manuscripts & publications
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COMMUNICABLE DISEASE CONTROL

by

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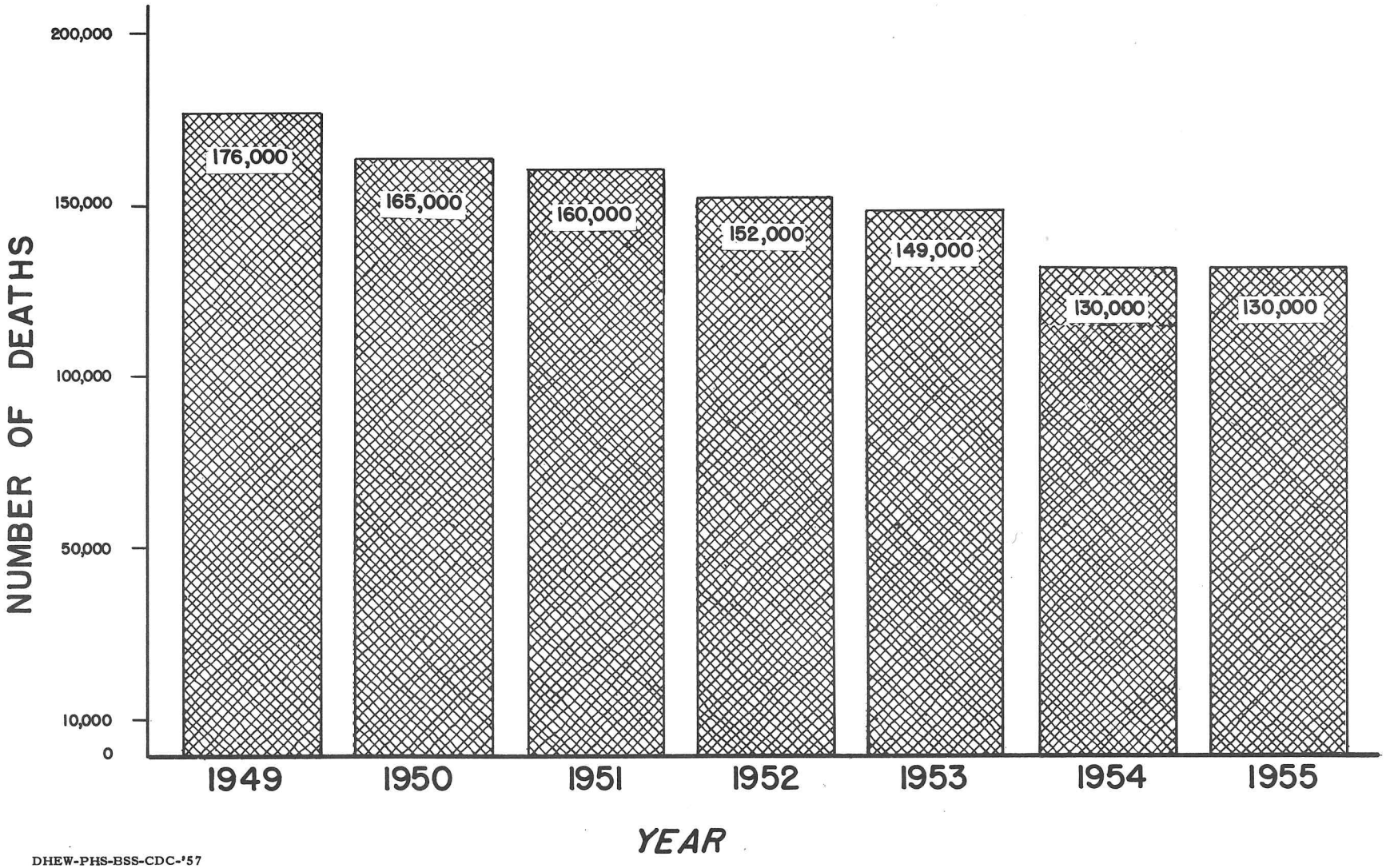
November 21, 1957

INTRODUCTION

This series of charts was originally prepared as a briefing tool for the Secretary's Consultants on Medical Research and Education, and presented at their meeting in Washington, D. C , on November 21, 1957. In the belief that the facets of the Communicable Disease Center's program depicted here would be of interest and concern to a wider audience, short explanatory texts have been added to the back of each chart.

COMMUNICABLE DISEASES

NUMBER OF DEATHS RESULTING FROM U. S. – 1949 – 1955



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COMMUNICABLE DISEASES AS CAUSE OF DEATH U. S. – 1949-1955

In 1954 and again in 1955, 130,000 deaths in this country were directly attributed to communicable diseases and their sequelae. These figures do not include deaths in which infective agents were a secondary cause.

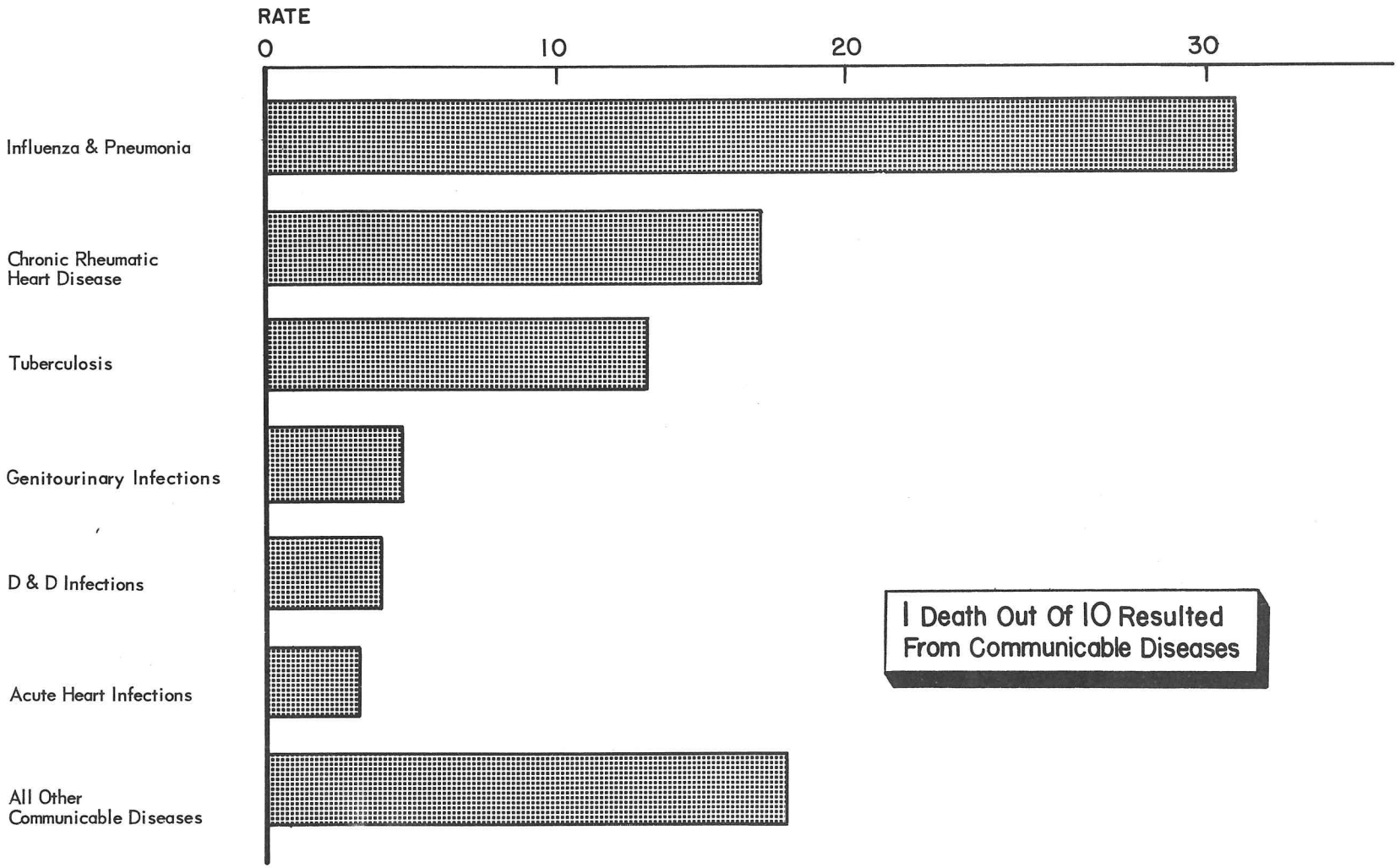
The emergence of resistant strains of bacteria and viruses – and of new strains, the increasing proportion of older age groups in the population, and the continued high birth rate exert an influence on communicable disease morbidity and mortality. Recent developments in the communicable disease field include the problem of antibiotic resistant strains of staphylococci and the widespread epidemic of Asian influenza due to a variant strain of Influenza virus A. Protection of older persons against infection is a fundamental principle of their care. At present, the total impact of a mild or acute infectious disease superimposed on chronic illness of long standing is not fully known. The enormous increase in the number of younger persons in the population automatically increases the number of cases of common childhood diseases – measles, chickenpox, pertussis, mumps, and rubella. Although the frequency of complications, residual effects, and death may be low, the magnitude of the numbers involved is considerable.

While the death rate due to communicable diseases and their sequelae may decline, the total number of deaths attributed to these diseases may remain constant for some years to come if the present high birth rate continues.

COMMUNICABLE DISEASES

AVERAGE ANNUAL DEATH RATE PER 100,000 POPULATION

U.S.-1951-1955



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COMMUNICABLE DISEASES

AVERAGE ANNUAL DEATH RATE PER 100,000 POPULATION
U. S. – 1951-1955

During the five-year period 1951-1955, influenza and pneumonia reflected the highest death rate of the communicable diseases. This was due in large part to the extensive influenza epidemic of 1953.

Death rates due to other infectious diseases, to chronic and acute rheumatic heart disease, and to acute genitourinary infections have all declined since the advent of antibiotics and chemotherapy, but the total number of deaths from these causes is still substantial. Despite the dramatic decline in mortality from tuberculosis during this same five-year period, the reported number of cases remains high.

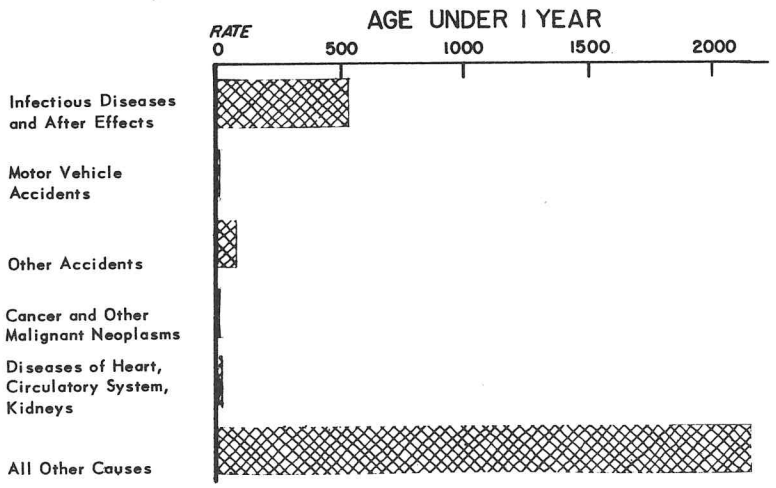
Mortality due to diarrhea and dysentery, although of considerable magnitude, is not uniform throughout the United States. The majority of these deaths are localized in several sections of the country, with children under two years of age chiefly involved.

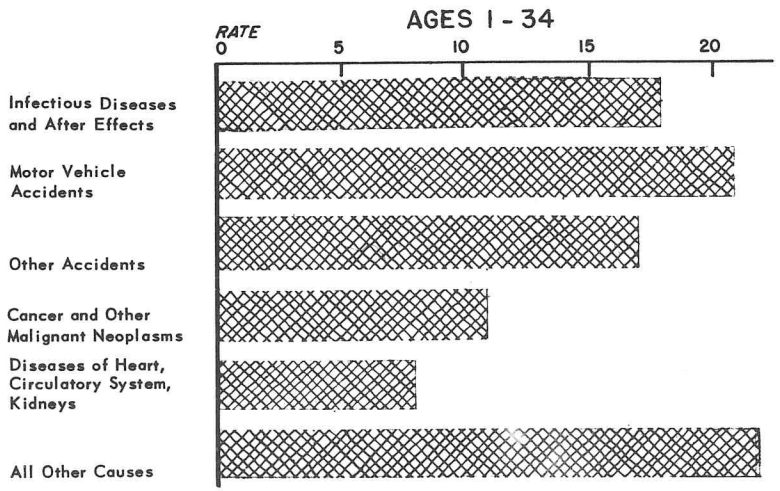
In the "all other" category, the mortality due to any single communicable disease during this five-year period was low; however, in the aggregate the death toll from these diseases was second only to that of influenza and pneumonia. In 1955, for example, there were approximately 4,000 deaths due to syphilis; 1,000, poliomyelitis; 1,000, infectious hepatitis; 1,000 septicemia and pyemia; 1,000, meningococcal infections; 500, whooping cough; 350, measles; 300, streptococcal infections; 300, tetanus; 150, diphtheria; and so on. Almost 2,000 deaths were recorded for meningococcal and tuberculous; for acute rheumatic fever, the figure was 1,131. However, in 1955 there was not a single death due to smallpox, cholera, plague, louse-borne typhus, or yellow fever, the scourges of less than a century ago.

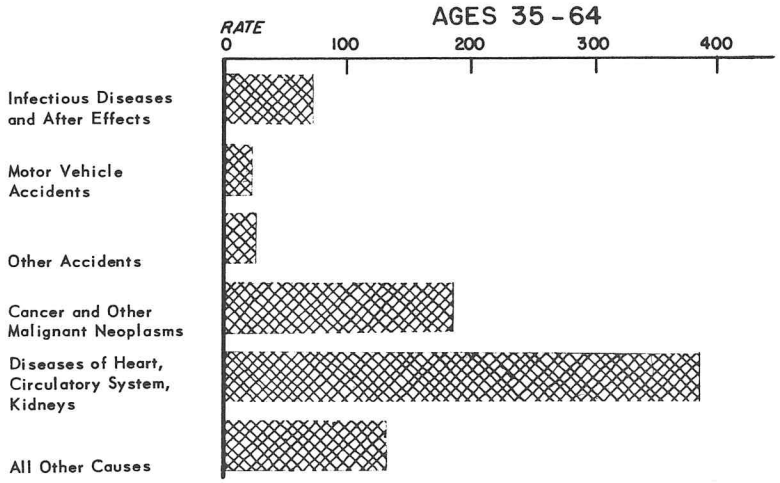
PRINCIPAL CAUSES OF DEATH BY AGE GROUP

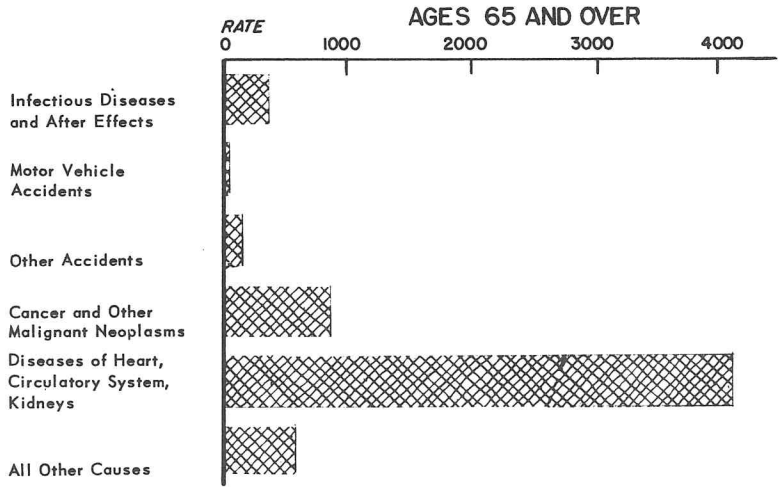
UNITED STATES, 1955

AGE—SPECIFIC DEATH RATES PER 100,000 POPULATION









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COMMUNICABLE DISEASES

PRINCIPLE CAUSES OF DEATH BY AGE GROUPS UNITED STATES, 1955

Infectious diseases acount for more than 500 deaths per 100,000 infants under one year of age. They are not the main cause of infant deaths, however; congenital malformations, birth injuries, and respiratory failure are responsible for the highest mortality rates in this age group.

