THE GEOGRAPHY OF SYPHILIS IN THE UNITED STATES

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PREFACE

This thesis was concerned with the syphilis rates in the United States. Its major objective was to provide some insight into the present syphilis rates of the United States. This "insight" was socio-economic characteristics common to cities with high syphilis rates.

I would like to extend my deepest gratitude to my major adviser, Dr. Robert E. Norris, for his constant encouragement and patience when it was most needed. Appreciation is also due to Dr. Stephen Tweedie and Dr. Keith Harries for their willingness to answer the, sometimes incoherent, questions I put to them.

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GLOSSARY

African Theory: A theory which states that syphilis, yaws and the other treponematoses are manifestations of a single disease, but that the clinical picture has been modified in less primitive peoples by improved hygiene and other circumstances.

Asymptomatic: Lacking in visible symptoms.

Bejel: A treponemal disease occurring in the Middle East, which is commonest among tribes and in primitive villages. Infection occurs in childhood and is usually transmitted by personal contact, eating utensils and possibly by insects.

Beta Gonorrhea: A type of gonorrhea which is not treatable by penicillin.

Bubo: Inflammatory swelling of a lymphatic gland, particularly in the groin.

Cardiovascular Syphilis: A latent stage of syphilis which affects the circulation and the heart. The lesions in most cases of cardiovascular syphilis are located in the thoracic aorta. The elastic tissue is destroyed and the aorta dilates, producing an aneurysm. The infection may also involve the aortic valve causing an insufficient flow of blood. The symptoms of cardiovascular syphilis differ in no unique way from other heart and vascular disorders.

Chancre: The lesion of primary syphilis; begins as a hard, dull red, painless bump which later breaks down to form an ulcer.

Chancroid: This is one of the less common venereal diseases; characterized by multiple painful ulcers on the penis or vulva.

Columbian Theory: A theory of the origin of syphilis which states that the disease was unknown in Europe before 1492.

Congenital Syphilis: Syphilis acquired by the fetus in the uterus before birth.

Endemic Syphilis: A treponema transmitted by skin contact, often referred to as bejel.

Epidemiology: The science dealing with the incidence, spread and control of disease.

Ergotism: The disease caused by eating food made with grain affected with ergot--a blackish fungus growth which replaces the grains, usually rye.

General Paralysis of the Insane: Is a progressive syphilitic disease of the brain, producing mental and physical deterioration and eventually complete dementia and paralysis with incontinence. It usually develops 10 to 15 years after the primary infection.

General Paresis: Another name for general paralysis of the insane.

Gonorrhea: The contagious inflammatory disease of the genitalia, affecting either sex, caused by a kidney-shaped diplococcus whose scientific name is Neisseria gonorrhoeae.

Granuloma Inguinale: One of the less common venereal diseases, caused by the "Donovan body"; characterized by lesions on the groin and genitals that become raised, red, and velvety and bleed easily.

Gumma: One form of tertiary syphilis; a soft gummy tumor.

Incidence of Syphilis: The number of new cases occurring in a given area within a specific time period, usually one year.

Late Syphilis: A stage of syphilis which occurs if the disease is allosed to go untreated.

Latent Syphilis: Latency begins with the disappearance of untreated secondary symptoms; it may extend from a few months to a life time. Latent syphilis is only detectable by blood tests. It is usually divided into two stages--early latent, for the first two to four years and late latent which lasts from several months to a lifetime.

Lesion: Tissue damage characterized by open sores of the disease which permit discharge of infectious pathogens from the surface of the skin or through any body openings.

Lymphogranuloma Venereum: One of the less common venereal diseases; can lead to elephantiasis of the scrotum or labia and to rectal strictures.

Meningovascular: One type of secondary syphlis, caused by involvement of the blood vessels of the meninges.

Mercury: The best treatment for syphilis before penicillin.

Neurosyphilis: A stage of latent syphilis where the nervous tissue is affected. The sumptoms arise from wide-spread destruction of the brain tissue. Mental changes vary but most commonly become manifest in gradual changes of personality, decreased ability to work, and impairment of concentration and judgement. These changes produce abnormal behavior, including delusions, loss of memory, lack of insight, apathy or violent rages, convulsions and disorientation.

