2008
Chapter 7
COMMUNICABLE DISEASE CONTROL

The local health director must be thoroughly familiar with the history of infectious disease outbreaks in the community and must exercise active (require formal periodic reports) and passive (accept voluntary reports) surveillance of physicians, laboratories and hospitals. He needs to be aware of the community's demographics to prepare for the diseases most likely to strike, and immunization programs. The director should know the community's level of "herd immunity" for the major infectious diseases. The department must have a plan to control epidemics. While communicable diseases may be so well-controlled that months pass without incidents, epidemics are marvelous opportunities to pull the staff together as a team and demonstrate the effectiveness of public health programs to the community. This has become even more important with all the anxiety over Avian Influenza and concern for bioterrorism.

The director must translate national objectives into effective local programs of communicable disease control. In smaller jurisdictions it makes sense to combine disease surveillance, immunization, and infectious disease control (of all types) into a single program, supervised by a staff member trained in epidemiology. The focus of diseases to be controlled are discrete categories in the *Healthy People 2010 recommendations';* with one section Objective 14 Immunization and Infectious diseases, and another Objective 25 Sexually Transmitted diseases.

While they are discussed separately here, in practice such compartmentalization strains the resources of smaller agencies. Managing childhood infections as a program separate from adult infections, or treating community surveillance as a program distinct from both, is organizationally inefficient at the state or local level. Infection control requires the use of geographic epidemiology and analysis of disease rates by age, sex, race, and socio-economic levels. Epidemiologic skills are similar for different diseases, whether they happen to be insect borne or sexually transmitted. Treatment for tuberculosis or Hansen's disease, immunization for measles or diphtheria and surveillance for Hepatitis-A and B, or regional diseases such as encephalitis, dengue and malaria are all part of a sound infectious disease program. When developing your goals and plans look at the data and recommendations available on both the CDC and WHO sites.

The information to assess progress in meeting goals for communicable disease control is clear in HP2010 "By 20__ the community will be served by a system for the detection, monitoring and control of communicable diseases of public health significance". The 2010 Objectives' goal calls for economic assessments as well as health monitoring and extends the range of reporting beyond the standard diseases. The 2010 Objectives propose a national network to collect and share this information across the country.

The *Model Standards* state: By 2010, all State health departments should be linked by a computer system to Federal health agencies for routine collection, analysis and dissemination of surveillance data, rapid communication of messages, and epidemic aid investigations. Few things have changed as dramatically as computers since 1979 when the First national diseases standards were recommended The expensive and cumbersome network first proposed in the 1985 model standards-II This is currently being enhanced by the Public Health Information Network. With only five years left to meet this objective, it is unlikely to occur without far more resources than presently available.

The single most effective barrier to any communicable disease in the population is widespread immunity to that disease. Routine immunization of children against a host of potentially devastating illnesses is an inexpensive and effective way to build that barrier. In the U.S., immunization is required by law at entry into school in all 50 states and the District of Columbia.

The HP2010 sets forth the broad goal of disease elimination with the statement that *"there will be no cases of officially designated vaccine preventable disease in the community."* It lists outcomes by disease, in terms of cases across the nation, and calls for *basic immunization of 90% of all two-year-olds and full immunization of 95% of children in school or day-care centers* Rather than trying to find their state's "share" of cases in translating the national objectives into state ones, the most states modified the national objectives to

Immunization percentages calling for: *97% of children in day care centers and 100% of those in school to be fully immunized,* specifying control by surveillance:

> "A system should be in place with 100% of reported, suspected, and confirmed cases logged and investigated within 24 hours." The plan also included provision for new vaccines, "By 2010 at least 50% of persons designated as targets by the immunization plan shall be immunized within 5 years of licensure of a new vaccine," and had guidelines in place against epidemics: "By 2010 Influenza and pneumococcal vaccines shall be made available to high-risk populations, " and, "By 2010 mass immunization campaigns shall use delivery systems already in place and adapt plans to local conditions."

In the late 1980s, the Texas steering committee considered the 2000 objectives to be realistic and attainable. It was necessary to be able to measure progress to meet these goals. One of the measurement problems was that of being able to validate immunization of children aged two or younger, in conformity with the 2000 objectives; Immunization of these young children can be measured only when the children are seen in public health clinics, day care centers and by reports from physicians. Thus, validation of an entire cohort of children can only occur when all children have to enter first grade in school, where compliance is measured by regular sample surveys. The requirement that everyone must have an up-to-date immunization record means that a health department needs a good data system that can be used to compare immunizations with occurrences of preventable disease as a measure of vaccine failure. These objectives, and the chosen measurements were developed with the understanding that only part of the population goes to the local or regional health departments for services while private physicians provide most immunizations.

