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STUDY OF DISEASE SURVEILLANCE POLICY ISSUES ACROSS THE INTERNATIONAL BORDERS OF THE UNITED STATES

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ABSTRACT

Integration of disease surveillance efforts across the international borders of the United States presents complex challenges and significant implications for national security against both natural epidemics and biological attack. To explore these issues, we conducted qualitative studies of surveillance of communicable diseases across the Mexico /Texas border and the Michigan/Canada border. We conducted a series of semi-structured interviews with public health officials and physicians responsible for surveillance along these borders. The interviews were audio- taped, transcribed, and then coded for themes that emerged from these data. The findings for the Mexico border indicate that the most important issues are differences in standards of health care (including diagnostic tests and treatment protocols), communication pathways, and information technology between the two countries. Accurate communication about diseases cannot take place while standards are different. Another key finding was the importance of bi-national organizations in coordinating a variety of health issues across these complex borders. Although bi-national organizations have functioned for a number of years, inadequate funding has hampered swift improvement in coordination. The issues along the Michigan/Canada border focus on communication and coordination rather than on standards for diagnosis and care because Canadian standards are comparable to the U.S. standards. Fewer organizations function between these two countries; a bi-national organization is needed to resolve issues of disease surveillance and disaster preparedness. Michigan is leading efforts to establish formal communication channels between the U.S. states and the Canadian province of Ontario. Michigan's Health Alert Network (MI-HAN) provides a model of the development process and operation of such systems for other U.S. states and foreign countries. Implications of our findings for national public health and security policy are discussed. Extensive additional work in planning, training, equipment and coordination needs to be accomplished at local, state, and federal levels among the U.S. Mexico, and Canada before the populations of all three nations can be secure from natural and man-made disasters.

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Introduction

Integration of disease surveillance efforts across the international border of the United States presents complex challenges and significant implications for national security against both natural epidemics and biological attack. Exploration of disease surveillance issues at the US-Mexico border issues grew out of the Case Study of Surveillance in Texas Department of State Health Service Region 8 (Williams, Edwards, Silenas, Akins, 2004). Region 8 encompasses a long stretch of the Texas/Mexico border. Our interviews about communicable disease surveillance with public health officials in the border towns of Del Rio, Texas and Ciudad Acuna, Mexico conducted in May, 2004 revealed important issues that were receiving relatively little attention at that time. Accordingly, we proposed to the funding agency to pursue exploration of the Mexico and Canadian border issues during the 2004-2005 year.

To explore similarities and differences of disease surveillance issues at the US-Canadian border, we elected to work with the public health communities of Michigan and Ontario. We established these contacts through our partners at the Altarum Research Institute, Inc., headquartered in Ann Arbor MI. Preliminary information indicated that the state of Michigan was making important progress in establishing a state-wide health alert network and working with Canadian officials in the province of Ontario to communicate across the border. Other states we considered studying included North Dakota, Minnesota, and Washington, but Michigan seemed most productive within our resources.

Method

The research team conducted qualitative studies of an exploratory nature to describe the issues. Public health officials with responsibility for matters dealing with the Mexico border and the Canadian border of Michigan were identified through networking with professional colleagues. Questions for semi-structured interviews were developed through preliminary reading of newspapers, journals, and government reports. The sets of questions are contained in Appendix A.

Table 1 displays information about the public health officials who were interviewed in the studies. For the Mexico-U.S. study, we interviewed five individuals, one at the Texas Department of State Health Services Office of Border Health, two at the US-Mexico Border Health Commission and two, interviewed in 2004, who were public health officers at the local level in Ciudad Acuna, Mexico. All except one are fluent in English and Spanish and all have extensive backgrounds in border health issues. For the Michigan/Canada study, we interviewed five officials from the Michigan Department of Community Health, and two members of our research team participated in the Great Lakes Border Health Initiative Conference in September, 2005. We were unable to gain interviews with Ontario public health officials.

Each interview was audio-taped, transcribed, and then entered into Ethnograph software. These interview data were coded by two independent coders for themes that emerged in the analyses. A significant advantage of Ethnograph compared to other software

designed for qualitative analyses is that the researchers develop their own codes and themes with the progress of text analysis. The software does not require the input of a coding system structured in advance. Thus, we were able to develop themes that emerged from the data as the analyses unfolded. The findings are organized in two sections: (1) those relating to Mexico; (2) those relating to the Canadian border.

Disclosures

Janine C. Edwards is an educational researcher who has worked in medical education for many years. She has been studying the interface of public health and medicine in the context of disaster preparedness since 2002. Though born and raised in Del Rio, Texas, she had been away from the Texas/Mexico border for the past thirty-seven years, until she returned in May, 2004 to interview public health officials.

Rasa Silenas, MD, FACS, is a medical preparedness researcher. As a former military plastic surgeon, she has extensive experience in international medical assistance, preparedness for delivering health care in disturbed conditions, and planning for management of the medical consequences of weapons of mass destruction. She has no professional or financial connection to practitioners or agencies on either U.S. border.

Table 1. Interviewee Information

US-Mexico Border (Ciudad-Acuna - Texas)				
Site	**Position**	**Degree**	**Yr in current position (Yr in PH)**	**Prior experience**
El Paso Texas, US	Coordinator, Early Warning Infectious Disease Surveillance Project (EWIDS), US-Mexico Border Health Commission	MD (Mexico), MPH (US)	6 mo (20 yrs in PH)	Pan American Health Organization; Texas Department of Health; American Land Association
El Paso Texas, US	Executive Director, US Section, US–Mexico Border Health Commission	MS in Social Work	18 mo (20 yrs in PH)	Border Health
Austin Texas, US	Director, Office of Border Health, Texas Department of State Health Services	PhD in Environmental Toxicology	10 yrs (10 yrs in PH)	Environmental health (CDC) International Life Science Institute
Ciudad Acuna State of Coahuilla, Mexico	Coordinator of Public Health Department of Health	MD	Unknown	Unknown
Ciudad Acuna State of Coahuilla, Mexico	Coordinator of Health Promotions, Department of Health	MD	Unknown	Unknown

Table 1. Interviewee Information (cont'd)

US-Canada Border (Michigan)				
Detroit Michigan, US	Acting Section Manager, Surveillance Section, Michigan Bureau of Epidemiology, MI Dept. of Community Health	BS in Biology, MPH	Unknown (12 yrs in PH)	County and State Epidemiologist
Lansing Michigan, US	Border Health Project Coordinator Division of Communicable Disease MI Dept. Of Community Health	BSN	6 mo (6 mo in PH)	Hospital nursing educator Hospital infection control
Lansing Michigan, US	MI-HAN Planner and Content Specialist MI Dept. Of Community Health	Unknown	Unknown	Information Technology
Lansing Michigan, US	HAN Coordinator, Office of Public Health Preparedness, MI Dept. of Community Health	MPA	4 yrs (10 yrs in PH)	Social services case worker Policy analysis research Community health statistics
Lansing Michigan, US	Acting Director, Division of Communicable Disease, MI Dept. of Community Health	MPH, DVM,	18 mo (5 yrs in PH)	Field veterinary medical officer, Epidemiology (USDA) Epidemic intelligence service, EIS officer (CDC)

Findings: U.S./Mexico

Ten states form the border: six on the Mexican side and California, Arizona, New Mexico and Texas on the U.S side. Each U.S state has its own Department of Health. Much of the terrain on both sides is desert. Many of the residents have family on both sides of the border and are accustomed to moving back and forth across it regularly. Poverty is endemic, although there has been tremendous growth of industry due to the North American Free Trade Agreement (NAFTA). Illegal migration, drug trafficking, and gang wars add a constant threat of violence; environmental contamination by industrial activities and insufficient sanitation add other public health concerns.(Homedes & Ugalde, 2003)

Figure 1. U.S.-Mexico Border

Source: http://www.epa.gov/usmexicoborder/map/sf-index.htm

Administrative Structures

Centralization vs. Decentralization:

The Mexican public health system is centralized. The Mexican State Departments of Health are subsidiary to the national Secretario de Salud. Final decisions about data sharing are made at the federal level. On the other hand, public health in the U.S. is decentralized. The central Secretario de Salud in Mexico does not have a direct counterpart in the Centers for Disease Control and Prevention (CDC), as the state

Departments of Health are independent of Washington. In Texas, furthermore, the Department of State Health Services (DSHS) is subdivided into eight regions. Each regional Director has a fairly high degree of autonomy regarding information he will transmit in a region-level meeting, after validation from Austin that the information is correct. In each of the other U.S states bordering Mexico, the public health structure is unique to that state.

U.S. State Departments of Health:

The Mexican Departments are subsidiary to the national Secretario de Salud. In the U.S., each health department is autonomous, although they coordinate and share information with each other and the Centers for Disease Control and Prevention (CDC).

Border Health Offices:

Each of the U.S. border states, California, Arizona, New Mexico, and Texas, has Offices of Border Health. These were all established in the early 1990s. Their primary function is to promote communication, collaboration and coordination with their sister states. They work with each other and with working groups from the Centers for Disease Control (CDC) and Environmental Protection Agency (EPA), as well as collectively with Mexican agencies on mutual support and advocacy. The Border Health Offices also work closely with the bioterrorism planning teams of their respective states and with their counterparts in Mexico in the planning of vertical forums, training, meetings and exercises. One major example of cooperation among the Border Health Offices is the creation of the US-Mexico Border Health Commission, which has its origins in aggressive grass-roots organization by several committed individuals from these offices.

