

**PUBLIC HEALTH AND INFORMATION TECHNOLOGY
AT THE UNITED STATES-MEXICO BORDER:
EXAMPLES SHOW POTENTIAL**

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DEFINITION OF FRONTIER

Note: All references to “frontier” use the Consensus Definition of the National Center for Frontier Communities unless otherwise indicated (Frontier Education Center 1998; 2002). Counties and/or frontier areas so defined have been developed with the involvement of all of the relevant State Offices of Rural Health (100 percent response rate). This definition has not been adopted by any Federal programs but has been adopted as policy by the Western Governors' Association (Western Governors' Association 2004) and the National Rural Health Association. The Consensus Definition weights three elements – population density, distance in miles and travel time in minutes, which together, generally describe the geographic isolation of frontier communities from market and/or service centers. The Center understands that various programs will establish their own programmatic definitions and eligibility criteria. See the NCFC Website for further information, www.frontierus.org.

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I. INTRODUCTION

Health Information Technology (HIT) is an over-arching term referring to various electronic information systems related to health care delivery. The following report by the Government Accountability Office (GAO), issued in 2005, summarizes the impetus behind the national movement toward HIT development.

- *The United States health care delivery system is an information-intensive industry that is complex, inefficient, and highly fragmented, with estimated spending of \$1.7 trillion in 2003.*
- *Calling for transformational change in the health care industry, the Institute of Medicine pointed out that health care delivery in the United States has longstanding problems with medical errors and inefficiencies that increase the cost of health care.*
- *The President's health care information technology (IT) plan calls for the development and implementation of a strategic plan to guide the nationwide implementation of interoperable health information technology in both the public and private health care sectors that will prevent medical errors, reduce costs, improve quality, and produce greater value for health care expenditures.*

SOURCE: United States Government Accountability Office, 2005.

Policy makers at the State and Federal levels have moved from calling for the use of health information technology (HIT) to taking steps to mandate the use of HIT in the near future. The implementation of a National or regional HIT program creates a number of challenges, many of which are especially complex in the binational, bilingual United States-Mexico border region. The technological challenges are presented in this paper along with information about three specific health concerns on the border as examples of the role of HIT in the field of public health.

Many experts agree that the key to a successful national health information technology (HIT) initiative lies in achieving interoperability of various systems, networks, and technologies, through the establishment of national standards that can be effectively implemented across a broad range of settings and service delivery contexts. Yet because of the high-tech nature of HIT and public health informatics, most efforts to develop applications occur in urban areas and are dominated by urban perspectives. Thus it is important to document the experiences and perspectives of HIT initiatives in the most challenging of settings to inform the development of flexible, appropriate, and functional national standards and guidelines.

This report will explore the current status of HIT technologies in the United States-Mexico border region. The region is characterized by predominantly frontier geography; dynamic and

diverse populations; special health care needs with relatively poor access to health services; and relatively poor access to broadband information networks. This context creates unique challenges, opportunities, and uncertainties for the deployment of HIT by public health and healthcare agencies within the region. Examples of State, county, and local efforts to improve quality of care using HIT in public health organizations will be drawn from California, Arizona, New Mexico, and Texas in the U.S.; integration with public health efforts in the Mexican States of Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas will also be considered.

Three health improvement objectives were selected for focus based on the priorities of the Healthy Border 2010 Initiative: immunizations, obesity/diabetes, and tuberculosis.

A. Project Background

This report was prepared for the U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration (HRSA), Office of Rural Health Policy, under contract with the National Center for Frontier Communities (formerly the Frontier Education Center).

As the first phase of the project, the Frontier and Rural Expert Panel advisory group for this contract met in Tucson, Arizona, on March 9 and 10, 2006. Members of the Panel are listed in Appendix E. The meeting consisted of presentations by invited border health experts followed by a group discussion. Day two of the meeting included a field trip to Nogales, Arizona and Nogales, Sonora, Mexico (National Center for Frontier Communities 2006).

The purpose of the meeting was to clarify and define further research topics on frontier border health issues.

B. Research Objectives and Methods

This report will examine the use of health information technology in public health programs at the United States-Mexico border, with an emphasis on frontier and rural health. This report has three main objectives:

- To identify and describe contextual factors of the United States-Mexico border region that influence the adoption, implementation, and effectiveness of HIT;
- To describe the experiences of public health programs with HIT and public health informatics; and,
- To identify constraints, opportunities, and uncertainties regarding the advancement of HIT at the border.

This report is principally a literature review; documents reviewed include peer-reviewed journal articles, monographs, reports, periodicals, and organizational Web sites. Telephone interviews with expert informants supplement the literature and helped guide the inquiry.

“Border health” is a broad issue being addressed by numerous international, Federal, State, and local-level institutions as well as a number of private commercial and non-profit entities. The same is true of health information technology / public health informatics. Variations in terminology increase the complexity in developing a “representative” view of available information. Thus while the intent of this report was to produce an overview of these multiple disparate strands, given the enormity of the task, the findings are indicative rather than exhaustive.

“As we observe the increasing momentum for HIT at the Federal level, we find that appropriate understanding and consideration of the unique HIT needs of community clinics are not being addressed. Unless careful attention is paid to realistic HIT strategies for these clinics, we are at risk for having HIT increase rather than decrease the disparities in care. We need to take steps to ensure that the patients in community clinics have the same benefits of technology that will be available to patients outside the safety net.”

Statement of the Community Clinics Initiative to the Congressional Hearing “Fourth in a Series on Health Information Technology,” 109th Congress, Committee on Ways and Means, Subcommittee on Health, 2006.

II. BACKGROUND

A. The United States-Mexico Border Region

The United States-Mexico Border Region has been formally defined as the area within 100 kilometers of the international boundary between the United States and Mexico (United States-México Border Health Commission 2003-2005). Administratively, this encompasses 48 counties in four U.S. States (California, Arizona, New Mexico, and Texas), and in Mexico, 80 municipios in six States (Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas) (see **Appendix A** for a map of the border region).

Despite this formal definition, various formulations of the “border region” continue to exist. For example, the United States-México Border Health Commission counts only 44 U.S. counties as part of the border region, and the United States-Mexico Border Health Initiative of the U.S. Department of Health and Human Services includes 45 U.S. counties (the Arizona counties of La Paz, Maricopa and Pinal are excluded). These differences in definition account for some differences in demographic estimates between different organizations. For this report, 48 U.S. counties were included in the region, which corresponds with how each border State defines its border region.

1. Border Populations

The border region is nearly 2,000 miles long, with more than 12 million residents on the U.S. side (see table below) and more than 6 million residents in 80 municipios on the Mexican side (United States-México Border Health Commission 2003). The border region is usually identified with its major border cities and 43 points of entry or border crossing sites. But, while 90 percent of the border population resides in 14 paired, inter-dependent sister cities, 3 out of 4 border counties were classified as “frontier” in 2000 among the most isolated and least populated areas of the United States (see page v for the definition of frontier, and **Appendix B** for a list of border counties and those classified as frontier).

Table 1: Border region population, by race/ethnicity, 2005

	Arizona	California	New Mexico	Texas	Border Region
Number of Border Counties	7	3	6	32	48
Population	5,062,171	4,880,063	321,607	2,323,880	12,587,721
Percent of Population by Race/Ethnicity					
White	77	66	81	76	73
Black/African American	3	5	2	1	4
American Indian/Alaska Native	2	1	2	<1	1
Asian	2	8	1	1	4
Native Hawaiian/ Pacific Islander	<1	<1	<1	<1	<1
Another race/ethnicity	12	16	12	16	15
Hispanic/Latino (any race)	31	36	55	86	44

Data source: 2005 American Community Survey, U.S. Census Bureau

A high proportion of the border population is of Hispanic/Latino ethnicity, ranging from 31 percent in Arizona to 86 percent in Texas; Hispanic/Latino populations are the majority ethnic group in the border region of New Mexico and Texas. In comparison, only 12.5 percent of the U.S. population in 2000 was of Hispanic/Latino ethnicity.

Yet these statistics reveal little of the diversity among the populations that inhabit the border region, and each group has distinct and significant impacts on health planning and services delivery. On the U.S. side of the border, 26 Federally recognized Native American tribes are located within the border region, and on the Mexico side, seven indigenous groups are recognized (U.S. Environmental Protection Agency 2006). Some of these indigenous groups, for example the Tohono O'odham Nation of Arizona and Sonora, straddle the border with members living on both sides. Many U.S. citizens of Mexican or Latino ethnicity reside on the U.S. side of the border, yet prefer to obtain health care in Mexico from providers who share their language and cultural traditions.

The majority of people on either side of the border are permanent residents; some are binational, crossing the border daily for work, while others rarely cross the border. Some residents are temporary, such as international migrants who typically only spend a few days in the border region. Some border region residents are seasonal, including migrant agricultural laborers, as well as U.S. “snowbirds” living on both sides of the border.

Many U.S. retirees have relocated to Mexico or reside in the border region during part of the year, and may be dependent on affordable healthcare services in Mexico. For example, Arizona attracts many snowbirds who seek medical services across the border from Yuma. Baja California, Mexico, and other northern Mexican States have growing populations of American nationals on fixed incomes who have relocated for economic reasons (Bach & Kiy 2006). Despite the fact that many residents of the region are elderly with significant health care needs, as is typical of most frontier populations, many border health programs focus on young adults and children.

2. Public Health Priorities – Healthy Border 2010

The *Healthy Border 2010* Program is a binational agenda for health promotion and disease prevention. Established by the Border Health Commission in 2003, the framework builds on the *Healthy People 2010* program, the *Healthy Gente* program (United States), and the *Indicadores de Resultado* (National Health Indicators, México). The framework sets 20 objectives for 11 focus areas (For a more detailed list of *Healthy Border 2010* indicators, see **Appendix C**):

1. **Access to Health Care** – ensure access to primary care or basic health care services;
2. **Cancer** – reduce breast cancer and cervical cancer mortality;
3. **Diabetes** – reduce both the mortality rate of diabetes and the need for hospitalization;
4. **Environmental Health** – improve household access to sewage disposal and reduce hospital admissions for acute pesticide poisoning;
5. **HIV/AIDS** - reduce the number of cases of HIV/AIDS;
6. **Immunization and Infectious Diseases** – expand immunization coverage for young children, as well as reduce the incidence of hepatitis and tuberculosis;

7. **Injury Prevention** – reduce mortality from motor vehicle crashes as well as childhood mortality from injuries;
 8. **Maternal, Infant and Child Health** – reduce overall infant mortality as well as infant deaths due to congenital defects, improve prenatal care and reduce teenage pregnancy rates;
 9. **Mental Health** – reduce suicide mortality;
 10. **Oral Health** – improve access to oral health care; and
 11. **Respiratory Diseases** – reduce the rate of hospitalization for asthma.
- (United States-México Border Health Commission 2003a).

The “Hispanic health paradox,” in which Hispanics often appear healthier than their American counterparts on a number of health indicators despite lower socioeconomic development status, is largely the result of lower rates of chronic disease. U.S. border residents have lower age adjusted mortality rates (494/100,000) than the U.S. national rate (560/100,000), while border residents in Mexico have higher mortality rates than other Mexican residents (760/100,000 vs. 630/100,000).

However, Hispanics have a higher rate of diabetes, chronic liver disease, and cirrhosis than other ethnic groups in the United States (United States-México Border Health Commission 2003). Amerindian ancestry and prenatal exposure are two possible explanations for the higher rates of diabetes among Mexicans and Mexican-Americans than other ethnic groups (Martorell 2005). Also, chronic disease rates increase with length of residence in the United States (particularly among those born in the United States) as they acculturate.