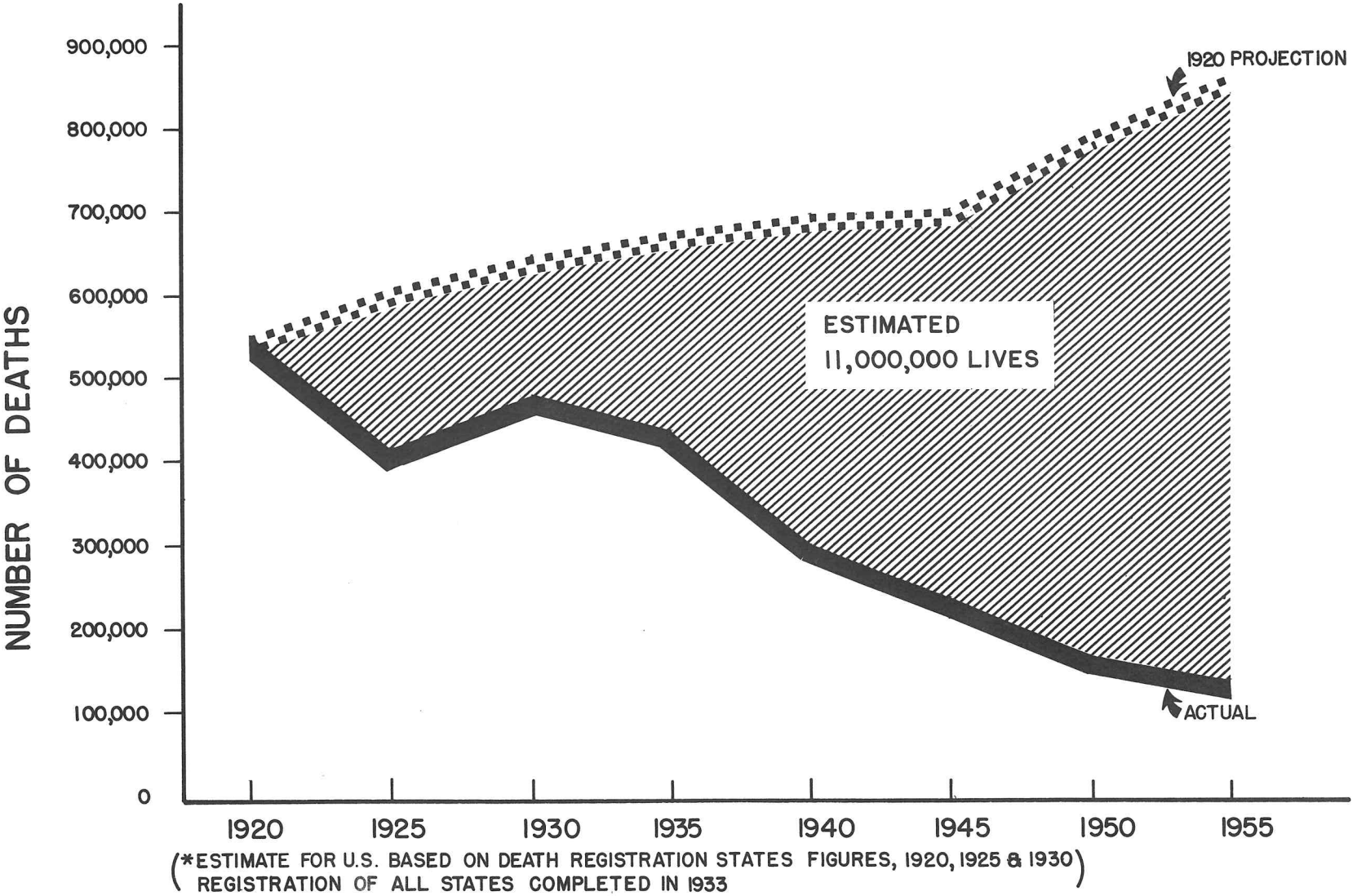
Among people in the vigorous years of life between infancy and up to 35 years of age, death from any cause is relatively uncommon. Of those that do occur, infectious diseases and their sequelae account for approximately 20 per 100,000 population each year. Although this rate is somewhat less than that due to motor vehicle accidents, it exceeds the rates caused by other accidents, cancer, or cardio-vascular-renal diseases.

Between the ages of 35 and 64, the general death rate increases. The mortality rate due to infectious diseases also increases and is more than triple the rate due to motor vehicle accidents.

Among persons 65 years of age and over, deaths due to communicable diseases again increase, but are overshadowed by the more usual causes of death in old age.

COMMUNICABLE DISEASES

COMPARISON OF ACTUAL* DEATHS WITH PROJECTION OF 1920 DEATH RATE



(*ESTIMATE FOR U.S. BASED ON DEATH REGISTRATION STATES FIGURES, 1920, 1925 & 1930
REGISTRATION OF ALL STATES COMPLETED IN 1933)

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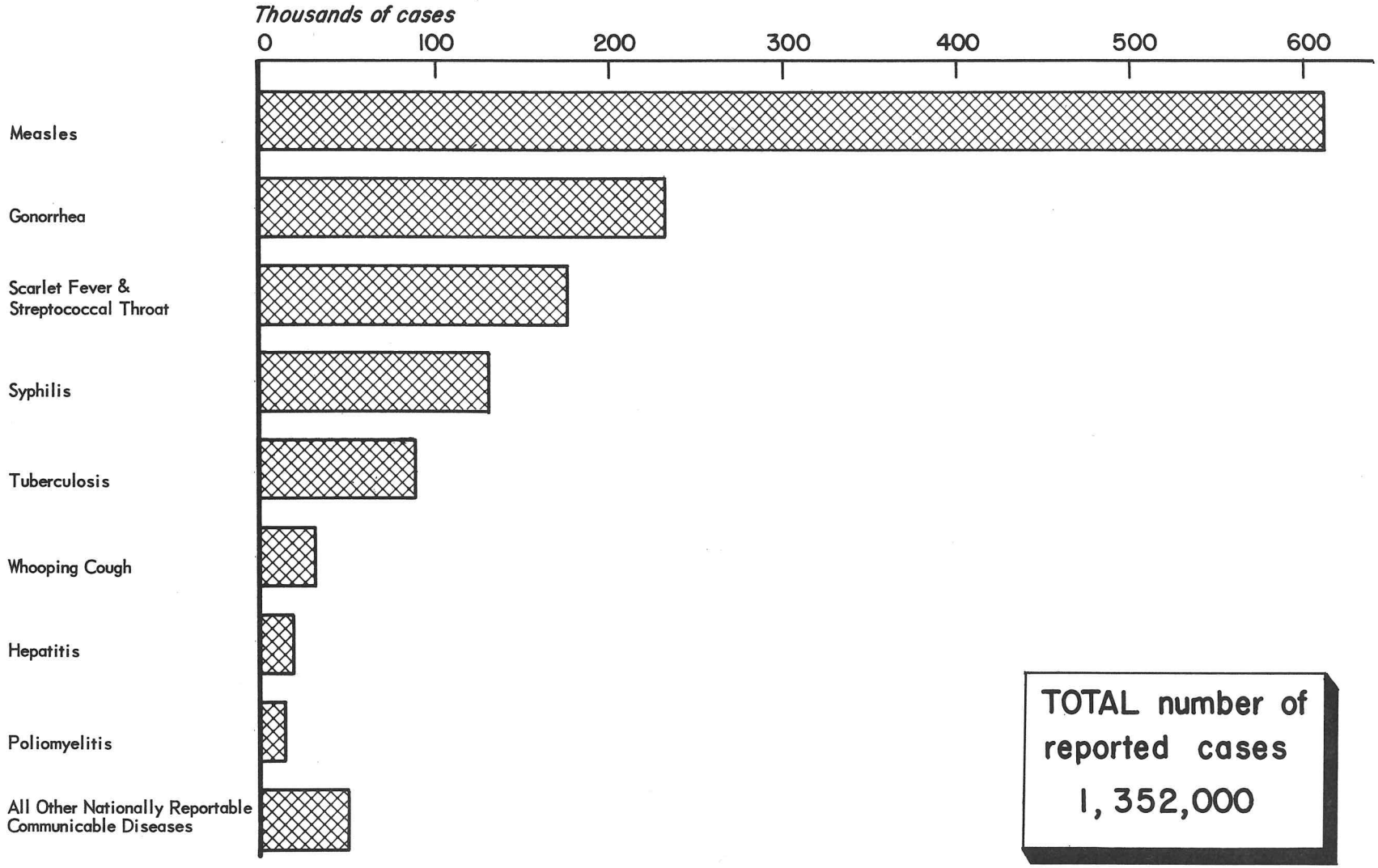
COMMUNICABLE DISEASES

COMPARISON OF ACTUAL DEATHS WITH PROJECTION OF 1920 DEATH RATE

A variety of factors have contributed to the lowered death rate from infectious disease since 1920: improved water, milk and food supplies; higher standards of living and of personal hygiene; nationwide immunization programs; the advent of chemotherapy and antibiotics; and, among other factors, unremitting vigilance on the part of State, local, and Federal health departments.

COMMUNICABLE DISEASES

NUMBER OF REPORTED CASES
U.S. – 1956



TOTAL number of reported cases
1,352,000

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COMMUNICABLE DISEASES

NUMBER OF REPORTED CASES
U. S. – 1956

Of the nationally reportable diseases, measles occurs most frequently: 90 percent of the population will have had measles before age 15. Although this is a relatively mild disease with complications of pneumonia, otitis media, and encephalitis occurring at low frequency, the total number of cases is impressive.

All other reportable diseases are low in incidence by comparison. The peak year of poliomyelitis was in 1952, when 57,879 cases were reported; in 1957, a total of 5,894 (preliminary) cases were reported. Infectious hepatitis reached a high figure of 50,093 cases in 1954; for 1957, the preliminary total was 14,806 reported cases. The number of cases of tuberculosis reported in recent years has slowly declined from 137,008 to 90,000 (approximate) in 1957. The reported cases of streptococcal sore throat and scarlet fever have steadily increased from a low of 64,494 in 1950 to a total of 176,392 in 1956.

Many infections which are not reportable nationally comprise communicable disease problems of varying magnitude.

COMMUNICABLE DISEASES
NOT REPORTABLE NATIONWIDE

COLDS

BRONCHITIS

LA GRIPPE

INFLUENZA

PNEUMONIA

GLANDULAR FEVER

CONJUNCTIVITIS

IMPETIGO

FOOD POISONING

STAPHYLOCOCCAL SKIN INFECTIONS

HISTOPLASMOSIS

COCCIDIOIDOMYCOSIS

BLASTOMYCOSIS

MONILIASIS

RINGWORM

TRICHOMONIASIS

PARASITIC WORMS

SCABIES

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COMMUNICABLE DISEASES
NOT REPORTABLE NATION-WIDE

It is difficult to assess the extent of the problem involving communicable diseases which are not reportable nation-wide.

It has been estimated that on any average winter day, more than 20 million persons would be found discomforted by a "cold." That more serious respiratory infections can involve a large proportion of the population was illustrated by the Asian influenza epidemic of 1957.

The pulmonary mycoses, which present a growing public health problem, have focal areas of high incidence in this country: coccidioidomycosis occurring in the west and southwest; histoplasmosis and blastomycosis in the central and south central portion.

Hospitals here and abroad have been beset by staphylococcal infections, and by monilial infections, especially in the nurseries. Infections due to antibiotic resistant staphylococci are particularly troublesome from the standpoint of control.

The protozoal infection, trichomoniasis, is stated to affect a relatively high proportion of both women and men.

Outbreaks of conjunctivitis and of ringworm of the scalp occur frequently, especially among the school population.

Glandular fever, or infectious mononucleosis, is often diagnosed in various age groups throughout the country.

Impetigo, scabies, and parasitic worms are known to be widespread in various communities.

Food poisoning outbreaks are regular occurrences all over the United States. Some involve only members of a single family; others affect larger groups.

DECLINING COMMUNICABLE DISEASE PROBLEMS

(DIMINISHING INCIDENCE--CONTINUED SIGNIFICANCE)

1955

DIPHTHERIA
CASES – 1,984
DEATHS – 150

ENDEMIC TYPHUS
CASES – 135
DEATHS – 5

TYPHOID
CASES – 1,704
DEATHS – 34

SHOULD ERADICATION BE PURSUED ?

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DECLINING COMMUNICABLE DISEASE PROBLEMS

The declining incidence of some communicable diseases has engendered a dangerous attitude of complacency toward them in this country. Diphtheria, endemic typhus, and typhoid fever are three such diseases. Preventive tools and control measures exist for all three. Nevertheless, outbreaks still occur from time to time, proving that available tools must be applied more aggressively if these diseases are to be eradicated.

In general, two types of diphtheria problems now exist in this country – endemicity in the southern States and the increasing ratio of cases in older children and adults in northern and western States. Routine immunization of infants and of other susceptible persons would eliminate diphtheria from the national picture.

Murine typhus fever is maintained in nature by a rat-flea-rat cycle. In endemic study areas, typhus activity has remained at a low level in the rodent reservoir for several years following a single rat and flea control program. This would indicate that the threat of endemic typhus in this country could be extinguished by a persistent, widespread attack against the flea host and the rat reservoir.

Sanitation provides the key to prevention of typhoid fever, of which man is the host. In recent years, safe water supplies, both public and private, sanitary sewage disposal, supervision of the processing, preparation and serving of food and milk, discovery and control of carriers, and education in personal hygiene have all contributed to its decline.

Should a militant campaign be waged to eradicate diseases such as these, when their incidence is declining under present control conditions and when more pressing disease problems confront us?

MINOR COMMUNICABLE DISEASE PROBLEMS

(MAJOR KILLERS IN SOME PARTS OF THE WORLD--RARE IN U.S.)

YELLOW FEVER
1924 - CASES - 1
DEATHS - 1

PLAGUE
1957 - CASES - 1
DEATHS - 1

SMALLPOX
1953 - CASES - 4
DEATHS - 1

MALARIA
1955 - CASES - 522
DEATHS - 18

CHOLERA - (ASIATIC)
1911 - CASES - 2
DEATHS - 2

HOW TO MAINTAIN COMPETENT SURVEILLANCE TO ENSURE MINOR STATUS.

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MINOR COMMUNICABLE DISEASE PROBLEMS

Certain death-dealing diseases of earlier years have vanished from the American scene or become so rare that they are no longer considered to be of major significance here. However, outbreaks of yellow fever, plague, smallpox, malaria, and cholera – diseases that have altered history – have all reached epidemic proportions somewhere in the world within recent years. Although any serious threat to our population appears remote, as long as the organisms responsible for these diseases persist anywhere in the world we must maintain competence in dealing with them.

CDC is particularly concerned with the northward movement of jungle yellow fever in Central America, because the mosquito vector *Aedes aegypti* is prevalent throughout the southern United States as far north as Maryland and as far west as Arizona. Sporadic cases of plague in this country warn us of its continued presence here. This disease is endemic in wild rodents throughout the western half of the United States, and constant surveillance must be maintained to prevent it from spilling over into domestic rats and mice in urban areas, with consequent risk to human beings. A human death occurred in California in 1956 and another resulted from a case believed to have been contracted in Colorado in 1957. Both of these cases were thought to be of sylvatic origin. Few indigenous cases of malaria have been reported in this country in recent years, although returning veterans and other travelers have occasionally brought the disease back with them. Until a decade or so ago, malaria was a major problem in the United States. It is still regarded as the world's Public Health Enemy Number One. Although laboratory diagnosis has failed to confirm any suspected case of smallpox reported in the United States in several years, the disease remains active south of the border and is widely prevalent elsewhere on the globe. Cholera, absent from this hemisphere for many years, could be reintroduced from Asia.

MAJOR COMMUNICABLE DISEASE PROBLEMS-1955

BECAUSE OF

MORBIDITY
MORTALITY
AFTER EFFECTS

TUBERCULOSIS
CASES – 99,000
DEATHS – 15,000

INFLUENZA AND PNEUMONIA
CASES – Not Reportable
DEATHS – 45,000

DIARRHEA AND DYSENTERY
CASES – Only Partially Reported
DEATHS – Under 2 Yrs. of Age – 4,600

STREPTOCOCCICOSIS
CASES – 150,000
DEATHS – 20,000

VENEREAL DISEASES
CASES – 372,000
DEATHS – 4,000

POLIOMYELITIS
CASES – 29,000
DEATHS – 1,000

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MAJOR COMMUNICABLE DISEASE PROBLEMS

The degree of activity directed by CDC toward the prevention and control of specific diseases depends on the morbidity, mortality, or sequelae produced by the diseases themselves and the need of the States for the type of technical assistance that can be rendered only by a national resource.

Some diseases, like influenza and pneumonia, or diarrhea and dysentery, rank high in incidence and as causes of death, and therefore require intensive study directed toward their ultimate control. Others, such as the streptococcal infections, pose both an immediate and a long-term threat to their victims. Many of the chronic diseases stem from earlier infections; streptococcal infections particularly are precursors to chronic heart and kidney ailments.

Advanced chemotherapy has shortened the course of treatment for syphilis and gonorrhea to a single injection in many instances, giving rise to the hope that these diseases might soon be conquered. This hope was further nourished by a consistent decline in incidence of venereal diseases from 1947 through 1955, when the downward trend was reversed. Furthermore, approximately 52 percent of all infectious venereal disease reported in 1956 occurred in the 15 to 24-year age group which represents only 13 percent of the total population, showing that greater effort must be concentrated toward pinpointing particularly vulnerable segments of our population for study and control activities.

The battle against poliomyelitis is by no means won, although the incidence decreased last year, with a particularly striking drop in the attack rate of paralytic polio among vaccinated individuals. At this time, the degree and duration of immunity produced by the present vaccine have not been determined or whether or not an attenuated live virus vaccine would afford greater protection with no risk of reversion to its original virulence.

EMERGING DISEASE PROBLEMS

VIRAL DISEASES —

50+ – KNOWN
5 to 6 – PREVENTABLE
FEW – TREATABLE

- POLIO-LIKE
- HEPATITIS
- RESPIRATORY
- ENCEPHALITIS

PARASITIC DISEASES

- TOXOPLASMOSIS
- ECHINOCOCCOSIS (Alaska)

BACTERIAL DISEASES

- ANTIBIOTIC-RESISTANT INFECTIONS
  - STAPHYLOCOCCIA
  - TUBERCULOSIS
- ATYPICAL ACID-FAST RESPIRATORY DISEASE

MYCOTIC DISEASES

- HISTOPLASMOSIS
- COCCIDIOIDOMYCOSIS
- BLASTOMYCOSIS

DISEASES OF OBSCURE ORIGIN
GROWING INSECTICIDE RESISTANCE

TO ACQUIRE KNOWLEDGE
REQUISITE TO EARLY CONTROL.

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EMERGING DISEASE PROBLEMS

As many once-important bacterial diseases have yielded to modern chemotherapeutic agents, antibiotics, and environmental improvements, they have been replaced on the roster of communicable diseases by other problems. Paradoxically, some of these have been created through the use of the very drugs developed to defeat them. For example, certain strains of bacteria have become resistant to antibiotics and are producing perplexing conditions for which no solution has as yet been found. Among these are the staphylococcal infections that are plaguing hospital surgical wards and nurseries for newborn infants here and abroad, in defiance of the so-called "wonder" drugs.

