual conference for school nurses.

b. Persuade local hospitals to adopt emergency department triage procedures that include an explicitly defined travel and exposure history for all patients presenting with fever. Of course, not all infected patients are febrile, so this could be extended to all medical (non-trauma) patients. The knowledge that a patient was recently on another continent, which could be easily missed in the absence of routine travel histories, would broaden the differential diagnosis for an astute clinician.

5. We found no real deficiencies in laboratory support for definitive diagnosis of SRTI. However, the timely diagnosis of unusual, exotic and emerging respiratory tract pathogens would surely benefit from expanded coverage of Williamson County hospitals by fellowship trained infectious disease specialists. WCCHD might offer to assist area hospitals as they seek to recruit additional infectious disease physicians.

6. Current reporting of notifiable conditions within Williamson County appears to be exclusively by phone or fax communication and requires active human intervention. WCCHD might collaborate with Texas A&M HSC and the Texas Department of State Health Services (DSHS) to implement automated reporting. Specific suggestions include:

a. WCCHD might encourage DSHS to collaborate with an early adopter of the electronic health record (EHR) to fully automate the reporting of all notifiable conditions. We have identified an eager candidate for this collaboration, but progress has been hampered by the need for greater clarity regarding precisely what should be reported and when. For example, should the clinical suspicion of anthrax, smallpox or measles trigger an electronic report or only the confirmed diagnosis? Would the same be true for salmonella, shigella or hepatitis A?

b. WCCHD might approach one or two of the largest primary care providers in Williamson County (LSCC, ARC, etc.) with a proposal to implement automated reporting of notifiable conditions.

c. WCCHD might approach local hospitals and reference labs operating in Williamson County with a proposal to implement automated reporting of notifiable conditions.

7. Since the initiation of mandated public reporting on certain aspects of care, all Williamson County hospitals have allocated resources for real time monitoring of the care provided to patients with community acquired pneumonia (CAP) who meet clinical criteria for admission. Hence, accurate and timely information exists
regarding this precisely defined clinical syndrome which is essentially synonymous with SRTI. We recommend WCCHD evaluate CAP incidence monitoring as a tool for the early detection of SRTI outbreaks. We believe the exclusion of HCAP will improve the signal to noise ratio and the positive predictive value of signals. Of course, CAP incidence monitoring will not, by definition, be capable of detecting healthcare associated outbreaks of SRTI. However, all accredited healthcare organizations have infection control programs charged with the detection of nosocomial outbreaks, whereas, the primary responsibility for early detection of community outbreaks rests with public health.

8. One other syndrome needs to be considered for routine reporting and surveillance: community-acquired, life-threatening (defined as requiring admission to ICU), illness consistent with infection in a presumably immunocompetent host without a definitive diagnosis after 36 hours in the hospital. Cases meeting this definition are expected to be quite rare. However, in the absence of routine reporting to public health, an outbreak could occur due to a new or emerging pathogen and escape detection if individual cases were admitted to different hospitals.

Conclusions and Recommendations to Improve Investigation of SRTI Outbreaks:

1. Whenever a CDC Category A agent of bioterrorism, other unusual pathogen, or case of community-acquired, life-threatening (defined as requiring admission to ICU), illness consistent with infection in a presumably immunocompetent host without a definitive diagnosis after 36 hours in the hospital is reported to public health, an explicit protocol of reactive surveillance should be initiated to identify similar, not-yet-reported cases within the County. Technologies beyond telephone and facsimile need to be evaluated and deployed in support of the critical and time-sensitive function. Potentially, the Public Health Information Network (PHIN) could be used for this purpose.

2. Broader coverage of Williamson County hospitals by fellowship trained infectious disease specialists would enhance public health's ability to efficiently investigate SRTI outbreaks. WCCHD might assist local hospitals in their recruiting efforts.

Conclusions and Recommendations to Improve Management of SRTI Outbreaks:

1. Existing surveillance systems are adequate for monitoring the progression and evolution of large outbreaks.

2. Google Flu Trends appears to provide comparable information at no cost4. Furthermore, Google Flu Trends may speak more directly to the public's perceived need for information. By monitoring Google search queries, public health might be able to monitor the public's appetite for information in the midst of non-influenza outbreaks.

3. The management phase of SRTI outbreaks is primarily about the availability and allocation of relevant resources, such as hospital beds,
ICU beds, ventilators, etc. Since this is not fundamentally different than the management of non-biological disasters, there is no need for separate policies, procedures or protocols for the management of SRTI outbreaks—the “All Hazards” approach should be employed.

REFERENCES


INTRODUCTION

In 2009, pertussis incidence in Williamson County, Texas, was 258 cases per 100,000 one of the highest reported for a county in the United States. Both the number of cases reported and the outbreak duration made it a sentinel event. The outbreak lasted nearly two years and had a dramatic impact on the lives of many residents. It was not uncommon for multiple household members to have suffered from pertussis by the end of the outbreak, amplifying the economic impact on families. The direct medical costs incurred included visits to the emergency department, admission to hospitals, visits to clinics, and cost of prescription and over-the-counter medications. Indirect costs included the cost of unpaid absences from work due to illness in the family and loss of revenue due to student absenteeism.