Pinta: A tropical disease that resembles syphilis in its manifestations; spread by skin contact and caused by a spirochete identical in appearance to the one that causes syphilis.

Primary Optic Atrophy: This involves degeneration of the optic nerve; it is usually first noticed as a loss of peripheral vision. Central vision may be lost in advanced cases, leaving the individual completely blind.

Primary Syphilis: The incubation of syphilis which ranges from ten to ninety days.

Secondary Syphilis: This stage occurs from four weeks to six months after the appearance of the primary chancre. These include a rash consisting of small lesions that do not itch, may appear over all the body or just on the palms of hands of the soles of feet, and which are often difficult to see.

Serological: Relating to blood serum.

Spirochete: A cordscrew-shaped microorganism.

Syphilis: A systemic disease produced by infection with spirochete treponema pallidum.

Tabes Dorsalis: This is a failure of muscular coordination within the body; it is the most common outcome of the progressive destruction of the spinal cord by large numbers of spirochetes. The usual diagnostic sign is a weakening or loss of ankle and knee reflexes.

Treponema: A genus of spirochete causing syphilis, yaws, and pinta; also contains nonpathogenic members.

Treponema Pallidum: The organism that causes syphilis.

Venereal Disease: Any disease which is spread by sexual contact.

Venerologist: A physician specializing in the diagnosis and treatment of veneral disease.

Wassermann Test: The oldest diagnostic test for syphilis.

Yaws: A tropical disease spread by skin contact and causing lesions in the skin and bones; caused by a spirochete identical in appearance to the one causing syphilis.

CHAPTER I

INTRODUCTION

General Considerations

A shepherd once (distrust not ancient fame)
Possest these downs, and Syphilus was his name.
-Fracastorius, "On the French Disease"

Ever since the physician-poet Fracastorius of Padua wrote the above lines about an afflicted Greek shepherd boy named Syphilus, who had offended the sun god, a name was found for the disease which caused "buboes" on its victims. It was also at this time that sexual intercourse was first suspected as a mode of contracting the disease. Syphilis, in near epidemic proportions, has struck every country in the world at one time or another.

Syphilis ranks third (exceeded only by chickenpox and gonorrhea) among reportable communicable diseases in the United States.[1] For the Fiscal Year 1975, there were 25,746 cases of early infectious syphilis reported, a 4.1 percent increase over FY 1974. Even though cases of primary and secondary syphilis are reportable by law in all fifty states and the District of Columbia, the Venereal Disease Control Division estimates that the actual incidence of syphilis[2] was about 82,000 cases in FY 1975. The nonreporters are usually private physicians protecting their patients against disclosure of a disease which still has many

taboos surrounding it. This underreporting results in the lack of follow-up measures being taken to find infected contacts.

Untreated syphilis cases cumulate to form a large reservoir of cases needing treatment, most of which are in the latent stage of the disease and are detectable only by means of blood tests. In the United States today there are estimated to be 430,000 cases of late and latent syphilis compared to the 29,264 cases reported in FY 1975. If untreated, syphilis may progress to destructive neurosyphilis, cardiovascular syphilis and other serious chronic manifestations. In FY 1975, alone, the hospital maintenance of patients with syphilitic psychosis cost the tax payers $58,214,000.[3] The trends of these later stages of syphilis are determined mainly by control initiated ten to twenty years ago. "In the last thirty years treating large numbers of patients with syphilis has produced a 90% reduction in the late damaging sequelae of syphilis."[4] Deaths due to syphilis, infant deaths due to syphilis and first admissions to hospitals of patients with psychoses due to syphilis for selected years from 1940 to 1975 can be found in Table I.

It can also be seen from the table that unlike Western Europe where congenital syphilis is extremely rare, the United States has enough cases to consider it a problem. There were 916 cases of congenital syphilis reported in calendar year 1975, a reduction of 222 cases from calendar year 1974. Of these, 221 occurred in newborns, a decrease of 28 percent from the previous year. "This decline results partly from more intensive case investigation and increased prenatal care in some areas."[5] Those areas with the higher rates of congenital syphilis are in need of better prenatal care.