Newer knowledge and advanced laboratory diagnostic techniques are rapidly expanding the list of known pathogens. In recent years over 80 previously unidentified virus strains and types, which are either responsible for specific diseases or are associated with specific diseases, have been described. Many or these produce syndromes that cannot be distinguished from each other clinically. The polio-like diseases, for example, achieved prominence during CDC's evaluation of the effectiveness of the polio vaccine, when specimens from thousands of cases clinically diagnosed as nonparalytic poliomyelitis failed to yield polio virus. Other viral agents, particularly members of the Coxsackie, ECHO, and Buffalo groups were recovered instead, and were subsequently proved capable of producing an aseptic meningitis that simulated nonparalytic polio. Viral diseases as a whole are among the most challenging in regard to diagnosis, prevention, and treatment. At present, preventive measures exist for only 5 or 6 of the recognized viral diseases, and only a few can be treated effectively. The etiology of a number of diseases, including viral hepatitis, is still obscure, and scientists are continuing their search for the causative agents.

Several diseases that were once considered rare have been found to be more common than was previously suspected. These include the bacterial disease, leptospirosis; the parasitic, disease, toxoplasmosis; and the systemic mycoses – histoplasmosis, coccidioidomycosis, and blastomycosis. Because of their growing public health significance, these diseases are now attracting the attention of many competent investigators.

Resistance problems are not limited to pathogenic organisms. Throughout the world, many species of mosquitoes and other insects that transmit important diseases have developed resistance to insecticides that were formerly effective in controlling them. In the search for other effective insecticides, newer compounds are constantly being developed. These must be carefully studied for their possible toxic effect on humans and animals, and safeguards must be devised for their use.

ELEMENTS OF CONTROL

DEFINING (OR REFINING) THE PROBLEM-ITS NATURE & EXTENT

REPORTING & SURVEYS
- INFECTION
- MORBIDITY
- MORTALITY

CASE-FINDING

- MEDICAL EXAMINATIONS
- NURSES' HOME VISITS
- CASE-CONTACT FOLLOW-UPS
- SCREENING EXAMINATIONS

PREVENTIVE ACTIVITIES

- IMMUNIZATION
- PROPHYLAXIS
- ENVIRONMENTAL CONTROL
- VECTOR CONTROL
- EDUCATION

TREATMENT

- INDIVIDUAL TREATMENT
- STANDARDIZED REGIMES

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ELEMENTS OF CONTROL

Adequate control of communicable diseases requires action at the local, State, national, and sometimes international levels, with each jurisdiction carrying out its own prescribed responsibilities. All have free access to information regarding the nature and extent of communicable disease problems and the tools that have been developed to cope with them. State and local health departments form the pivot of the total health organization. They provide the basic data on the incidence of diseases of public health importance in man and animals and they are generally responsible for the direct application of control measures.

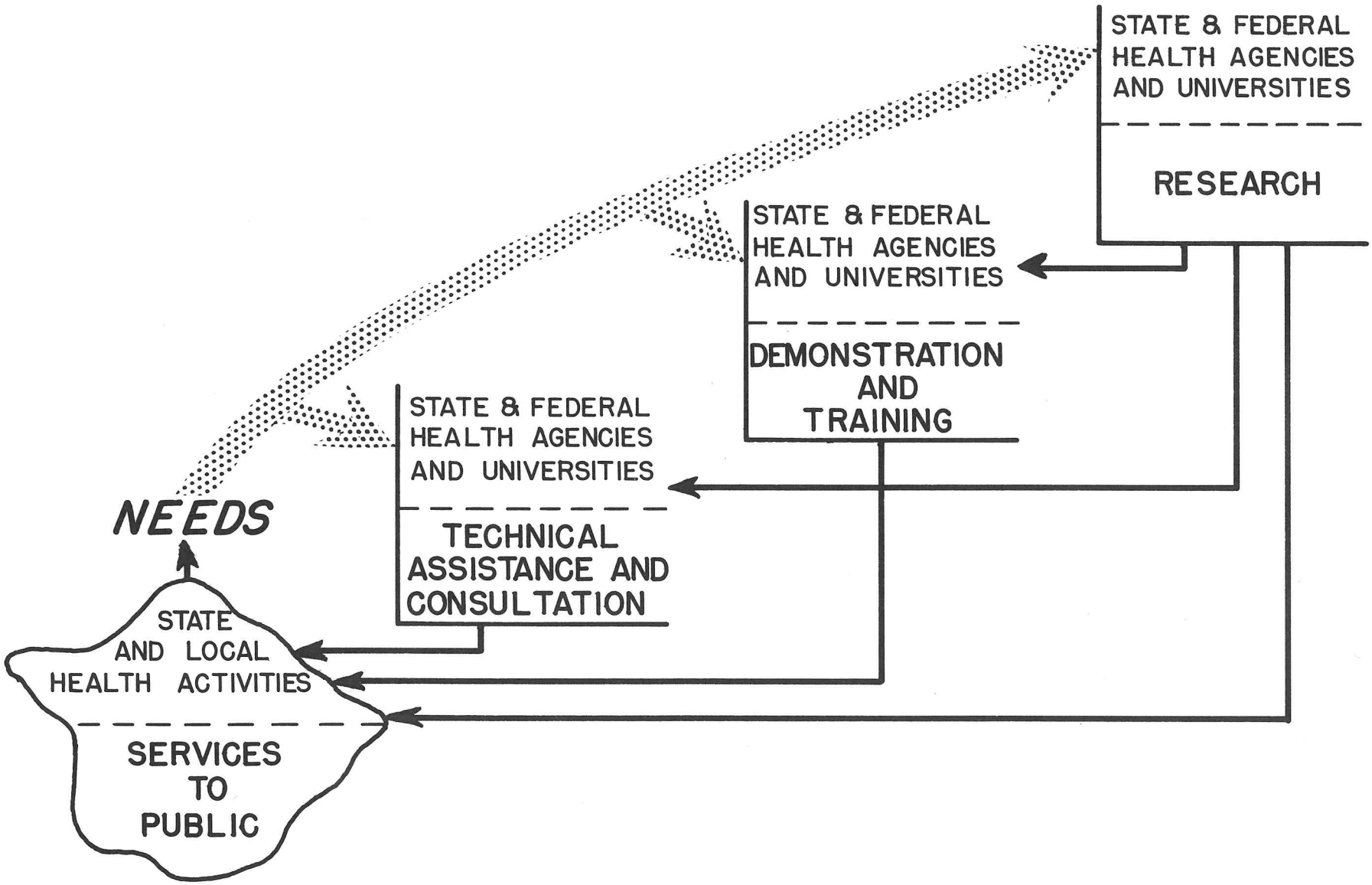
Collection of data begins at the local level with reports, largely by physicians, of instances of notifiable illnesses that come to their attention. Even when a disease is not regularly reportable, the occurrence of an unusual number of cases is noted for epidemiological reasons. This is also true of the occurrence of a disease long absent from a locality or of one previously unknown there. Special surveys provide a way for State and local health departments to appraise a particular problem and to explore and measure less obvious areas of infection, such as the presence of asymptomatic cases or the existence of animal reservoirs of disease. Morbidity and mortality data collected from local sources are next assembled by State health departments and forwarded to the Public Health Service, where they are summarized and published. In this way, the total health organization is kept informed of disease frequencies on the local, regional, and national levels.

Very often, aggressive local case-finding programs disclose unsuspected as well as unreported instances of infectious disease. These programs may utilize medical or screening examinations for various segments of the population or for the public as a whole. On a more constant basis, they involve follow-ups of contacts of known infected persons to provide information on the spread of such important diseases as tuberculosis, poliomyelitis, venereal disease, and of others that occur in epidemic form. Visiting nurses are in a particularly favorable position to detect unreported cases of communicable disease in the community.

Preventive activities reach their culmination at the State and local level in services rendered directly to the people. The most personal protection afforded individual humans and animals is through immunization and prophylaxis. Less personal, but equally important, are the provision of a safe water supply, sanitary disposal of organic waste, prevention of air pollution, supervision of food processing and handling, and other environmental control measures. Wherever animal reservoirs of disease and insect vectors endanger public health, they must be sought out and controlled. Since the effectiveness of many control measures is incumbent on public understanding, acceptance, and cooperation, a continuing program of health education is an integral part of preventive activities.

Treatment of infected persons is the final element of control. It involves treatment of individuals by private and public health personnel, standardized regimes, and elimination of the carrier state.

FUNCTIONS IN CONTROL



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FUNCTIONS IN CONTROL

Control of communicable diseases is neither simple nor static. It requires the interaction of State and Federal agencies, universities and other centers of research, and of local health personnel. Increasingly effective control is achieved as emerging knowledge – based on laboratory, clinical, and field research regarding the agents and circumstances that affect health – is converted into useful practices and made available to the individuals and organizations responsible for their application.

The investigations carried on at universities, certain government agencies like the National Institutes of Health, and other research centers are predominantly fundamental or basic in character, whereas those conducted by CDC and by some State and local health agencies are largely, but not exclusively, of an applied nature. In this way, component parts of the health organization complement each other in acquiring and applying new knowledge. The various centers also provide demonstrations and training in the use of new tools and offer technical assistance and consultative services to members of the health organization that seek to improve their competency in the detection, prevention, and control of communicable diseases.

Disease problems and deficiencies in their prevention and control are brought into sharp focus at the grass-root level of State and local health activities. Needs that are encountered in the field influence the direction of research and of services rendered throughout the total health organization.

COMMUNICABLE DISEASE PROGRAM

ELEMENTS OF CONTROL	FUNCTIONS IN CONTROL OF COMMUNICABLE DISEASES				
		SERVICE	TECHNICAL ASSISTANCE AND CONSULTATION	DEMONSTRATION AND TRAINING	RESEARCH
	Defining or Refining the Problem	Compilation and analysis of national data Special reports Surveillance reports	On 47 diseases Insect resistance Toxicology of insecticides	Courses and assignments in epidemiology and biostatistics	Ecology Epidemiology Diagnostic methodology Toxicology of insecticides
	Preventive Activities	(State and local responsibility)	Disaster aid Epidemic aid Immunization programs Public educational programs Vector control Toxicology of insecticides Technical visual aids and publications	Disease control methods Vector control Toxicology of insecticides	Vaccination and methods Vector Control Venereal disease and tuberculosis prophylaxis Toxicology of insecticides
	Case-finding	(State and local responsibility)	All communicable diseases Supply standardized diagnostic materials Provide reference diagnosis VD case-finding conferences	Application of epidemiological technique and laboratory methodology	Development and evaluation of screening techniques Development and evaluation of rapid and practical laboratory diagnostic techniques
	Treatment	(State and local responsibility)	Tuberculosis Venereal diseases Mycotic diseases Parasitic diseases	VD Symposia	Tuberculosis Venereal diseases Mycotic diseases Parasitic diseases Tissue culture assay

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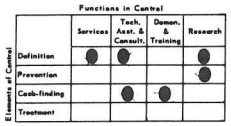
COMMUNICABLE DISEASE PROGRAM

The basic objective of the Communicable Disease Center is to plan, conduct, coordinate, and evaluate a comprehensive, nation-wide program in cooperation with State and local health agencies for the prevention and control of communicable diseases. Research activities are an integral part of the program and are geared to meet known needs and unsolved problems in the epidemiological, laboratory, technological, and training fields. As such, they are inseparably connected with the operational functions of the Center.

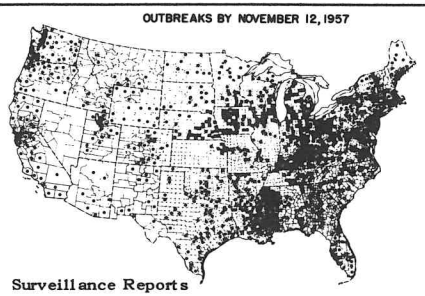
The Center's training activities provide a major means of integrating new knowledge and new methods into existing public health problems, and of bridging the gap between academic training and its practical application. They are designed to serve all categories of public health workers in the communicable disease field. In addition, CDC conducts demonstrations to acquaint public health personnel with the newer concepts and techniques of communicable disease prevention and control.

Through years of study and experience, the Center has accumulated a valuable stockpile of information related to communicable diseases and their control, which it puts into practical use by providing technical assistance and consultative services to public health agencies that request help with specific problems. The operational activities performed in answer to requests for epidemic and disaster aid are the heart of the Center's program. In helping the State and local agencies to investigate epidemics or to restore facilities destroyed by disaster, the Center's personnel gain practical experience in the epidemiology and control of the communicable diseases. They also become aware of the States' problems and of the difficulties in their solution. To a considerable extent, the Center's laboratory research and field investigations are directed toward eliminating the problems and difficulties.

CDC helps to define the extent of specific disease problems by compiling and analyzing infection, morbidity, and mortality data collected by the National Office of Vital Statistics. This material is digested to get the current picture in communicable diseases, integrate the present with the past, and to try to project trends. One of the most important goals of this work is to detect deviations from the expected or usual pattern as early as possible. Detailed information on the status of various diseases is made available to the States through CDC's regular and special surveillance reports.



CDC INFLUENZA ACTIVITY 1957 – ASIAN EPIDEMIC

	Service	Technical Assistance and Consultation	Demonstration and Training	Research
Defining Problem	 Surveillance Reports	Isolation and identification of viruses		Investigation of variations in viruses
Preventive Activities				Evaluation of vaccines and vaccination procedures Studies to correlate circulating antibody level with resistance to clinical illness
Case-finding		Furnishing diagnostic reagents – viral and bacterial – to laboratories	Workshop for State Laboratory Personnel (52) – October 1957 Loan of visual aids on laboratory diagnostic techniques	
Treatment				

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CDC INFLUENZA ACTIVITY 1957 – ASIAN EPIDEMIC

The Asian influenza epidemic beginning in 1957 afforded the Communicable Disease Center a unique opportunity to assist in mobilizing civilian health and medical resources in the face of an impending nationwide emergency. This epidemic stimulated medical teamwork on a national scale that was unprecedented in peacetime history. Never before have so many elements of our society joined together, in so short a time, to plan and prepare a counterattack against a threat to our nation's health.

Probably starting from the mainland of China, a mild form of influenza moved, by way of Hong Kong, into several major areas of the Far East during April 1957. Shortly thereafter, when United States military units in the Pacific were affected, variant strains of Influenza virus A were isolated by Army laboratories. At the Walter Reed Army Institute of Research, these were demonstrated to be antigenically different from other known strains. Since an influenza epidemic spreads rapidly, all agencies concerned with studies of influenza were informed of these findings.

CDC was already studying influenza and other respiratory diseases and serving as the World Health Organization International Influenza Center for the Americas. It immediately initiated an intensive surveillance program for influenza and established a mechanism for epidemic aid. Epidemiological investigation of early outbreaks in this country made it possible to chart the course of the disease, predict its trend, and plan the attack against it. CDC sent diagnostic sera, antigens, and seed viruses to laboratories throughout the Western Hemisphere and helped establish a network of diagnostic laboratories in this country to assist in the early detection of influenza and determination of virus strains. Through its weekly Influenza Surveillance Reports, it kept the public health profession informed concerning spread, incidence, mortality, industrial absenteeism, and vaccine production and distribution.

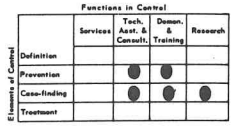
Vaccination is the only proven protection against influenza. Although many influenza vaccines were in use, none contained components covering the Asian variant strains. Before the epidemic had time to become firmly established, the Public Health Service assisted and encouraged pharmaceutical houses in formulating monovalent vaccines. CDC evaluated them as they were produced, and experimented with various vaccination procedures in order to determine the amount and number of dosages required and the optimum time interval between inoculations. Serology studies were set up on selected groups of individuals before and after vaccination, so that the circulating antibody level produced by vaccine could be correlated with resistance to clinical illness. As a result of these studies and of others conducted elsewhere, the potency of the vaccine was increased to provide greater protection.

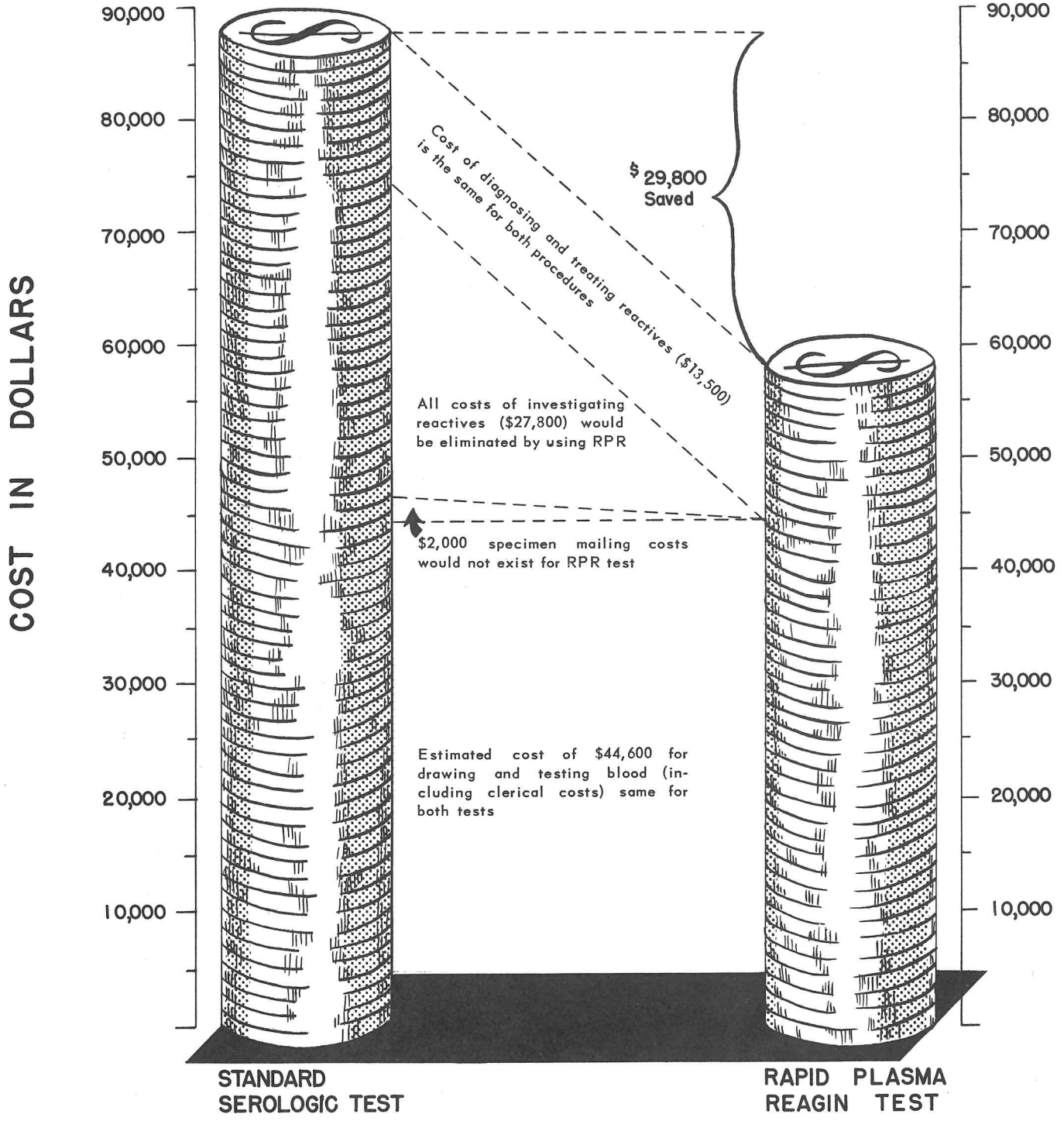
In addition to providing laboratory diagnosis, training, and reference services in strain typing, CDC assisted State and local health departments in setting up their own influenza programs.