Although the magnitude of the outbreak was unexpected, a rise in incidence was not, since pertussis generally follows a three to five year cycle. In 2005, the last significant outbreak year in Williamson County, the incidence was 76 cases per 100,000 (Chart 1).

The reasons for the dramatic 2009 increase in pertussis undoubtedly include increased awareness of the disease by providers and the public, the availability of molecular tests (PCR) with a rapid turn-around time, and aggressive case and contact investigation by the Williamson County and Cities Health District (WCCHD). However, the impact of other factors on the incidence of disease and reporting data are less
certain. Reduced effectiveness of the vaccine may point to lower than expected vaccine efficacy rates, improper vaccine handling, or changes in the biology of *Bordetella pertussis*. The switch from whole cell vaccine (DTwP) to acellular vaccine (DTaP) is another factor to consider. The high efficacy rates referenced by manufacturers for acellular vaccines are based on a case definitions with clearly defined symptoms for pertussis. However, surveillance systems may capture milder cases that may not be considered a case in a vaccine efficacy study. Many of the mild cases were documented to be fully vaccinated. Many of the day-care and school age children reported as cases during the outbreak received a primary vaccination series which included both acellular and whole cell pertussis vaccines. In addition, a compressed schedule for the primary series, in which the administration of the fifth dose is closer to 4 years rather than 6 years of age, may play a role in the timing of waning immunity.

To further complicate pertussis surveillance, alternative etiologies and/or co-infections may be responsible for some of the pertussis cases being reported to public health. *B. holmesii* and *B. parapertussis*, and a number of viruses mimic pertussis, particularly during the initial or catarrhal stage.

Before the outbreak subsided in December 2010, the number of reported cases peaked during the months of April 2009, January 2010, and October 2010, illustrating the progress of the disease as it moved throughout Williamson County producing “mini” outbreaks. Each of these outbreaks followed a similar pattern, with extensive spread of the illness within households, day cares, school systems, and businesses. Often the illness spread beyond one location by the time a public health investigation was initiated. Lags in the reporting of suspect cases made it difficult to get ahead of the outbreak and control spread from community to community.

**Disease Surveillance Methods**

WCCHD followed CDC and DSHS guidance for investigating pertussis. For endemic or sporadic cases, the clinical case definition is a cough illness lasting at least two (2) weeks with one of the following symptoms occurring without other apparent cause: paroxysms of coughing, inspiratory whoop, and post-tussive vomiting. The decision on whether or not to broaden the case definition to a “cough illness lasting at least 14 days” was based on (1) approval of an outbreak name by DSHS, and (2) the potential for spread and exposure to high risk individuals.

During patient interviews detailed demographic and clinical information were collected on the suspect cases. Interviewers are trained to ask probing questions to uncover additional suspect cases in the household and to determine the potential for spread outside of the household during the period of communicability. Clinical data for all cases, including treatment data, were usually obtained directly from providers and patients. Most laboratory reports were electronic and assigned to WCCHD via the National Electronic Disease Surveillance System (NEDSS). If pertussis was highly suspected, WCCHD investigators identified and recommended chemoprophylaxis to close contacts and high-risk contacts. In areas with documented outbreaks, investigators did not wait for laboratory confirmation to
implement outbreak control measures appropriate for the setting. If suspicion of pertussis was low (i.e., sporadic case in an area with no reported outbreaks, no epidemiologic linkage to a confirmed pertussis case, no paroxysms, etc.), investigators waited for laboratory confirmation of the case to initiate contact investigations and recommendations for prophylaxis.

**Laboratory Confirmation and Case Classification**

Over the course of the outbreak, problems with laboratory testing complicated investigation of cases and outbreaks. PCR testing protocols used by several private laboratories resulted in an unusually high number of false positive and equivocal results being reported to providers. These invalid laboratory results misinformed providers and distorted the clinical presentation of pertussis. WCCHD was one of two public health departments in Central Texas to partner with the Texas Department of State Health Services (DSHS) to conduct a comparison study of PCR testing at DSHS versus a private lab. Two clinics collected dual nasopharyngeal swabs on patients presenting with pertussis-like symptoms. Parallel testing was performed by a private laboratory and the DSHS laboratory. The dramatic lack of congruence between the two laboratories (Table 1) prompted DSHS to notify the Centers for Disease Control and Prevention (CDC).

WCCHD and DSHS also conducted an environmental study which affirmed the conclusion of investigators in other parts of the country that vaccine DNA contamination in provider offices was a possible source of false positive and equivocal pertussis PCR tests. The results of this and similar investigations suggest high cutoffs may be picking up low level (environmental) DNA, resulting in the
reporting of equivocal and false positive results. Environmental contamination of clinical swabs is more likely to affect outcome of testing when liquid media is used for transport/testing. In response to these problems, the CDC issued “Best Practices for Health Care Professionals on the use of Polymerase Chain Reaction (PCR) for Diagnosing Pertussis.”