In Texas, the Office of Border Health was created ten years ago. Although public health officials had wanted such an office for various reasons for a long time, the immediate impetus was national concern about several outbreaks in the border areas in the early 1990s, including a cluster of neural tube defects in the Lower Rio Grande valley and an increase in animal rabies in South Texas. One of the main responsibilities of the Office is to be involved in bi-national coordination with Mexico. Members serve as official delegates on a number of established platforms that are working with Mexico. Also, they have specific programs along the Texas border, which sometimes work bi-nationally but sometimes work for Texas border counties. The Office gets most of its funding from the state and some from federal sources. It has five or six field offices along the border (from El Paso to Brownsville) as well at the central office in Austin.

U.S. and Mexico National Level:

In the U.S., the CDC, an agency of the Department of Health and Human Services, provides support and central coordination to the state Departments of Health, though the

CDC is not in their chain of authority. The Department of Homeland Security (DHS) has an interest in disease surveillance information. The Animal and Plant Health Inspection Service (APHIS) of the Department of Agriculture was moved under the Border and Transportation Security Directorate of DHS. However, human disease surveillance remains the responsibility of the CDC.

In Mexico, functions which were recently consolidated in the US Department of Homeland Security are divided among multiple agencies. The office of the Secretario de Salud is the highest Health Authority for the entire nation. It has multiple divisions involved in bioterrorism preparedness, including disease surveillance and laboratory response, preparedness, and deployment of action teams.

Bi-national and International Organizations: United States-Mexico

There are a number of established bi-national organizations striving to provide leadership in across-borders bioterrorism preparedness and disease surveillance. Bi-national Health Councils are coordination bodies formed by Health Departments of sister cities across the border. However, due to legislative, bureaucratic and political limitations, their function has been somewhat restricted and yet remains to be fully defined. Table 2 displays pertinent information about some, but not all, of the bi-national organizations. Each organization listed in the table is described in the text below.

Table 2. Bi-national Organizations

Name	Acronym	Function or Purpose	Funding Sources	Activities
US-Mexico Border Health Commission	USMBHC	- Legislated mandate - To provide international leadership to optimize health and quality of life along the U.S.-Mexico border.	DHHS (Department of Health and Human Services)	- Frequent meetings. - Comprised of the federal secretaries of health, the chief health officers of the ten border states and prominent community health professionals from both nations. - Addressing their surveillance system, communications and training needs related to Public Health preparedness.
US-Mexico Bi-national Commission	BNC	- Not border –specific - Cabinet level forum to allow for regular exchanges on a wide range of issues critical to U.S.-Mexico relations.	CDC (Centers for Disease Control and Prevention), Department of State	- Including various fields, not limited to health - Six Core Groups on Health: Immunizations, Women's Health, Aging, Epidemiological Surveillance, Migrant Health, and Addictions.
Global Health Security Action Group	GHSAG	- Development of Health Security strategy.	Canada, European Union, France, Germany, Italy, Japan, Mexico, UK, US	- Developing proposals and concrete actions to improve global health security. - Serving as a network of rapid communication /reaction in the event of a crisis.
United States-Mexico Border Governors Health Table	BGC	- Addressing agriculture, border crossings, education, economic development, energy, environment, health, tourism, and border security		- Annual conference
Council of State and Territorial Epidemiologists	CSTE	- Promoting use of epidemiological data by state and local level health department.		- Regular meeting - Supporting each other's activities

Source: http://www.borderhealth.org/border_region_health_organizations.php?curr=border_region

U.S.-Mexico Border Health Commission (USMBHC): This Commission was created by Congress in 1994 for the purpose of providing leadership to optimize health and quality of life along the U.S. Mexico border. The President was directed to negotiate Mexico's participation with the President of Mexico. These negotiations were complicated by political events, which Mexico perceived as anti-immigrant, in the State of California The issues eventually were resolved and Mexico joined in. However, funding followed slowly, and the 2005 budget was only about $5 million. The Commission facilitates and coordinates relationships, communications and protocols regarding health issues between the two nations. Along the U.S. Southern border, the USMBHC coordinates strategically the Early Warning Infectious Disease Surveillance (EWIDS) program.

There are grant programs extant for which the Commission would be an excellent fiduciary agent, but there is lack of clarity on its status as an independent body vs. an agency under the Department of Health and Human Services (DHHS), which hinders such programs.

U.S. - Mexico Bi-national Commission (BNC): This Cabinet-level group is longstanding, considerably pre-dating the Border Health Commission. It is a unique forum for addressing a wide range of topics critical to U.S. –Mexico relations, such as diplomatic issues, transportation, etc. Six core groups address health issues: immunizations, women's health, aging, epidemiological surveillance, migrant health, and addictions. The BNC is funded by the Centers for Disease Control and Prevention (CDC).

Global Health Security Action Group (GHSAG): The senior health officials of the U.S., Mexico and seven other partners (the United Kingdom, Germany, Italy, France, Canada, Japan, Mexico, the European Union) meet for actions to improve health security. These nations are developing proposals and concrete actions to improve global health security, and they serve as a network of rapid communication /reaction in the event of a crisis. Mexico and the U.S. have recently begun discussions about strategic national stockpile efforts.

United States-Mexico Border Governors Health Table (BGC): The Governors of the ten border U. S states and Mexican border states form this group. It meets annually with representatives from DHHS, to address a wide variety of border issues, including agriculture, border crossings, education, etc. The format includes issue-specific work tables. The health workgroup has specifically focused on the ability to do vertical planning between U.S states and Mexico, about preparedness around areas of interest and need. There are two work tables for the bioterrorism and homeland security issues in the region.

Council of State and Territorial Epidemiologists: This group promotes use of epidemiological data by state- and local-level health departments. A comparable organization was founded in Mexico seven years ago. The two groups meet regularly and support each other's activities.

Programs

Education: The U.S.-Mexico Border Health Commission offers training programs for both health professionals and others that have a role to play in disease surveillance efforts. The States on the U.S. side provide funding for various border activities including training. Sometimes, States like New Mexico or Arizona invite health professionals from Mexico to their own training programs. This is an informal opportunity to share information across the border.

Healthy Border 2010: This program was negotiated by the ten border State Departments of Health before the institution of the U.S.-Mexico Border Health Commission. The Commission is actively engaged in various initiatives of this program. It has two goals: increase and improve the quality of life and years of healthy life and eliminate health disparities. It also establishes 10 year objectives for bi-national health promotion and disease prevention in the border region.

Border Infectious Diseases Project (BIDS): The Border Infectious Diseases Project (BIDS) is funded through the CDC Office of Quarantines. It has been in place since June, 1997, setting up sentinel sites along the border to track, by clinical reporting, a designated set of communicable diseases and syndromes, such as febrile exanthema and hepatitis A. The data it has produced so far have not been as good as Texas public health officials would like, but as the infrastructure of the program improves, the data may improve too. The flow of cross-border surveillance information under this program is still not mature. More information is available on the website (http://www.r10.tdh.state.tx.us/obh/bids.htm).

Early Warning Infectious Disease Surveillance (EWIDS): The Early Warning Infectious Disease Surveillance (EWIDS) program operates with the Mexico and the Canadian borders. The EWIDS Program is funded by the U.S Department of Health and Human Services, Office of the Secretary. In 2005, the budget for the programs was $5.4 million. Each of the 20 U.S. states bordering Mexico and Canada receives base funding of $15,000 and an additional allocation based on the number of legal border crossings in that state. This funding has recurred for the past three years. This is termed the U.S Border States EWIDS Project. Beginning in 2005, states that receive EWIDS funds can leverage their resources by engaging in regional collaborations. An additional one-time funding of $5.0 million has been provided to the U.S. –Mexico Foundation for Science (FUMEC). This is the EWIDS –Mexico Project. The program focuses, not on doing public health activities, but on building capacity of both U.S. neighbors in four focus areas: laboratory, disease surveillance, education, and training. EWIDS funding was authorized only through 2006; whether additional monies will become available is uncertain. Surveillance enhancements under EWIDS include registry forms, communications capabilities and a variety of similar programs. Additional information about the U.S. Border States EWIDS Project is available at http://www.bt.cdc.gov/planning/guidance05/pdf/appendix2.pdf