The combined efforts of CDC and other health organizations directed toward the control of Asian influenza undoubtedly mitigated the disruption that would have accompanied a higher incidence.

CDC is continuing its studies on other forms of influenza and on the respiratory diseases as a whole.

ESTIMATED COSTS OF TESTING, FOLLOW-UP AND TREATMENT OF 100,000 MEXICAN MIGRANT LABORERS AT POINT OF ENTRY INTO THE UNITED STATES USING TWO DIFFERENT TESTING PROCEDURES





DHEW-PHS-BSS-CDC-'57

DEVELOPMENT OF THE RAPID PLASMA REAGIN TEST (RPR) FOR SYPHILIS

The RPR test for syphilis was developed to overcome a specific problem. Attempts to screen agricultural migrants for syphilis on the Mexican border met with great difficulty in the past because the blood specimens had to be mailed to distant laboratories for testing, and the braceros were processed through the centers and dispersed to various working localities before the results of the tests were known. So the reactive cases had to be traced to their place of work, located and brought in for diagnosis before they could be treated for syphilis. This procedure involved costly field work and complicated record keeping. Furthermore, about one-fifth of the reactives were never located.

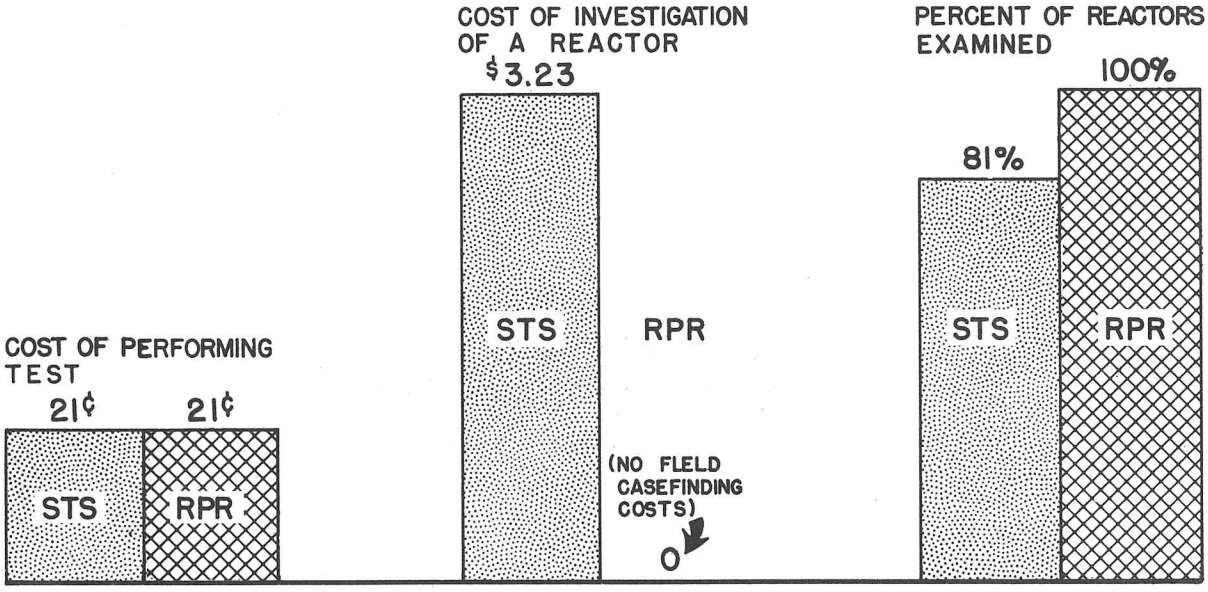
The conventional tests for syphilis were too time consuming for on the spot testing leading to immediate diagnosis and treatment. Therefore, the Venereal Disease Experimental Laboratory of the Venereal Disease Program developed the RPR to overcome these difficulties. The RPR test was first used on a large scale from April 16 through June 28, 1957, at which time 47,579 Mexican migrant laborers were tested as they passed through the reception center in El Centro, California. The tests were performed on the spot, diagnosis made, and treatment given immediately. As a result, 3,728 of the migrants were diagnosed and treated for syphilis before leaving the reception center.

The results of the RPR test compared favorably with those of the treponemal and nontreponemal tests done on a sample of about 1600 specimens.

The economies effected by the RPR test are chiefly in savings of field investigation costs and in raising the efficiency of testing by bringing 100 percent of the reactors to examination.

The chart on the back depicts the estimated cost of testing, diagnosing, and treating 100,000 Mexican migrants at point of entry into the United States by using a conventional test for syphilis and by using the RPR. The chart below makes other comparisons of the RPR with other tests for syphilis.

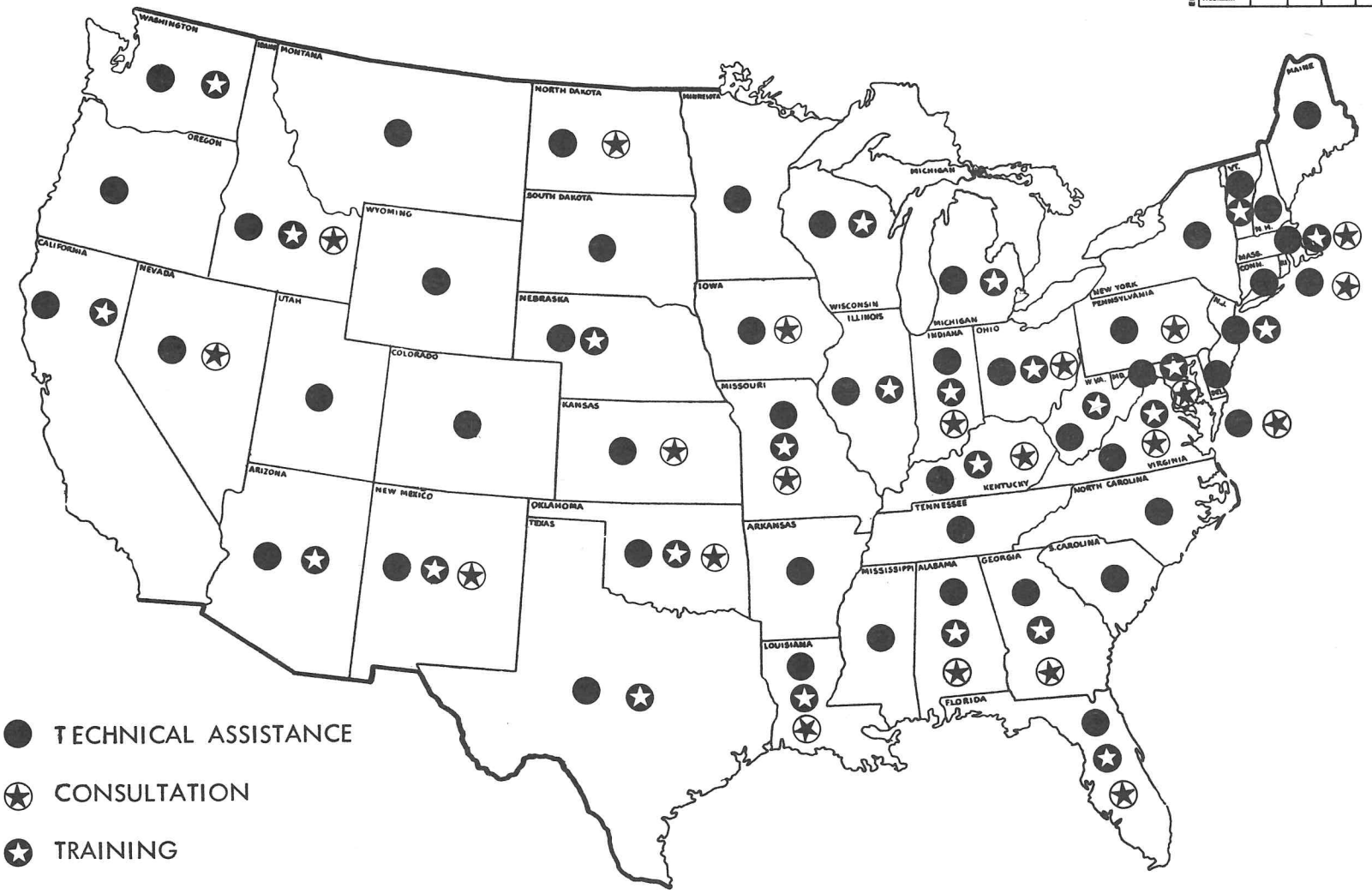
THE RAPID PLASMA REAGIN TEST (RPR) COMPARED WITH STANDARD TESTS FOR SYPHILIS



VENEREAL DISEASE RESEARCH LABORATORY - FISCAL YEAR 1957

ASSISTANCE TO STATE AND TERRITORIAL HEALTH DEPARTMENTS

Elements of Control	Functions in Control			
	Services	Tech. Asst. & Consult.	Demon. & Training	Research
Definition				
Prevention				
Case-finding		●	●	
Treatment				



● TECHNICAL ASSISTANCE

✪ CONSULTATION

✪ TRAINING

ALASKA ●✪✪ HAWAII ● PUERTO RICO ● VIRGIN ISLANDS ● OTHER COUNTRIES ●✪

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VENEREAL DISEASE RESEARCH LABORATORY - FISCAL YEAR 1957

SERVICES

The service program of the Venereal Disease Research Laboratory of the Public Health Service at Chamblee, Georgia, was evolved for the purpose of assisting the State laboratories to attain and maintain a high level of efficiency in serologic testing and through them to exert a favorable influence on the testing efficiencies of all laboratories within the States. This program is composed of the following integrated segments, each of which is of small value as a separate entity, but which collectively have been effective in reaching the objective with a minimal expenditure of time and money.

Manual - A manual of serologic tests for syphilis is prepared with the assistance of the test authors and revised at appropriate intervals. The manual is a standard guide in most serologic laboratories throughout the World.

Standardized reagents - Standardized antigens and other reagents for tests listed in the Manual are prepared and made available for check-testing purposes to commercial or State laboratories that manufacture these reagents.

Consultation - State laboratories are visited, on request, for consultation and for the purpose of reviewing the serology program, (testing, laboratory control, etc.).

Scheduled training courses - (1) Serology of syphilis - designed for senior or supervisory technologists of the State laboratories who are directly responsible for testing and training activities, covers the theory and practice of several of the recognized American methods in complement-fixation and flocculation, including the preparation and use of control sera and (2) Management and control syphilis serology by the regional laboratory - designed for assistant laboratory directors and senior laboratory staff members, includes reviews of interlaboratory training programs, regional laboratory evaluation studies, laboratory inspection procedures, etc.

Dehydrated control serum - Dehydrated control serum for serological tests for syphilis is offered to State laboratories with a protocol showing the quantitative reactivity of each serum lot in all tests performed at the Venereal Disease Research Laboratory.

Field or workshop refresher training course - These courses may vary in length from part of one day to as much as two weeks and may be restricted to State employees or may be conducted as a part of the State training program, in which instance the representative from the Venereal Disease Research Laboratory serves as consultant and part-time participant.

National serological evaluation study - Twenty prepared sterile sera are sent to participating laboratories each month and a tabulation of comparative results is issued once a year. In addition to State and territorial laboratories and author control laboratories in the United States, the 1957 evaluation also included laboratories in Canada, Mexico, Peru, Denmark and Taiwan. This type of survey produces information that may be used for ascertaining the relative efficiency of many laboratory performances of each type or kind of test as compared, with the results of the tests' authors.

State serological evaluations - On request, the Venereal Disease Research Laboratory serves as a control or co-control for intra-State serological evaluation studies conducted by State laboratories for all laboratories within their jurisdiction.

TPI testing - The Treponema pallidum immobilization test is offered by the Venereal Disease Research Laboratory as a reference service on a national basis, through the State departments of health.

The present status of serological tests for syphilis performed in the State laboratories of the USA, as reflected in the yearly national serological evaluation studies, shows an appreciable improvement over the performance levels of 1936. The laboratories within each State have been favorably influenced by the efforts and examples of the laboratories of the State departments of health. The Venereal Disease Research Laboratory of the Public Health Service has acted as a federal representative for consultation and guidance in this improvement program.

OTHER ACTIVITIES

WHO Reference Laboratory - By invitation of the Director General of the World Health Organization, the Venereal Disease Research Laboratory has served as a WHO Reference Laboratory for several years. In this connection, the Venereal Disease Research Laboratory has assisted in research studies participated in by laboratories and related groups in other countries for the purpose of establishing reagent and performance standards and ascertaining the effect of exotic diseases and other factors on the serodiagnosis of venereal disease in population groups of other countries of the world. Members of this laboratory also serve on WHO committees.

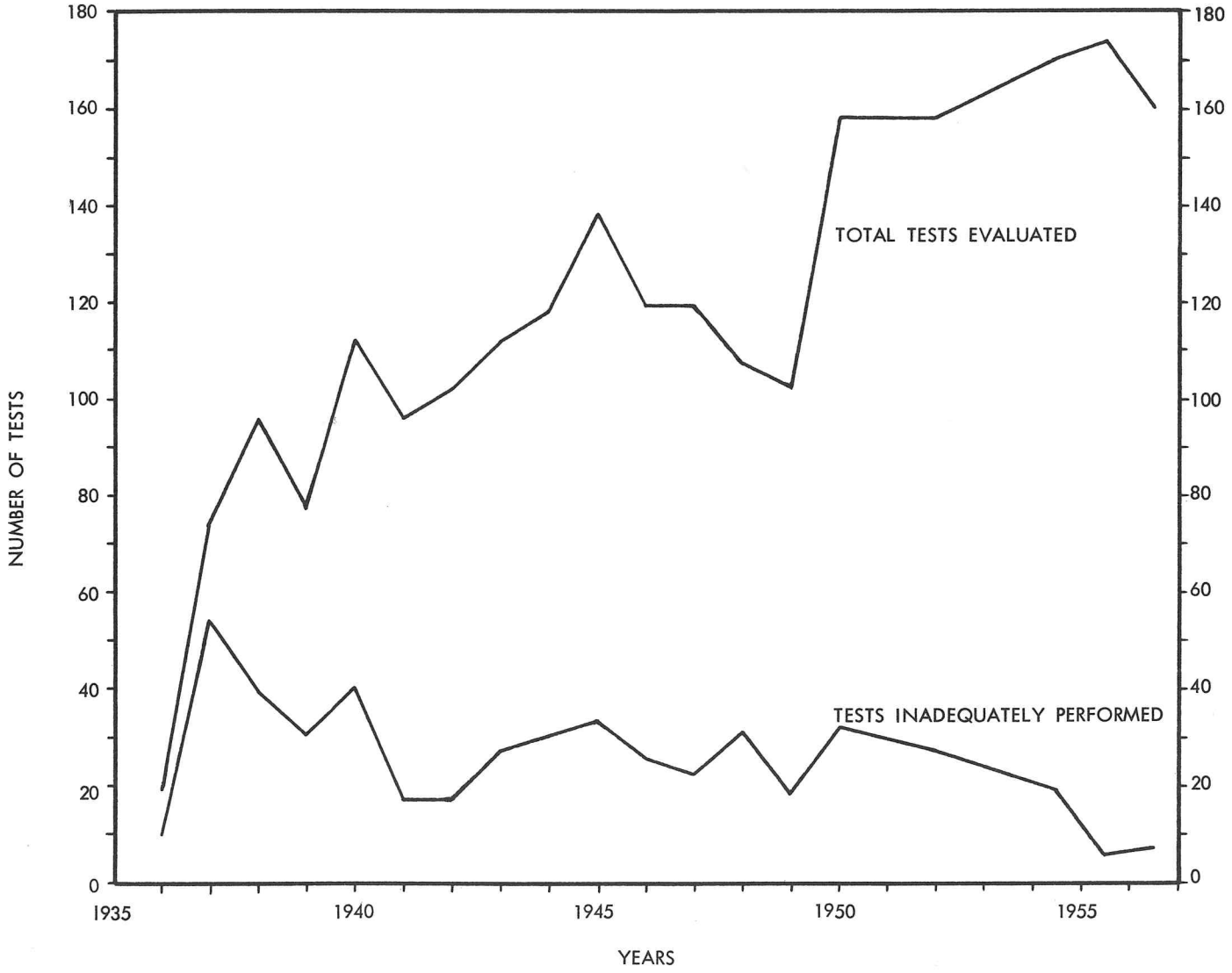
Supportive Research - Many of the research studies originating within the framework of the Venereal Disease Division or Branch were supported by the Venereal Disease Research Laboratory by, a) Advice in the planning of these studies, b) Occasionally in carrying out of the field phases of these investigations, and c) Performance of serologic test procedures including treponemal and nontreponemal tests.