WCCHD currently does not require the confirmation of outbreaks through the isolation of *Bordetella pertussis* from a clinical specimen. In 2009, there were two culture positive results but these tests were ordered by providers without any guidance from public health. The majority of confirmed cases in Williamson County were persons who met the case definition and were PCR positive, or persons who met the case definition and were epidemiologically linked to a PCR positive confirmed case.

Probable cases that met the case definition (or outbreak definition for close contacts of cases), were not PCR or culture positive (not tested or tests are negative), and were not epidemiologically linked to a laboratory-confirmed case.

<table>
<thead>
<tr>
<th>AGE GROUP (Years)</th>
<th>CASE STATUS</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Confirmed</td>
<td>Probable</td>
</tr>
<tr>
<td>&lt;1</td>
<td>110 (11%)</td>
<td>71 (9%)</td>
</tr>
<tr>
<td>1-4</td>
<td>219 (23%)</td>
<td>212 (26%)</td>
</tr>
<tr>
<td>5-9</td>
<td>221 (23%)</td>
<td>261 (32%)</td>
</tr>
<tr>
<td>10-14</td>
<td>125 (13%)</td>
<td>132 (16%)</td>
</tr>
<tr>
<td>15-19</td>
<td>45 (5%)</td>
<td>23 (3%)</td>
</tr>
<tr>
<td>20+</td>
<td>236 (25%)</td>
<td>128 (15%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ETHNICITY</th>
<th>CASE STATUS</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Confirmed</td>
<td>Probable</td>
</tr>
<tr>
<td>non-Hispanic</td>
<td>606 (73%)</td>
<td>725 (76%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>201 (24%)</td>
<td>208 (22%)</td>
</tr>
<tr>
<td>unknown</td>
<td>20 (3%)</td>
<td>24 (2%)</td>
</tr>
</tbody>
</table>

TABLE 3. PERTUSSIS CASES BY ETHNICITY & CASE STATUS 2009 – 2010
**Descriptive Epidemiology**

**Case Counts**

The outbreak probably started in the urban areas of Round Rock, Austin, Cedar Park, and Leander and expanded to include Georgetown, Taylor, and the rural areas (see Chart 2). Outbreaks in the Round Rock/Hutto and Georgetown areas both had two peaks 8 to 9 months apart. Because mailing addresses for cities extend beyond the incorporated area of a city, it is very difficult to obtain a population estimate for calculating incidence. This problem is usually magnified in rural areas and for smaller cities like Hutto. Without a geographic adjustment to account for cases living outside of the official boundaries of a city, the incidence calculation which utilizes the place population estimate from the census would most likely be inflated.

**Incidence**

For the <1 year age group, incidence is usually higher in males (see Chart 4). From 2009 to 2010 incidence went down in every age category except 1 – 4 years of age (see Chart 5). For infants <1 year of age Hispanic infants had the highest incidence. In all other age categories non-Hispanics had higher incidence (see Chart 7). For 2009, a peak in incidence occurred at age 9 (see Chart 6). This result clearly reinforces the ACIP recommendation for a Tdap at 10 – 11 years of age.

**Symptoms & Severity**

The top four symptoms reported by patients in 2005 were cough, paroxysmal cough, vomiting following cough, and inspiratory whoop. These symptoms predominated again in 2009 to 2010. However, there appears to be differences in symptoms characteristic of severe disease in the <1 year and 1 – 4 year old age groups. In 2005, 24% of cases <1 year of age included a report of cyanosis as a symptom. The profile for these cases also included apnea (8%) and seizures (3%). For 2009 – 2010 cases, cyanosis and apnea were both reported in only 2% of cases <1 year of age. In the 1 – 4 years of age category, apnea and seizures were both reported in 2% of 2005 cases.
There were no reports of these symptoms in this age group for 2009 – 2010. Fever, wheezing, and gagging were all reported in 2009 – 2010 but were absent from the 2005 outbreak.

**Laboratory Testing**

During 2009, WCCHD received reports for 1,344 PCR laboratory tests on 1,337 patients. The seven patients with multiple test results all had tests performed on specimens collected more than a month apart. The percentage of all pertussis investigations which included a PCR test was 68% (1,337/1,953). Seventy-six percent (1,016/1,344) of all PCR tests were negative. Sixty-three percent (328/517) of cases classified as confirmed were PCR positive. Thirteen percent (41/328) of PCR positive cases did not meet clinical case definition and were therefore classified as "not a case". PCR was more likely to provide confirmation of a pertussis diagnosis for children 5 to 14 years of age (see Chart 9). PCR may not be the best choice for confirming cases in adolescents and adults, with only 19% and 14%, respectively, of PCR tests performed on suspect cases in these age groups producing positive results.