In Virginia, where surveillance data indicated that 97% of children in schools and day care centers are already appropriately immunized on entry immunization goals were not set using the HP 2000 objectives. Instead, the state objectives emphasized maintaining current communicable disease incidence trends. The resulting objectives were:

> *By 2000 the reported incidence shall not exceed the average reported from 1982-1986.*
> *By 2000 indigenous measles and rubella shall be eliminated in Virginia.*
> *By 2000 the absence of diseases such as diphtheria, tetanus and polio will be maintained.*
> *By 2000 the incidence of pertussis and mumps will not exceed 1 case per 100,000 population.*
> *By 2000 the incidence of Haemophilus influenza-b will not exceed 2 cases per 100,000.*

The time frame for a Virginia long range plan is six years, and covers three biennial state budgets. See if you can find the rates of common vaccine preventable diseases in Virginia and determine how close the state is to meeting the year 2010 goals (remember it is now 2008).

Local objectives

In a typical health department the long-range local goals will be similar to the state objectives. The short-term goal is based on the actual resources available for the next year. Thus, a local short-term goal for Corpus Christi, Texas was:

1) *To increase the number of children immunized annually by 10%, an increase from 11,215 to 12,500 children immunized annually.*
2) *To increase the total number of individual doses of vaccines given from 45,690 to 46,300*

No additional local objectives could be made because there was no way to measure them. When the local objectives were set for the 300,000 people in Corpus Christi and Nueces County *the incidence of preventable childhood infections* was too small to measure change in any useful way, compared to the whole state. Such measurements are only useful with much larger populations.

The second objective was used to prepare a budget for immunizing children that required a total of five DTP shots, three polio doses and one dose each of measles, mumps, and rubella vaccines before school entry. Birth certificates which describe how many children are born, and where, were used to set the second objective in Corpus Christi.

To encourage parents to bring their children in for immunization and ensure the department met its goals pre-and post-natal education programs emphasized the need to vaccinate children, while visits by nurses and social workers to child & infant day care centers were used to reinforce the need for immunization. Records from clinic sessions in previous years show how much vaccine was used, and surveys of schools and day care centers measure the vaccination compliance level at time of entrance to school.

Immunization tracking

Data systems should track a child's immunization by type, number, and interval to the next dose of vaccine. With appropriate tracking software, described in the section on data systems, computer generated reminders can be sent to parents prior to the child's next clinic appointment. If the child does not come in, the system sends a reminder to a nurse or immunization aide to make a home visit to check on the child and family. Good software ensures adaptability, allowing the system to extract data from birth records, and remind parents that their new baby needs to be immunized, by either the family physician or the health department. A data system may be modified to account for local behavior, provide information in different languages, send out interpreters, and provide pamphlets or other visual advice to persons who may be illiterate. One advantage of performing your own programming is the ability to build in locally useful data, such as census tracts, language needs, and educational levels. The program can generate messages most suitable to each particular neighborhood. Review the updates on immunization registry programs

The department's immunization system should be linked to state and federal immunization programs. This allows remote evaluation of the program, without the need to produce additional data. The system should provide information about the number of individual children previously fully immunized, the number starting immunization, the number completing immunization, the number with delayed completion and actions planned to complete the required immunizations. Data on individual doses used should be passed to the department's supply system automatically to ensure that sufficient vaccine is always on hand. A small inventory, keeping only necessary stock, prevents vaccine from becoming outdated and saves money.

The data system keeps the local immunization manager abreast of the program's effectiveness (number of persons at risk who are completely immunized) and efficiency (the number completing immunization with minimal or no recalls, by census tracts). The health director may not appear to need such an elaborate data system in a small community, but where there is more than one clinic at one site a month, such a system has an enormous effect on the department's operations. When records are completed by hand, the same data is often gathered in different formats. This prevents an accurate count of doses used, and persons immunized, unless the records are complex and redundant. Also, as adult immunization status becomes more important, with immunizations for hepatitis b, pneumonia, tetanus, and other diseases the data systems can easily be extended to include everyone in the community, if desired. A review of lessons learned about immunization tracking can be found at the Robert Wood Johnson Foundation (Richmond City Health Dept was one of the originals 12 recipients of A.K.C. grants, the Chief Co-Investigator was Dr. Buttery).