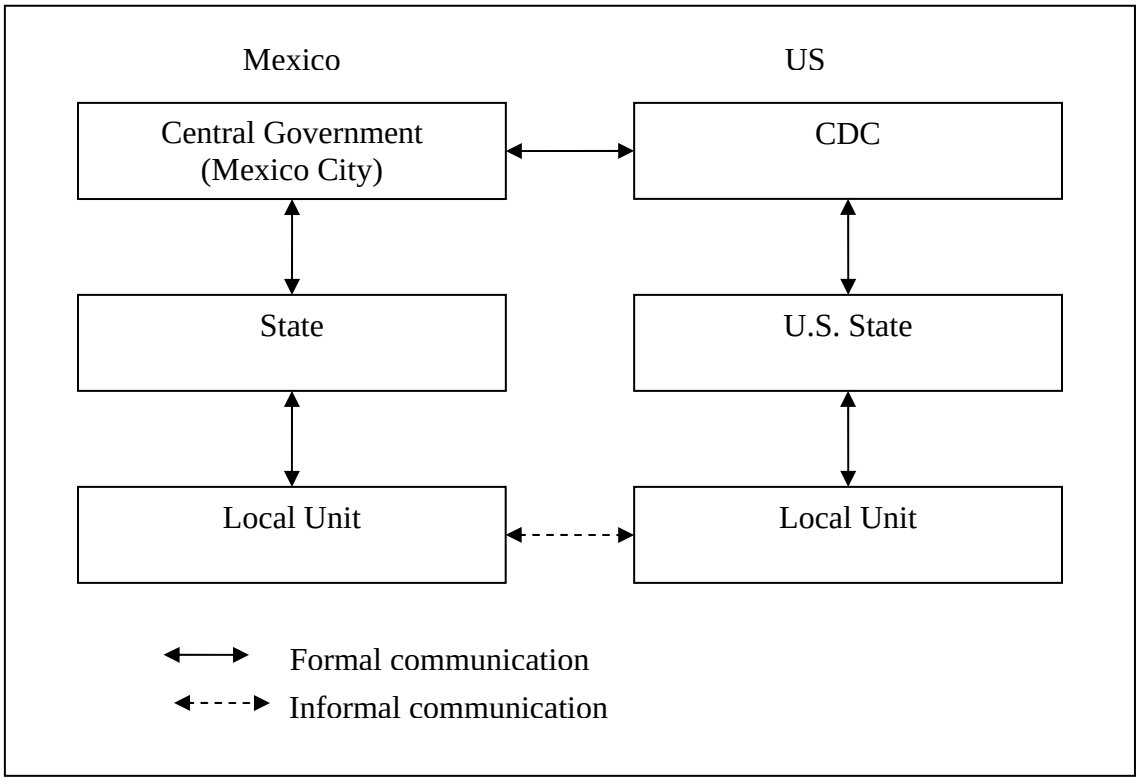
Communication

Pathways

Formal cross-border communication is an overarching issue at national and regional levels while informal contacts and information sharing appears to be flowing naturally at local levels.

The formal (official) path of communication in Mexico follows the centralized chain of authority from the local level through the state level to the Secretaria de Salud (Secretary of Health) in Mexico City (federal level). The Secretaria de Salud then will contact the CDC. Mexico and the U.S. have established protocols for reporting public health threats. Specific channels of communication and time lines are prescribed for specific types of threats. Protocols for coordination of managing bi-national outbreaks are being developed with the help of the Border Health Commission. The diagram below illustrates the formal and informal pathways of communication.

Figure 2. Formal and Informal Communication Pathways between Mexico and the U.S.



In contrast to the U.S., in which communications are directed to whomever is currently fulfilling a specific function, or even to other people in an office, Mexican practice directs information to an individual. The Mexican officials speak through one voice - vo*cero unico*. This centralized system has a clear chain of command. However, if the point of contact is unavailable, others may hesitate to step into that role and

communication may not occur. This individual-based system also makes it more difficult to maintain up-to-date contact information lists for notifications as individuals change jobs.

Informal communication flows freely at the local level. As in all small towns, people bump into each other often and exchange the news of the day. Public health officials who work on both sides of the border also telephone each other frequently with any news they think might be relevant to the others. There are regular bi-national meetings in seven towns on both sides of the border; the function of these meetings is to cultivate working relationships and informal communication. Nevertheless, from the perspective of the Texas public health officials, there is not enough informal communication to handle adequately all the medical matters that arise. One Texas official with a broad overview said that the central Mexico officials seem to accept informal communication as long as the official protocols are being followed simultaneously.

One of the interviewees who works in a bi-national program said:

> *I just want to say that one of the beauties of the U.S.-Mexico border region is that they're professional on both sides of the border. I'm not stopped by the border when they need to inform and communicate with each other, or share respective information around training opportunities, capacity building options, activities programs, research and so forth.*

Diagnostic Standards Issues:

Movement of border residents creates information transfer issues, as when a resident on the Texas side seeks health care in Mexico or vice versa. If the patient has a notifiable condition, the official pathways through both national capitals are time-consuming and information may fall through the cracks. However, if the situation is urgent, local officials will notify each other through informal pathways. Diagnostic standards in Mexico are more clinically-based, in contrast to the laboratory-based tests expected in Texas and throughout the U.S. This difference of diagnostic standard creates difficulties in communication and in treatment of patients who cross the border freely. An example of these difficulties was unfolding at the time we conducted interviews in Del Rio, Texas and Acuna, Mexico.

In the spring of 2004, two Mexican medical doctors who live in Del Rio, Texas, but work as public health officials in Acuna, Mexico communicated informally with the Del Rio public health nurse that there were a few cases of measles in Acuna. The nurse gave the following description in her interview:

> *We have a lot of people who go across to get medical care. And a perfect example, we had a child. It's kind of ironic, and I'm glad that it's all turned out the way it did. Two weeks ago we had a call from a school nurse indicating that they have a child that was diagnosed, but it wasn't measles, it was rubella (German measles—RS). She called it" rubeola" (measles—RS), which in Mexico*

is rubella, which is very confusing. And so, we did the bloods (serologic tests for disease-specific antibodies—RS) on that child and they were all nonreactive, but we find a lot of times that they don't do the bloods on the mumps and the measles and stuff like that, or even the hepatitises. They'll do the LFT's (liver function tests).

And so we have seen many people, you know, the hepatitises are probably right. You know, they usually have elevated LFT's and so, generally with children, they'll call it hepatitis A, which it probably is on the children. But with the mumps and the measles and rubella, every lab that we have done to follow up on that has always turned out to be negative. And we try to follow up on those because we need to know. And particularly, like I said, I'm kind of glad with this last one that the mother did consent to the labs. And that's another issue, is that the mother has gone through all the trouble of going over there, going to somebody she thinks is very good, and rightly so, and then we come back and say, but we need verification over here. Are you willing to let us repeat the tests or do the lab? And fortunately, she let us, and like I said, particularly right now, because of what's happening, I'm glad we have it. I have it in my hand, you know. And it is negative.

In other words, the clinical diagnoses of notifiable diseases from health care facilities in Mexico are often not borne out by serological (many childhood diseases, hepatitis) or culture (tuberculosis) testing of those patients in the U.S. Thus the same patient might be reported as a case of disease in one country but not the other. Non-uniform nomenclature of diseases can also cause problems, especially when the Mexican name for a disease ("rubeola") refers to a different, also reportable disease (rubella) in the U.S. The Border Health Commission is facilitating the development of a common list of diseases for bi-national notification and working to resolve reporting issues caused by differing diagnostic standards.

Confidentiality:

An additional problem with health information management is confidentiality. Patients are concerned about being tracked for non-medical reasons, U.S. health care organizations are concerned with being reimbursed for the care of Mexican citizens, and the U.S. Department of Homeland Security has a growing interest in knowing who is crossing the border. Achieving good coordination of health records without violating the patient's confidentiality is complicated in this setting. In the case of tuberculosis, a de-identified bi-national health card is being used. The card lists the patient's medications so that they could be continued as he/she moves across the border. However, there is no comparable mechanism for information sharing about other diseases. Again, the Border Health Commission is helping to develop a list of diseases for bi-national data sharing protocols.

Tools:
Along the Texas-Mexico border, telephone is the main communication tool for immediately-reportable conditions. Nearly all jurisdictions of Mexico have access to telephones. However, in some areas, the number of available lines is limited and the same phones are used as fax lines. So, it can be frustrating or time-consuming to make urgent calls. Cell phones are common and work very well in most areas in the U.S. In Mexico, availability of cell phones is much more limited, especially outside of urban areas, and signals may drop out when travelers cross jurisdictions. Thus cell phones are of limited value for public health purposes at this time. Fax machines also play an essential role in surveillance on the U.S. side of the border.

Mexico has made great advances over the past few years in the availability of state-of the-art computer equipment, software, and infrastructure. Training and funding are ongoing challenges. In larger Mexican jurisdictions, Internet and email are in use, but many semi-rural and rural areas do not have internet service yet. One difficulty with widespread use of Internet and email for public health communications is that broadband access is still limited; many offices are still using dial-up access. Current efforts in Mexico include making sure that the equipment and software are being used to full potential.

Some health agency offices already have video conferencing equipment. The first video teleconference was held between senior public health officials at Nuevo Leon, Mexico and Austin, Texas in January 2005 and the participants were enthusiastic over how much more personal it was than telephone conferences. Plans are to expand use of this capability. To promote better communication, Texas has supported Mexico by donating equipment and put funding directly into sister states and the local jurisdictions of Mexico. This has developed basic infrastructure such as email capacity.

Texas DSHS is trying to include Mexican counterparts on the Health Alert Network. This work is incomplete because of challenges of both communications infrastructure and identifying consistently-available offices or individuals to notify.

One interesting cultural difference, which occasionally causes information disconnects, is that U.S. officials tend to be engaged with electronic communications technology, and to use email. However, some senior Mexican officials perceive email as a clerical function in which they prefer not to engage. The following quotation, from a Mexican official, illustrates this point vividly.

> *Let me tell you one big difference between the United States and Mexico, in that area (computer systems). In this area, we have a room with under-paid personnel to do computer work. And, the chiefs, the coordinators, they don't handle computers. Only the secretaries. And here, you have to do it yourself, you know.*

Overall, communication across the border has become much more frequent and valuable to the participants in the last five years. The improvement and dissemination of

technology has played an important role by spreading information and training opportunities.

Disease Surveillance Systems

Both nations have robust surveillance systems based on reporting by labs and health care practitioners to public health authorities (Williams, Edwards, Silenas, Akins, 2004). The use of automated disease surveillance systems is limited on both sides of the border although more so in Mexico.

As Mexico continues to expand the role of electronic information technology throughout its States, it is deploying a single nation-wide electronic disease surveillance system. In contrast, the U.S. is developing the fifty state-level National Electronic Disease Surveillance (NEDS) systems. Although the NEDS standard is intended to provide data interoperability, and official protocols require that U.S.-Mexico data-sharing go through the CDC, which would consolidate and coordinate multi-state information, the multiplicity of data systems on the U.S. side of the border creates obvious challenges not only for Mexican public health officials, but for public health agencies in bordering U.S. states.