**Vaccination Status**

Vaccination histories were evaluated on 47% (494/1060) of confirmed and probable pertussis cases in 2009. Of these, 170 cases were laboratory confirmed with PCR, while 91 cases were classified as confirmed by being epidemiologically linked to a laboratory confirmed case.

More immunization records were obtained for boys (51%) than for girls (42%). The majority of immunization records were obtained for children 1 to 14 years of age. The percentages of records obtained by age group were: <1 year (29%), 1 – 4 (37%), 5 – 9 (77%), 10 – 14 (75%), 15 – 19 (66%), and 20+ (2%). The significant differences amongst age groups were due in large part to the responsiveness of
school districts to public health record requests. Records for adults are more likely to be incomplete and fragmented amongst several different providers.

The vaccination records were evaluated for their up-to-date (UTD) status for pertussis vaccination as of the date their pertussis symptoms started (i.e. onset date). As expected, coverage was highest for 5 – 9 year olds. Coverage levels for 10 – 19 were lower due to the lack of a Tdap booster; many of the 11 – 12 year olds were not necessarily behind according to the current ACIP recommendations, but they were eligible for Tdap. Overall, 80% of cases were UTD, 14% were not UTD, and 6% were technically UTD according to the ACIP schedule but eligible to receive a pertussis vaccine. The average age for the administration of the 4 to 6 year booster was 4.4 years.

Approximately 39% of cases reported for 2009 – 2010 were 10 years of age and older. This cohort likely received whole cell vaccine for most of their primary series. The primary series for cases 7
to 9 years may have included both whole cell and acellular vaccines. For children 6 and younger, the vaccine used to complete their primary series was most likely exclusively acellular.

**DISCUSSION AND RECOMMENDATIONS**

The rise in pertussis is a complex, multifaceted public health problem. However, while epidemiologists work to address questions about vaccine efficacy, case definition, and laboratory testing, public health departments must explore innovative solutions for improving communication with healthcare providers and raising the public’s awareness of pertussis. Key messages include:

- Unimmunized infants and children are at higher risk of illness and severe complications. Vaccination is part of a strategy to prevent hospitalization and death due to pertussis;
- As a general rule, infants should not be in close contact with coughing children and adults;
- Infants must start their primary series on time and stay on schedule;
- Adolescents and adults can help form a protective cocoon around an infant by getting vaccinated with Tdap.

WCCHD is currently evaluating how it handles confirmation of pertussis cases and outbreaks. Physician diagnosis is a key component of the pertussis case definition. Without ready access to information documenting an alternative diagnosis, public health investigators generally assess symptom information during a telephone interview of the patient or patient guardian. Improved communication with providers as well as direct access to patient information in a clinic chart, electronic health record (EHR) or a health information exchange (HIE), is needed to improve the process for assigning a final case status.

Resources to assist with differential diagnosis for respiratory disease may be found at: [http://emergency.cdc.gov/urdo/differential.asp](http://emergency.cdc.gov/urdo/differential.asp)

WCCHD can support providers by (1) monitoring the quality of PCR testing, and (2) informing
the general public of the limitations of PCR testing for pertussis. WCCHD recommends providers evaluate their current clinic layout and patient flow. Changes may be needed to address possible vaccine DNA contamination if a clinic experiences a sudden increase in PCR positive or equivocal results. For all diseases, any significant changes in the routine pattern for laboratory results or clinical presentation should be discussed with public health.

As the 2009 outbreak intensified, residents became more aware of pertussis. Many parents demanded their physician order a PCR test for pertussis even though the clinical presentation often did not warrant testing. WCCHD now asks providers if the test was ordered as a rule out or as a confirmatory test of a doctor’s diagnosis of pertussis. Successful interventions include the treatment of the case and the prescribing of appropriate chemoprophylaxis for close contacts, even if a report of a confirmed or probable case was ultimately not submitted to the CDC. Rule-out tests returning a positive test result are not reported as cases if they do not meet clinical case definition.

For best practices for the use of PCR go to: http://www.cdc.gov/pertussis/clinical/diagnostic-testing/diagnosis-pcr-bestpractices.html

Other points about laboratory testing to consider:
- Providers should not wait for confirmatory laboratory to report a case they feel meets the clinical
case definition. The patient should be treated and WCCHD notified immediately to initiate a public health investigation;

- PCR test results should not be used exclusively as criteria for excluding children from school or adults from work. Treated patients may continue to cough long after their period of communicability;

- Serological testing may be preferable to PCR for confirmation in adolescents and adults.