B. Access to Health Services

Basic access to health services in the border region remains one of the most critical problems. Over 80 percent of U.S. border counties have Health Professions Shortage Areas (HPSAs) (Bach & Kiy 2006), with border populations having 25 percent fewer primary care physicians than the general U.S. population.

Residents of the border States also have the lowest levels of health insurance coverage, with an estimated 21 percent of the U.S. border population uninsured. Mexican-Americans have the lowest rates of health insurance among U.S. population groups (Sullivan 2004). In 2000, an estimated 14 percent of the U.S. population was uninsured; border States had much higher rates of uninsurance, ranging from a low of 18 percent (Arizona) to a high of 24 percent (New Mexico). Texas border counties had the highest rates of uninsured populations, with nearly 1 in 3 residents lacking health insurance; 13 of its 32 border counties had uninsured populations greater than 30 percent. Aggregation masked large variations between counties. Among the three California border counties, Imperial County had the highest rates of uninsured, but is dwarfed in the aggregate by the size of San Diego County’s population. Similarly, Arizona had two large counties (Maricopa, Pima) below the State average for uninsured; the other five counties had an uninsured rate of 24 percent.

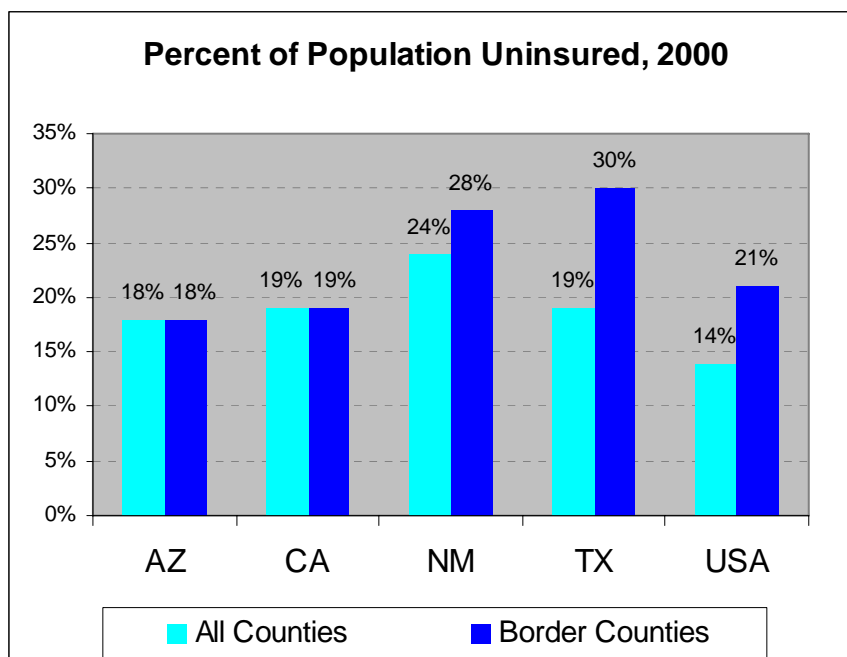


Figure 1. Data Source: U.S. Census Bureau Small Area Health Insurance Estimates: Experimental estimates of health insurance coverage, 2000 (release date: July 2005).

C. Organization of Border Health Activities

In addition to the usual array of State and local government health departments, private providers, and non-profit providers, border health activities involve a broad spectrum of international, Federal, and regional programs. In the international arena, the Pan American Health Organization, U.S. Agency for International Development, and World Health Organization (WHO) work at the border. At the Federal level, the U.S. Department of Health and Human Services Border Health Initiative is managed by the HRSA Office of Rural Health Policy. Each of the four U.S. border States has a State Office of Border Health, and some municipalities (e.g. San Diego) have their own border health initiatives.

United States-México Border Health Commission. The United States-México Border Health Commission (USMBHC) was formed as a binational commission in 2000, and designated a Public International Organization in 2004, to provide the leadership for “coordinated and binational actions that will improve the health and quality of life on the border” (United States-México Border Health Commission 2003-2005). Commission membership consists of 26 members, with 13 members forming 2 sections, 1 from each country led by a Commissioner, the Secretary of Health. Other statutory members of the commission are the chief health officers from the 10 border States, with the remaining 14 members appointed by the Federal governments of each nation.

The functions of the U.S. section of the USMBHC are identified as:

1. To conduct a public health needs assessment in the United States-Mexico border area as well as to conduct or support investigations or studies designed to identify, study and monitor health problems
2. To provide financial, technical, and administrative support to assist the efforts of non-profit, public, and private entities to prevent and resolve health problems
3. To conduct or support health promotion and disease prevention activities in the United States-Mexico border area
4. To emphasize best practices in public health at the border
5. To make recommendations that will guide public policy, allocation of health resources and the development of binational health projects
6. To establish a comprehensive and coordinated system, which utilizes advanced technologies for gathering and disseminating health-related data, and monitoring health problems in the United States-Mexico border area
7. To promote cooperation among Federal, State, and local authorities, communities, private organizations, and others to accomplish the goals of this Commission
(United States-Mexico Border Health Commission 2003b)

Binational health councils. The four border States have established binational health councils with sister cities and regions in Mexico to address border health issues. According to the Texas Office of Border Health, the councils “examine health needs, problems, and available programs with particular attention and concern to the Council's geographical area, and to consider how its members can promote appropriate actions by the Council via participatory activities” (Texas Department of State Health Services 2005a). There are 12 binational health councils listed by the U.S.-Mexico Border Health Association, and one additional council recognized by the State of California:

Eagle Pass, TX/Piedras Negras, Mexico/Kickapoo Nation (Trinational)
Del Rio, TX/Ciudad Acuña, Mexico
Brownsville, TX/Matamoros, Mexico/Cameron, TX
San Diego, CA/Tijuana, Mexico
Columbus, NM/Luna County, NM/Palomas, Mexico
El Paso, TX/Ciudad Juarez, Mexico/Las Cruces, NM
Laredo, TX/Nuevo Laredo, Mexico
Mc Allen, TX/Reynosa, Mexico/Condado Hidalgo, TX
Nogales, AZ/Nogales (“Ambos Nogales”), Mexico
Noreste de Sonora, Mexico/Cochise County, AZ
Presidio, TX/Ojinaga, Mexico
Yuma, AZ/San Luis Rio Colorado, Mexico
Imperial, CA/Mexicali, Mexicali (recognized by the State of California)

As the health system in Mexico has more public medicine (sponsored at the Federal level), and is more centralized and hierarchical, it is often difficult for U.S. health officers to meet directly with their Mexican counterparts, who are typically not authorized to communicate directly with their U.S. counterparts. The role of binational councils may vary depending on local needs, but they provide a forum for public health managers and providers from both countries to speak with

each other and understand each others' perspectives. As U.S. and Mexican public health officers typically do not speak each others' language, translators play an important role at the meetings.

Institutional barriers to cross-border collaboration. Some border health experts note that while much attention is currently being paid to border health issues, few of the problems are new and they are already well documented. From an intervention perspective, despite extensive research there has not been enough action to make a difference.

The International Community Foundation, working in the San Diego-Baja California border region, cites two major types of institutional impediments to improving the health of the border population, and subsequently the health security of all Americans (Bach & Kiy 2006). The first is a failure of leadership to make necessary policy changes to enable effective action. The second is the fragmentation of health services and programs that “focus exclusively on one disease, treatment, or subgroup.” This fragmentation is self-reproducing in an environment of chronic shortage of resources and in the absence of leadership for a more comprehensive, coordinated effort. In turn, “fragmentation reproduces limited capacity, even when a program is successful within its own objectives.”

“The missing ingredient in this collective understanding of binational health risks is the persistent failure of political and institutional leadership to move from knowledge to action” (Bach & Kiy 2006).

Where programs are funded on the U.S. side, for example, they may not be funded on the Mexican side of the border, and U.S. Federal funding agencies may not permit expenditures on the Mexican side of the border. This undercuts the ability of individuals and organizations in Mexico to work with their American colleagues. In addition, a donor emphasis on “sustainability” may inadvertently contribute to the demise of once-funded HIT initiatives. The implementation of HIT may increase operational costs, and if support is made available only for new projects over the short-term, non-profits will face increasing difficulty raising funds to sustain ongoing operations.

D. Information and Communications Technology Infrastructure in the United States

Health information technology remains a vision of the possible rather than an everyday reality for public health and health care programs, particularly in remote rural areas. Compared with other developed nations, the United States lags behind in the development and deployment of HIT (The Economist 2005). One reason is the difference in health systems – a country with a national health system will face fewer hurdles to the development and deployment of HIT. It is perhaps not surprising that many are skeptical of the possibility of a national health information system, given the characteristics of the U.S. health care system: a chaotic mix of providers and payers; a blend of public and private enterprise; tensions between cooperation and competition in a quasi-market-based health system; layers of administration; and a mosaic of legal regulations. The United States also lags behind other developed nations in the deployment of essential telecommunications infrastructure.

BORDER HEALTH WEB SITES

United States-México Border Health Commission

<http://www.borderhealth.org/>

U.S.-Mexico Border Health Association

<http://www.usmbha.org/>

U.S.-Mexico Border Counties Coalition

<http://www.bordercounties.org/>

HRSA Border Health Program

<http://ruralhealth.hrsa.gov/border/>

Rural Assistance Center, USA-Mexico Border Health

<http://borderhealth.raonline.org/>

1. Lack of infrastructure on the United States-Mexico border

Lack of access to essential telecommunications infrastructure remains a major bottleneck for HIT in many parts of the United States, as well as in Mexico. Most HIT applications require high-speed Internet connections, and some require the strength of T1 connections. Yet rural residents are more likely to rely on slow dial-up connections than their urban counterparts, and many places lack any service provider. However, data on the extent of broadband deployment in the United States are limited and difficult to assess (United States Government Accountability Office 2006).

Although a recent national survey of local health departments showed that only 1 percent lack a computer, 2 percent lack Internet access, and only 7 percent lack high-speed Internet access, the survey also shows a consistent pattern of lower access to information and communication technologies among health departments that serve a population of less than 25,000 (Leep 2006). Data on the populations served by local health departments for the entire border region are not available. However, in the 2000 Census, 27 of the 48 U.S. counties in the border region had populations of less than 25,000. (Some counties have more than one local health department, and some local health departments in Texas cover more than one county.)

2. The National Health Information Technology (HIT) Strategy

“Fewer Mistakes, Lower Costs, Less Hassle, Better Care.” The importance of HIT is summarized in this way by the U.S. Department of Health and Human Services (U.S. Department of Health and Human Services 2005). Evidence of the benefits of health information technology to improve quality of care, increase efficiency of service delivery, and reduce costs over time are now well established (RAND Health 2005; Shekelle et al 2006). HIT also can

increase access to care through applications such as telemedicine. Widespread use of HIT may also improve public health initiatives through the automated collection and transmission of data for improved surveillance and monitoring of population health indicators.

National Health IT Strategy. The vision of HIT received an important boost in 2004 with the establishment of the Office of the National Coordinator for Health Information Technology (ONCHIT) within the U.S. Department of Health and Human Services. The Office provides the leadership for the development of a national HIT platform and promotes the widespread adoption of HIT in health care (U.S. Department of Health and Human Services). Under the National Health IT Strategy, various divisions within HHS now coordinate IT initiatives (see **Appendix D** for a list of HHS IT initiatives).