Laboratories

As in the U.S., State-level labs have varying levels of basic capabilities, with the national-level labs available for more specialized testing. There is a laboratory response network between Mexico and the US. The USMBHC has been helpful in facilitating donations of surplus laboratory equipment from DSHS to Mexican laboratories.

Disease Issues

Bi-national disease surveillance for bioterrorism and other acute biological disasters is happening in the context of a great deal of surveillance activity for other, "peacetime" conditions, such as these:

> Tuberculosis: Both Mexico and the US consider their southern borders to be their areas of greatest risk regarding migration of TB patients. Thus for Mexico, the border with the US, its northern border, is not its highest priority for funding TB programs.
>
> Birth defects: As noted above, clusters of birth defects have been noted in the colonias, notably a cluster of neural tube defects in the early 1990s. Interestingly, though these were felt to be influenced by environmental pollution, and area manufacturers paid significant settlement claims, recent information (Missmer et al, 2006) suggests that fumonisin, a toxic contaminant in tortillas made from moldy corn, may be the real cause.

Cancer: there is a perception that the area has increased cancer mortality, but the data are weak. Improving cancer reporting in border areas is an area of interest for public health officials on both sides.

Diabetes : Type 2 diabetes is 2.5 times more prevalent in adults along the border than elsewhere in the U.S. Multiple programs in the area seek to improve prevention, diagnosis and treatment.

Economic Development and Public Health

The North American Free Trade Agreement (NAFTA) signed into law in January, 1994 has had far-reaching economic effects. The Mexican and U.S. states situated along the border are booming with trade traffic and industries. The 2003 Canadian website for NAFTA (http://www.dfait-maeci.gc.ca/nafta-alena/menu-en.asp) proudly announces:

> *The Agreement has brought economic growth and rising standards of living for people in all three countries. In addition, NAFTA has established a strong foundation for the future growth and has set a valuable example of the benefits of trade liberalization…*
> *As we near the tenth anniversary of the implementation of the NAFTA, it is important to take stock of its achievements. The verdict is clear – it has been a great success for Canada and its North American partners, and we are committed to ensuring that it continues to help us to realize the full potential of a more integrated and efficient North American economy.*

There is no dispute about the economic achievements, but the public health consequences have not been foreseen nor adequately planned for in both Mexico and the United States.

In May, 2004 two medical doctors who are public health officials described the scene in the Mexico state of Coahuila, Ciudad Acuna, the town bordering Del Rio, Texas. Forty factories (maquinarias) had been built in that town following the passage of NAFTA. These factories produce such things as automobile parts and accessories, i.e., seat covers. During regular sanitation checks of air and water quality, inspectors found, for example, that only three factories had exposure to fresh air. Burning of garbage was common throughout the area. At that time there were approximately 27, 000 young adults (aged 16 to 24 years old) of both sexes who had flocked to Ciudad Acuna to work in the factories. With this large influx of young adults came medical and public health problems that overwhelmed the region: medical conditions, reproductive conditions, pregnancy, prenatal care, and sexually transmitted diseases (STD). Public health officials and medical doctors were straining to provide the most basic services. Although the economic benefits of NAFTA may be large, it is desirable for higher standards of health to be achieved simultaneously.

Findings: Michigan/Canada

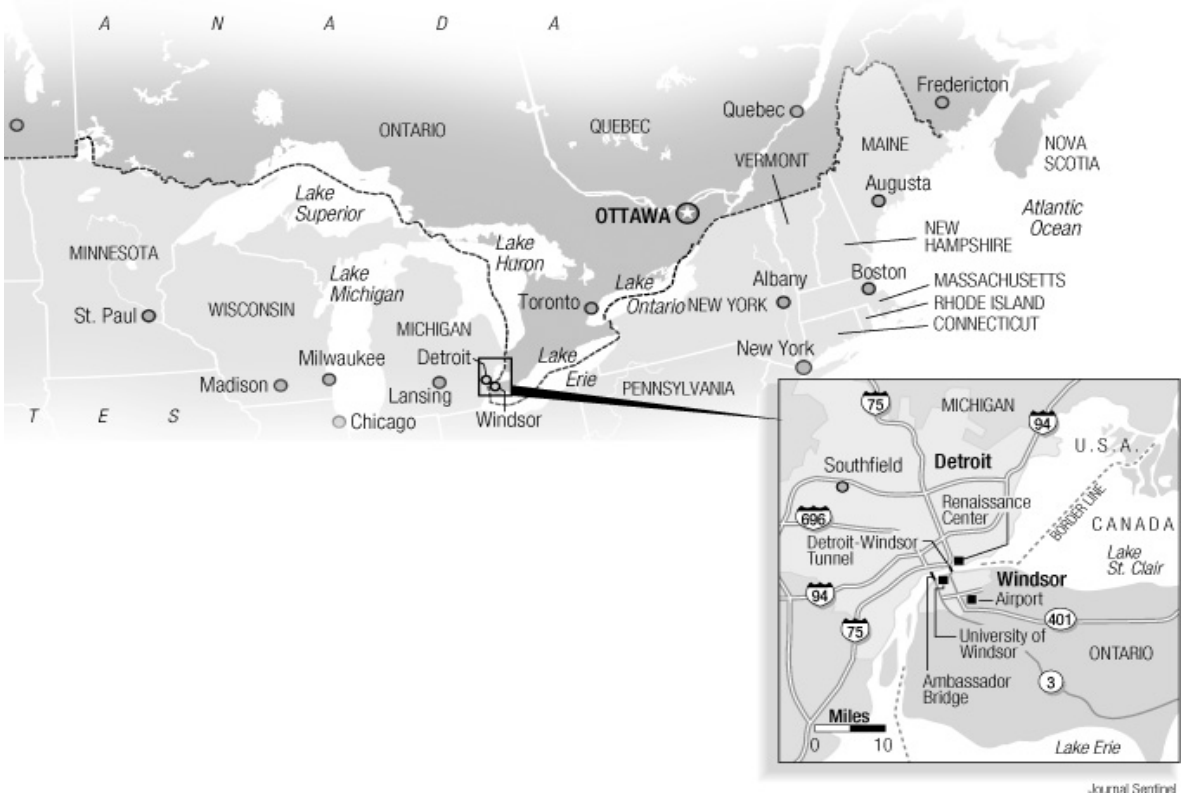
Our attempts to study the relationship between Ontario and Michigan public health agencies and officials were impaired by the legacy of the recent SARS outbreak in Toronto. In its aftermath, Canada is reassessing its own public health structures and processes. Canadian officials declined to be interviewed in 2005, perhaps because they anticipated significant changes in the near future. This central reorganization has also placed some provincial efforts "on hold."

Administrative Structures

There are significant differences in the public health care systems between US and Canada and especially between the state of Michigan and the province of Ontario. The size of the two populations is approximately equal (Michigan has 10 million and Ontario has 12 million), but Michigan's geographical size is only 57,000 square miles compared to Ontario's 400,000 square miles. It should be noted that the majority of Ontario's citizens live within fifty miles of the U.S. Canadian border.(Button & Seeger, 2004)

Ontario has 37 Boards of Health; 26 single and multi-municipal autonomous boards (local health units), 10 regional municipalities, and the city of Toronto. The map below displays Ontario's border with Michigan. There are three land border crossings between Michigan and Ontario.

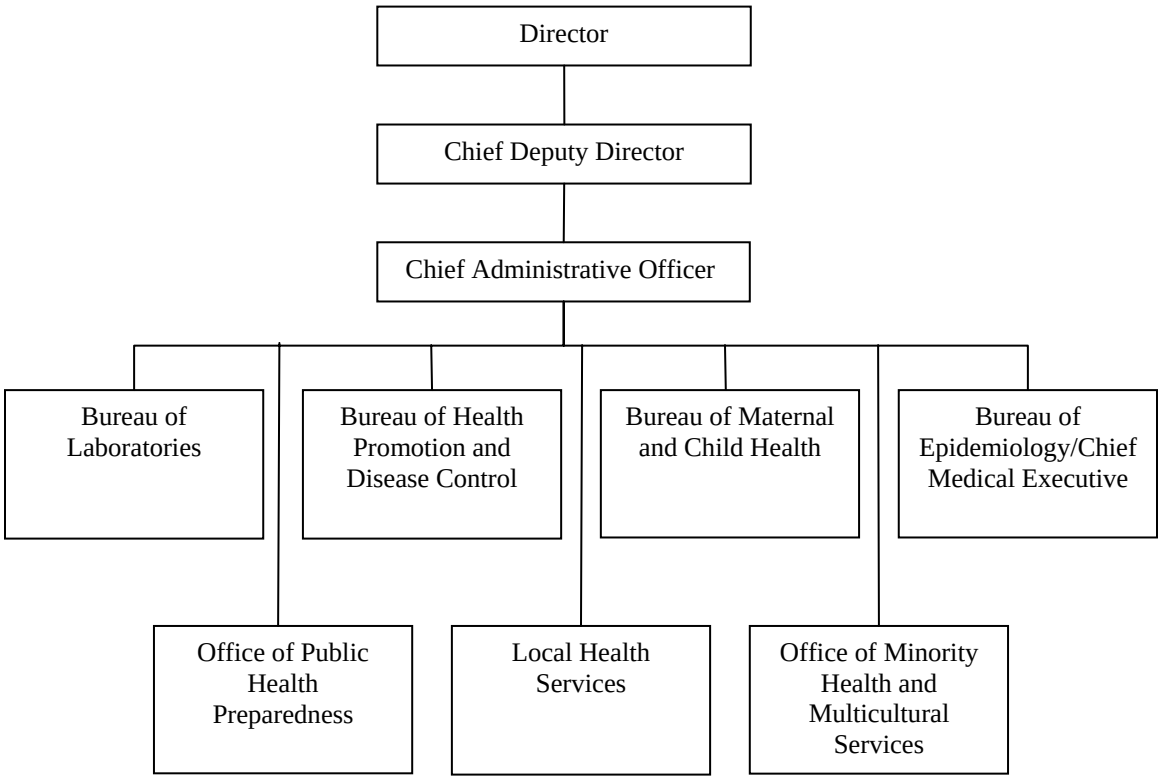
Figure 3. Ontario and the U.S. Border States