Does every case of pertussis need to be investigated and counted to achieve the goal of preventing severe disease and death in infants? Reports to WCCHD in the older age groups range from mild to severe. Hospitalizations in the older age groups are uncommon but do occur; however, these infections are rarely life-threatening. Unfortunately, there simply are not enough resources to identify and count all cases of pertussis in the adult population. Pertussis appears to be "hyper-endemic" in Williamson County, with the disease control activities of public health having little impact on spread. Past studies confirm that if you look hard enough for additional pertussis cases, particularly in adults, you will find them. Limited resources will need to shift toward supporting broad educational campaigns, fully utilizing new media tools and direct public health interventions focused on preventing pertussis in infants and other high risk individuals.

WCCHD will advocate for the development of new vaccines, ensure all emergency rooms utilize Tdap, support the Texas Medical Association and other advocacy groups in their efforts to improve systems for vaccination and reimbursement, emphasize the importance of protecting newborns from coughing children and adults, while at the same time ensuring providers and parents understand infants may not have classic symptoms. The WCCHD epidemiologist will continue to monitor trends in pertussis as well as severity of disease. To ensure our surveillance has not missed any pertussis deaths, WCCHD plans to review vital records during 2009 – 2010 to look for any unusual trends in infant mortality that parallel the pertussis outbreak. Resources permitting, WCCHD may also work to validate the immunization histories collected during the outbreak by comparing with provider records.

<table>
<thead>
<tr>
<th>Age Group (Years)</th>
<th>% Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>27%</td>
</tr>
<tr>
<td>1 - 4</td>
<td>22%</td>
</tr>
<tr>
<td>5 - 9</td>
<td>31%</td>
</tr>
<tr>
<td>10 - 14</td>
<td>32%</td>
</tr>
<tr>
<td>15 - 19</td>
<td>19%</td>
</tr>
<tr>
<td>20+</td>
<td>14%</td>
</tr>
</tbody>
</table>
Twenty-eight percent (7/25) hospitalizations were Hispanic. All Hispanic cases admitted were in the <1 year of age category, three male cases and four female comprising thirty-nine percent (7/18) of admitted cases <1 year of age.

### TABLE 5. PERTUSSIS HOSPITALIZATION BY AGE GROUP & GENDER 2009 – 2010

<table>
<thead>
<tr>
<th>AGE GROUP (Years)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>1-4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5-9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10-14</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15-19</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20+</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

*Twenty-eight percent (7/25) hospitalizations were Hispanic. All Hispanic cases admitted were in the <1 year of age category, three male cases and four female comprising thirty-nine percent (7/18) of admitted cases <1 year of age.

### REFERENCES


5. DSHS Surveillance Guidelines for pertussis.


**Introduction**

Pandemic outbreaks are caused by new virus subtypes, by virus subtypes that have never circulated among people, or by virus subtypes that have not circulated among people for a long time.\(^1\) During the 20th century, the emergence of several new influenza A virus subtypes caused three pandemics, all of which spread around the world within a year of being detected. Before 2009, the last influenza pandemic in 1968-1969, called the “Hong Kong flu,” caused about 34,000 deaths in the United States. The 1957-1958 “Asian flu” caused about 70,000 deaths in the United States. The highest number of known influenza deaths from pandemic influenza occurred in 1918-1919 with the “Spanish flu.” More than 500,000 people died in the United States and as many as 50 million people may have died worldwide. Many people died within the first few days after infection and others died of secondary complications. Nearly half of those who died were young, healthy adults.\(^1,2\)

<table>
<thead>
<tr>
<th>Area</th>
<th>Hospitalizations*</th>
<th>Intensive Care Unit (ICU) Admissions*</th>
<th>Deaths**</th>
<th>Pediatric Deaths **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Williamson County†</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>DSHS HSR 7†</td>
<td>113</td>
<td>35</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Texas</td>
<td>2,316</td>
<td>585</td>
<td>240</td>
<td>37</td>
</tr>
</tbody>
</table>

† Williamson County is one of thirty counties in the Texas Department of State Health Services (DSHS) Health Services Region 7 (HSR 7). HSR 7 is one of the eight health service regions of DSHS.
* Reporting of hospitalizations and ICU admissions began 9/20/2009; ICU admissions are included in total hospitalizations.
** Reporting of deaths began 4/15/2009; statewide total includes a child from Mexico City who died in Texas. Pediatric deaths are included in total deaths.

Texas data source: http://www.dshs.state.tx.us/txflu/TX-surveillance.shtml
THE SCENARIO

In 2009-2010 a new and very different flu virus (called 2009 H1N1) spread worldwide causing the first flu pandemic in more than 40 years. Novel 2009 H1N1 influenza virus was first detected in the United States in April 2009.\textsuperscript{3,4} The Williamson County and Cities Health District (WCCHD) coordinated the response to this emerging threat with partners at the state, regional, and local levels.