Table 2: Goals and Strategies of HHS’s Framework for Strategic Action

Goals	Strategies
Goal 1: Inform clinical practice with the use of electronic health records (EHR)	<ol style="list-style-type: none"> 1. Incentivize EHR adoption 2. Reduce risk of EHR investment 3. Promote EHR diffusion in rural and underserved areas
Goal 2: Interconnect clinicians so that they can exchange health information using advanced and secure electronic communication	<ol style="list-style-type: none"> 1. Foster regional collaboration 2. Develop a national health information network 3. Coordinate Federal health information systems
Goal 3: Personalize care with consumer-based health records and better information for consumers	<ol style="list-style-type: none"> 1. Encourage use of personal health records 2. Enhance informed consumer choice 3. Promote use of telehealth systems
Goal 4: Improve public health through advanced biosurveillance methods and streamlined collection of data for quality measurement and research	<ol style="list-style-type: none"> 1. Unify public health surveillance architectures 2. Streamline quality and health status monitoring 3. Accelerate research and dissemination of evidence

Source: United States Government Accountability Office, 2005.

In spite of the ambitious scope of activities, some advocates fear that important stakeholders are not yet participating in this national dialogue, including rural and frontier stakeholders. In order to achieve a system that is truly national and interoperable in scope, the resulting systems must be acceptable and accessible to all levels within the system, including those traditionally underserved.

Community health centers (CHCs) are an important part of the public health safety net. According to data available from the HRSA data warehouse (Health Resources and Services Administration, no date), there are 186 Federally-Qualified Health Centers (FQHCs) in the 48 border counties (FQHCs are a subset of all CHCs, however no reliable data are available for the entire border region for CHCs that do not receive Federal funds). In a review of recent HIT policy initiatives, proposals and related activities, the Community Clinics Initiative in California suggests some specific additions to ensure that community health centers (CHCs) are part of the process:

- Specific mention of community health clinics in all sections that list providers (hospitals, physicians, laboratories, etc.)
- Requiring a safety net representative on the American Health Information Community (AHIC), a high-level advisory panel appointed by the Secretary of Health and Human Services
- Establishing preferences for the awarding of grants based on designated health care shortage areas
- Including language that ensures that the loan review standards and the repayment requirement recognize the unique financial structure of CHCs. (SOURCE: DDB Issues & Advocacy 2005)

It is generally accepted that rural and frontier providers have less access to HIT than their urban counterparts, in part because smaller practices and service populations render them unable to achieve the economies of scale that support the business case for HIT. For example, in a survey of community hospitals in Georgia, researchers found that urban hospitals had significantly more functional electronic applications and technical devices in place than rural hospitals, although some of these differences were attributed to different scope of services (Culler et al 2006). An analysis conducted by RAND found that small size, rural status, and a high share of claims paid by Medicare / Medicaid contribute to low adoption rates of HIT (Fonkych & Taylor 2005). However, the RAND study also found that hospital network membership was a more important predictor of HIT adoption.

The urban-rural HIT disparity is explained either as the typical lag involved in the diffusion of innovations from urban to rural, or a naturalized economic order in a market-based system (Bower 2005; Helitzer et al 2003). Proponents of market-based solutions accept this disparity in the belief that the market can achieve faster change than planned interventions; others insist that Federal intervention is the only way to achieve national HIT that is truly comprehensive (Middleton 2005).

3. Public health informatics (PHI)

The Public Health Informatics Institute defines public health informatics as “the systematic application of information and computer science and technology to public health practice, research, and learning” (Public Health Informatics Institute 2005a). Public health information systems range from categorical or stand-alone systems (such as a disease registry) or those linked with other systems from which they extract data.

Public Health Information Network. Under the leadership of the Centers for Disease Control and Prevention (CDC), the Public Health Information Network (PHIN) was developed “to advance the use of interoperable information systems” for:

- Detection and Monitoring of Diseases and Health Threats
- Early Event Detection
- Outbreak Management

- Connecting with Laboratory Systems
- Surveillance
- Communications and Alerting
- Information Dissemination and Knowledge Management
- Countermeasure and Response Administration

The process of developing and implementing HIT / public health informatics systems fundamentally involves a re-engineering of work processes. One key lesson is that a clear understanding of these work processes – both the current and desired reality – is essential to designing acceptable and well-functioning systems. Participation of all key stakeholders is essential, both for the design of the system and for creating a shared commitment to the success of the project.

“Currently . . . local health departments manage system application decisions (including identifying needs, solution selection, and implementation strategies) independently of each other. No long-term, shared strategy for achieving the vision of interoperable LHDs exists, nor does a formal process to collaborate on system application decisions” (Public Health Informatics Institute 2006b).

The Public Health Informatics Institute and the **National Association of County and City Health Officials (NACCHO)** recently completed a demonstration project that tested a collaborative approach to defining the business processes of local health departments (LHDs). Funded by the Robert Wood Johnson Foundation (RWJF), the goal was to “provide the foundation for developing a base set of detailed information system requirements that meet the needs of all LHDs”(Public Health Informatics Institute 2006b). The “requirements development methodology” as collaborative process is designed to create a shared understanding among the different actors within the system who may not be aware of each others’ roles or information needs. “Once defined, the business processes would provide the foundation for developing a base set of detailed information system requirements that would meet the needs of all LHDs and serve as a starting point for creating requests for proposals and contracts for building or buying new information systems. With requirements in hand, every LHD would not need to re-create the wheel when it comes to defining their information system needs” (Public Health Informatics Institute 2006b). Defining common business processes does not preclude tailoring systems to meet local needs, but rather provides for a set of common information structures that will enable improved information exchange with other public health agencies and the health care system.

“... ‘If you’ve seen one local health department, you’ve seen one local health department.’ Although this turn of phrase draws chuckles, it should draw frowns or worse. The policy challenges of aligning the local infrastructure and delivering on the IOM vision, shared by the national leadership in public health and NACCHO, include moving toward and adopting a shared organizational definition, agreed-upon parameters of function, and effective and efficient processes for measuring the performance of duties” (Tilson & Berkowitz 2006).

The InfoTech Collaborative, also funded by the Robert Wood Johnson Foundation, will assess, evaluate, and recommend innovative ways to improve the nation's public health infrastructure in the following ways:

- use information technology to effectively collect, analyze, and disseminate information
- improve data access and community participation for making public health decisions
- enhance the performance of the public health system through the use of information technology (InfoTech Collaborative no date).

The six participating States in this collaborative – Oklahoma, Kansas, New Hampshire, South Carolina, Maine, and Missouri – do not include any border States. The Collaborative has assembled an online catalog of public health information systems at <http://toolbox.airws.org/>. There are no entries yet from the four border States.

4. Health Information Exchange - Where PHI and HIT Meet

Because public health informatics is interdependent with clinical HIT initiatives, its success lies in the ability of public health programs to exchange information with a multiplicity of health service providers. Organizations that work to enable the exchange of health data across a variety of technologies, vendor platforms, and organizational types are referred to as health information exchanges (HIEs) and regional health information organizations (RHIOs), among other terms. HIE applications differ from the clinical and business-oriented applications of HIT; HIE applications “may include a central Web site, health care terminology translation tools, a master patient index, authentication and authorization infrastructure, and applications to aggregate information from multiple sources” (Arizona Health-e Connection 2006). (See textbox below).

Ideally, RHIOs or HIEs, when fully operational, will bring together patient information from hospitals, physicians, clinics, pharmacies, community labs, radiology facilities, nursing homes, health plans, and public health information systems. Many emerging models of HIE, however, focus on the needs of health care practitioners and the business of providing health care, without focusing on population health or other public health concerns (Public Health Informatics Institute 2005b).

Public health is an information-intensive field that contributes to and depends on data from the health care system. It needs to be included in the development of health information exchanges, to ensure that any systems developed are responsive to and can benefit from public health data (Public Health Informatics Institute 2005b). The Robert Wood Johnson Foundation’s current grant program, *InformationLinks*, supports the participation of public health agencies in the development of health information exchanges (Robert Wood Johnson Foundation 2006).

At this time, most RHIOs or HIEs are urban and hospital-based. Demonstration projects exist for rural areas, although it is unclear how representative these projects are. For example, one Agency for Healthcare Research and Quality (AHRQ)-sponsored project was the first to plan and now to implement a “frontier model” of health information exchange in Nebraska (AHRQ National Resource Center for Health Information Technology no date-a; Shank et al 2005; Vogt et al 2005). HIT grants may include resources to pay for necessary infrastructure upgrades. Yet this particular frontier region, the Nebraska panhandle, is actually the “most wired” region of Nebraska; 75 percent of residents have Internet access compared with 66 percent in other regions

of the State. For other frontier regions, the lesson of this model underscores the fundamental requirement of essential infrastructure.

Rapid implementation of HIT, especially if financed by various Federal agencies as well as national and local private foundations, may result in increasing difficulty coordinating HIT efforts at a local, regional, or State level. "Partners" are often competitors, and turf issues erupt and need resolution. For example, in New Mexico, at least two RHIO initiatives – one funded by CMS and one funded by AHRQ – were initiated at roughly the same time, with very different business models (Blair 2005; Gunter 2005).

Health Information Exchange (HIE)

According to the AHRQ National Resource Center for Health Information Technology, HIE "refers to the sharing of clinical and administrative data across the boundaries of health care institutions and other health data repositories" and "involves a number of important cultural and technical components" such as:

- *Data-Sharing Agreements (define the policies and procedures for data sharing)*
- *Data Pipes (the actual networks over which data will flow from place to place)*
- *Interface Engines (systems that can interpret and translate incoming messages)*
- *Data Models (the technical term for the architecture of the data sharing system)*
- *Record Locator Service (one technical solution to finding the location of patient information)*
- *Master Patient Index (MPI - a common medical record number or algorithm that identifies patients across several institutions)*
- *Data Repository (the database that holds all of the patient data)*
- *Standards (the coding and messaging schemes used to share data)*
- *Interoperability (when two systems are able to talk to each other and share data they are said to be interoperable)*

(Excerpted from the Web article, "Health Information Exchange," AHRQ National Resource Center for Health Information Technology, no date-b).

For more information, go to the AHRQ Web site, <http://healthhit.ahrq.gov>

Much of the work of information exchange involves the development of standards, protocols, and vocabularies to enable the exchange of both data and *information with shared meaning* when data are exchanged. Health Level Seven (HL7), an ANSI-accredited Standards Developing Organization, focuses on producing standards for clinical and administrative data in the health care arena (Health Level Seven no date). The data exchange standards developed by the organization are also referred to as HL7. The CDC has adopted HL7 messaging standards, which enable different information systems to communicate and exchange data, for the Public Health Information Network.

The importance of the HL7 standard was demonstrated after Hurricane Katrina, when providers across the United States needed to access Louisiana's immunization registry to enroll displaced

children in school (Brewin 2005). Because the immunization registries in Louisiana and Houston were both HL7-compliant, two-way information exchange was enabled within a few days, allowing health care providers at the Houston's Astrodome to log into the Louisiana registry and retrieve immunization records. All HL7-compliant registries were eventually able to perform two-way data exchanges, while others were able to achieve read-only access and had to re-enter data into their own system.

The Hurricane Katrina example demonstrates both the benefits and challenges of health information exchange – the main objective being to turn stand-alone, local or regional, and “silo” systems into interoperable networks that overcome the geographical and/or functional limitations of any one system. These challenges increase dramatically in the border context, given different languages, infrastructures, governance, and clinical protocols. In the next three chapters, examples of HIT applications supporting three Healthy Border 2010 objectives are described: immunizations, obesity/diabetes, and tuberculosis.