Source: http://graphics.jsonline.com/graphics/news/img/mar02/det2gx030902.jpg

Michigan's public health system consists of the Michigan Department of Community Health and 45 local health boards.(Button & Seeger, 2004) There are eight public health preparedness regions, which coincide with the state police regions in Michigan. The administrative structure of the Michigan Department of Community Health is displayed below:

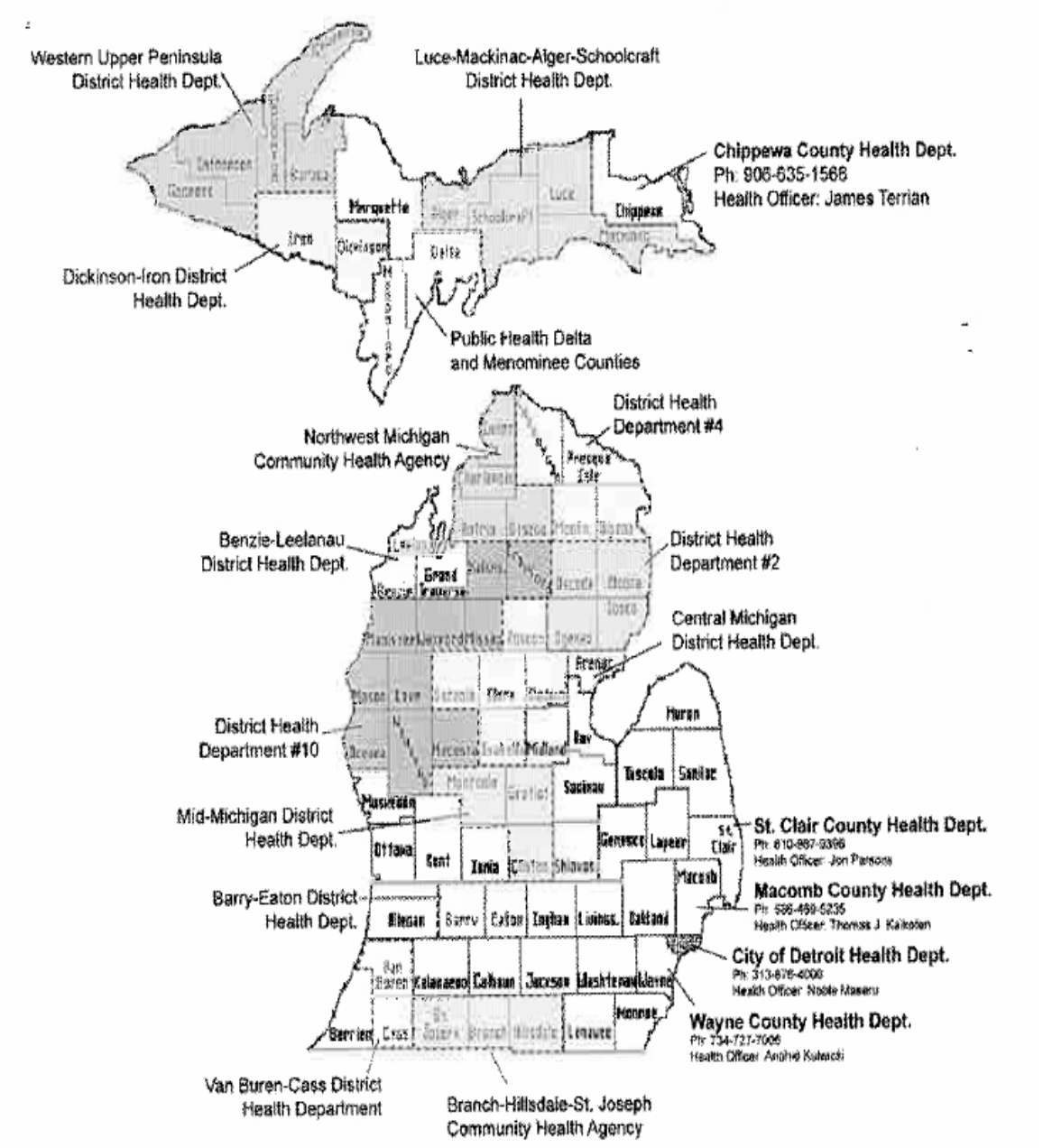
Figure 4. Structure of the Michigan Department of Community Health (MDCH), Public Health Administration



Source: Allen-Bridson, 2004

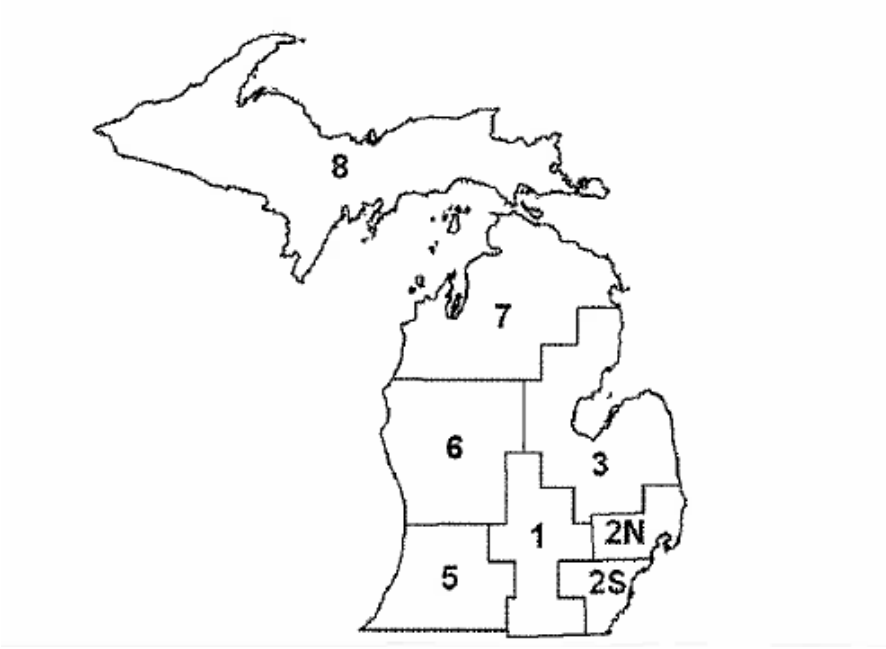
Ontario and all provinces of Canada have a centralized administrative structure with well-defined lines of authority. In contrast, each state of the U.S. has great autonomy and more complex lines of authority and communication with the federal government. These differences compound the coordination/communication difficulties.

Figure 5. State of Michigan Local Health Jurisdictions



Source: Allen-Bridson, 2004

Figure 6. State of Michigan Public Health Preparedness Regions



Source: Allen-Bridson, 2004

The organizational differences in the two countries cause differences in administrative culture even though they share the same language. Canadian public health is more hierarchical than in U.S. States. Provinces of Canada have fairly tight control over activities at the local level. The Canadian government funds health care all the way down into the individual level and has a tighter linkage between public health and acute health care, whereas the U.S. government has a less direct influence at the level of local governments and health care providers. This administrative culture has an influence on the public officials' attitude towards information exchange. Some U.S. interviewees said that, while Michigan officials are eager to communicate with their Ontario counterparts about border health issues, the Canadians are more cautious about what and to whom they communicate.

Furthermore, Ontario borders three U.S. states, Minnesota, Michigan and New York, and is separated from Ohio and Pennsylvania only by the narrow Lake Erie. Coordination with multiple U.S. States appears to be frustrating for the Canadians. Because communication over the border is international contact, all but the most informal communications must be coordinated through both State Departments. Formal agreement and formal, regular meetings may increase active communication.

Despite significant organizational differences, there are some important similarities between U.S. and Canadian structures. The Public Health Agency of Canada, which was formed following the SARS epidemic, functions similarly to the CDC. The Canadian National Health Emergency Management Framework is comparable to the U.S. National Response Plan. The U.S. National Incident Management System (NIMS) has similarities

to the Canadian National Health Emergency Management System currently under development. Finally, considerable variation exists from province to province within Canada just as there is considerable variation among the U. S. states (ATHOS, 2005).

Workforce

The workforces of Michigan and Canada are similar. Each of the eight public health regions in Michigan has an epidemiologist; these persons usually take the position right after finishing a master's degree in public health. These epidemiologists are responsible for syndromic surveillance in public health.

At the local public health departments, persons with public health background are preferred for employment. However, the communicable disease staff members are usually nurses with various types of nursing backgrounds. They would have taken a course in Public Health in their nursing training, but most of them do not have graduate degrees of public health. They enter data on the electronic reporting system, and they are responsible for doing the contact tracing to collect the reporting information that is fed into the national system. Funding from the CDC was passed down from the state to the local level for training and educational purposes, and local departments offer orientations for the public health officials.