Original Laboratory Research - Original research studies have been conducted by the Venereal Disease Research Laboratory for the purpose of, a) Evaluating laboratory procedures in the field of venereal disease that have been reported by other workers, b) Evaluation of newer chemo-therapeutic agents, and c) Development of more efficient laboratory means as aids in the diagnosis of venereal infections. The most widely used test in the United States, the VDRL test, was developed in this laboratory.

RESULTS OF ANNUAL SEROLOGIC EVALUATION CONDUCTED BY VENEREAL DISEASE RESEARCH LABORATORY

1936 - 1957

Elements of Control	Functions in Control				
		Services	Tech. Asst. & Consult.	Demon. & Training	Research
	Definition				
	Prevention				
	Case-finding		●	●	
	Treatment				



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ANNUAL SEROLOGIC EVALUATION

In order to take effective action against syphilis, either in treatment of the individual or case-finding in the community, effective diagnostic techniques are essential. Diagnostic observations, follow-up studies, evaluation of treatment results, and even determination of the prevalence of syphilis in given population groups or areas depend upon the sensitivity and specificity of the test used, the reproducibility of the test procedures, and the competence of the serologist.

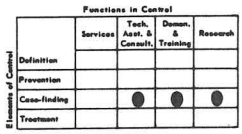
Realization of the need for definition of the characteristics of a given test procedure, for standardization of procedures, and for development of tests which could be used widely at low cost led to three international evaluation conferences called by the League of Nations Health Organization. These conferences were planned to define, under carefully controlled conditions, the diagnostic potentialities of the multiplicity of tests then in use.

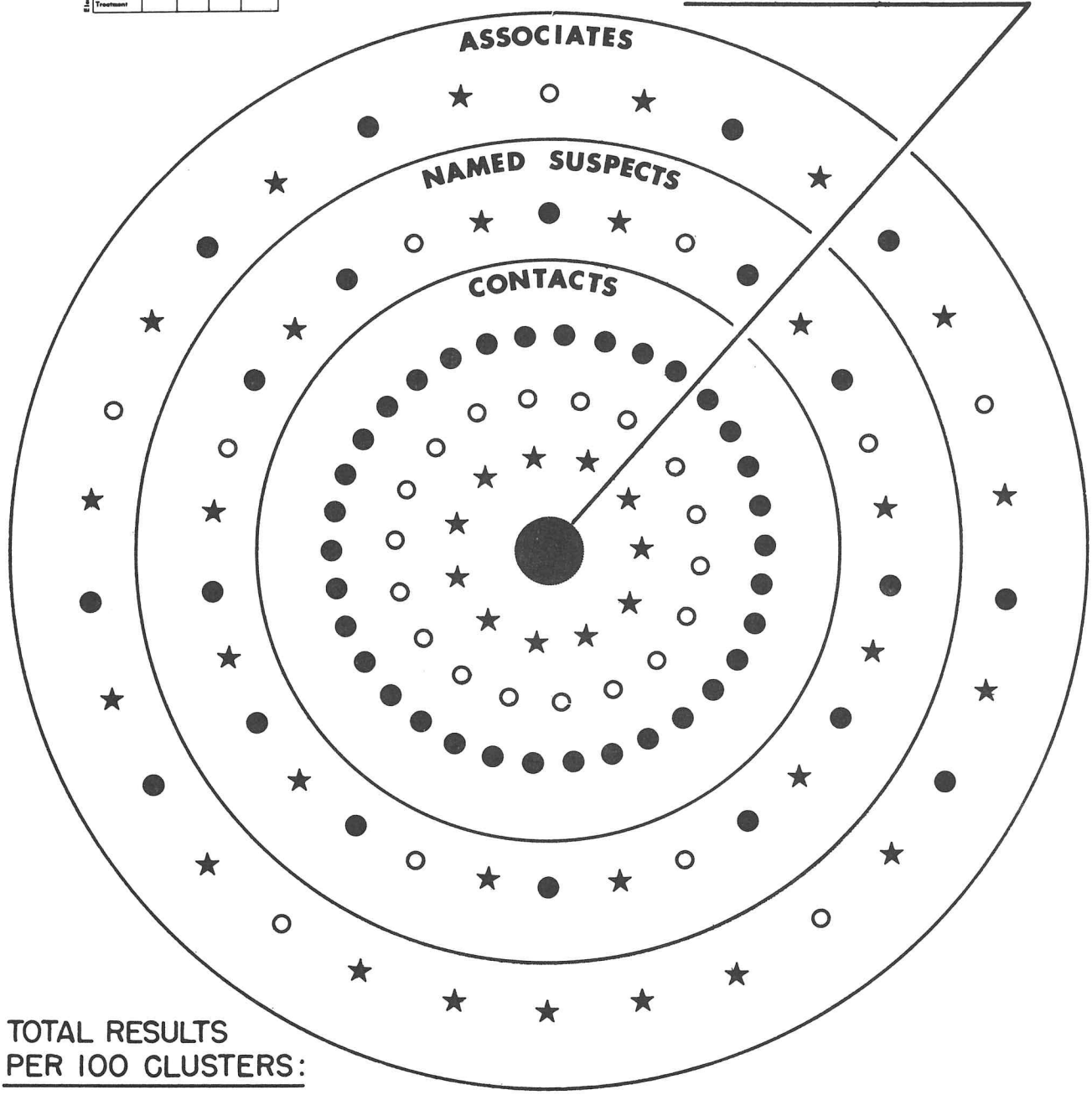
To meet the same problems in the United States, plans were laid to undertake a program to improve the performance of serologic tests for syphilis in this country. A continuing advisory committee on serology to the Surgeon General of the Public Health Service was constituted, and a plan was made whereby a yearly check of the official State laboratories could be carried out in order to obtain and maintain high standards in them. These State laboratories would then take the responsibilities for raising standards of the laboratories within the various States.

The first of these annual evaluations was conducted in 1936, with 9 States entering a total of 19 testing procedures. Of these 19 tests, 10 (53 percent) were considered inadequately performed. In 1940 all of the States and the District of Columbia participated in the evaluation. Of the 112 tests entered, 40 (36 percent) were inadequately performed. By 1957 performance was considered inadequate in only 7 of the 160 tests entered.

RESULTS OF CLUSTER TESTING PER 100 CASES OF PRIMARY AND SECONDARY SYPHILIS

BASED ON THE RESULTS OF APPLYING THE CLUSTER TESTING TECHNIQUE TO 285 PRIMARY & SECONDARY PATIENTS IN GEORGIA DURING FISCAL 1957





TOTAL RESULTS PER 100 CLUSTERS:

- ● 54 PRIMARY AND SECONDARY CASES BROUGHT TO TREATMENT
- ○ 29 OTHER SYPHILIS CASES BROUGHT TO TREATMENT
- ★ 40 SYPHILIS CASES RETURNED TO TREATMENT

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ATLANTA, GA.-AUG., 1957
58-50

The Cluster Testing Technique

Cluster testing is a new casefinding technique which is an extension of the standard contact investigation process. Patients with infectious syphilis are interviewed for sex contacts as usual and are also asked to name other persons (designated as "named suspects") of either sex who move in the same socio-sexual enviroment. In addition "associates" of patients, contacts and suspects are blood tested. Associates include neighbors, fellow employees, and others who have not been specifically named as contacts or suspects.

In the Georgia demonstration study of the cluster testing technique in Fiscal Year 1956, the technique was applied to 285 primary and secondary patients. The 1,301 sex contacts of these 285 cases of infectious syphilis who were examined yielded 97 cases of primary and secondary syphilis or 34 cases per 100 patients. This was a typical contact yield figure. By extending the investigation process from contacts to suspects and associates, an additional 2,410 suspects were examined and 56 more cases of primary or secondary syphilis were discovered (an additional 20 cases per 100 primary and secondary patients). Thus the yield of primary and secondary cases discovered through the investigation process was raised from 34 per 100 patients from sex contacts alone to 54 per 100 patients by also including suspects and associates, an increase in yield of infectious syphilis of almost 60 percent.

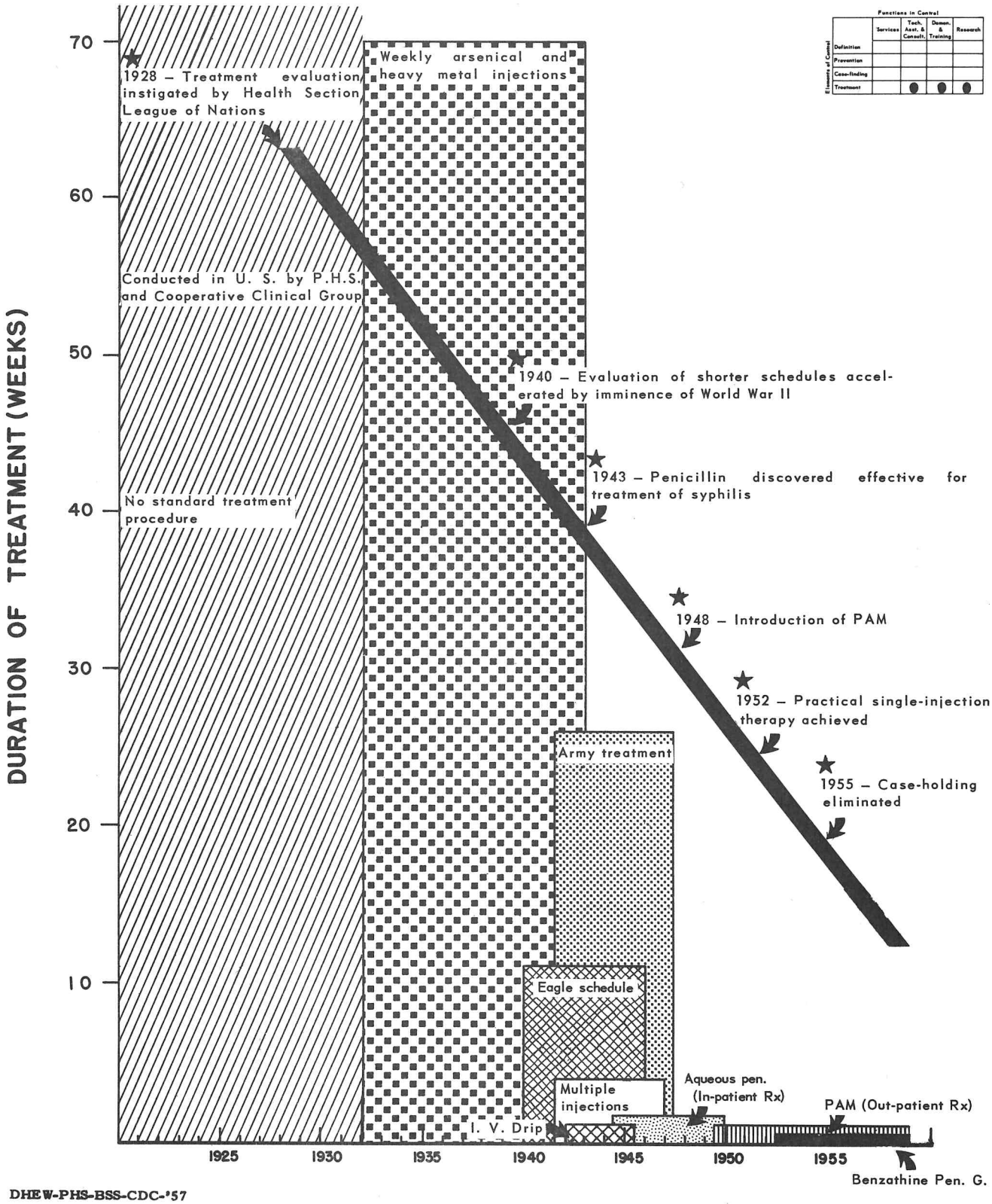
In addition, 32 patients with other stages of syphilis were discovered among the suspects and associates who would not have been found had the cluster testing technique not been employed.

RESULTS OF CLUSTER TESTING 285 CASES OF PRIMARY AND SECONDARY SYPHILIS

Number of Cases of Syphilis Found per 100 Patients

	Named Contacts	Named Suspects	Associates	Total
Brought to Treatment for the first time:				
Primary and Secondary	34	12	8	54
Other Syphilis	18	6	5	29
Returned to Treatment	11	12	17	40
Total	63	30	30	123

EVOLUTION IN THE TREATMENT OF SYPHILIS
-SHORTENED SCHEDULES - CHANGE IN DRUG-
RESULTING FROM LABORATORY AND CLINICAL RESEARCH



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EVOLUTION IN THE TREATMENT OF SYPHILIS

In 1928, under the auspices of the Health Section of the League of Nations, the first cooperative effort to evaluate the treatment of syphilis was undertaken. Arsenicals and heavy metal were the drugs employed, but there was no standard procedure or schedule for their administration.

In conjunction with the League of Nations study, the Cooperative Clinical Group headed by the Chief of the Venereal Disease Division of Public Health Service and composed of leading syphilologists in the country was formed to evaluate treatment for syphilis in the United States. This evaluation began in 1929 and continued through the 1930's. As a result of this evaluation, a schedule utilizing alternating courses of an arsenical and bismuth preparation for a period of seventy weeks was recommended. Although this schedule was as effective as any employed today, only a small percentage of patients completed treatment and case-holding required as much emphasis as case-finding.

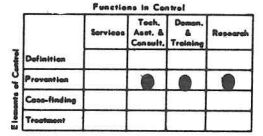
The need for shorter schedules became acute with the advent of World War II. In the early 1940's numerous schedules were evaluated – Eagle treatment consisting of 3 arsenical injections a week for 8 to 12 weeks; 5-day intravenous drip; the Schoch method employing 2 arsenical injections a day for 10 days; artificial fever therapy combined with arsenical and bismuth injections; and various modifications of these schedules. The majority of these schedules required hospitalization and because of the risks involved could be administered only by experienced medical staffs.

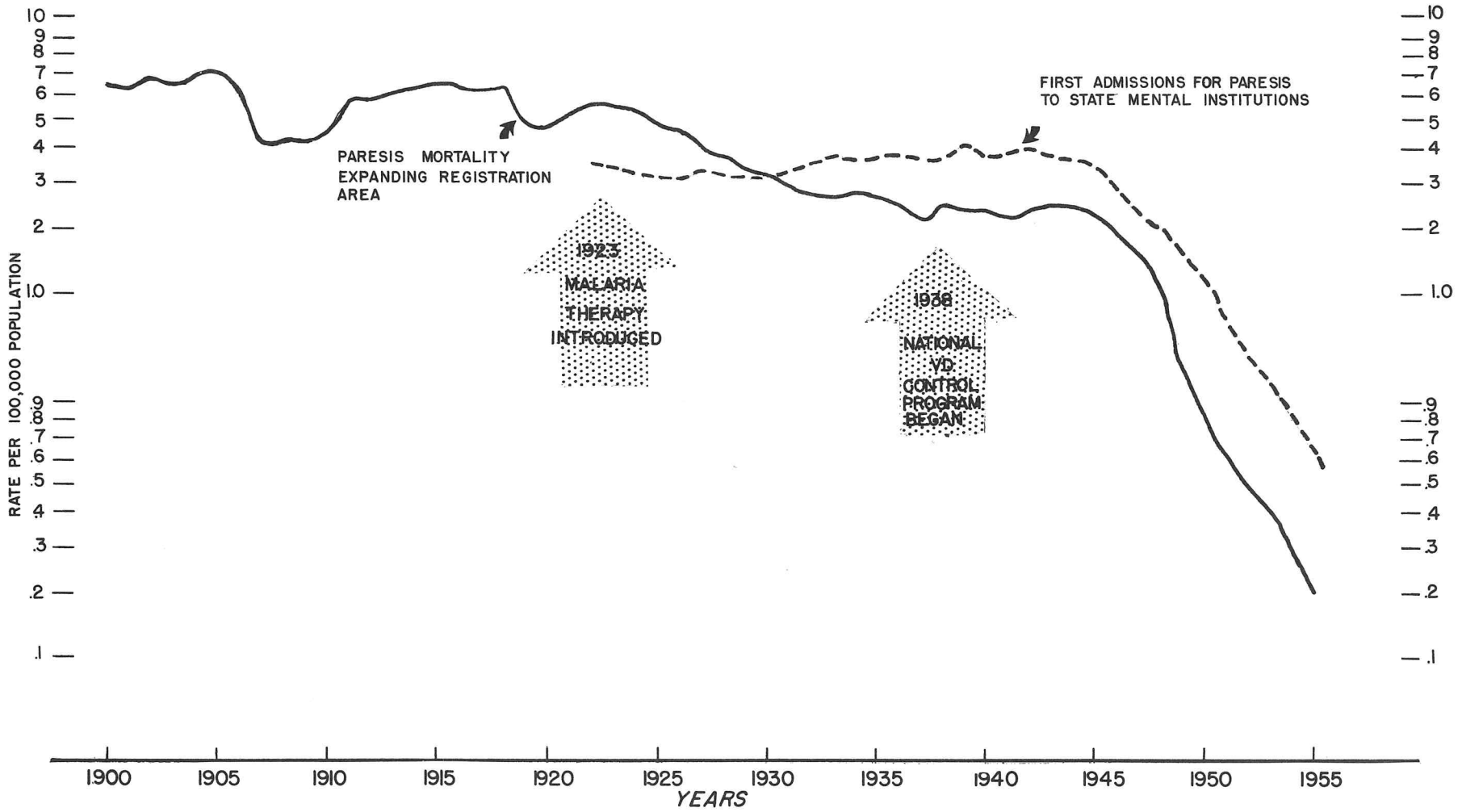
In 1943 Mahoney discovered that penicillin was effective in the treatment of syphilis. A nationwide evaluation was immediately conducted and in a relatively short time the optimum dosage and injection intervals were established .Since the aqueous penicillin employed required around the clock injections at 2 or 3 hour intervals, the treatment of syphilis remained an in-patient procedure.