Electronic Medical Records (EMR) and Electronic Health Records (EHR): What's the Difference?

Excerpted from Garets, D. and M. Davis (2005). Electronic patient records: EMRs and EHRs. *Healthcare Informatics Online*: <http://www.healthcare-informatics.com/issues/2005/10/garets.htm>

EMRs are computerized legal clinical records created in [care delivery organizations] CDOs, such as hospitals and physician offices. EHRs represent the ability to easily share medical information among stakeholders and to allow it to follow the patient through various modalities of care from different CDOs. Stakeholders in this context are consumers, healthcare providers, employers and payers, including the government. Because our organization focuses on researching healthcare IT and must be clear in questions to healthcare providers, we've established the following definitions:

EMR: *An application environment composed of the clinical data repository (CDR), clinical decision support system (CDSS), controlled medical vocabulary (CMV), computerized provider order entry (CPOE), pharmacy and clinical documentation applications. The patient's electronic record is supported across inpatient and outpatient environments; is used by healthcare practitioners to document, monitor and manage care delivery within the CDO; and is owned by the CDO. The data in the EMR is the legal record of what happened to the patient during encounters at the CDO.*

EHR: *A subset of each CDO's EMR, presently assumed to include summaries, such as ASTM's Continuity of Care Record (CCR) and HL7's Care Record Summary (CRS), and possibly information from pharmacy benefit management firms, reference labs and other organizations about the health status of patients in the community. It contains patient input and access spanning episodes of care across multiple CDOs within a community, region, or state (or in some countries, the entire country). The patient controls access to information. In the United States, EHRs will ride on the proposed National Health Information Network (NHIN).*

III. TUBERCULOSIS

Among the focal issues discussed in this report, tuberculosis (TB) prevention and treatment projects have had the most sustained binational attention. In 2001, a work group reporting to the CDC identified a number of “converging factors” resulted in higher TB rates in the border region for both the United States and Mexico (Lobato et al 2001). These factors include:

- Mexico's higher TB rate;
- Low socioeconomic status and limited access to health care in the border area;
- Frequent border crossings and travel in the United States for employment, commerce, health services, and leisure;
- Language and sociocultural differences;
- Lack of coordinated care across health jurisdictions on both sides of the United States-Mexico border.

The work group report describes select cooperative tuberculosis activities along the United States-Mexico Border, including three Texas-Mexico projects (Project Juntos, Los Dos Laredos, and Grupo Sin Fronteras); three Arizona-Sonora cross-border projects; the California-Baja California TB committee; Imperial-Mexicali farmworker projects; CURE-TB, operated by San Diego County as a binational referral system; TB Net, an Austin, TX-based migrant support system operated by Migrant Clinician’s Network (MCN); Ten Against TB; and the United States-Mexico Border TB Laboratorian Binational Training Project (Lobato et al 2001).

The work group also reported that “TB control programs along the border identify locally defined binational cases in their own TB registries, but none maintains local or statewide electronic records for these cases,” and that the lack of a unified electronic binational TB registry was “hampering effective TB prevention and treatment programs.” The report further described various models that could be explored for such a registry.

A. The Binational Tuberculosis Referral and Tracking Project

In 2003, three programs, the Binational Card project, CURE TB, and TB Net, were integrated as the Binational Tuberculosis Referral and Tracking Project (Laswell 2005). The Binational Card project was piloted in target sites in the United States and Mexico by CURE TB and TB Net, who divided territory so as not to duplicate efforts. TB Net, based in Austin, TX, covers patients who initiate treatment in Texas, who move within the United States, and who move to countries other than Mexico (from Central America to as far away as China). CURE TB is operated by the San Diego County Department of Public Health, and covers patients who move from the United States to Mexico (except those from Texas). In cooperation with Mexico’s National Tuberculosis Program, patients in either country are registered in a central database, one in Mexico City and one in the United States; the U.S. database is managed by the CURE TB project.

The Binational Card Project is a collaborative effort between the CDC and the National Tuberculosis program of Mexico, in partnership with a number of State, local, and international agencies. The card, given to TB+ patients at participating sites in Mexico and the United States, is designed to ensure completion of treatment among patients with a planned move out of the jurisdiction of the initiating care provider, and facilitates access to the referral network on both

sides of the border. Patients receive a portable health record to carry with them; patients' names are not on this card but instead a system of unique identifying numbers are used. The record displays the 800-number that patients can call to locate a provider in their new location.

An evaluation of the Binational Referral System and Card Project conducted in 2005 showed that despite many successes, prescribed data exchanges between nations did not occur routinely (Laserson 2005). Formal protocols for transmission of information were hierarchical: from local up to national, then between national programs, and then down to the local level again. This process could be time consuming, face bottlenecks, and often information was delivered in batches; this time lag meant that the process was not completed as quickly as the patient moved, and referral information was sometimes delivered too late to be of use for patients and providers (Laserson 2006). Direct communication at the local level between countries did occur where strong personal connections existed, however, this level of communication was outside of the program protocol. Necessary modifications are being made to the data collection and communication and referral systems. The Binational Card project has now moved beyond the pilot phase and is expanding to new sites.

CURE TB. The CURE TB program is a referral program for TB patients who move between the United States and Mexico, based in the TB control program of San Diego County Health and Human Services Agency (County of San Diego no date). When a patient is diagnosed with TB and has plans to move, providers or health departments provide a patient referral sheet (usually via fax or telephone) to the CURE TB office, along with details (if known) about where the patient is moving. CURE TB staff may contact the patient to clarify the location, as well as provide the patient with information on where to go for services. Patients can call toll-free numbers in both the United States and Mexico for assistance or if their plans change. CURE TB will transmit patient information to the Ministry of Health in Mexico and will follow up with providers in Mexico as well. CURE TB staff are primarily Mexican MDs who are bilingual and familiar with both countries' health systems.

The project is "low tech," using an over-the-phone case management system to assist and motivate patients, monitor patient treatment, and document outcomes, primarily utilizing telephone and fax communications (Stop TB Partnership). This presents some difficulty in communicating with health authorities and providers in Mexico, as most fax lines are shared with telephone lines, necessitating multiple calls to send a single fax. It can be difficult for contacts in Mexico to return calls, as many do not have access to international telephone lines (Moser 2006). The project is finding that, as in many parts of the world, Mexico is "leapfrogging" over old technology to new, and email is increasingly used as a more reliable mode of communication with Mexico.

At the CURE TB office, patient data is stored in an Access database. The database is in the process of being migrated to and integrated with a new county electronic TB registry. Ideally, the program would like to be able to simultaneously transmit patient information to the National TB Program in Mexico City and to local providers. At this time, however, the program does not have the IT expertise or financial resources to develop new information and communication technology (ICT) applications (Moser 2006).

TB Net and the MCN Health Network. TB Net is a Binational Tuberculosis Referral and Tracking Project operated by the Migrant Clinician's Network (MCN), currently with 57 participating clinics in 17 States in the United States and Mexico (Migrant Clinicians Network 2006c; no date) (Migrant Clinicians Network 2006b). A potentially mobile patient who tests positive can have all treatment records centralized and accessible to clinicians to improve continuity of care and successful completion of treatment. Here, a mobile patient is "one who moves regularly for work (such as migrant/seasonal farm workers), one whose employment status is marginal (increasing the likelihood of mobility), or one who receives medical care and/or lives on both sides of the U.S.-Mexico border." TB Net also helps providers on each side of the border understand each other's treatment protocols. Providers call TB Net to update the registry.

TB Net has recently been integrated with three other MCN tracking programs under the MCN Health Network (Migrant Clinicians Network 2006a). Previously, the only automation occurred at the central database level; communications were paper-based, by telephone, or by email. The program is moving toward the provision of more electronic services. Patients will now receive a single ID card for all four Network programs with a unique identifying number, and a signature panel to designate a single first and last name for consistent usage (many Hispanic patients have several first names and at least two last names, creating confusion for clinic staff). Patients must choose a PIN number which providers will use to access their medical records, and will facilitate future electronic transmission of records.

B. Grupo Sin Fronteras

Grupo Sin Fronteras is a binational tuberculosis project (Brownsville / Matamoros and McAllen / Reynosa) representing cooperation between the States of Texas and Tamaulipas (Texas Department of State Health Services 2005b). Funded with a grant from the CDC, the project also works with the Texas State Public Health laboratories to provide testing services for Mexican patients; results are reported to both Texas and Mexican public health authorities (Association of Public Health Laboratories 2004).

C. National TB Surveillance Program

At the national level, the CDC collects data from all health jurisdictions in the United States on TB cases for its National TB Surveillance program. Since 1993, the CDC has operated the Tuberculosis Information Management System (TIMS). All TB reporting jurisdictions in the United States reported TB cases to the CDC using TIMS. TIMS also included extensive patient management functions, however, few made use of these functions, even though the software was supplied by the CDC. Instead, some State and local programs developed their own patient management systems, ranging from focused applications such as contact investigation to comprehensive patient management applications. However, "Even today, many local and state programs lack any information system capability to support patient management activities" (Banerji 2003).

Now, the CDC is in the process of developing interoperable and integrated systems based on new public health information standards: the Public Health Information Network and the National Electronic Disease Surveillance System (NEDSS) (Baptiste 2005). The national TB surveillance program will be integrated into these other systems; TIMS is being replaced by a new TB Surveillance Program Area Module (TB PAM) of NEDSS. The TB module is being designed so that it can be used as part of the larger system but also as a stand-alone module.

Another project sponsored by the CDC, the TB Patient Management Project, sought to address the need for TB patient management systems in a way that recognized variations in local systems and patient management, rather than develop another “one size fits all” application that few would use (Banerji 2003). It had two goals:

- Document the functional requirements and identify core TB patient management practices and program evaluation activities across programs.
- Use this information to develop evaluation criteria to assess and evaluate various existing information system options.

The result of the project is the *Tuberculosis Patient Management Applications Assessment Guide*. The Guide is hosted online by the InfoTech project and includes criteria to help users determine whether a particular application meets PHIN standards for compatibility (InfoTech Collaborative no date; National Tuberculosis Controller's Association 2005). The guide “is intended to help programs procure a patient management system that meets local needs while ensuring compliance with surveillance reporting” (Banerji 2006).

IV. IMMUNIZATIONS

According to the CDC, one-fifth of all children have been seen by more than one doctor by the age of 2 (Centers for Disease Control and Prevention 2005a). When medical records are scattered, clinicians may not know which immunizations are needed by the children they see. This increases the likelihood of both under- and over-vaccination. It also makes it more difficult for immunization outreach programs to target their interventions and resources. One study estimated that scattered records in the United States resulted in over 150,000 completely vaccinated children being misclassified as needing vaccination (Stokley et al 2001).

Immunization registries are one tool to consolidate records for improved information management and are usually organized at the State level. Electronic registries with additional functionality are referred to as immunization information systems. An immunization information system (IIS) can assist in clinical decision-making and automatically remind parents of their child's immunization schedule. These systems can also provide a central source of immunization information for research and vital statistics needs, as well as for local officials who are required to collect immunization information in schools, day care centers, and camps. An immunization information system may be one component of a more comprehensive Child Health Information System (CHIS), and is often the first module developed and implemented on the road to a CHIS (Saarlas et al 2004). Immunization information systems have most commonly been developed at the State level, through two main programs: the All Kids Count program, sponsored by the Robert Wood Johnson Foundation, and the National Immunization Program of the CDC (Freeman & DeFries 2003).