MI-TRAIN is a web-based training system which gives an important educational opportunity to regional epidemiologists to conduct training and surveillance throughout their regions. The system supports local communicable disease staff members in reporting requirements, in follow-up requirements, and also in the use of some of the new surveillance systems.

Also, there is a series of communicable disease conferences by the communicable disease unit. This conference gives an opportunity for training people, updating data, transferring HUD news and communicating with local staff.

The Department of Community Health of Michigan has updated the list of reportable diseases and has educated physicians to improve their reporting through the MDSS system. Their reporting can be handled by the lab staff members and good information can be fed back to the physicians.

In Ontario, local health units have a workforce similar in background to that of the U.S. There are nurses, some individuals with public health degrees, and epidemiologists in the regions.

One interesting workforce issue is that an estimated 4,000 health care workers for the Detroit area live in Canada and cross the border daily. When the borders were sealed after the attacks of 9-11, getting permission for these workers to enter the U.S. to work required lengthy negotiations. A similar problem could arise if the borders were closed as a communicable disease control measure, significantly reducing the health care

capacity in the Detroit area. More than 200 million border crossings between the U.S. and Canada occur each year (ASTHOS, 2005); therefore, any disruption of those crossings would have far-reaching impact.

Communication

Because of the differences in the administrative structures, communication is difficult. When public health officials on one side of the border want to contact their counterparts, they have problems knowing who the counterpart is and how to contact the counterpart. When a new official is charged with responsibility for border health issues, he or she has to spend much time learning the administrative structure across the border to decide how and what to do with the partner. One interviewee expressed the problem in the following language:

> *So, a lot of the first year work has been identifying the structures of the health service from Public Health Systems across the border and what that meant for us as far as interacting with them, you know, because the structures are so different. How they want to be approached vs. how we want to be approached is quite different…*

Informal communication at a local level frequently occurs, but at the state/provincial and national level, communication appears to be constrained. U.S. state officials in the past had to contact Ontario Ministry of Public Health officials in a formal manner. Recently, however, there is more communication between mid-level managers in the state of Michigan and the province of Ontario. They have drafted a contact list between the two agencies, which did not exist before.

Figure 7 displays the current communication process. The dotted lines indicate the informal process. Public health officials at the local level on both sides of the border communicate informally. If the matter requires attention at a higher level, it is referred up the chain of authority to the state and provincial level. Some important cases are referred to the federal levels (CDC and Public Health Agency of Canada) and subsequently filter down. This type of informal, bottom-up communication has been valuable, but it cannot suffice for all communication. The only formal communication that occurs currently is at the federal level.

The interviewees in this study called for leadership at the federal level to facilitate communication. Because several U.S. states border the large Canadian province of Ontario, they need a united communication pathway with the guidance of the federal government. The differences in size, population, and funding between one U.S state and a Canadian province are large.

Because there has been a lack of adequate guidance and leadership at the federal level, three regional organizations have formed to address the Canadian-U.S. public health and disaster preparedness issues. These are the Northwest region comprising Washington state, British Columbia, and surrounding areas; the Northeast Border Infectious Disease

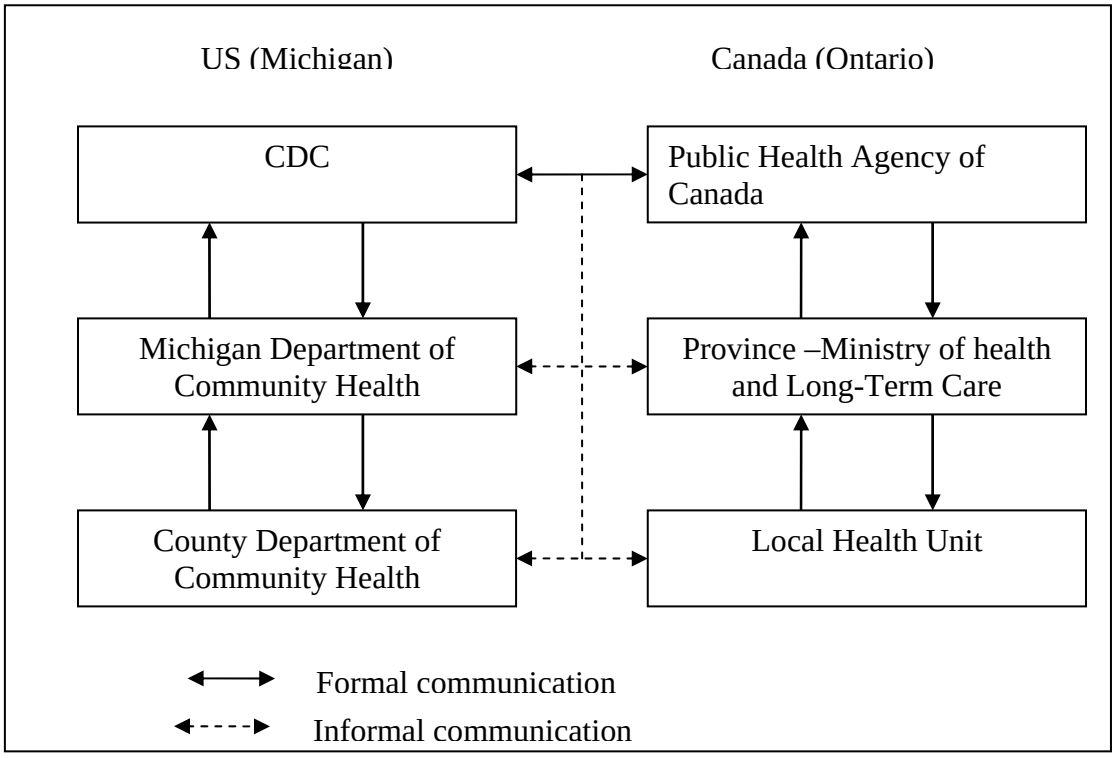
Surveillance Initiative of the New England states and the Maritime provinces; and the Great Lakes Border Health Initiative (ATHOS, 2005).

One interviewee stressed the need of federal government leadership with the following language:

> *We've received sort of vague guidance but I guess what we want is leadership to bring the northern tier states together, and it would only help the Canadians because Ontario is bordering four or five states. So they don't want five states contacting them and trying to do the same thing over and over.*

Public Health officials also noted that Border Patrol officials and Customs officials need to be involved in regular communication with them and with medical personnel, but these linkages do not yet exist. Public health officials also need knowledge of law enforcement and legal issues. Currently, the legal subcommittee of the Great Lakes Border Health Initiative conference is collaborating with other public health officers to prevent unexpected challenges in cooperation with Canada.

Figure 7. Current Cross-border Communication

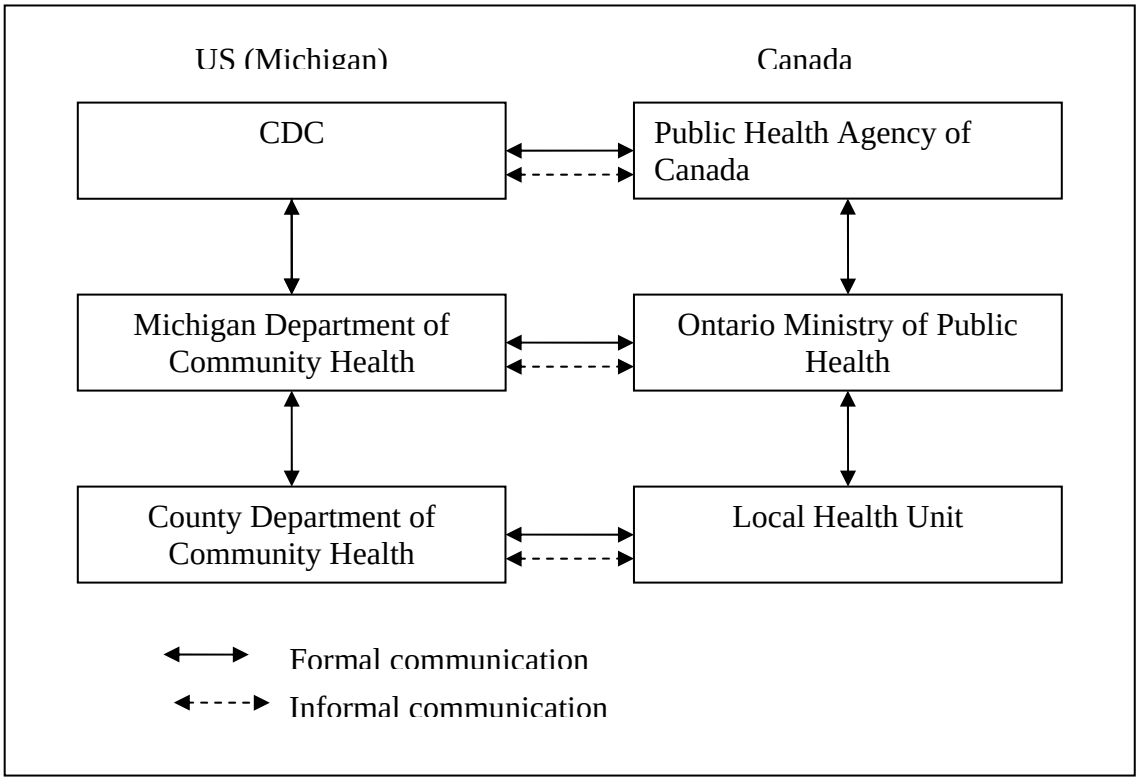


Source: (*Enhancing Early Warning Infectious Disease Surveillance and Response*, 2005)

Figure 8 shows the proposed pathways of formal, as well as informal communication, between Michigan and Ontario. Through the Great Lakes Border Health Initiative, the Public Health Communications Subcommittee has developed a draft of the Public Health

Emergency Communication Agreement. This agreement will include a purpose statement, decision tree, and definition of terms, communication protocols, reportable diseases, and a contact list (*Enhancing Early Warning Infectious Disease Surveillance and Response*, 2005). With this arrangement, public health officers would have a clear understanding of the responsibilities of each organization as well as a mechanism for resolving disputes among organizations. This formal, regular communication would promote timely and effective communication in an emergency situation between the two countries.(Allen-Bridson, 2005)

Figure 8. Proposed Cross-border Communication



Source: (*Enhancing Early Warning Infectious Disease Surveillance and Response*, 2005)

Data sharing is a key component of the U.S. communication with Canada. Officials on both sides of the border need to share information with jurisdictions across the border for the following purposes (ASTHO, 2005):

- Identifying current disease trends
- Knowing potential threats
- Preparing for emergency situations.