Various absorption-delaying preparations were investigated. The first successful one produced commercially was penicillin in oil and beeswax, which increased the injection interval from 2 to 24 hours. In 1948 procaine penicillin with 2 percent aluminum monosteorate (PAM) was introduced. This preparation, which maintains a detectable blood level for several days, made treatment for syphilis again available on an out-patient basis. PAM has remained the most widely used preparation in the treatment of venereal disease. With the introduction in 1952 of Benzathine penicillin G the long-hoped-for single-injection treatment for syphilis became a reality.

Thus, through laboratory and clinical research, in roughly 20 years the treatment of syphilis was reduced from 72 weeks to a single injection.

PARESIS MORTALITY & FIRST ADMISSIONS TO MENTAL INSTITUTIONS IN THE CONTINENTAL UNITED STATES
RATES PER 100,000 POPULATION, 1900–1955





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PARESIS MORTALITY AND FIRST ADMISSIONS TO MENTAL INSTITUTIONS IN THE CONTINENTAL UNITED STATES RATES PER 100,000 POPULATION, 1900 - 1955

Reported death rates from syphilis in the continental United States have been steadily reduced since the passage of the National Venereal Disease Control Act in 1938. This trend is considered to be highly reliable, since probable improved reporting by physicians has exerted an upward force on the rate during this period. In spite of this, the observed trend is downward.

For the period 1900 to 1923 during which there was no effective therapy, the trend of paresis deaths was irregular and the slope of the trend line was not significantly different from zero.

Malaria and other fever therapy was successful in reducing the mortality from paresis in the years 1923 to 1938, but the incidence of paresis as measured by first admissions figures did not diminish during this period.

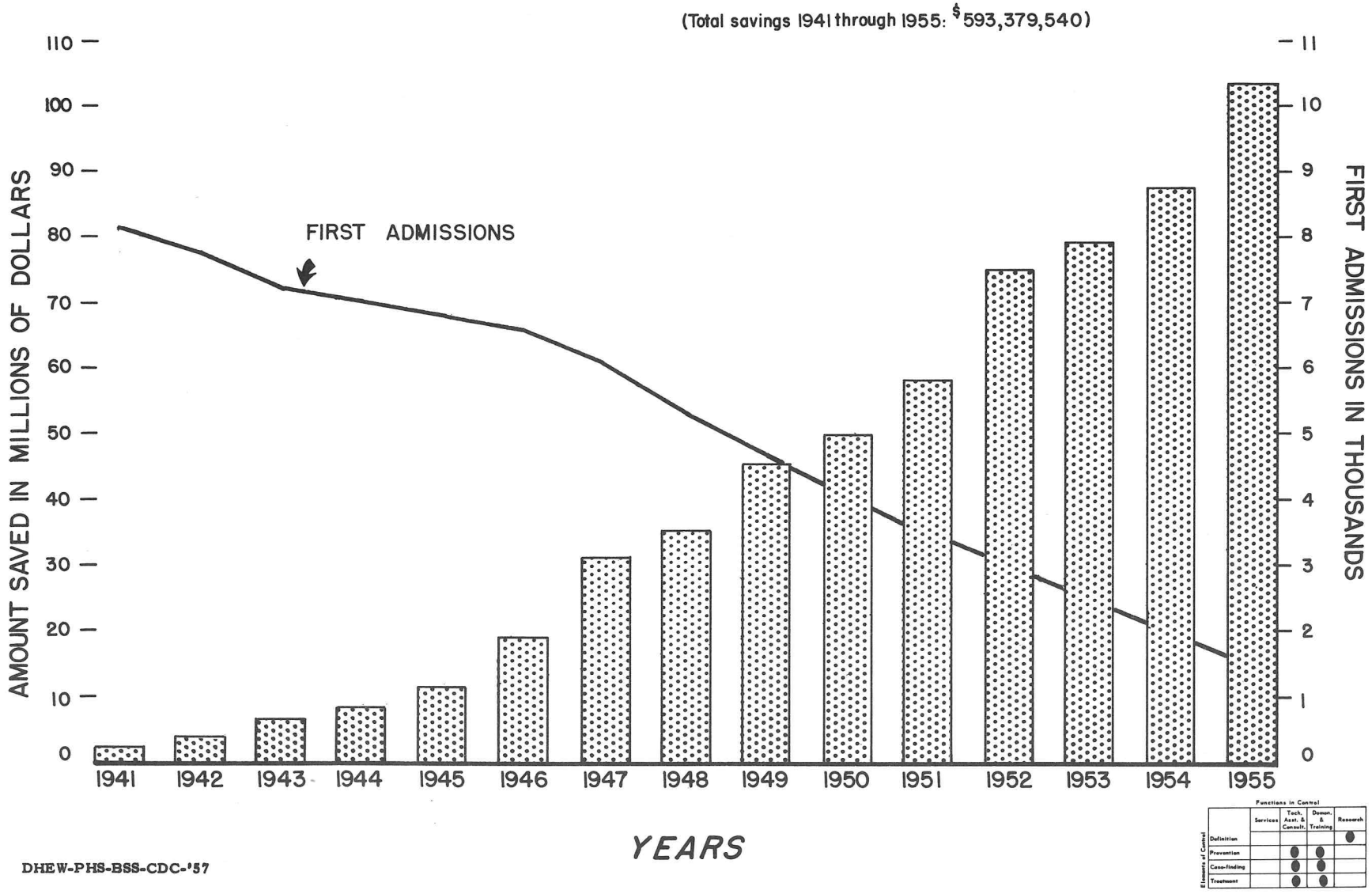
Mortality from paresis apparently had reached a plateau shortly before the start of the national syphilis control program in 1938 and no further reductions seemed likely through fever therapy.

Soon after its inception, the national syphilis control program apparently was effective in reducing the incidence of paresis. Reductions in paresis deaths followed after a period of about 4 years.

Further reduction in first admissions and in mortality from paresis is indicated by the present trend.

Loss of expectation of life due to premature death from paresis amounted to 70,295 years and loss of income associated with this loss of life totaled $76,161,511 in 1955.

ECONOMIC SAVINGS THROUGH REDUCTION IN ADMISSIONS TO MENTAL INSTITUTIONS DUE TO SYPHILIS



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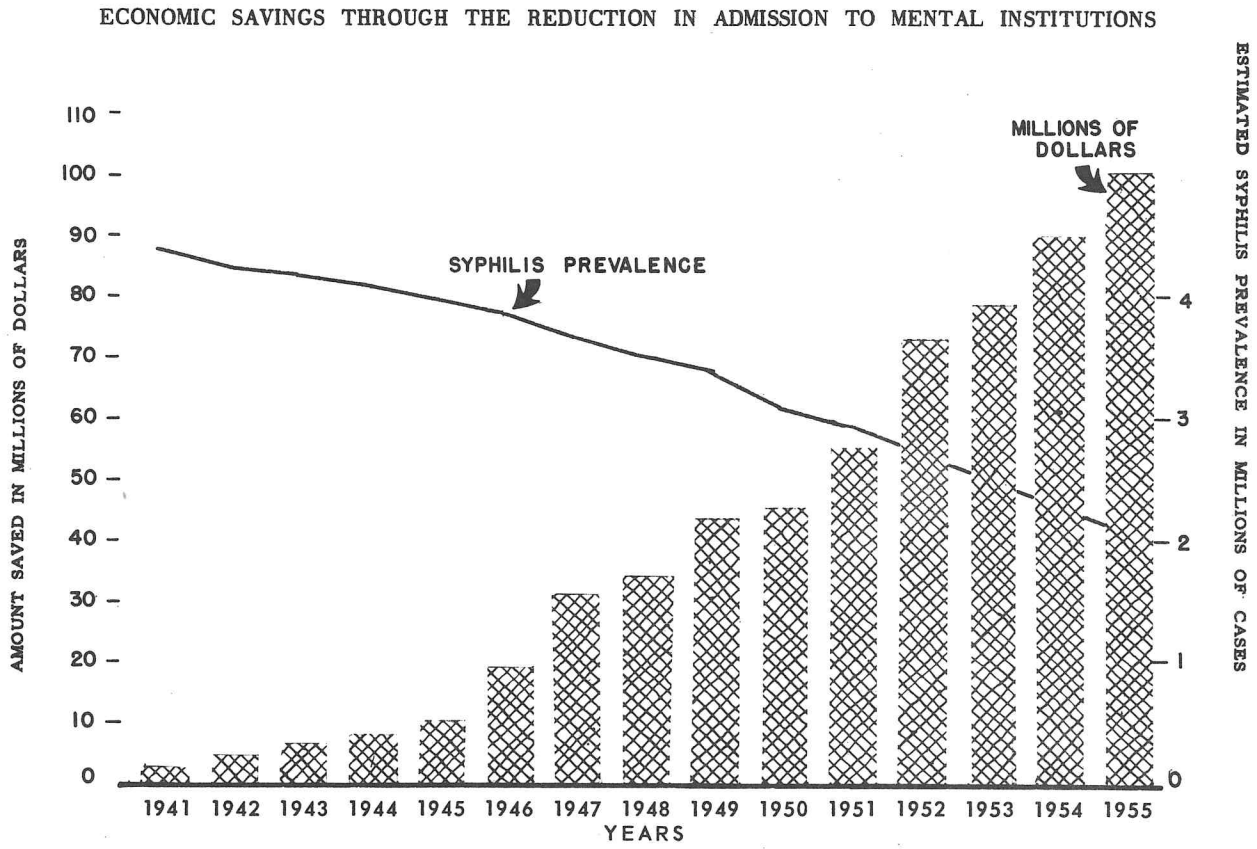
ECONOMIC SAVINGS THROUGH THE REDUCTION IN ADMISSIONS DUE TO SYPHILIS, TO MENTAL INSTITUTIONS

The period 1941 to 1955 has seen great advances in the venereal disease field. Deaths due to syphilis declined from 17,728 in 1941 to 3,836 in 1955. Insanity due to syphilis has also declined as measured by 8,083 first admissions to mental institutions due to syphilis in 1941 compared to 1,663 first admissions to mental institutions due to syphilis in 1955.

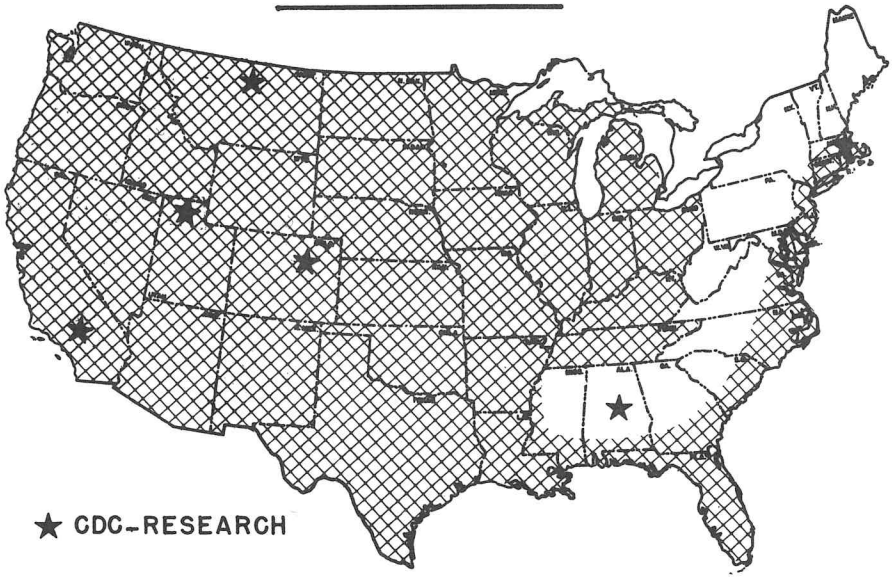
Estimated savings attributable to the National Venereal Disease Control Program resulting from the reduction in admissions to mental institutions for the period 1941 to 1955 have amounted to $593,379,500. This savings is computed from the difference between actual admissions to mental institutions with psychoses due to syphilis and the number of first admissions which would have occurred had the base rate, derived from the base period 1933 to 1939, of 6.6 per 100,000 population prevailed. Had this rate prevailed in 1955 there would have been 10,712 admissions to mental institutions with psychoses due to syphilis but actual admissions in 1955 totaled 1,663, the difference being an estimated 9,049 cases saved in 1955.

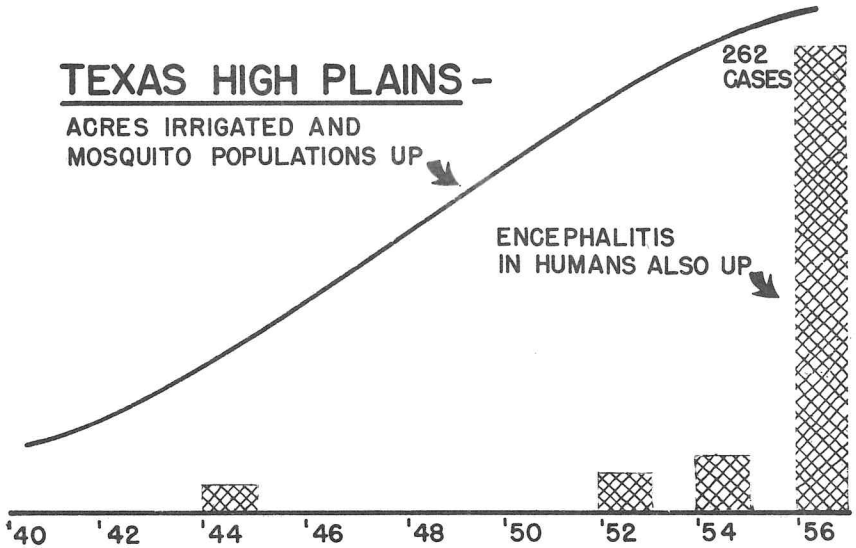
Syphilis prevalence, estimated cases of syphilis needing treatment in the population, has been reduced from 3,282,000 cases of syphilis in 1941 to 1,921,000 cases in 1955.



MOSQUITO-BORNE VIRUS ENCEPHALITIS- A NATIONAL PROBLEM

DISTRIBUTION





CDC — ENCEPHALITIS RESEARCH ACTIVITIES

ECOLOGY - MOSQUITOES, BIRDS, MAMMALS

EPIDEMIOLOGY — HUMAN CASES

VECTOR CONTROL —

- WATER UTILIZATION PRACTICES
- INSECTICIDES

Functions in Control

Elements of Control	Services	Tech. Asst. & Consult.	Demon. & Training	Research
Definition		●		●
Prevention		●		●
Case-finding				●
Treatment				

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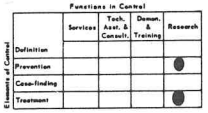
MOSQUITO-BORNE ENCEPHALITIS

Devastating outbreaks of mosquito-borne encephalitis among horses and humans during the past 25 years have caused concern among agriculturists and public health workers in the United States. These outbreaks have involved an estimated million cases in horses and at least 25,000 clinical cases in humans. Because reporting of "infectious encephalitis" is grossly inaccurate and incomplete, the public health magnitude of the problem is unknown; however, recognition of the importance of this disease in the United States is increasing. Furthermore, a growing threat to public health of the nation is posed by increased irrigation mosquito production associated with the growth of irrigation agriculture and increased domestic mosquito populations accompanying the growth in urbanization and industrialization. Virturally no State is free of the potential of mosquito-borne encephalitis.

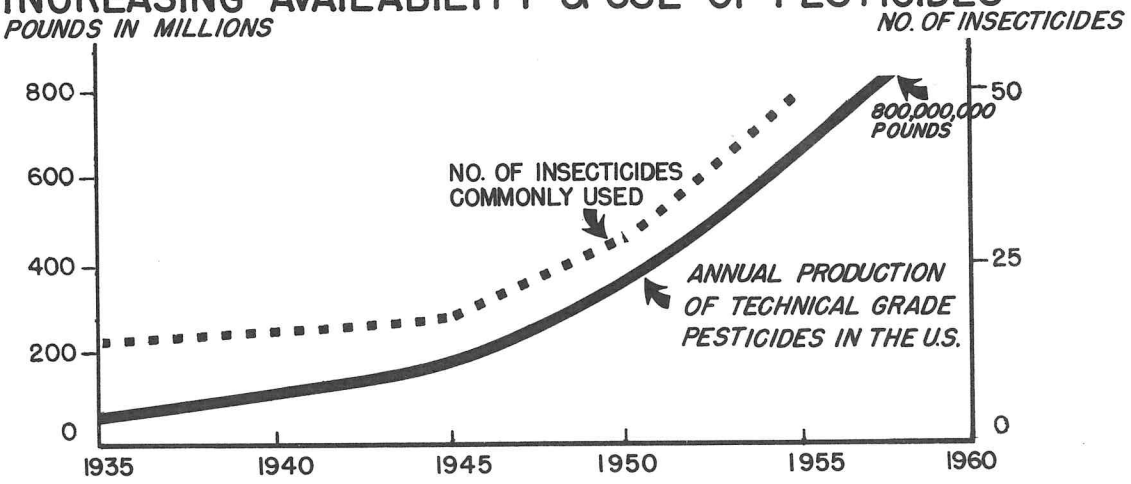
Investigations by the Communicable Disease Center are directed toward the solution of the following outstanding problems in the field of mosquito-borne encephalitis:

1. Better definition of the extent of human infection and the public health importance of the disease.
2. Determination of the natural history of the disease, including:
   a. Definition of the specific mosquito vector(s) for each of the three important strains of encephalitis virus in the United States – western equine, eastern equine, and St. Louis.
   b. Study of the mechanism of survival of virus from season to season, particularly its overwintering.
   c. Elucidation of the importance of various bird species as reservoirs of infection.
3. Demonstration in a localized area of vector (mosquito) control, by insecticides and better water utilization practices, and its effect upon incidence of infection.
4. Development of improved diagnostic tests that are highly specific, rapid, and economical.
5. Attenuation of the viruses in an attempt to develop a safe, effective, and economical vaccine.