It is estimated that 48 percent of children under the age of 6 were enrolled in an immunization information system in the United States in 2004. While the benefits of immunization registries may be obvious, actual participation in registries remains low, particularly among private providers (Clark et al 2006). In a survey of private providers, the most common barrier to participation is a perception of a cost to the practice, both in terms of the technology and in terms of staff time. The most frequently reported impetus to participation was the need to consolidate records across multiple sites of a single provider / organization; the second most important reason was a State mandate.

A. Arizona

Arizona is among the 10 States who had achieved the national health objective of greater than 95 percent of children greater than age 6 enrolled in an immunization information system (Centers for Disease Control and Prevention 2005b). Reporting to Arizona's State registry is mandated by law; the system is flexible enough to enable paper, Web, and data-exchange reporting (Arizona Department of Health Services 2006). Organizations that have developed HIE capacity, including the Indian Health Service and some managed care organizations, can connect to the Arizona State Immunization Information System using HL7 standards to exchange data.

B. California

In contrast with Arizona, California ranks near the bottom of the States in terms of proportion of children in registries (California Statewide Immunization Registry System 2005). California's

statewide immunization registry initiative involves the support of nine regional and two county registries and the planned development of a statewide HIE that is interoperable with the regional registries. In the border region, the San Diego Regional Registry is a Web-based system requiring high-speed Internet access that serves only San Diego County. Riverside County uses an immunization information system called VaxTrack with all of the public health and community clinics and more than 120 private practices participating (Riverside County Department of Public Health 2000).

Imperial County is the only California border county classified as frontier. The county has its own Web-based immunization registry that is currently utilized by public health departments, community clinics, and some private physicians (Binggeli & Vargas 2006). The immunization registry is one module of a comprehensive public health information management system (PHIMS) that was developed by the county. At this time, the county IIS cannot exchange data with the State IIS.

An estimated 40 percent of the county's immunization providers are "active users"; another 30 percent have used the system but do not do so on a regular basis (Binggeli & Vargas 2006). The remaining 30 percent are largely small private practitioners, many of whom lack a high-speed Internet connection. Although most areas have a high-speed Internet service provider, the service is costly, and many continue to use a dial-up service that is too slow to effectively use the IIS. Providers who do not use the Web-based system continue to submit paper reports. On a read-only basis, all public schools can access a school immunization card. The county is currently working on connecting Head Start and childcare centers.

Imperial County is a current grantee of the RWJF *InformationLinks* program that supports the development and implementation of health information exchanges (Public Health Informatics Institute 2006a). Imperial's HIE project is focused on improving information exchange at the

Imperial County Health Information Exchange

Over 5 years, the Imperial County Health Information Exchange developed in partnership between the Imperial County Public Health Department, Advanced Business Software (ABS), local pediatricians, Clinicas de Salud Del Pueblo Community Clinic Network, the Department of Health Services Lead Branch, and the Reference Lab (Quest Lab). Based on this experience, the partners identified three key challenges to the development of a health information exchange:

- **Lack of trust, buy-in, and understanding:** Existing collaborative partners and/or potential new partners may perceive conflicting missions between public health, providers, and other agencies. They may perceive that the system doesn't serve its purpose, support workflow, inform, or improve community status.
- **Lack of partner resources/capacity:** Collaborative partners may not have necessary resources, such as adequate staff or adequate technology capabilities, i.e., no/inadequate computers systems, dial-up and slow Internet connection.
- **Inability to obtain long-term funding:** Scarce resources in a small county may make it difficult to maintain the system.

SOURCE: Public Health Informatics Institute 2006a.

community level. The project focuses on developing data exchange applications for communicable disease, laboratory result reporting, immunization registry, access to health care and HIV/AIDS. Imperial County shares a border with Yuma County, Arizona, and is currently in talks with the Arizona State immunization registry to develop an exchange.

C. New Mexico

After a decade of discussion, New Mexico's statewide immunization registry, NMSIIS, is completing its pilot test and is set to "go live" this year (New Mexico Department of Health no date). New Mexico adopted its Internet-based system from the Wisconsin Immunization Registry, now available as public domain software. CMS is funding the hardware and ongoing support for the project (Scientific Technologies Corporation 2005). When fully operational, immunization providers will have three options to report to the NMSIIS: electronic data transfer, direct data entry through the Internet, or submission of a scannable paper form.

A key barrier to full participation, particularly of private providers, is that the development of the HIE – the technology to transfer data from practice information systems to the NMSIIS – will not be sponsored by the New Mexico Department of Health, leaving the costs to be borne by providers (Blair 2005; Lovelace Clinic Foundation 2005).

"Since many patients seen in New Mexico cross the Texas and Mexico borders, interstate/international data exchange with these registry systems is a long-term goal" (Scientific Technologies Corporation 2005).

D. Texas

ImmTrac is the Texas Department of State Health Services' statewide immunization registry developed in collaboration with Electronic Data Systems (EDS) (Texas Department of State Health Services 2005c). Four modes of reporting immunizations include paper-based reporting, a Web-based application, submission of electronic data on disk, and direct electronic data transfer from compatible systems.

ImmTrac is also taking steps to improve the interoperability of the system with other electronic data systems. Currently, ImmTrac has a standard import file format but is developing the capacity to accept a variety of file formats, and is in the process of developing HL7 exchange capabilities. Other statewide information systems like the Texas Web-based Client Encounter System (TWICES) used by Texas health department clinics, and the Pharmacy Inventory Control System (PICS) already exchange data with ImmTrac, but plans include enhanced integration of the systems (Texas Department of State Health Services 2006a).

Texas also has a number of local registries. ImmTrac exchanges data with the Houston-Harris County, the City of San Antonio, and Tarrant County immunization registries, although they cannot exchange data with each other, and the State wants to discourage the development of other local registries (Texas Department of State Health Services 2006a).

An immunization registry is only as good as the proportion of the child population and vaccinations registered. As new registries are developed, it takes time to fully populate the registry. In the meantime, many providers are reluctant to use the registry because of perceptions of poor data quality and incomplete records. This, in turn, becomes a barrier to registration. Other perceived barriers to provider participation are staff/time demands for data entry; low computer literacy among clinical office staff; and fear of the potential misuse of data (Texas Department of State Health Services 2006a; Kerber 2006).

Texas has taken a carrot-and-stick approach to promoting the use of ImmTrac. In 2005, the Texas State Legislature passed a bill requiring all providers and health plans to report all immunizations to ImmTrac (Texas Department of State Health Services, 2006a). But ImmTrac is also taking a proactive role to improve business processes and technical capabilities and promote the use of the registry among providers. One planned strategy is to make it easier and more efficient to use; streamlining the provider registration process, for example, and plans to enable real-time access to vaccination records during the clinical encounter. Another promotion strategy is to increase the available training and support offered by ImmTrac for the use of the registry, as well as to provide value-added functions of the registry. The registry is developing a reminder-and-recall function to help improve compliance with a complex vaccination regime. Providers can generate lists of patients who need to return for vaccinations, as well as bilingual letters to send to parents as reminders of the need to bring children for their next scheduled vaccination. Although the system is in place, improvements are needed in the vaccine protocol routines (Kerber 2006).

V. DIABETES

IT tools to assist in the management of patients with chronic disease range from comprehensive applications such as electronic medical records (EMRs), to chronic disease management modules, to disease-specific registries.

Chronic disease management systems (CDMS) are dedicated modules with more intensive patient management tools than are found in a generic patient management system. CDMS can also be developed to coordinate care for patients with multiple chronic diseases, such as diabetes, asthma, and depression. Although EMRs and CDMS offer many similar functions, one survey found that potential users rated CDMS higher than EMRs in their ability to support chronic disease management (Jantos & Holmes 2006). Of course, EMRs provide functionality beyond the management of chronic disease. Disease registries are different from CDMS in that they focus on tracking cases of a disease in a population. Some registries blend population information functions with patient care functions and may be referred to as CDMS (Skinner et al 2006).

According to one report on the use of CDMS in rural health care, applications are readily available to rural clinics and able to be used and maintained with minimal expenditures (Skinner et al 2006). For example, the Washington State Diabetes Prevention and Control Program first developed a diabetes registry and later a more comprehensive CDMS; both modules are available for free and work on basic PCs with Microsoft software. Federally Qualified Health Centers (FQHCs) that participate in the National Health Disparities Collaborative have free access to a Patient Electronic Care System (PECS), modeled on a CDMS. Registries need not be expensive; one proponent describes the development of a diabetes registry using Microsoft Access or Excel, and offers a downloadable Excel database design (Ortiz 2006).

However, one border health project that worked with five community health centers in Arizona and Texas to improve clinical adherence to national diabetes guidelines reported that all of the CHCs in the study used paper-based records (Schachter & Cohen 2005). Many diabetes projects in the border region have focused on community-based interventions (see for example Cohen & Ingram 2005). The patient self-care model emphasizes education, and information technology has supported health education efforts by supplying access to health information for community members, through electronic information kiosks, for example.

“Rural clinics are beginning to feel increasing pressure to implement some type of electronic disease management system. Successful implementation, use, and sustainability of simple CDMSs have helped introduce technology into small rural clinics and have positively impacted chronic disease management programs” (Skinner et al 2006).

Migrant Clinicians Network – Diabetes Track II. One program of the Migrant Clinician’s Network (MCN) Health Network project (described above with TBNet) is the diabetes program that “is designed to track mobile individuals with diabetes to encourage continuity of care with

the transfer of vital health information between clinics, assistance to finding and accessing services, and support as they implement their treatment plan” (Migrant Clinicians Network 2006d). Track II is one component of the MCN Diabetes program. Track II maintains a database of a patient’s diabetes medical record that can be accessed by providers. The program also provides guidance to providers on the comparative availability of diabetes medications in the United States and Mexico, as well as price comparisons.

The MCN Diabetes Program also provides a number of resources for both patients and providers. A Diabetes Moving Pack is distributed to patients through providers. The materials are in English and Spanish, at a basic reading level. A clinic directory, key chain, and a flyer entitled “Living with Diabetes” from the Texas Department of Health are included; providers are encouraged to personalize the packs for patients and add items relevant to specific patients.

VI. DISCUSSION AND CONCLUSIONS

As stated earlier, this report is being written during the early phases of the development of HIT, especially along the United States-Mexico border. In many ways it is a snapshot of the baseline as of 2006. Large scale experiments with the alphabet of health information systems, HIT, PHI, and HIE to name a few, have only recently begun operations and appear to be diffusing to frontier regions last – with some notable exceptions. The slow dissemination has numerous causes including infrastructure, financial, social, and cultural reasons. Many frontier providers are not at the forefront of technology and systems development, and many feel left out of the ongoing collaborative initiatives that will result in a national HIT architecture.

“Another related challenge is Arizona’s geographic diversity. Each region has its own opportunities and challenges. For example, some rural areas of Arizona are fairly isolated without bandwidth to take advantage of many of today’s technologies. Some consumers live on the borders of other states and receive medical services in those states. Also, some communities, such as Yuma, have close relationships with the medical communities in Mexico.” (Arizona Health-e Connection 2006).

Yet clearly, the border context has influenced the adoption of HIT / PHI in a number of ways. In terms of HIT more generally deployed within health services, it is not surprising that HIT lags in the border region compared with more affluent, urbanized areas of the United States. However, this generalization does not adequately describe a varied and dynamic region. The urban areas along the border are dynamic and well connected – particularly San Diego, California and Yuma, Arizona – and compare favorably with other parts of the country. A recent focus on biosecurity has also helped fund innovation in disease surveillance along the border. And finally, national and international focus on health concerns relevant to border populations has promoted local and regional innovations mixing paper-based and computer-based technologies.