Data sharing does not occur as frequently as desirable for the health of both nations because there is no established routine. The issues in data sharing are: (1) What type of data will be shared? (2) How will data be shared? (3) How will patient data be kept confidential?

Each hospital or healthcare facility should know how many of their staff members live in Canada, and they should have an emergency plan that addresses possible lack of staff members in the event of closing of the border crossing. So far, there is no integrated medical response plan across the border. Michigan is just trying to coordinate within its jurisdictions and is trying to address staffing issues and surge capacity issues of direct care across the border.

The Public Health Communications Subcommittee has examined the possibility of data sharing systems, such as the Michigan Disease Surveillance System (MDSS) or the Canadian system, iPHIS . Michigan officials suggested that some of the public health workers in the Canadian local health unit or the province be listed in MDSS so they could enter patient data on reportable diseases. However, Ontario officials did not want to register until there is a formal data sharing arrangement. Last year they shared a listing of aggregate cases of reportable diseases. However, the concerns about patient confidentiality prevented them from moving to the next step. Currently, they are creating a Data Sharing Arrangement.

Health Alert Network (HAN)

The United States Centers for Disease Control and Prevention (CDC) provided some initial funding to selected states to establish public health notification systems called Health Alert Networks (HAN) in 1998. In 2002 Michigan and the other States and Territories all began to receive funding to establish HAN systems from CDC under Focus Area E grants for bioterrorism preparedness. One of the central requirements of the CDC grants were that the HAN systems should use a directory which was based on roles or functions rather than persons. The CDC grants also specified that a state's HAN system should be able to contact people via multiple methods, e.g. phone, E-mail or pager and recipients should be able to acknowledge receipt.

Michigan did not want to build its own HAN system and, therefore, sought vendors who might offer an "off-the-shelf" HAN solution. The State found just such a vendor in Virtual Alert Incorporated (currently Global Secure Systems (GSS)). GSS had been working with some Western states since 1998 on CDC HAN grants building a system which met all of the Focus E, HAN requirements. The State of Michigan initiated a contract with GSS in February of 2003 to host and install their Internet based, Bio-Terrorism Response Suite (BTRS) software as the platform for the MIHAN system.

At the same time as the initiation of the GSS contract in early 2003, Michigan formed a Health Alert Network steering committee comprised of state and local public health, state emergency management and hospital officials to design the business rules for the system. Within three months of signing the contract, Michigan had a functioning system

up and running. It is a web based system that does mass notifications. Upgrades to the computer system are included in the contract. Global Secure Systems is a Microsoft partner, which means that it uses Microsoft.NET software. The Michigan Health Alert Network (MIHAN) exists on two sets of servers connected by a VPN; the primary server is in Sacramento, California and the back –up is in Austin, Texas.

Advantages of this contract as compared to a state developing its own system include speed of full implementation and cost effectiveness. Some states employ a contractor to build a system for them. The first cost is small, but each time the contractor does additional work, there is an additional fee. This method of development takes months and years of work and is far more costly in the long run.

Michigan's Health Alert Network Coordinator proposed a directory design based on the State's geography. That is, the directory lists offices by regions, with roles for each organization, such as epidemiologist or emergency manager, rather than just listing persons by name. Therefore, contacting pertinent persons in each organization is simplified and more efficient because the role or function is the most important information. For each district, this same set of 13 roles is implemented. The MIHAN employs one support person for every two districts; this provides adequate resources to operate the system successfully. When someone calls MIHAN for support, a person answers the phone; it is not an automated support system..

To operate the alerting system, any person with a function in the system can type in a message of low, medium or high priority alert and send that message to persons with the same function throughout the state. Three types of officials have broad authority to alert all functions in the system; these three functions are the Public health Officer in each local public health administration, the Emergency Preparedness Coordinators in the hospitals, and the regional Bioterrorist Coordinators. The system documents the entire process so that officials can retrieve the documentation. This is not a "top down" system; it provides broad alerting authority to specific local health department roles and regional hospital roles. The system then contacts each person according to the media preference that person recorded in his/her profile; i.e. email, telephone, alpha pager, etc. The person contacted confirms having received the alert and by which medium. There is also a distributed administrative piece in the system. In each of the forty-five local health departments in the state, through funds from the health Resources and Services Administration (HRSA), a position was funded and called the Emergency Preparedness Coordinator, who also performs as the MIHAN coordinator for the department, Additionally, the eight bioterrorism regional coordinators are charged with coordinating MIHAN support for the hospitals in their region. These persons are responsible for changing the contact information in the system when a person leaves his/her position.

Communication across the international border with Canada is essential because communicable diseases and natural disasters do not respect nations' borders. The staff of MIHAN have reached out to the Canadian province of Ontario to include the public health, emergency managers and medical professions in this alerting system. In 2004 MIHAN worked with an Ontario official to create an Ontario directory in MIHAN.

MIHAN then sent people to Toronto to train key people in the Ontario Ministry of Health. The individual who headed it then moved into a different position, and no one in Ontario has assumed his duties in regard to MIHAN.

In addition to land borders with Ontario, Michigan also has water borders at the St. Clair River, as well as the Great Lakes. Therefore, environmental issues are important along the water borders. For example, in January about three years ago, there was a large chemical spill into the St. Clair River that separates Port Huron, Michigan and Sarnia, Ontario. The public water supplies along the river had to be shut down. Using MIHAN, notification went out to all the public health departments in the communities along the river on both the U.S. and the Canadian side. This is one example of an efficient alerting system.

For the past year and one half during the development of the Early Warning of Infectious Diseases (EWIDS) Program in Michigan, progress on the notification system across the border has been halted. Recently progress has resumed with the states of Minnesota and Wisconsin being brought into share the Michigan notification system with Ontario. A gateway is being created with XML from the Canadian system to the Michigan HAN via the internet.

The staff members of MIHAN have been aware of the need to create ownership to populate the system. This necessity to obtain "buy-in" from stakeholders is described in many organization development publications (references here). Table 3 lists the strategies employed to develop participation from many different sectors – starting with public health and including emergency management and the medical sector. A general strategy has been to utilize a private foundation to employ contract workers, thus avoiding the pitfall of swelling the permanent ranks of the state public health department with persons employed on grant funds that will, at some time in the future, expire. The MIHAN director, instead, has carefully selected a few of the contract workers to become permanent civil service employees based on their job performance. The Department of Community Health in Michigan had the foresight some years ago to spin off the private foundation, which has had long-term advantage

Specific strategies began with the local public health departments in each region. The MIHAN Coordinator obtained a position in each department through HRSA funds called the Emergency Preparedness Coordinator and then worked to add other members of the department into the system. These public health people were then asked to identify county emergency management people for the system. Next, fire department personnel and then emergency medical system persons were added in. A big step of progress was made when hospital persons joined the system; an incentive is that the Health Alert Network contains the most up- to- date contact information among the hospitals. Now clinics are being added into the system. An incentive for clinics is that HAN can deliver information to clinics directly from the CDC; this is an advantage that clinics have not had before.

Because of the international complexities of communication with the Canadian provincial authorities of Ontario, MIHAN worked to obtain information about local contact persons from Canadian independent contractors. These local people were then contacted and asked if they wished to be included in the system. Throughout this development process, attention has been given explicitly to creating incentives and ownership of the stakeholders in the system.

A major test of the Michigan health Alert network came when Hurricane Katrina struck the gulf coast and subsequent flooding inundated the city of New Orleans on Monday, August 29, 2005. At 2 p.m on Friday afternoon, September 2, 2005, the MIHAN coordinator received a message from FEMA requesting that volunteer environmental health workers go to new Orleans as soon as possible. The Coordinator used his broad authority to send a high level alert to every function in the state-wide system asking for environmental volunteers. By 3:00 p.m, one hour later, 25 to 30 volunteers had replied on the system that they were ready to fly to New Orleans that afternoon.

Another example of the use of the MIHAN came when evacuees were being flown into Battle Creek, Michigan from New Orleans hospitals. The local bioterrorism coordinator was notified each time a plane was approaching with evacuees. The Han system was used to alert workers to arrive at the staging area to meet the plane and transport the patients to the assigned hospitals. These uses of the Michigan Health Alert Network are the result of the hard work of preparing a state well for emergencies.