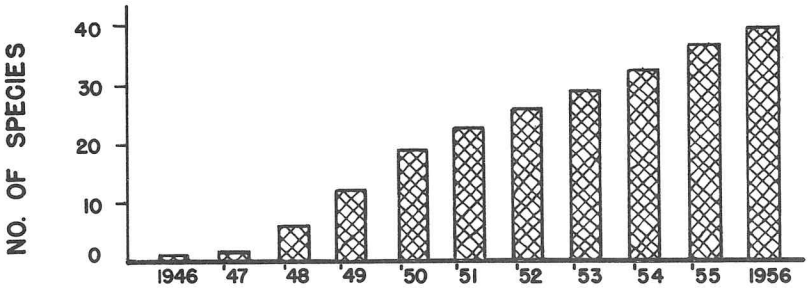


TRENDS IN THE VECTOR CONTROL AND TOXICOLOGY PROBLEMS

INCREASING AVAILABILITY & USE OF PESTICIDES



INCREASING WORLDWIDE RESISTANCE TO INSECTICIDES OF INSECTS OF PUBLIC HEALTH IMPORTANCE



RESISTANT INSECT VECTORS OF DISEASE

DISEASE	VECTOR
Yellow Fever	*Aedes aegypti*
Malaria	*Anopheles* (6 species)
Encephalitis	*Culex tarsalis*
Filariasis	*Culex pipiens quinquefasciatus*
Diarrhea-dysentery	*Musca domestica*
Epidemic Typhus	*Pediculus humanus humanus*
Chagas' Disease	*Triatoma infestans*

CDC RESEARCH ACTIVITIES:

EVALUATION OF HEALTH HAZARDS IN USE OF PESTICIDES
ANIMAL & HUMAN TOXICITY STUDIES OF INSECTICIDES
STUDIES ON PREVENTION & TREATMENT OF INSECTICIDE POISONING
STUDIES ON THE MECHANISM OF RESISTANCE
DEVELOPMENT OF MORE EFFECTIVE FORMULATIONS

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VECTOR CONTROL AND TOXICOLOGY PROBLEMS

The number of different basic insecticidal compounds commonly used has approximately tripled in the last ten years. Also, about 800,000,000 pounds of technical grade pesticides are now produced each year in the United States, representing about a threefold increase in the last decade.

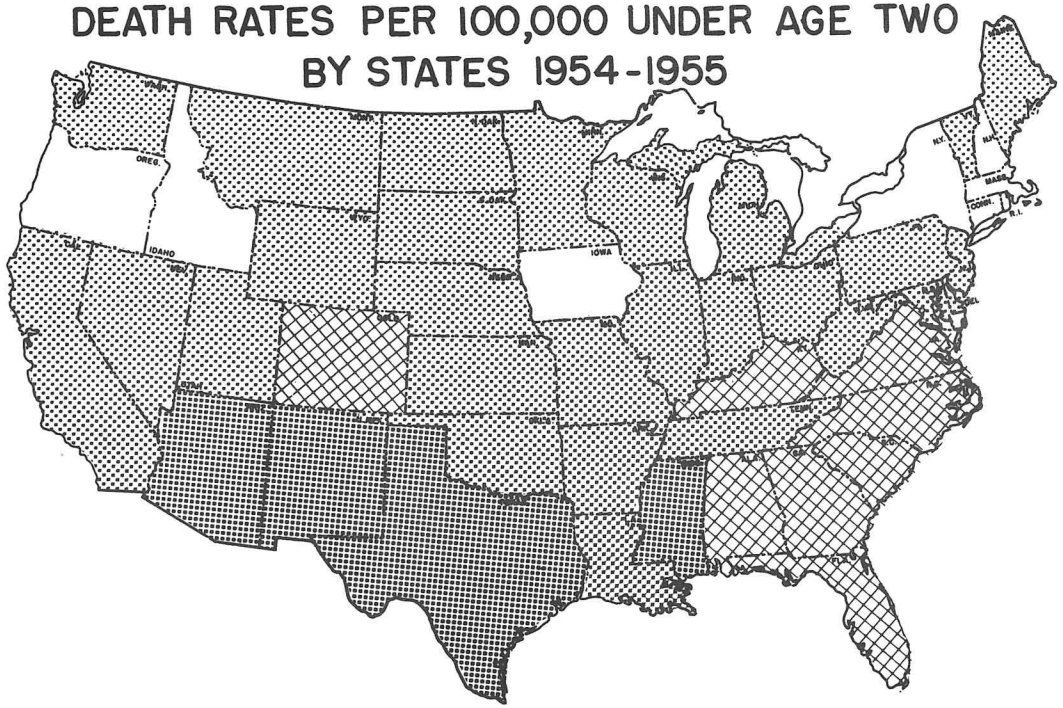
As a result, continuing evaluation of the health hazards associated with greater pesticide use has become necessary. These hazards are created by exposure of body surfaces to toxic substances, or by their inhalation or ingestion. As greater quantities and varieties of insecticides are used in agriculture, the problems caused by insecticidal residues on foods are increasing. CDC is investigating the toxicity of pesticides to humans and animals, including the mode of action and clinical effects of poisoning. Other studies are directed toward developing usage precautions and antidotes, together with recommendations for prevention and treatment of pesticide poisoning.

The increased use of pesticides has also magnified the world-wide problem of insecticide resistance among insects of public health importance. Resistance was no problem in 1945. Today (1957), 39 insect species important to public health have been reported resistant to insecticides somewhere in the world – 17 species in the United States. To counter this problem, CDC is carrying out basic and applied research on the mechanism of resistance and development of effective formulations and methodology to control resistant strains. It also participates in cooperative vector control activities with the Public Health Service Divisions of Foreign Quarantine and International Health, the World Health Organization, the Department of Defense and other Federal agencies, State and local health departments, and private and industrial organizations.

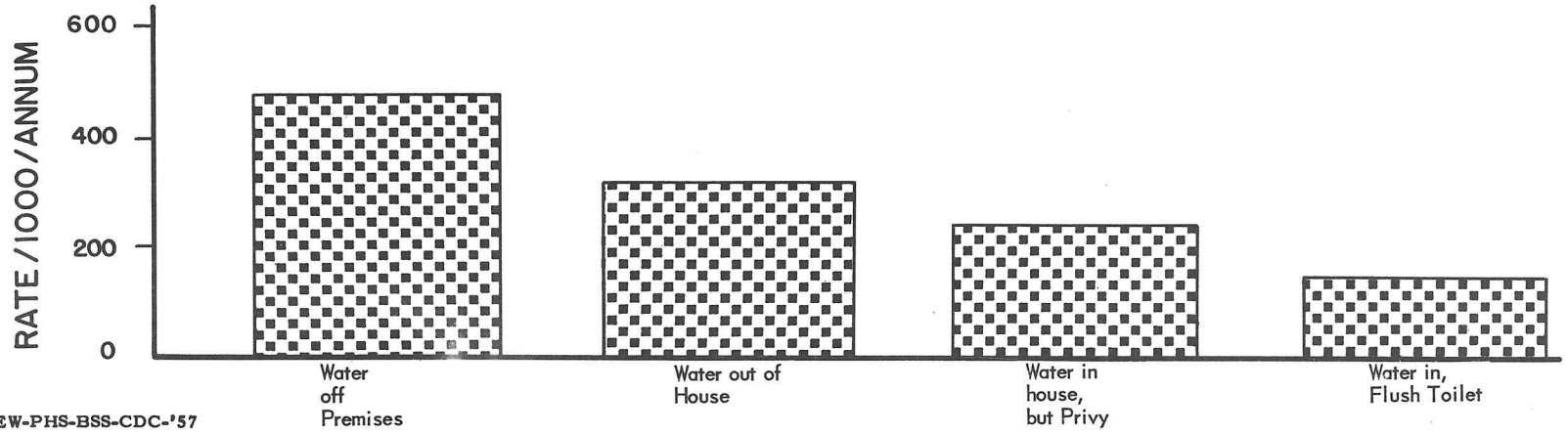
Elements of Control	Functions in Control				
	Services	Tech. Asst. & Consult.	Demon. & Training	Research
Definition				●
Prevention				●
Case-finding				
Treatment				

DIARRHEAL DISEASES

DEATH RATES PER 100,000 UNDER AGE TWO BY STATES 1954-1955



RELATION OF HOUSEHOLD SANITARY FACILITIES & DIARRHEAL DISEASE MORBIDITY ALL AGES, EASTERN KENTUCKY, 1954-1956



DHEW-PHS-BSS-CDC-'57

DIARRHEAL DISEASES

Diarrheal diseases continue to be a major public health problem in the United States. Despite the decline in mortality rates over the past 50 years, about 5,000 deaths annually are still caused by these diseases. Among children under two years of age, enteric diseases are second only to respiratory infections as death-causing communicable diseases.

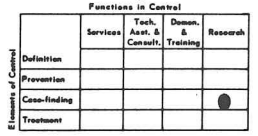
In general, highest morbidity and mortality rates are experienced in those populations having a lower level of environmental sanitation than the national or community average. Presumptive evidence obtained in studies conducted by the Communicable Disease Center from 1955 into 1957 in eastern Kentucky indicates that significant reductions in enteric disease can be achieved through selective improvement of household sanitary facilities, irrespective of measurable socio-economic variables or etiological agents. Further investigations of the epidemiology of diarrheal diseases are presently being conducted in Arizona.

The etiological agents for diarrhea and dysentery can often be isolated by present methods from cases that occur in highly endemic areas or during well-defined epidemics. When sporadic cases occur in areas of low endemicity, on the other hand, the isolation rate may fall as low as 15 or 20 percent. The diarrheal diseases are considered to be principally of bacterial origin, although certain parasitic infections also produce the syndrome. Many outbreaks that occur during the winter months, and others that cannot be ascribed to bacteria or parasites, are thought to be of viral origin.

Among the bacterial infections it is to be expected that shigellosis (bacillary dysentery) would be endemic chiefly among populations with poor environmental sanitation, where lower standards of personal hygiene facilitate the spread of the pathogens through person-to-person contact as well as by environmental factors. The other bacillary diarrheal diseases, including salmonellosis, diarrhea of the newborn, and food poisoning due to staphylococci, fecal streptococci and *Clostridium welchii* occur in so-called satisfactory environments more frequently than appears compatible with existing knowledge of personal hygiene and sound sanitary practices.

CDC is working actively against diarrheal diseases on several fronts. The International Typing Center for Shigellae, the National Salmonella Typing Center, and the National Escherichia Typing Center are all located in the CDC laboratories. By careful biologic study and the application of advanced laboratory techniques, it has become possible to classify and identify several groups of enteric bacteria more accurately than heretofore. Many types can now be distinguished for epidemiological purposes. Human carriers responsible for certain outbreaks of enteric infections besides typhoid fever can now be identified and controlled. Increased knowledge regarding the bacterial flora of animals and fowl has laid a scientific foundation for epidemiologic studies of food poisoning originating in infected animal products. Progress is also reflected in better methods for controlling bacterial contamination in food processing plants.

FLUORESCEIN-TAGGED ANTIBODY TECHNIQUES



CAN CUT LABORATORY DIAGNOSTIC TIME FOR

BACTERIA
FROM 5 DAYS
TO 30 MINUTES

VIRUSES
FROM 7 DAYS OR MORE
TO 1 DAY OR LESS

NOW APPLIED TO

8
BACTERIA

3
PROTOZOA

4
VIRUSES

1
RICKETTSIA

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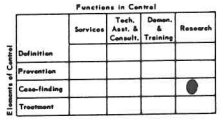
FLUORESCENT ANTIBODY TECHNIC

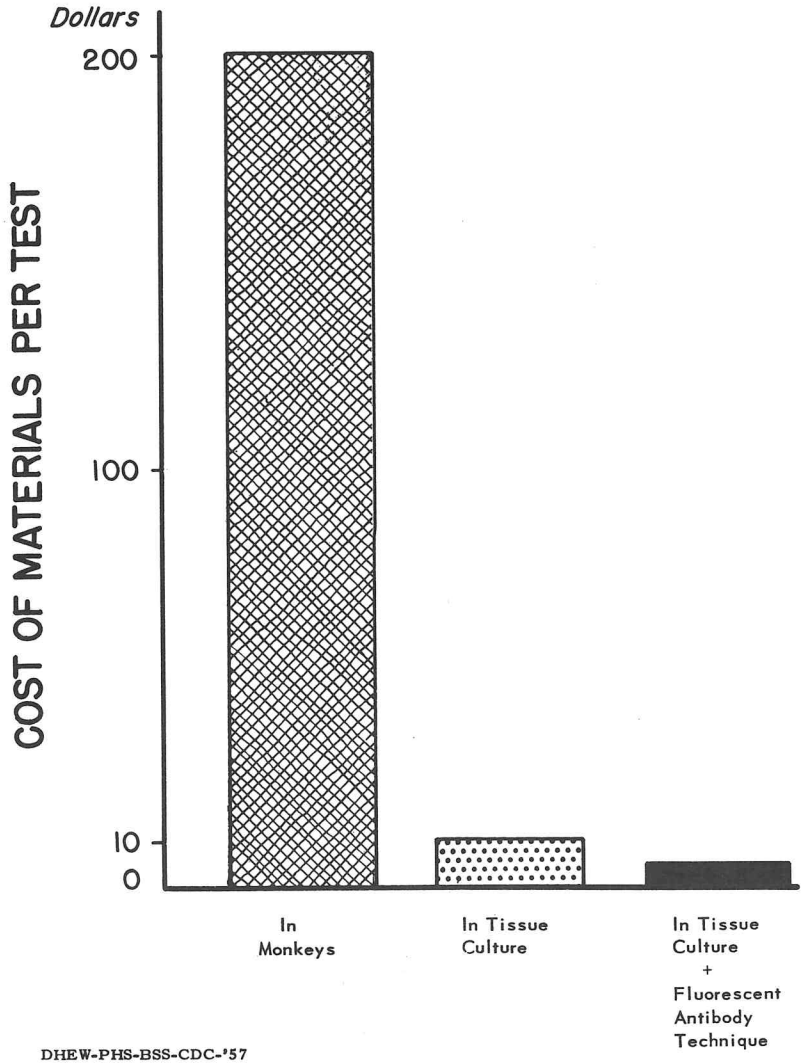
The fluorescent antibody technic is a new application of serological principles to the problem of rapid identification of microorganisms and viruses. Although the Public Health Laboratory is primarily interested in applying it to pathogenic organisms, the technic has great potential for resolving several immunological problems of a more fundamental nature.

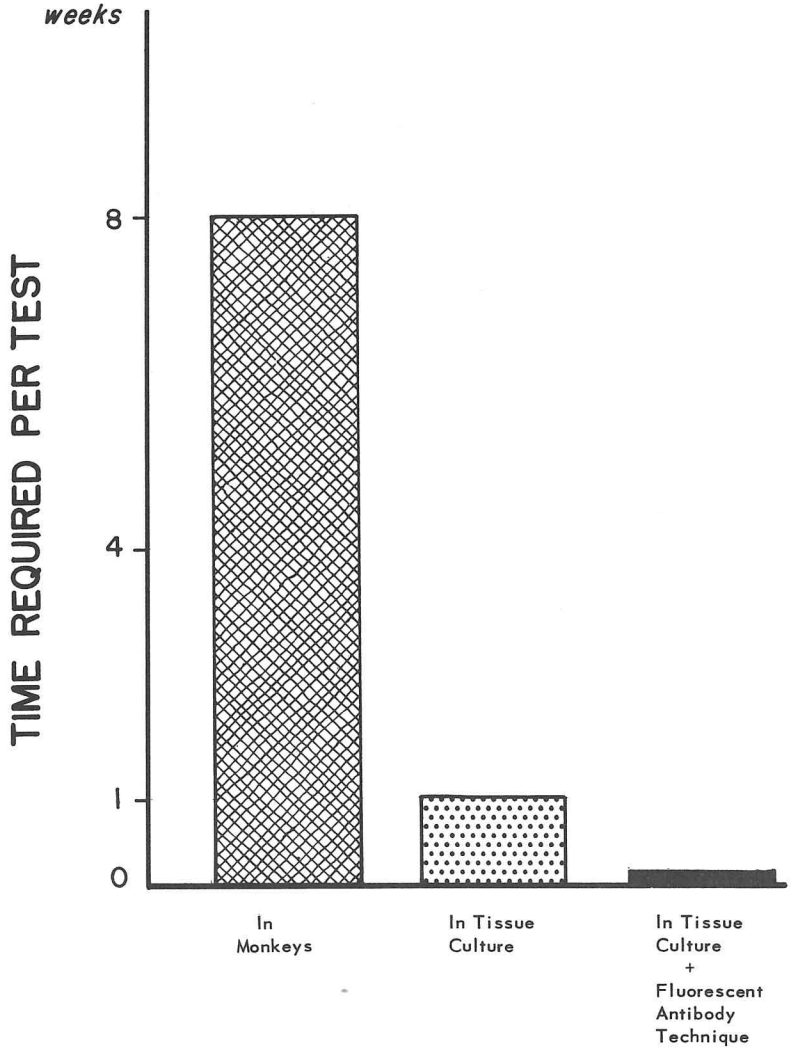
The use of fluorescent antibodies for rapid identification of organisms is based on coating the organisms with fluorescein tagged antibody which makes the organisms visible by microscopic examination. The antibodies are labeled with a compound known as fluorescein isocyanate. When this substance is activated by high intensity ultraviolet light, it emits a strong fluorescence and illuminates the object with which it is combined. The same basic technic can be used to identify either an unknown antigen or an unknown antibody.