The following discussion will address issues that constrain PHI in the border region or require innovations specific to the region.

A. Infrastructure Issues

Broadband access remains a bottleneck. In spite of significant gains in broadband deployment in rural and frontier areas, the benefits of HIT / PHI will remain out of reach for those who lack access to essential ICT infrastructure. In frontier communities, factors such as low population densities, long distances, extreme topography, and limited financial resources combine to discourage market-based development of ICT. IT leadership and State-based or quasi-public initiatives can succeed where the market fails, however.

The Texas Association of Community Health Centers developed its wide area network using funds from the Telecommunications Infrastructure Fund Board (Texas Association of Community Health Centers no date). The funding was used to purchase computers, network consulting services, and videoconferencing and telemedicine equipment for community health centers. Over 100 sites were also equipped with broadband access. The association continues to

support the network by providing Internet access, email accounts, teleconferencing, and technical support.

Frontier economics: higher capital costs, lower financial gains. Because of the many situations where market failures are a barrier to HIT adoption (Middleton 2005), the need for State intervention at many levels is recognized. Yet the barriers are exacerbated by the frontier context. As with basic ICT infrastructure, the frontier context negatively influences the “business case” for HIT. Rural practitioners and care delivery organizations may find that they will not experience financial gains to offset the costs of HIT, and local financial resources are insufficient to fund HIT.

In general, the cost gains of HIT accrue “upstream” to payers, not to providers who are expected to invest in HIT. This imbalance is widely recognized as a major impediment to the diffusion of HIT. In the case of CHCs, few financial rewards would accrue to the centers themselves; according to Fiscella and Geiger, “compared with most practices, CHCs will realize relatively little return on their HIT investments” and savings would accrue to the U.S. Department of Health and Human Services (Fiscella & Geiger 2006).

“HHS will ultimately pay for EHRs for CHCs—either actively or passively. The critical question confronting HHS, then, is not whether to support HIT for CHCs, but when and how. If HHS is passive, the process will be slow, fragmented, disjointed, and full of false starts, with minimal impact on quality or costs. EHRs will be relegated to tools for upcoding visits and eliminating transcription and filing positions. Alternatively, HHS can actively assist CHCs along each step of the process, minimizing waste and duplication of effort while ensuring health care transformation” (Fiscella & Geiger 2006).

“Failure to provide a dedicated funding stream for HIT at health centers will only widen the digital divide between safety net providers and other providers, thus hampering health centers’ ability to further reduce health care disparities” (National Association of Community Health Centers, Inc. 2006).

Need for financial and technical assistance – on both sides of the border. Funding for frontier providers must accompany any HIT mandates. Implementation of HIT / PHI on the border will require funds and technical assistance for both the deployment of basic ICT infrastructure and the implementation of HIT / PHI technologies and applications. In the cross-border context, however, the full benefits of these investments cannot be realized if Mexican partner organizations lack the capacity to collaborate and exchange information. Given the realities of binational interdependencies, such assistance is required on both sides of the border, and policy barriers to the expenditure of funds across the border should be re-examined.

Health service providers. One of the “lessons learned” from the Hurricane Katrina Health e-Initiative was that, by limiting the electronic access of patient medical and pharmacy records to physicians and pharmacists, the service was not utilized to its fullest potential. Midlevel practitioners (nurse practitioners, physician assistants) were not authorized to access prescription information, hampering their role as both primary care providers and physician extenders (Markle Foundation et al 2006). As frontier communities rely heavily on mid-level providers, this lesson for disaster preparedness also applies to frontier and border health IT initiatives.

Rapid change in the HIT environment. In some cases, the decision to implement a system was delayed due to the expectation of better tools and new requirements in the near future. For example, one respondent cited by Skinner et al. reported not installing a local CDMS in new clinics because of the expectation that CMS will be releasing a better product in the near future (Skinner et al 2006).

B. Undocumented Immigrants

Because of their particular social, political, economic, and cultural circumstances, undocumented immigrants may interact differently with health services than other populations. As a significant subpopulation in the border region, this has important impacts on both the acceptability and the efficacy of HIT / PHI applications.

Fear of detention and deportation can contribute to distrust of the health care system, and this fear may be exacerbated by the use of computerized information systems. For some, the fear may be a sufficient deterrent to avoid seeking necessary care. While HIPAA has greatly improved privacy standards and health data security, use of health records for law enforcement purposes is permitted. And incidents, such as when Immigration and Customs Enforcement (ICE) agents posed as OSHA trainers to snare 48 undocumented immigrants in 2005, will only increase distrust and reluctance to seek care (Migrant Clinicians Network 2005). As noted by the American College of Occupational and Environmental Medicine,

Raising suspicion among them of the potential for identification and deportation as a result of trying to learn how to do their job safely or how to prevent the spread of serious communicable diseases such as drug-resistant TB (widespread in their ranks) can only lead to additional pain and suffering as well as the increased costs to society for their health care for such injuries and illnesses. (American College of Occupational and Environmental Medicine 2005)

When they do seek care, undocumented immigrants often prefer to conceal their identity, and frequently provide false names and addresses to health care providers. As one of the main benefits of HIT and PHI is to link disparate records and create accurate histories and registries, false or unreliable data from undocumented immigrants can detract from data quality and the efficacy of the entire system.

The CURE-TB Project has not encountered any problems regarding immigration status with their members (Moser 2006). When patients phone the project hotline, trained providers respond to their concerns. When the patients feel comfortable with the system, they are very interested in using the system to complete their treatment.

As is often noted, HIT / PHI cannot solve the many problems of our health care system, but these problems can and will undermine the anticipated benefits of HIT / PHI initiatives.

C. Mobile Populations and the Limitation of Local / Regional Approaches

Local and regional initiatives to develop interoperable HIT systems are important steps on the way to a national health information system and may provide important benefits to residents. In the border region, however, the high proportion of mobile populations can affect their data. Incomplete records result when care is obtained outside of the regional exchange. Data derived from an RHIO may reflect a population that is no longer within the region or conversely fail to reflect the resident population. Exacerbating the data problem is the generally poor quality of population estimates for non-permanent residents, seasonal residents, and transient populations.

From a border health management perspective, the region of interest is the border region, yet an RHIO encompassing the entire border region – across State and national boundaries – is a long way off. Tuberculosis projects are the closest to developing a regional information system, but HIT / PHI initiatives remain fragmented by multiple health jurisdictions and the relative infancy of health information exchanges.

High rates of uninsured populations, as well as lack of reimbursement for technology-based services, represent a barrier to the advancement of HIT in the border region in at least four ways:

- The uninsured, when they seek care, are most likely to seek care from an emergency room rather than appropriate preventive services.
- The uninsured are less likely to use available services; insufficient volume of specialist service (already a problem in frontier regions) make even telemedicine applications unsustainable (Alverson et al 2004).
- The burden of uncompensated care in the border region not only reduces financial resources available to invest in HIT, but threatens the entire healthcare safety net (MGT of America 2002; Sullivan 2004).
- Development of insurance coverage schemes of technology-based services is widely viewed as an essential step in the promotion of HIT, as an uncompensated innovation is unlikely to be adopted (Shortliffe 2005).

Among those who are Medicaid and Medicare eligible, the lack of portability of benefits between States (Medicaid) or to Mexico (Medicare and Medicaid) effectively renders many beneficiaries without insurance (Eldridge 2002; Warner & Jahnke 2001). Retirees in Mexico either go without services or return to the United States for covered – but costlier – care. Seasonal migrants face barriers to accessing health services outside their State of Medicaid registration, and may end up using the emergency room. Portability of benefits would improve the use of appropriate care and enable the use of lower cost services in Mexico.

D. Unmet Needs, Potential Applications

The “connectivity conundrum” and public health. Access to appropriate health services remains difficult in the frontier and border contexts. Lack of primary care providers, as well as specialist care within a reasonable travel distance, continue to characterize the frontier. Residents of the frontier could potentially benefit greatly from various HIT applications. Yet given the relatively poor ICT infrastructure, the lack of financial resources, and the lesser deployment of HIT in rural and frontier communities, they are the least likely to benefit. This is

the “connectivity conundrum” – those most likely to benefit from ICT are the least likely to have access to it. Thus the digital divide has a role in maintaining or increasing health disparities.

Telehomecare. Many believe that HIT / PHI has an important role to play in reducing health disparities, particularly for rural residents, through applications including telehomecare (Chang et al 2004). For the management of chronic diseases like diabetes that require monitoring and follow up care, home-based telemedicine applications could significantly reduce the burden of distance for frontier patients and improve the quality of monitoring and follow up care. Innovations such as the IDEATel Project’s home-based diabetes monitoring units were designed to work over ordinary telephone lines, in English and Spanish, and could be adapted to work with a variety of telecommunication systems (Starren et al 2002) (IDEATel 2006). Although tested in urban and rural New York, the “electronic house call” could significantly improve access to and quality of care for diabetic patients in the frontier.

Personal health records. Most of the key informants spontaneously mentioned the need for some kind of portable, personal health record. Given the time required to implement a fully integrated, interoperable health information system, the difficulties with cross-border information exchange, and the reality that many patients obtain care in more than one health jurisdiction, many feel that a portable personal medical record is one way to empower consumers with their own health information and improve quality of care right now. For example, many residents of Imperial County reportedly prefer to obtain health services in Mexico, but cannot currently access their own health records (Binggeli & Vargas 2006). A portable, personal health record (PHR) would support the choice of residents of one geographic health authority to go elsewhere for care, as well as enable the chosen provider to provide better quality of care.

The binational health card is one example of a portable medical record, but is program-specific. Also, such records can be lost or destroyed and exist alongside electronic systems. Electronic PHRs can be provider or patient owned and controlled. The Community Hospital of Anaconda, Montana, aims to be the Nation’s “first rural online health record-keeping initiative”(California Healthcare Foundation 2006a), where patients’ health records will be available to them online. In a provider- or institution-based PHR, data are entered and updated by physicians and stored electronically in one place. Patients will receive cards that will enable them to access secure records on the Internet and share data with other physicians and family members.

Other personal health records are created and controlled by the patient rather than a physician. Patient-owned personal health records allow patients to manage their own information and are not limited to the input of a single provider or health system (Gearon 2005). Several options exist to individuals, ranging from the largest (WebMD) to smaller firms (FollowMe, CapMed, Vital Vault, and Laxor). Patients enter medical conditions, treatments, allergies, and test results; PHRs can also be used to set up appointment reminders, as well as provide access to health information. Some PHRs allow members to store digitized documents (e.g. x-rays). Some are Web-based, others use storage devices like CDs and flash drives to store information. Costs to the patient may include an annual subscription fee as well as costs related to Internet/computer access and producing the medical record itself.

One of the pioneers in PHRs, Follow Me, is a Web-based PHR launched in 2000. A customized bilingual version of the PHR, VIA, has been developed for migrant health workers, offered through Vineyard Worker Services, www.vwvia.org (Steakley 2002). The PHR is offered free to farm workers who come to Sonoma Valley and includes a printable emergency medical card, a secure Web-based PHR, and an email account. An early review of the program by the Connecting for Health Collaborative indicates that successful use of the PHR does not require a high level of IT capacity or expertise, and that “While the program is still evolving, the simple technology required for this practice could allow it to flourish in many settings” (Connecting for Health 2003).