For the 2009-2010 pandemic, the U.S. Centers for Disease Control and Prevention (CDC) estimates between 43 million and 88 million cases of 2009 H1N1 occurred between April 2009 and March 2010. The CDC also reported over 12,000 H1N1 influenza-associated deaths including over 1,200 deaths in children age 0 – 17 years.\textsuperscript{3,4,5} In Texas, the peak month for adult and pediatric H1N1 influenza-associated deaths was October (81 deaths, including 20 pediatric). For the entire pandemic period, there were 240 H1N1 influenza-associated deaths reported in Texas, including 37 pediatric deaths. An additional 23 pediatric deaths were reported associated with “other” flu.\textsuperscript{6}

PUBLIC HEALTH RESPONSE

OBJECTIVE #1: Utilize disease surveillance systems for monitoring the progress of the pandemic, tracking spread of illness as well as severity

During the initial stages of the pandemic, emphasis was placed on laboratory confirmation of the presence of 2009 H1N1 in each Texas County. However, due to the length of time between specimen collection and reporting of results, it quickly became obvious that confirmation was simply a signal indicating the virus had already spread throughout the County. To be effective, many of the pandemic control measures such as social distancing and school closures would need to have occurred well before the presence of the virus was confirmed in Williamson County. Once the novel virus was identified and it was clear it had spread quickly, the basic goals of surveillance did not differ significantly from seasonal surveillance. Keeping track of the number of cases was impractical. The emphasis shifted toward monitoring trends and severity, particularly in the pediatric and high risk populations (e.g. pregnant women).

NOTE: Routine seasonal WCCHD flu surveillance system does not capture all cases of influenza or influenza-like illness (ILI). The number of reporters sending in flu reports varies from week to week. Results of analysis using these data should be interpreted with caution and are generally useful only for detecting trends.

OBJECTIVE #2: Ensure effective communication between WCCHD & other responding agencies

During the initial 7 days of response to the reports of H1N1, there was great uncertainty about the potential scope and severity of the pandemic. To facilitate communication between public health and other response agencies, Williamson County Department of Emergency Communications deployed a Regional Mobile Communication trailer to the Georgetown location of WCCHD (see picture). The information technology systems, including satellite connectivity and television, were utilized to increase WCCHD’s communications capacity.
Configured radios and other mobile assets were positioned in advance to support sites to be opened in the event a community-wide mass vaccination or dispensing campaign was ordered.

The number of guidelines, websites, and conference calls associated with the pandemic grew as the event evolved, and it became difficult to keep track of updates. The task of monitoring changes to various websites (CDC, DSHS) ultimately had to be delegated to one position at WCCHD. This position was responsible for keeping a binder with hard copies of all CDC and DSHS guidelines and recommendations, looking for any inconsistencies, and sending out alerts to WCCHD leadership if significant changes in guidance occurred.

**OBJECTIVE #3: Organize the public health response under the Incident Command System (ICS) and Activate Plans to Protect Critical Infrastructure**

The Incident Command System (ICS) enables a coordinated response among various jurisdictions and agencies, and establishes common processes for planning and managing resources. Organizing the pandemic response was complex because many different levels of government were involved, many of which had limited experience working together. During the initial stages, when the severity of the illness was not well known, WCCHD disease investigators worked to initiate active surveillance and process key guidance from DSHS and the CDC, making sure providers were kept up to date. WCCHD activated personnel under ICS as needed to accomplish these tasks; however, much of the work associated with the pandemic was performed as part of routine operations.

In the event of a request for resources from the Strategic National Stockpile, Williamson County activated an All Hazards Incident Management Team to help manage movement and distribution of material from the stockpile. ICS played a significant role in organizing the longer term response, providing a framework for the cooperation across agencies and jurisdictions vital for ensuring consistency of media messaging and recommendations to providers.

Soon after vaccine became available, WCCHD activated plans for its distribution. WCCHD’s role was to serve as a depot for vaccine and supplies, securing the valuable vaccine and working with emergency management officials to identify agencies vital to a successful response to the pandemic. Emergency Medical Services, fire departments, law enforcement agencies, hospitals, WCCHD, and school districts all were identified as critical infrastructure for the County and received vaccine through an emergency
vaccine distribution system. Public health was also responsible for monitoring vaccine usage and possible adverse events due to vaccination.

Williamson County was prepared to protect its critical infrastructure during the pandemic in part because of an annual exercise testing the systems for distributing the vaccine. The annual exercise includes vaccination training conducted by Williamson County EMS for all EMT-B fire fighters in the County, site security at the WCCHD depot, designation of authorized representatives to receive vaccine, allocation of limited vaccine supplies, notification of vaccine availability and scheduling pick-up, and collection of vaccine doses administered data. During the exercise, representatives picked up seasonal flu vaccine, supplies, and paperwork from a WCCHD Public Health Center. The jurisdictions administered vaccinations to first responders in their jurisdiction over a two to three day period.

Prior to 2009, the number of agencies participating in the influenza vaccine distribution exercise was increasing (see Chart Pg. 32), and the exercise evolved to include more complex communications elements and advance training. These enhancements were made possible through partnerships nurtured with school districts, emergency management coordinators and first responder agencies. With the arrival of the pandemic, key responder agencies were already familiar with the role of public health in a pandemic scenario and the requirements for picking up vaccine or medication at a WCCHD facility. As a result, when the exercise was held in 2010 over 5,000 doses of vaccine were distributed to twenty agencies.