Use of the fluorescent antibody technic may be expected to shorten the time required for diagnosis of many communicable diseases from several days to an hour or two. It has the specificity inherent in all serologic tests, but since it is microscopic in nature, it is significantly more sensitive than other serologic tests. Theoretically, it is possible to make a specific identification based on the staining of a single organism. The test can be applied equally well to viable and non-viable organisms, and the specific organisms may be seen even in the presence of heavy contamination by other bacteria. The technic of staining and demonstrating the presence of antigenic particles is simple when the necessary reagents are available.

RAPID DIAGNOSTIC METHODS
POLIOMYELITIS







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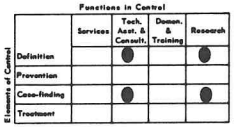
RAPID DIAGNOSTIC METHODS

The development of rapid diagnostic methods that are simple, specific, economical, and practical for everyday public health laboratory use is one of CDC's basic objectives. Performance of the "classical" laboratory diagnostic procedures for many diseases, such as diphtheria, requires so much time that a patient may have died, or recovered, before the final laboratory results are known. Some laboratory diagnostic procedures are so difficult technically that only a few laboratories in the country are able to perform them; others involve a combination of time and cost that prohibits their routine performance.

The application of several technics for rapid identification of pathogens is being investigated at CDC. These include lysis by specific bacteriophages, hemoglutination tests in various modifications, infrared spectrophotometry, and fluorescent antibody technics. All possess certain merits, however, the fluorescent antibody technics show promise of being most widely applicable in the entire field of microbiology and virology.

By using recently developed immunological technics for diagnostic purposes, it has been possible to reduce the time required for streptococci grouping from a week by the conventional method to two hours or less. The time required for tetanus antitoxin determination has also been cut from a month to a few hours, and the cost has been reduced from $20.00 to 20 cents per test.

Rapid diagnostic technics can be applied to all larger groups of pathogens. So far they have been applied to approximately 20 different infections. Research is continuing on their further application with the expectation that they will ultimately prove adaptable to everyday public health laboratory work.



PRODUCTION AND QUALITY CONTROL OF DIAGNOSTIC REAGENTS

NEEDED TO IDENTIFY BACTERIA, VIRUSES, AND OTHER PATHOGENS

WHY CDC PRODUCES THEM: NOT AVAILABLE COMMERCIALLY IN KIND, QUALITY, QUANTITY NEEDED

CDC USES OVER 1,000 DIAGNOSTIC REAGENTS — ONLY 30 OF WHICH ARE AND WILL BE AVAILABLE COMMERCIALLY. LIMITED QUANTITIES REQUIRED MAKE COMMERCIAL PRODUCTION UNPROFITABLE.

TECHNICAL ASSISTANCE:

PROVIDING PROTOTYPE PATHOGENS TO DIAGNOSTIC LABORATORIES.
PROVIDING INTELLIGENCE ON QUALITY CONTROL OF COMMERCIAL DIAGNOSTIC REAGENTS.
PRODUCING DIAGNOSTIC MATERIALS:

- 600 DIFFERENT SERA FOR IDENTIFICATION OF BACTERIA
- 100 DIFFERENT SERA FOR IDENTIFICATION OF VIRUSES
- 300 ANTIGENS AND OTHER REAGENTS (VIRAL, BACTERIAL, MYCOTIC, PARASITIC)

INCREASING NUMBERS BEING SUPPLIED TO STATE AND LOCAL HEALTH DEPARTMENTS — DEMAND EXCEEDS SUPPLY.

RESEARCH:

EVALUATION AND CONTINUING IMPROVEMENT OF REAGENTS FOR POTENCY, SPECIFICITY, AND STABILITY.

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PRODUCTION AND QUALITY CONTROL OF DIAGNOSTIC REAGENTS

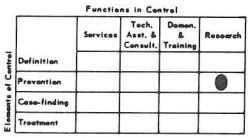
As our knowledge of communicable diseases expands, we are confronted with an increasing number of etiological agents and their subdivisions which must be identified in the laboratory. From an epidemiological standpoint, isolation and identification of the species of pathogen responsible for an outbreak of disease is no longer sufficient. In the case of typhoid fever, we need to know which of the 45 phage types of *Salmonella typhosa* is being spread. Separation of polio and the polio-like diseases is not enough – we must know which one of the three types of polio virus or which of the many ECHO viruses, Coxsackie viruses or adenoviruses is responsible, since clinical differentiation is not usually possible. Immunizing agents that are effective against one pathogen are ineffective against others.

A wide variety of diagnostic reagents is needed to identify disease-causing organisms and to determine the type and titer of antibodies in the blood of patients. Very few of the antigens and antisera used in these determinations are produced commercially, since the quantities required on a nation-wide basis are too small to justify the capital outlay in equipment, buildings, and animal facilities. Therefore, CDC produces diagnostic reagents for its own use and for other qualified health laboratories. Research is carried on to determine the best species of animals in which to produce quality antisera, methods of preserving antisera to maintain their specificity, andoptimum methods of storing antigens.

Because some of the commercial diagnostic reagents that are available have been found to vary greatly in potency, stability, and specificity, the Center is frequently requested to test products bought on the open market.

Because the Communicable Disease Center is a reference laboratory for the World Health Organization for influenza and for some of the enteric diseases, and because most of the specimens sent to CDC by other health laboratories are for reference diagnosis, a large stock of prototype pathogens has been accumulated. Seed viruses and bacterial cultures are made available to the National Type Culture Collection and to qualified investigators in certain cases.

PROPHYLAXIS



TUBERCULOSIS

TO DEVELOP OPTIMUM PROPHYLACTIC AGENTS AGAINST PROGRESSIVE DISEASE.

POLIOMYELITIS

TO DEVELOP ATTENUATED STRAINS OF VIRUS FOR USE IN LIVE VACCINES.

TO DETECT REVERSION TO VIRULENCE OF LIVE VACCINES.

RABIES

TO DEVELOP A SAFE HUMAN VACCINE.

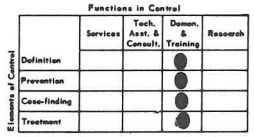
DHEW-PHS-BSS-CDC-'57

PROPHYLAXIS

The practice of large-scale immunization programs lags far behind the application of other preventive measures. At present immunization is widely used against only a few major human diseases – smallpox, diphtheria, whooping cough, tetanus, typhoid fever, and poliomyelitis. Numerous other types of vaccine are produced but not used extensively. All of the present vaccines could be improved significantly in regard to their effectiveness and safety. Among the problems to be overcome before scientifically sound large-scale immunization programs can be effected against a broad spectrum of diseases are the limitations of our present knowledge regarding methods of preventive immunization and our lack of a substitute for human beings in which to test the effectiveness of prophylactic agents.

CDC is approaching these problems on a limited basis through systematic studies. One is directed toward the development of simpler, practical tests to measure the immunity status of the population for such common or dangerous diseases as influenza and diphtheria. Another is aimed toward developing more effective immunization procedures in regard to dosage, timing, route, and other factors. Extensive effort is being made at CDC and elsewhere to improve certain vaccines now in use. This is particularly true in regard to the present live polio vaccine, which modifies the course of clinical disease but does not eliminate the pathogen from the population. The development of new vaccines is also under investigation. The Asian influenza epidemic pointed up the need for a specific vaccine against a new mutant strain of virus. The risk involved with the Pasteur treatment for rabies, particularly when repeated courses are necessary, shows the need for a rabies vaccine that is safe and effective in humans.

COMMUNICABLE DISEASE CENTER TRAINING



Directly Related to National, State, and Local Program Objectives

Short in Duration
Topical in Nature
Usually In-Service
No Academic Credit
Tailored to Meet Specific Needs

Generally Planned to Utilize State Educational Resources

Materials and Technical Assistance Available to Universities Without Charge

Subject Areas

Epidemiology and General Communicable Disease Control
Environmental Control of Communicable Diseases
Vector Control
Epidemic and Disaster Aid
Epidemic Intelligence
Laboratory Diagnostic Courses
Venereal Disease Control
Public Health Aspects of Civil Defense
Training Methods and Aids
Communicable Disease Control Organization and Orientation

Fiscal Year 1957

Attended by 8,235 Persons From

State and Local Health Departments	4,696	Industry	360
Federal Agencies	968	Foreign Countries	255
Universities and Colleges	620	Others	1,336

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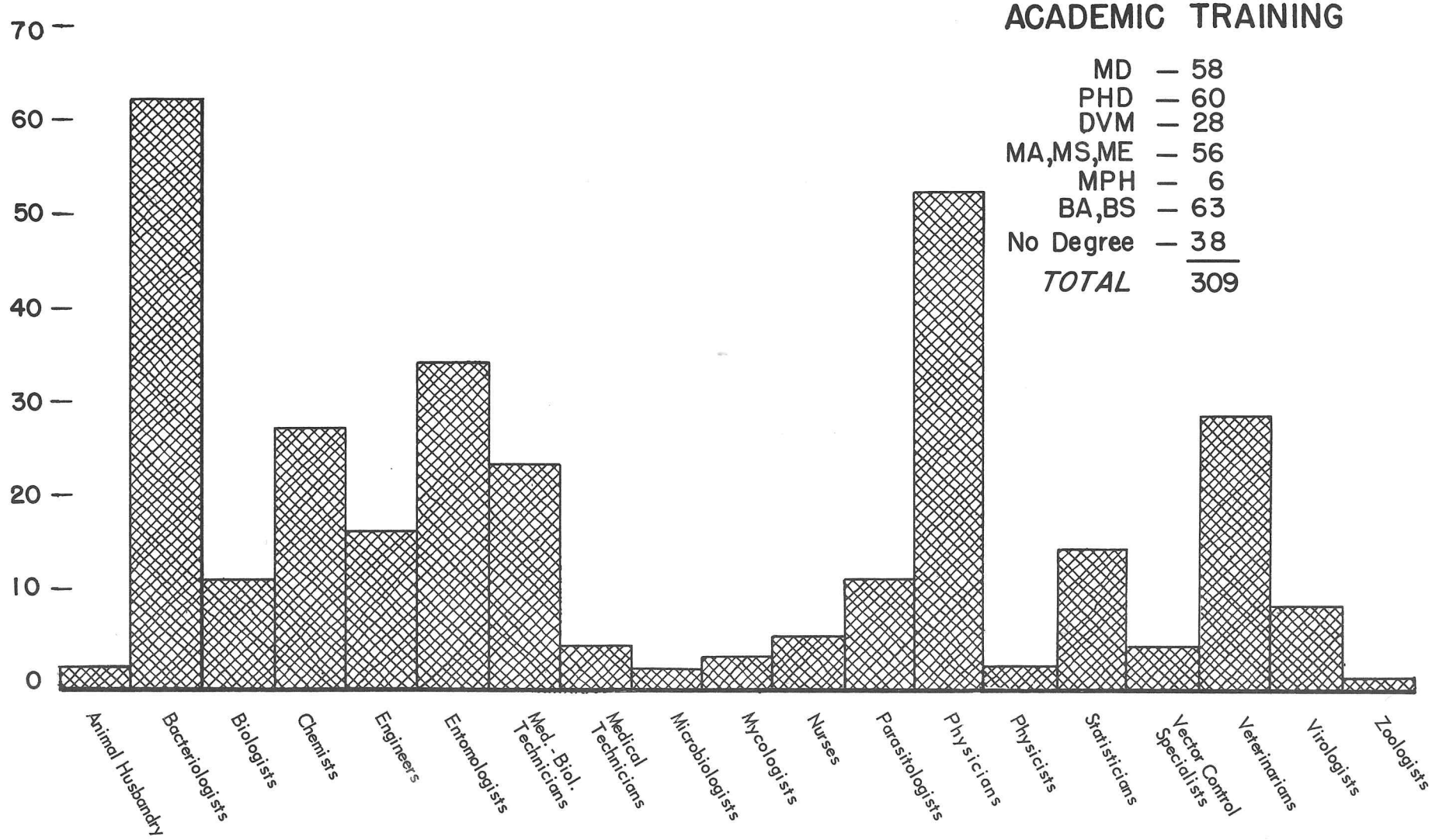
COMMUNICABLE DISEASE CENTER TRAINING

The Communicable Disease Center's training program is designed to improve national, State, and local public health efforts in communicable disease control. Therefore, training activities are closely coordinated with the Center's field and laboratory investigations and with research and operational programs of other public health organizations. Each year has seen a noteworthy increase in the number of courses given and the number of individuals trained at the Center's facilities and in the States. Since one of the primary objectives of the program is to aid the States in conducting in-service training for all public health workers concerned with the control of communicable diseases, it is particularly gratifying that the greatest increase has occurred in the number of courses conducted in the States and localities.

The extensive use of outside resource people – often from universities and professional schools – as teachers has enabled CDC to present more courses on a wider range of subjects to a greater body of trainees than could have been achieved by using CDC personnel exclusively. In addition to alleviating the shortage of suitable instructors for State-held courses, the use of non-Center personnel has proved beneficial in other ways. Through their participation as teaching staff, hundreds of professional workers all over the country have gained greater understanding and appreciation of current operational and training activities in the control of communicable diseases. Center personnel also have been enriched by contact with resource people of diverse background and experience.

CDC PERSONNEL ENGAGED IN RESEARCH

BY PROFESSIONAL CATEGORIES



ACADEMIC TRAINING

MD	58
PHD	60
DVM	28
MA,MS,ME	56
MPH	6
BA,BS	63
No Degree	38
TOTAL	309

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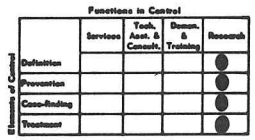
CDC PERSONNEL ENGAGED IN RESEARCH

The Communicable Disease Center carries on a variety of studies and projects that require the services of a wide range of professional workers. Within the limits of existing knowledge, their combined skills represent competence in all phases of communicable disease control.

A significant portion of the Center's activities involves research. All operational functions of the Center in the form of assistance rendered to the States are backed by specific investigations and by the competency of trained and experienced research personnel. This direct association of research with other functions makes CDC a unique organization in the public health field, one which could not be duplicated or maintained at State level.

CDC-UNIVERSITY COOPERATIVE RESEARCH PROJECTS

Fiscal Year 1958



WASH.
OREG.
CAL.
IDAHO
NEV.
MONT.
WYO.
UTAH
ARIZ.
COLO.
N. MEX.
N. DAK.
S. DAK.
NEBR.
KAN.
OKLA.
TEXAS
MINN.
IOWA
MO.
ARK.
LA.
WIS.
ILL.
MICH.
KY.
TENN.
MISS.
ALA.
GA.
FLA.
S.C.
N.C.
VA.
W.VA.
OHIO
PA.
N.Y.
MAINE
VT.
N.H.
R.I.
MASS.
CONN.
N.J.
DEL.
MD.

Univ. of Calif.
Plague
Encephalitis
Psittacosis
Coccidioidomycosis
Q fever
Trachoma
Composting

U.C.L.A.
Venereal Disease

Utah State
Arthropod Control

Univ. of Utah
Arthropod Control

Arizona State College
Coccidioidomycosis
Composting

Univ. of Arizona
Coccidioidomycosis
Rabies
Composting

Colo. State Univ.
Coccidioidomycosis

New Mexico A & M
Rabies

Univ. of Kansas
Respiratory Diseases
Pulmonary Mycoses

Oklahoma State
Rabies

Baylor Medical School
Venereal Disease

Univ. of Minn.
Silo-fillers Disease
Poliomyelitis

State Univ. of Iowa
Influenza

Univ. of Ill.
Influenza
Poliomyelitis

Univ. of Mich.
Poliomyelitis
Venereal Diseases
Influenza

Western Reserve
Poliomyelitis
Polio-like Diseases

Univ. of Louisville
Poliomyelitis

Delta State Teachers
College
Arthropods

Tulane
Polio-like Diseases

Duke Univ.
Venereal Disease

Emory Univ.
Arthropod Bionomics
Diagnostic Methods
Diarrhea and Dysentery
Hepatitis
Leptospirosis
Leprosy

Univ. of Miami
Poliomyelitis
Influenza

State Univ. of N. Y.
Parasitic Diseases

Harvard
Influenza

Tufts
Encephalitis

Columbia Univ.
Syphilis

Univ. of Penn.
Anthrax
Psittacosis

Johns Hopkins Univ.
Rabies
Staphylococcal Diseases
Venereal Disease

Univ. of Md.
Influenza

Univ. of Va.
Influenza

Univ. of N. C.
Venereal Disease

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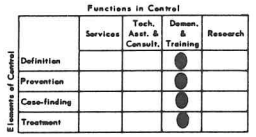
CDC-UNIVERSITY COOPERATIVE RESEARCH PROJECTS

It would be impossible for any organization or agency to conduct all the research, basic and applied, that is essential to an understanding of the communicable diseases and their control. In dealing with communicable disease problems, CDC often arranges to have special investigations and diagnostic services carried out in academic institutions that have a particular interest in a subject and the competency to deal with it. Several universities, widely scattered throughout the country, are cooperating in studies on diseases of such general concern as poliomyelitis, the polio-like diseases, and influenza. Studies on the pulmonary mycoses, on the other hand, are concentrated in the areas endemic for them. A glance at the map will show the diversity of these cooperative studies and the geographic span of contractual services.

CDC TEACHING APPOINTMENTS AT ACADEMIC INSTITUTIONS

SCHOOL YEAR 1955-'56



70 STAFF MEMBERS DEVOTED

OVER 2700 HOURS TO EDUCATION

AT 30 ACADEMIC INSTITUTIONS

IN 20 STATES & PUERTO RICO

AS

VISITING LECTURERS
CONSULTANTS

FACULTY MEMBERS

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CDC TEACHING APPOINTMENTS AT ACADEMIC INSTITUTIONS

In university lecture halls and laboratories throughout the country, CDC's professional personnel are making significant contributions to the training of graduate and undergraduate students. Representing competency in many disciplines, these individuals are able to assist in bridging the gap between scientific theory and practice for the students. In this way, the students also become acquainted with the type of problems that confront workers in the health fields and learn what is being done to resolve them.