While PHRs may be a way forward for mobile populations, there is no guarantee that providers will accept them. Some physician offices continue to lack PCs, and Web-based PHRs cannot be accessed without Internet connectivity. Some providers simply have an aversion to the technology, and others may not trust the content of a PHR, even though they rely on verbal histories provided by the patient (Gearon 2005). A third model envisioned is an integrated EHR-PHR, where personal health records can exchange data with provider or facility-based EHRs. From a provider perspective, this is the preferred model, as “all the advantages of PHRs for providers depend on the PHR being integrated with the provider’s EHR” (Tang 2006). Yet this is the most complex model, with the primary barrier being the lack of widespread EHR usage.

Public domain systems. The move toward increasing the availability of public domain systems will make HIT / PHI more affordable to clinics and programs with limited resources, as well as more standardized across systems. Examples range from comprehensive systems to stand-alone modules. The code of the widely-lauded VA patient management system, VistA, is in the public domain and is being transformed by the open source movement into OpenVistA; it is also being developed as a customized product from vendors (Goulde et al 2006). The Centers for Medicare and Medicaid Services is working on a repackaged version, VistA-Office EHR, designed for small physician offices. VistA formed the basis of the Indian Health Service’s Resource and Patient Management System (RPMS), which in turn contributed modules back to VistA. It has also been adopted by Mexico and other countries for use in its public healthcare systems, as well as some State and local health systems in the United States (California Healthcare Foundation 2006b).

Dedicated modules are also available in the public domain. A number of systems available for free have been described in this report, such as the Wisconsin Immunization Registry. A recent assessment of the use of chronic disease management systems (CDMS) in rural health care concluded that such technology is available and being implemented in rural clinics; a key benefit is that the “use of a standardized system in a collaborative helps provide data comparisons and share costs involved with technical assistance services across the group” (Skinner et al 2006). The increasing availability of public domain modules and systems promises to transform the economics of public health information technology, for the benefit of all.

E. Conclusions

Recognizing that information technology relies on agreed-upon standards, structures, and vocabularies helps explain, in part, why it has been difficult for public health agencies to make

greater advances in the use of HIT and PHI. The diversity in the organization, financing, and management of public health agencies reduces the possibility of achieving economies of scale (for example, adopting off-the-shelf, public domain applications). It also increases the technological challenge of achieving interoperability, as well as meaningful information exchange (as opposed to data sharing). This underscores the importance of initiatives such as those undertaken by NACCHO and the Public Health Informatics Institute to define the business processes of local health departments.

The binational challenges of public health at the border only increase the complexity of HIT in border health applications. The adoption of the VistA system for use in government hospitals by Mexico suggests a possible future strategy to achieve interoperability with Mexican providers at the border. Adoption of VistA-based systems on the U.S. side of the border may enable improved cross-border data sharing in the future.

Although there are many challenges in implementing HIT in the border region, the diversity of the region also translates into diversity in experience with HIT. There were as many positive examples of HIT implementation as there were obstacles to its adoption. In many ways, the challenges are the same as anywhere else in the country. And some border communities fulfill a leadership role in HIT / PHI. For example, Imperial County's TB Module has been ranked by the CDC as one of the top PHIN-compliant modules in the country, based on technical requirements, core business functionality, and usability (Binggeli & Vargas 2006). Informants of Imperial County reported "no special challenges" beyond the usual rural constraints and the typical issues associated with the adoption of HIT.

Frontier stakeholders need to be part of the national dialog on the development of standards for HIT, PHI, and health information exchange. Involving frontier stakeholders is in itself a challenge. For a frontier resident to participate in meetings at a statewide or even local level usually involves long travel times. As one informant stated, it "it is impossible to overestimate the amount of time we spend in our cars, even to organize a county-wide meeting." In spite of the logistical challenges, frontier stakeholders must be "at the table" to achieve the goal of a functional national health information system and to transform public health in the frontier.

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LIST OF ACRONYMS

AHRQ	Agency for Healthcare Research and Quality
ANSI	American National Standards Institute
ASTM	ASTM International, originally American Society for Testing and Materials
CDC	Centers for Disease Control and Prevention
CDMS	Chronic Disease Management System
CDO	Care Delivery Organization
CHIS	Child Health Information System
EHR	Electronic Health Record
EMR	Electronic Medical Record
FQHC	Federally Qualified Health Center
HIE	Health Information Exchange
HIS	Health Information System
HIT	Health Information Technology
HIMS	Health Information Management System
HL7	Health Level Seven (a standard for health information exchange)
ICT	Information and Communication Technology
IIS	Immunization Information System
IOM	Institute of Medicine
MCN	Migrant Clinicians' Network
NACCHO	National Association of City and County Health Officials
NEDSS	National Electronic Disease Surveillance System
PHI	Public Health Informatics

PHIN	Public Health Information Network (CDC)
PHR	Personal Health Records
RWJF	Robert Wood Johnson Foundation
TIMS	Tuberculosis Information Management System
USMBHC	The U.S.-México Border Health Commission

APPENDIX A

THE BORDER REGION - MAPS

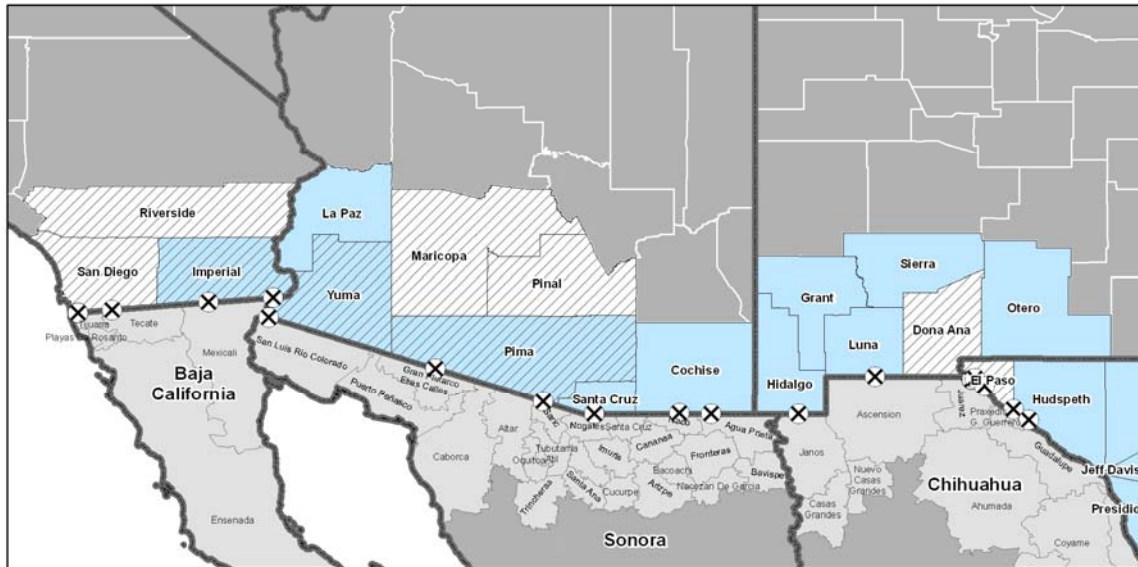
Map A: Border Counties in California, Arizona, and New Mexico

Map B: Border Counties in Texas

Map C: Health Services in CA-AZ-NM Border Counties

Map D: Health Services in TX Border Counties

Map A: Border Counties in California, Arizona, and New Mexico



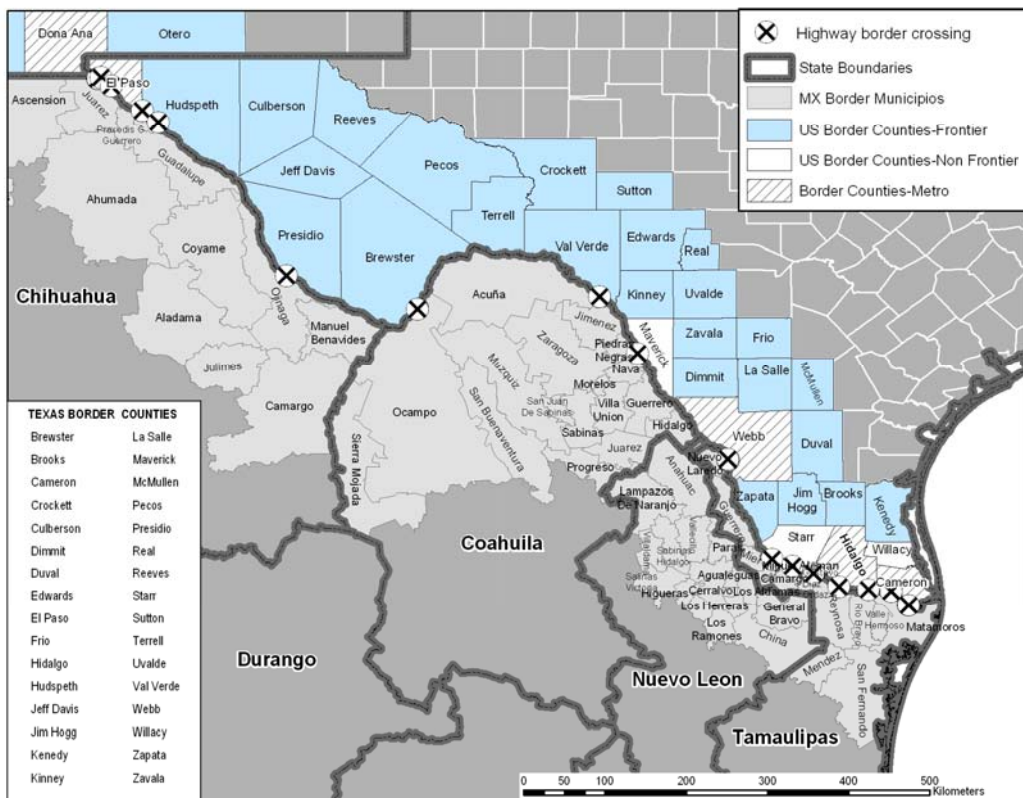
0 50 100 200 300 400 500 Kilometers

Border Counties - within 100km of the US-Mexico Border

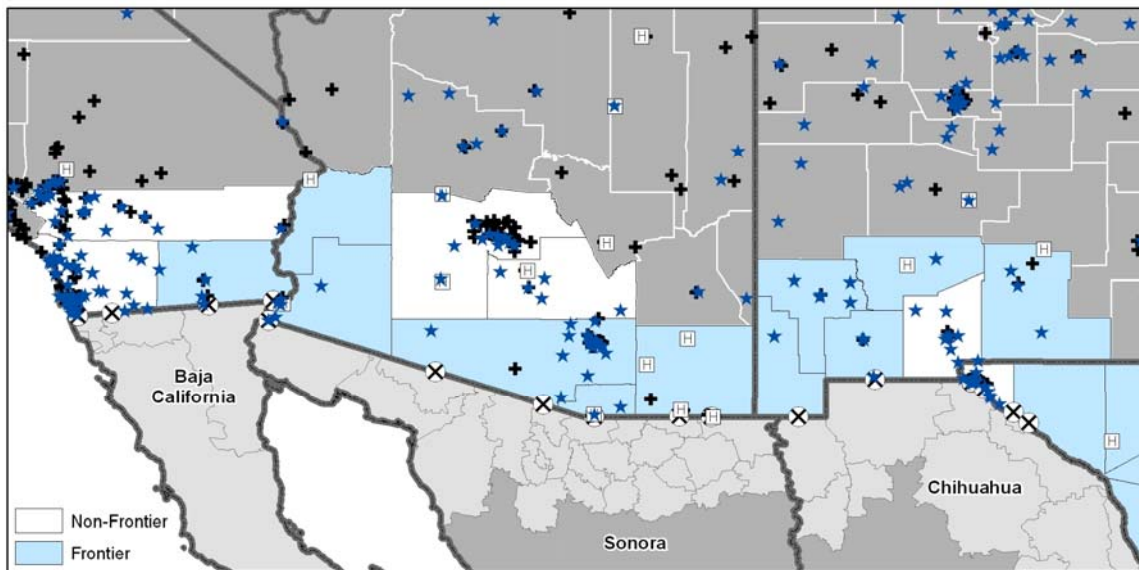
CA: Imperial, Riverside, San Diego
AZ: Cochise, La Paz, Maricopa, Pima, Pinal, Santa Cruz, Yuma
NM: Dona Ana, Grant, Hidalgo, Luna, Otero, Sierra