Table 3. Strategies of HAN

General Strategies	
- Employ a consultant firm (Altarum Research Institute, Inc.) to develop the software for the Health Altert Network. Expertise to develop HAN did not exist in the state department of Public Health. Grant funds were used. - Build ownership in HAN and thus increase the member of role-based contact persons in HAN - Build good working relationship with the people in each role, so they will feel "ownership" or "partnership". - Employ new personnel on contracts paid by grant funds through a private foundation. Select carefully those employees with special talent/expertise and create only a few new positions in civil services for these individuals. This strategy supplies new employees needed for new work, but avoids swelling the permanent ranks of civil service.	
Specific Strategies to Build HAN Network	
▪ Begin with Local Public Health Departments.	- Identify and register in HAN a contact person (Emergency Preparedness Coordinator) from every local Public Health Department. - Then add other roles from every Public Health Department.
▪ Add County Emergency Management people.	- Ask the local Public Health Department to identify County Emergency Management people.
▪ Add agencies or associations.	- Add fire departments, which link to local Public Health department. - Add EMS agencies to HAN.
▪ Add hospital personnel.	- HAN is able to provide the most up-to-date contact information for people in hospitals. That makes HAN valuable for hospitals to communicate with other hospitals.
▪ Add clinic associations.	- Associations of clinics bring multiple clinic contacts into HAN. Rural health clinics have HAN coordinators who manage the clinic contacts and can add constituents. This builds ownership. It is free of charge. - Every county has at least one clinic person in HAN. - HAN delivers CDC information directly to clinics.
▪ Add long-term care facilities	- Designated funding to add long-term care facilities to HAN.
Strategies for Canada Involvement	
	- Communication with people inside Canada Health was difficult. So, use contractors or consultants to Canada Health to obtain information. - The contractors supplied names & contact information of people in small areas bordering Michigan. Then HAN administrators contacted those people and asked to register them in HAN.

Discussion and Implications for Practice and Policy

Our research identifies areas of shared concern about infectious disease surveillance at both U.S. borders, as well as areas of difference, and *four specific issues that we believe should receive priority:*

(1) the need for robust bi-national health organizations to overcome jurisdictional obstacles to public health
(2) *funding for border health security*
(3) *the need for local-regional public health agencies to be able to function relatively independently during disaster*
(4) *the need to understand and properly manage emerging health disparities at both borders*.

Bi-national Organizations as Tools for Resolving Jurisdictional Challenges

On the U.S.-Mexico border, improving bi-national coordination of disease surveillance will require reducing disparities in health care standards and improvement of information technology capabilities on both sides of the border. Fortunately, public health officials on both sides of the border are working on these problems although the two systems, one centralized and one state-based, are not designed to work with each other.

On the Michigan/Ontario border, although health care standards are more similar, there is less collaboration on health issues. The self-assessment and reorganization of public health agencies in Canada following the SARS epidemic have further complicated communication with the province of Ontario. On both borders, the meeting of centralized, hierarchical public health systems (Mexico, Canada) with decentralized and relatively autonomous U.S. state health departments creates significant problems for local officials who need to share information about infectious diseases, which do not respect borders. Furthermore, there is variation among Canadian provinces within its centralized system. A major problem is that within the U.S., states have obstacles to overcome in communicating surveillance information among themselves. Communication from Michigan to Montana, for example, is not immediate or easy. Federal support is needed for interoperable communication systems from Maine to Washington state. These problems are further magnified by the mismatch of multiple jurisdictions—each state or province on one side of a border may touch multiple states on the other, and so, currently they need to coordinate with each one separately. Canada fronts 14 different U.S. states. Working out agreements with each state separately is a nightmare that no Canadian federal official would want to attempt. Mexico interfaces geographically with only four U.S. states. Nevertheless, official communication is complex.

These mismatches will only be exacerbated by the development, in the U.S., of fifty individual state electronic disease surveillance systems, as compared with single systems in Mexico and Canada. As a result of jurisdictional mismatches, formal communications

about communicable diseases are time-consuming and unreliable. Informal communications between public health officials play a critical role in the rapid dissemination of critical information. While such communications will always be valuable, they are not sufficient. A *mechanism to develop consensus on data-sharing across the borders* is needed.

On the U.S.-Mexico border, this mechanism exists, though it is constrained by limited funding. Long-standing shared concerns about the health of indigent populations, migrants, environmental pollution and similar problems have led to the creation of a number of vigorous border issues organizations, such as the U.S.-Mexico Border Health Commission. These organizations provide a forum recognized by both national governments for working out common solutions and useful compromises.

Common concerns that need to be worked out for data-sharing on infectious diseases and other public health problems include the types of data to share, with whom, and how, and how to balance public health and national security needs with patient confidentiality. Furthermore, especially on the U.S.-Mexico border, differences in diagnostic standards and reporting requirements need to be resolved to ensure that a report means the same thing in both countries.

An encouraging initiative is the Security and Prosperity Partnership of North America, which comprises the U.S., Mexico, and Canada. A report issued in June, 2005 outlines its goals, which include several to implement a strategy of addressing public health interests. Although a number of U.S. agencies have activities relating to cross-border public health preparedness, these activities overlap, but are not well coordinated (ASTHO, 2005).

The U.S.-Canadian border has not had a long history of shared problems as had the U.S.-Mexican border, and thus does not have the same types of organizations to address twenty-first century issues. We believe that the U.S.-Mexico Border Health Commission provides a valuable template for a much-needed comparable organization on the U.S.-Canada border.

A *forme fruste* of such an international organization is the three regional international groups, which have been working together for the past few years in coordination, communication, and disaster preparedness. Some progress has been made. For example, the development process of the Michigan Health Alert Network (MI-HAN) is a model for other U.S. states, Canada, and Mexico. However, there is duplication of effort, lack of adequate and reliable funding, and lack of sharing among the three regional entities. These regional entities are only stop-gap, informal organizations.

After the federal Canadian government completes the re-structuring of public health /medical services consequent upon the SARS epidemic, the Ontario provincial government may be able to cooperate and communicate more freely with U.S. states. *A*

whole range of issues concerning to the U.S., Canada, and Mexico, in addition to surveillance of communicable diseases, needs to be addressed on an on-going basis.

Funding Border Health

On both borders, U.S. self-interest requires that *these border health organizations be well-funded*. The border states are already heavily committed to border health. At the federal level, however, it will be important to maintain awareness of the national security implications of public health programs at the border. Federal public health funding tends to come with directives to the states to apportion it on the basis of population rather than risk. Although the southern border population is growing rapidly, such formulae still do not fund this critical area adequately on either border.

Disaster Preparedness

Our study highlights unequivocally the difficulties that multiple, complex jurisdictional relationships across the U.S.'s Mexican and Canadian borders create for disease surveillance even when no crisis in emerging. During a disaster, either natural or man-made, these will only be magnified. It is important for local-regional public health agencies to be able to function relatively independently, yet cooperatively, during disasters. *There are large "holes" in preparedness on both sides of the border that must be addressed. Again, vigorous border health organizations can play a critical role in seeking solutions for all types of disasters.*

Several examples of disasters in recent years illustrate the "holes." The SARS epidemic hit Toronto and other parts of Canada hard. The Canadian federal government has re-assessed it s preparedness and is re-structuring. Hurricane Katrina revealed complex political maneuvering between the City of New Orleans, Louisiana state, and federal government officials, with no international issues to create additional challenges to coordination. The results were all too obvious. Another example of concern is the city of Detroit, which has many demographic and economic similarities to New Orleans. The vigorous efforts being made by the Michigan Department of Community Health for surveillance and disaster preparedness are critical and laudable. However, Detroit also has a border with Canada. When this border was closed after 9/11, an unintended consequence was the first full appreciation of how many of Detroit's health care workers live in Windsor, ONT. They could not cross the border to come to work. *It is important to learn how many U.S. cities on both borders have similar situations, and to create ways to maintain access to health care on both sides of the border.*

Emerging Health Disparities

We believe that our findings illustrate an interesting and important relationship between economic change, public health, and border security. The state of Michigan, which had a strong economy for many years, is now part of the "rust belt". The automobile industry has gone to Asian countries, which are now locating their manufacturing plants in the U.S., especially in southern states. Economically, Michigan is a specter of its former strong self, though the government, education, and public health infrastructure still function at a high level.

One result of the North American Free Trade Agreement (NAFTA) has been to shift jobs from Michigan to Mexico. Factories that produce auto parts and accessories have been moved out of Michigan, where labor unions negotiated wages and conditions, to Mexico where labor and regulatory costs are lower. At least part of the "savings" comes from lesser expenditures on environmental cleanliness, public health and medical care. It is ironic that the loss of an industry from Michigan, which has a highly developed public health structure, has benefited Mexico's economy but has fueled a serious public health problem for the Mexican and U.S .border states. Ultimately, the loss of manufacturing jobs and attendant tax revenues may also undercut Michigan's ability to fund its public health and medical infrastructure as well. The *impact of these economic changes on emerging health disparities at both borders needs further study and mitigation*.

We will continue to work at examining the issues identified in this study. At the state and federal levels in the United States, in Canada, and in Mexico, the following issues require on-going discussion to reach feasible solutions:

1. Facilitating formal communication at the federal level between the United States, on the one hand, and Canada and Mexico, on the other hand. Expedient communication of various types of health and public health information, especially in disasters, needs clear and practiced pathways.
2. Resolving differences in diagnostic standards and reporting requirements about communicable diseases.
3. Creating and funding a bi-national border organization between the United States and Canada. Providing adequate funding for existing U.S.-Mexico bi-national organizations.
4. Planning and exercising effective preparedness for all types of disasters across the international borders.
5. Planning public health in relation to economic changes resulting from trade agreements.

In conclusion, large amounts of critical planning and work need to be accomplished at local, state, and federal levels among the U.S. Mexico, and Canada before the populations can be secure from natural and man-made communicable disease disasters.

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