Sexually Transmitted Diseases

Public health officials have known how to control STDs for at least 50 years, but eradication remains difficult. In the 1940s, the treatment for tertiary syphilis was by infection with malaria, in the hope that the high fever of a malarial crisis would kill the temperature sensitive syphilis bacterium but not the patient (host.) This treatment was abandoned in the latter part of that decade when penicillin was found to be effective against all forms of syphilis. It is unfortunate that HIV infection has not been treated as just another serious STD, and less time wasted in political battles. When developing plans to control HIV, local health department staff should remember lessons learned from controlling syphilis and tuberculosis infection, which included public education, screening for disease, contact tracing, compilation of confidential disease registers, development of State and regional objectives.

State objectives for STDs tend to follow the *2010 Objectives* in setting outcomes by disease. The state objectives in Texas took differing conditions in the various parts of the state into account when setting its goals. Surveillance, reporting, and information sharing are often additional objectives at regional levels. One Texas region set an objective that *"95% of all reported cases of gonorrhea and syphilis would be investigated according to state guidelines",* and another *"to ensure that all residents had up-to-date information on HIV and AIDS".*

In Virginia the year 2000 state objective was that

> *"by 2000 the incidence of reported gonorrhea will by reduced to 224/100,000 and pelvic inflammatory disease to 37/100,000."*

The northern region set its objective to

> *50 new cases per 100,000 of the population*

In the Eastern Region the objective was

> *to reach the 1986 state incidence by 2000*

Another region intended to have *a computerized data and tracking system in place by 2000,* to have AIDS information available to all citizens, and ensure that all school age children would have education in preventive health practices that included AIDS prevention (go to the VDH web site and find the current objectives.)

Local objectives.

Many local health departments start their plans with the ***Healthy People Objectives,*** but integrate them into the community's economy, health care, and human service systems. Local advisory boards can help to set reasonable goals and objectives in relation to the community's problems and resources and with health departments reaching and exceeding those objectives, an annual review of plans is essential, while complete revision is advisable at least every four years. Each revision of the planning process (community health assessment) should try to improve its data, as well as the infrastructure necessary to deliver and measure services, and better acceptance of programs. One advantage of public health planning, over that of mental health, is that measurement of changes in physical health outcome is usually easier to define. Many mental health results are measured as behavioral changes. It is simpler to measure a blood sugar, blood pressure, or to culture a bacterium than to measure behavioral changes. Diabetics can be tracked with blood tests while changes of behavior by substance abusers may be difficult to validate.

When setting objectives for STDs the health director needs to take special care to examine the local organization, delivery, and program accountability. STDs although diagnosed by laboratory tests have a large behavioral health component. Different STDs may have different behaviors associated with them. Exposure to one STD is often accompanied by infection with a second. Objectives to decrease the incidence of STDs should include behavioral measurements. For instance gonorrhea is usually associated with heterosexuality, except that rectal gonorrhea is mainly a homosexual disease. Objectives for gonorrhea control should include processes to test patients for HIV and hepatitis-B infection as well as Chlamydia and syphilis. Objectives for counseling and contact tracing may require cooperation with mental health professionals as well as infectious disease experts to define all the objectives needed for community-wide control of STDs. Many public health programs are only successful when other agencies are included in both goal setting and program service.

Setting objectives and obtaining resources to reach the objectives is often more difficult outside urban centers where many legislators think of STDs as some-thing you get for breaking community mores, and that catching the disease is a well deserved lesson. It may be difficult to get a city council to consider the need for additional funding of STD programs. If local health departments focus on low-income areas and on young people from puberty through 20 years of age, they find gonorrhea in 4,000-5,000/100,000 persons at risk rather than in the 200-300/100,000 range expected for the total population. Without epidemiologic studies to identify high-risk groups, and efforts to contact them and get their trust, the health director has little to discuss with city and county officials other than generalities. Personal testimony about what is actually going on in their community has much greater impact.

One local plan in a city-county health district of 300,000 people was developed after data showed that syphilis incidence increased from 227 to 271 cases, while gonorrhea decreased from 1278 to 1019 cases. Additionally, an outbreak of hepatitis-A started from an index case as a sexually transmitted infection. These data led to an objective to:

> *Increase the number of STD patients seen from 1,850 to 2,200 and to continue development of the AIDS programs*

To do this, the department needed an additional STD investigator, one public health nurse, two community service aides, and three clerks.