- ⊗ Highway border crossing
- ▬ State Boundaries
- MX Border Municipios
- US Border Counties - Non-Frontier
- US Border Counties - Frontier
- ▨ US Border Counties - Metro

Map B: Border Counties in Texas



Map C: Health Services in CA-AZ-NM Border Counties



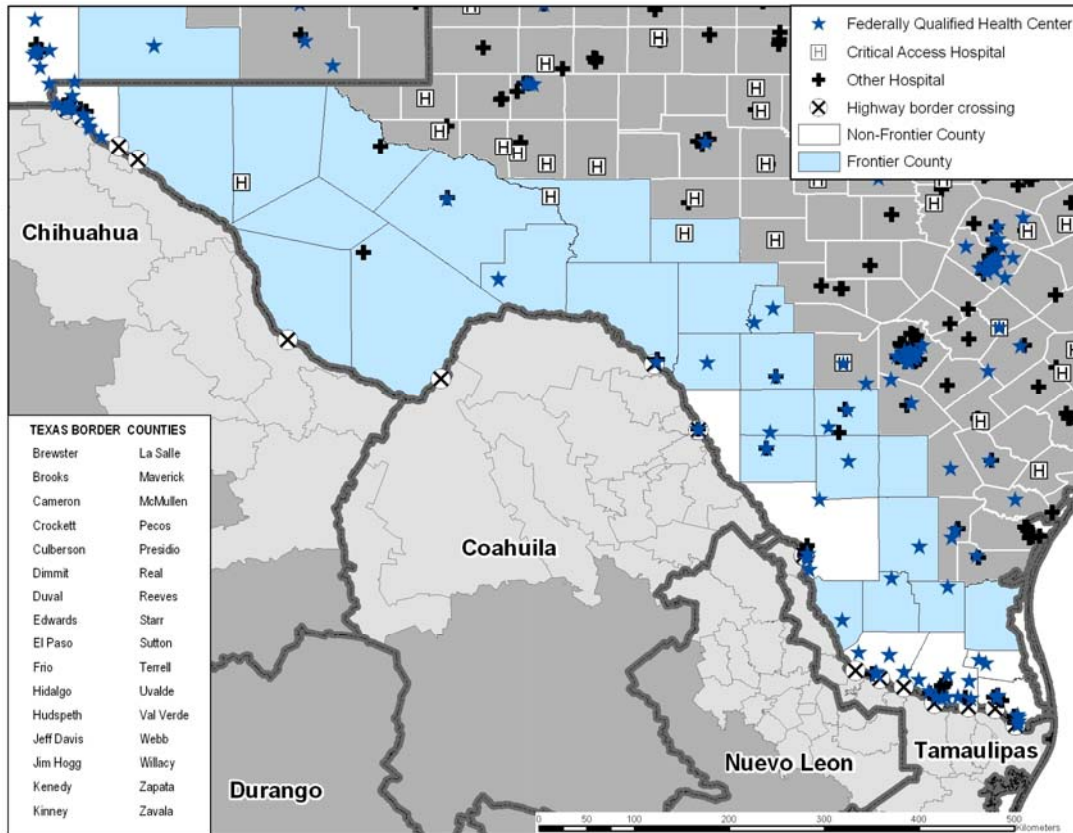
0 50 100 200 300 400 500 Kilometers

Border Counties - within 100km of the US-Mexico Border

- CA:** Imperial, Riverside, San Diego
- AZ:** Cochise, La Paz, Maricopa, Pima, Pinal, Santa Cruz, Yuma
- NM:** Doña Ana, Grant, Hidalgo, Luna, Otero, Sierra

- ★ Federally Qualified Health Center
- ⊞ Critical Access Hospital
- ⊕ Other Hospital
- ⊗ Highway Border Crossing

Map D: Health Services in Texas Border Counties



APPENDIX B

U.S. BORDER COUNTIES, BY FRONTIER CLASSIFICATION

	FRONTIER COUNTIES	NON-FRONTIER COUNTIES
CALIFORNIA	Imperial	Riverside San Diego
ARIZONA	Cochise La Paz Pima Santa Cruz Yuma	Maricopa Pinal
NEW MEXICO	Grant Hidalgo Luna Otero Sierra	Dona Ana
TEXAS	Brewster Brooks Crockett Culberson Dimmit Duval Edwards Frio Hudspeth Jeff Davis Jim Hogg Kenedy Kinney La Salle McMullen Pecos Presidio Real Reeves Sutton Terrell Uvalde Val Verde Zapata Zavala	Cameron El Paso Hidalgo Maverick Starr Webb Willacy

Note: 32 of the 48 U.S. Border Counties were classified as frontier in 2000.

APPENDIX C

HEALTHY BORDER 2010 GOALS AND OBJECTIVES

Source: United States-México Border Health Commission (2003). Healthy Border 2010: An Agenda for Improving Health on the United States-Mexico Border. El Paso, TX: 88 p. Available (05/13/06) at http://www.borderhealth.org/files/res_63.pdf

The overarching goals of the Healthy Border Program are:

1. **Improve the quality and increase the years of healthy life, and**
2. **Eliminate health disparities.**

The 20 Healthy Border 2010 objectives fall into 11 principal areas with their specific objectives as follows:

1. **Improve access to primary health care.**

Mexico:

Maintain at fewer than 5 percent of the population lacking access to basic health services.

United States:

Reduce by 25 percent the population lacking access to a primary care provider.

2. **Reduce cancer mortality in women through improved screening for breast and cervical cancers.**

Mexico:

Reduce female breast cancer death rate by 20 percent.

Reduce cervical cancer death rate by 20 percent.

United States:

Reduce female breast cancer death rate by 20 percent.

Reduce cervical cancer death rate by 30 percent.

3. **Reduce morbidity and mortality from diabetes mellitus.**

Mexico:

Reduce deaths due to diabetes by 10 percent.

Keep hospitalization rate stable at no more than 25.6/100,000 (Year 2000 level).

United States:

Reduce deaths due to diabetes by 10 percent.

Reduce hospitalizations by 25 percent.

4. Improve water quality through improved sanitation and reduce amount of acute pesticide poisoning.

Mexico:

Reduce the proportion of households not connected to compliant public sewage systems or septic tanks to less than 21.3 percent.

Maintain hospital admission rate for acute pesticide poisoning at 0.1/100,000 (Year 2000 level).

United States:

Reduce to zero the proportion of households without complete bathroom facilities.

Reduce number of hospital admissions for acute pesticide poisoning by 25 percent.

5. Reduce transmission of HIV.

Mexico:

Maintain HIV incidence at 3.1/100,000 (2000 level).

United States:

Reduce incidence of diagnosed HIV by 50 percent.

6. Improve rates of immunization and reduce rates of infectious diseases.

Mexico:

Maintain current immunization coverage of 95 percent for children age under 1 year and 1-4 years.

Reduce incidence of all forms of hepatitis by 50 percent.

Reduce incidence of tuberculosis by 10 percent.

United States:

Achieve/maintain 90 percent immunization coverage in children aged 19-35 months.

Reduce incidence of hepatitis A by 50 percent and of hepatitis B by 50 percent.

Reduce incidence of tuberculosis by 50 percent.

7. Reduce mortality from unintentional injuries.

Mexico:

Reduce motor vehicle crash death rate by 20 percent.

Reduce childhood death rate due to unintentional injuries by 50 percent.

United States:

Reduce motor vehicle crash death rate by 25 percent.

Reduce childhood death rate due to unintentional injuries by 30 percent.

8. Reduce infant mortality and increase the number of women receiving prenatal care.

Mexico:

Reduce infant mortality rate by 50 percent.
Reduce infant mortality rate from congenital abnormalities by 50 percent.
Increase proportion of mothers getting prenatal care in first and second trimesters to 70 percent.
Reduce pregnancy rate in adolescents 10-19 years old by 20 percent.

United States:

Reduce infant mortality by 15 percent.
Reduce infant mortality from congenital abnormalities by 30 percent.
Increase proportion of mothers getting prenatal care in first trimester to 85 percent.
Reduce pregnancy rate in adolescents 15-17 years old by 33 percent.

9. Reduce the suicide mortality rate by improving mental health.

Mexico:

Reduce suicide mortality rate by 25 percent.

United States:

Reduce suicide mortality rate by 15 percent.

10. Increase the usage of dental and oral health services.

Mexico:

Ensure that 25 percent of the population uses oral health services annually.

United States:

Increase proportion of population using oral health services to 75 percent per year.

11. Reduce morbidity from asthma.

Mexico:

Maintain asthma hospitalization rate at 4.0 per 100,000 population (year 2000 level).

United States:

Reduce asthma hospitalization rate by 40 percent.

APPENDIX D

**NATIONAL HEALTH IT STRATEGY – FRAMEWORK’S GOALS AND SUPPORTING
HHS IT INITIATIVES**

Division	Initiative	Goal 1 Inform Clinical Practice	Goal 2 Interconnect Clinicians	Goal 3 Personalize Care	Goal 4 Improve Population Health
AHRQ	Health IT Resource Center	*	*	*	*
	State and Regional Health IT Demonstrations	*	*	*	*
	Transforming Healthcare Quality Through IT		*		
CDC	Public Health Information Network				*
CMS	Doctors’ Office Quality – IT	*			*
	Medicare Care Management Performance Demonstration	*			
	Virtual Call Center			*	
	VistA–Office EHR	*			
FDA	Bar Coding for Prescription Products				*
	Structured Product Labeling Program		*		*
IHS	Resource and Patient Management System	*			
HRSA	Advancement of Telehealth Grants	*		*	
	Health Communities Access Program	*	*	*	*
	Integrated Services Development Initiative	*	*		
	Patient Electronic Care System	*			*
	Sentinel Centers Network	*			*
	Shared Integrated Management Information Systems/Information and Communication Technology	*	*	*	*
NIH	Cancer Biomedical Informatics Grid		*		*
	Grants for Research, Training, and Access to Informatics Resources	*			
	National Electronic Clinical Trials and Research Network		*		*
	Development and Implementation of Controlled Clinical Vocabularies		*		
ONCHIT	Consolidated Health Informatics	*	*		*
	Federal Health Architecture	*	*		*
	National Health Information Network	*	*	*	*

Excerpted from: United States Government Accountability Office (2005). Health Information Technology: HHS Is Taking Steps to Develop a National Strategy. GAO-05-628. Washington, DC: 88 p. Available (07/25/06) at <http://www.gao.gov/new.items/d05628.pdf>

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