**OBJECTIVE #4: Follow guidance targeting priority groups for vaccination & implement WCCHD mass vaccination plans & procedures**

Vaccine for the novel virus was available in Texas starting in October 2009. WCCHD received its first shipment in November 2009 to support vaccination of CDC-designated priority populations. In December 2009 restricted use ended. During the initial phase of vaccine distribution, November 2009 – December 2009, WCCHD provided technical and logistical support for seven H1N1 vaccination clinics hosted by school districts. Districts provided the facility, nursing staff, vaccine storage, and inventory management. Prior experience of school nurses in conducting pediatric vaccinations and mass vaccination clinics within their facilities during the “back-to-school rush” and through the Texas Vaccines for Children (TVFC) program allowed them to plan for and conduct H1N1 vaccination clinics with minimal oversight from WCCHD.
**LESSONS LEARNED**

Following the pandemic response, WCCHD identified potential areas for improvement through an After Action Review (AAR) process. The AAR process produces a report summarizing joint universal lessons learned. AAR recommendations include:

1. Strengthen and improve the quality of surveillance for acute respiratory disease;
2. Automate process for reporting influenza and influenza-like illness using electronic medical records and health data exchanges;
3. Utilize existing disease surveillance systems in place in hospitals. See article entitled "Performance Improvement Project on Outbreaks of Severe Respiratory Tract Infection" in this report by Sherwood et al;
4. Direct a regional Epidemiology workgroup to standardize procedures for seasonal influenza surveillance;
5. Direct a regional Epidemiology workgroup to create a template for situational updates during a pandemic;
6. Seek feedback from clinicians on how to improve communications systems. Make improving communications with providers a high priority;
7. Work with Chambers of Commerce and businesses to improve pandemic planning for dealing with sick leave policies that incentivize coming to work when ill. Also explore expanding concept of vaccine distribution to large business with onsite medical resources;
8. Review pandemic messaging to ensure public are receiving clear and concise messages with an emphasis on hand hygiene, cough/sneeze etiquette, staying at home if sick, and vaccination;
9. Review triggers for school closure. Look at other factors besides the rate of transmission when considering school closure (e.g. negative consequences of closure to the community, severity of illness).
WCCHD achieved its objective of providing the initial limited quantities of H1N1 vaccine to target priority groups as identified by both DSHS and the CDC. By capitalizing on strong working relationships that already existed, WCCHD demonstrated the ability to provide vaccine and supplies, coordinate planning efforts, and provide contract nursing staff as needed to man vaccination clinics. School districts provided manpower, facilities, expertise, and access to ensure H1N1 vaccine reached the desired audience. Relationships with emergency management personnel, first responders, and volunteers were strengthened through these efforts. Basic emergency management principles were followed throughout, and areas for improvement were identified and are currently being addressed.

Improvements to County pandemic response plans must be evidence driven, developed from a local and regional perspective. Epidemiologists from across Central Texas can prepare for the next pandemic by building upon the culture of cooperation that already exists. Whenever possible, epidemiologists should respond jointly to outbreaks and other routine public health interventions. This familiarity will inevitably improve the ability to communicate effectively, anticipate resource needs, act decisively, and respond in a coordinated fashion.

**REFERENCES**


7. Edward J. Sherwood, MD, FACP; Courtney Dodge, MPH; Catherine Pepper, MLIS, MPH. Performance Improvement Project on Outbreaks of Severe Respiratory Tract Infection. Williamson County and Cities Health District 2011 Epidemiology Report.
**INTRODUCTION**

Several Texas laws (Health & Safety Code, Chapters 81, 84, and 87) require specific information regarding notifiable conditions be provided to the Texas Department of State Health Services (DSHS). Health care providers, hospitals, laboratories, schools, and others are required to report patients who are suspected of having a notifiable condition (Chapter 97, Title 25, Texas Administrative Code). The Reportable Conditions List indicates when to report each condition. Cases or suspected cases of illness considered to be public health emergencies, outbreaks, exotic diseases, and unusual group expressions of disease must be reported to the local health department or DSHS immediately. Other diseases for which there must be a quick public health response must be reported within one working day. All other conditions must be reported to the local health department or DSHS within one week. Without such data, unusual occurrences of diseases might not be detected, trends cannot be accurately monitored, and the effectiveness of intervention activities cannot be easily evaluated. To view national reports for CDC/MMWR Summary of Notifiable Conditions go to: http://www.cdc.gov/osels/ph_surveillance/nndss/annsum/index.htm

**LIMITATIONS OF DISEASE SURVEILLANCE DATA**

For most conditions, the number of actual cases is likely higher due to under-reporting. Over-reporting is also possible due to misclassification of cases, false positive laboratory results or a probable case classification based solely on a symptom profile which mimics other conditions. Ongoing quality assurance is vital to minimizing the impact of these issues and ensuring the validity and consistency of surveillance data.