In many local health departments immunization, tuberculosis, and STD programs are part of a combined infection control program. In the local department described in the preceding paragraph immunization accounted for 60% of the infection control program budget (including vaccine cost), tuberculosis 10%, and STDs 30%. The whole cost of the program was $226,877 or 5% of the department's total budget.

Communicating with the public.

The success of public health programs in controlling communicable disease makes it difficult to fund their continuation. Without community-wide education the general public, and government officials alike, are all too likely to assume a disease has been eradicated when it is only out of sight. Dramatic outbreaks of new

infections, like AIDS, SARS or Legionnaire's disease, raise people's consciousness about these particular threats, but do not foster an overall understanding of the nature of infectious diseases and the need for continuing measures to control them.

Control of infectious diseases is the broadest possible public health activity. It includes nearly every other activity we undertake--childhood immunization, school health, clinical services, detection, screening, sanitation, insect spraying, water and wastewater management, sex education, food protection, etc. This breadth makes the topic difficult to grasp, as many of the results can only be expressed clearly with statistics. Public education, then, becomes a vital step in disease control. When the public understands how a disease works, how it is transmitted and what conditions promote its spread, they understand a rate reduction by 2 cases per 100,000, not as two individuals somehow receiving special treatment, but as an indicator of disease control that prevents them from being stricken themselves. If such understanding is widespread in the community, the health department will have little trouble getting support for its programs. More importantly, the citizens are actively involved in creating a healthier community.

Health education takes many forms. Staff teams can be developed to talk about the nature of communicable diseases, in formal teaching sessions in schools and community agencies and as invited speakers at club meetings. The mechanics of the reservoir and vectors of, and host responses to, particular diseases can make excellent stories for the press; it may even be possible to produce a weekly column on these topics for a local newspaper or a short taped program for radio or TV. Whenever staffers deal with community members directly in immunization clinics, home visits or elsewhere, they should be encouraged to explain what they are doing and why it is important. Vector control, animal control, and sanitarian staff have hands-on knowledge of infection possibilities, and direct experience is more meaningful than statistics for all of us.

Because no one agency or group working in isolation can be effective, disease control requires some effort and attention from all of us. This can be made clear by describing, in detail, the accomplishments of everyone involved in communicable disease control including the private practicing physicians and hospital staff members who help prevent epidemics, the voluntary agencies that help make immunization programs work and the sixth grade class that spent a Saturday cleaning trash from a stream. The health department that attempts to take all the credit for good health is probably in trouble. The one that shares the spotlight and praises others will tend to get the cooperation it needs.

In the early 1980s the Corpus Christi health department, school system, and private pediatricians worked closely together to raise immunization levels enough to produce herd immunity and prevent further disease when a measles outbreak occurred. After five years without a single reported case of the disease, the community was struck by four cases, reported on a single Monday morning, all by older pediatricians who knew what 'Koplik's' spots were. Because the health department knew the immunization efforts had produced a high immunity level in the school system, it expected the outbreak to be contained. With the close cooperation of the community, built up over the years, the department staff contacted the school principals for permission to draw blood from all students at the two schools initially reporting measles cases. The permission was given within 24 hours. Within 48 hours, blood was drawn from more than 75% (1400) of the students at the two schools. Blood was drawn again three weeks later, by which time more than 130 definitive cases of measles had occurred. Antibodies from the blood drawn before the infection became widespread showed measurable measles titers for more than 97% of the students sampled, confirming the accuracy of the immunization records in the schools. Out of a school population of almost 60,000, the disease was confined to 350 students. The community was given an excellent example of shoe leather epidemiology by a department seen as doing everything possible, by both the general population and the medical community. An open discussion with the media, of all the department's actions during the epidemic, did much to maintain its credibility.

Recommended Reading:

1. Heymann DL , (Ed): Communicable Disease in Man. Ed 18th, Washington DC, American Public Health Association, 2004
2. Morbidity and Mortality Weekly Reports. Atlanta GA, Centers for Disease Control
3. Wolff SH et al. (Ed): The Year Book of Infectious Diseases. Chicago, Year Book Medical Publishers Inc.
4. Healthy People 2000, USPHS - GPO, 1990
5. Healthy People 2010, USPHS - GPO, 2000
6. Immuniz.org Statement on Adult Immunization.
7. Immuniz.org Statement on Childhood Immunization