**CALCULATION OF INCIDENCE**

Incidence is the number of new cases of a disease that arise during a specific period of time. In this report it is expressed as: Incidence = (# cases of a disease or condition reported for a year/population at risk) x 100,000 = reported cases per 100,000 population

Disease incidence is only calculated if there are more than five cases reported. The reliability of incidence statistics based on a low number of reported cases should be questioned. Whenever possible, WCCHD utilizes the most current population estimates produced by the United States Census or the Texas State Data Center and Office of the State Demographer to calculate incidence. For current year data, incidence is calculated using a population projection.
### Summary of Notifiable Conditions (Incidence) - Cases Reported to WCCHD 2005-2010

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*Data source: Texas STD Surveillance Reports: [http://www.dshs.state.tx.us/hivstd/reports/default.shtm](http://www.dshs.state.tx.us/hivstd/reports/default.shtm)
### Summary of Notifiable Conditions Reported to WCCHD 2005-2010

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<td>-</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Vibrio spp. Non-toxigenic other unspecified</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>West Nile Fever</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yersiniosis</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Data source: Texas STD Surveillance Reports: [http://www.dshs.state.tx.us/hivstd/reports/default.shtm](http://www.dshs.state.tx.us/hivstd/reports/default.shtm)
Williamson County has some of the highest STD Case Numbers in 2010 compared to other counties:
  - Ranks #16 for Chlamydia cases (1,283)
  - Ranks #21 for Gonorrhea cases (237)
  - Ranks #15 for Primary and Secondary Syphilis (11)
  - Ranks #19 for Total Syphilis (37)

Even though case counts are high Williamson County is not among the 25 counties with highest STD case rates in 2010.

The number of STD cases that go undetected or unreported is unknown.

Upward trends in rates for Chlamydia and Syphilis must be addressed.

In 2010, Round Rock reported 602 Chlamydia cases, 118 Gonorrhea cases, 3 Primary and Secondary Syphilis, and 11 total Syphilis cases.
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Research Specialist, Transforming Texas

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Darlene MacFarland  
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Jacqueline Cavazos  
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Mike Caudle  
Emergency Preparedness & Response Coordinator

NOT PICTURED
Lisa Cogar - Nurse, Katie Arnold - Research Specialist, Margaret R. Richardson - Nurse, Ryan Moeller - Emergency Preparedness & Response Coordinator
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APPENDIX 3

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The yearly WCCHD Epidemiology Report welcomes contributions that help meet the informational needs of healthcare professionals, public health officials, and community leaders by describing issues or significant events with local impact particularly disease outbreaks, disease surveillance, case studies of unusual disease, community health assessments, relevant policy issues, health survey results and examples of successful evidence based programs.

**Article Types**

*Case Studies:* A case study presents detailed information about particular participant, patient or small group. Conclusions drawn from case studies are not applicable at the population level. Emphasis is placed on exploration and description.

*Feature Articles:* Features present the current status of a subject area with emphasis on implications for policy, practice, or future research.

*Public Health Practice Articles:* Practice articles describe innovative public health programs and initiatives, their current status, and documented outcomes.

**Topic Areas**

- Chronic or Infectious/Communicable Disease
- Mental Health
- Access to Healthcare
- Community Health Assessment
- Injury/Accidents/Emergency Medicine
- Emergency Preparedness & Response

**Conflicts of Interest** - The Epidemiology Report seeks full disclosure to avoid any appearance of a conflict. Please provide a statement regarding any potential conflict when you submit your manuscript. If no conflict of interest arose, a statement must still be submitted.

**Cover Letter** - When submitting your manuscript, please include a cover letter describing the article and explaining why it is unique, relevant, and applicable to the WCCHD Epidemiology Report. The cover letter should also note Institutional Review Board determination (approval or waiver) for all studies involving people, medical records, and human tissues.

**The Manuscript** - Title Page: (a) title (short and descriptive); (b) full names of all authors, including their graduate degrees (please limit number of authors to 10); (c) all authors’ institutional affiliations and job titles during the course of the research (and current affiliations and titles if different); (d) name, street address, telephone number, fax number, and e-mail address of corresponding author; (e) word count of the text (exclusive of synopsis, tables, and references), and the number of charts, tables, and figures.


**Article Length** - Please limit manuscript length to approximately 2,500 words, excluding synopsis, tables, figures, and references.

**Page numbering, Font, & Line Spacing/Numbering:** - To aid in the review process, please include page and line numbers in the manuscript and use 1.5-line spacing for optimal readability. The article must be typed in 12 point Times New Roman font.

*Submit manuscripts electronically in Microsoft Word (doc) to: Emily Ver Hoeve, evhoeve@wcchd.org*

*The deadline for submission is March 29, 2013. All submissions must be received by 5 pm on this day to be considered for the 2012 Epidemiology Report.*