TABLE I

REPORTED MORTALITY AND FIRST ADMISSIONS TO MENTAL HOSPITALS WITH PSYCHOSES DUE TO SYPHILIS, UNITED STATES, SELECTED YEARS 1940-1975

Calendar Year	Deaths due to Syphilis		Infant Deaths due to Syphilis		First Admissions with Psychoses due to Syphilis	
	Number	Rate per 10,000 Pop.	Number	Rate per 100,000 Live Births	Number	Rate per 100,000 Pop.
1940	14,064	10.7	1,251	53.0	7,694	6.1
1950	7,568	5.0	201	5.7	3,751	2.6
1960	2,945	1.6	30	.7	742	.4
1965	2,434	1.3	25	.7	232	.1
1966	2,193	1.1	25	.7	225	.1
1967	2,381	1.2	15	.4	162	.1
1968	586	0.3	15	.4	154	.1
1969	543	0.3	22	.3	NA	NA
1970	461	0.2	12	.3	NA	NA
1971	375	0.2	8	.2	NA	NA
1972	344	0.2	2	.1	NA	NA
1973	393	0.2	9	.3	NA	NA
1974	300	0.1	7	.2	NA	NA
1975	300	0.1	NA	NA	NA	NA

Source: Mortality and Natality Data, National Vital Statistics Division; First Admissions to Mental Hospitals, National Institute of Mental Health; Rates based on population estimates of the Bureau of the Census.

Note: NA means not available.

The statistics surrounding syphilis are interesting and have varied considerably since they were first reported in 1919. Many of these trends will be discussed throughout the thesis.

Syphilis is a major medical problem today, if not for its seriousness, but for sheer numbers alone. It is important to control venereal diseases before they become an even more serious problem. Asymptomatic syphilis, cases where there are no apparent symptoms, is on the rise in men as well as women. This permits the undiagnosed spread of the disease. Also, there is evidence that syphilis as well as gonorrhea is developing resistance to penicillin, making treatment more expensive and unsure. "More than fifty cases of infection with the new strain have been detected in the United States and alarmed public-health officials are desperately trying to prevent it from spreading through the country."[6] Beta gonorrhea is rapidly becoming a public health concern, which can be seen from the above statement found in a 1977 issue of Newsweek magazine. It emphasizes the need for better venereal disease programs in the United States.

Syphilis: The Disease

The word venereal refers to Venus, the Roman goddess of love. Frequently the diseases so named are referred to collectively as venereal disease (VD). Five such diseases are recognized in the United States--gonorrhea, syphilis, chancroid, granuloma inguinale and lymphgranuloma venereum. This thesis is concerned only with that disease referred to as syphilis.

Treponema Pallidum

"The organism of syphilis, treponema pallidum, is an anaerobe requiring moisture and tissue for survival."[7] The syphilis spirochete dies quickly outside the body and is readily killed by drying or by exposure to soap and water. It is normally spread during sexual intercourse where it burrows into the moist tissue of a partner. There are several other treponemata--yaws, bejel and pints--which are spread by skin contact among children and young adults, especially in tropical climates among primitive people.

Catterall describes the organism treponema pallidum (spirochaeta pallida) as a:

> minute, slender, spiral or corkscrew shaped organism, which looks bluish white when seen in the dark ground illumination of the microscope. It is from 5 to 24 m in length, the average being 8 to 10 m. The average thickness is about 0.25 m. It has between 8 and 20 coils and the distance between each coil is 1 m. It will remain alive for only a few hours outside the human body but will live for up to 72 hours in blood taken for transfusion. It is killed immediately by heat, drying, and most weak antiseptics.

Although the transmission of syphilis is most often associated with sexual intercourse, there are other modes of transmission. Sometimes it may be acquired by prolonged close contact with an infected person wihtout actual sexual intercourse taking place. "Infection sometimes occurs through kissing and rarely from drinking from an infected cup."[9] It also occurs accidentally in surgeons and dentists through pricking the finger when operating on a patient with active, infectious syphilis. A number of cases of transmission by blood transfusion have also been recorded.

> Syphilis passes through several separate stages:
>
> (a) the incubation period of 3 weeks duration (range of 10 to 90 days). During this stage there are no signs or symptoms of the infection; (b) the primary stage (chancre) lasting 1 to 5 weeks; (c) the secondary stage appearing 2 to 10 weeks later; (d) the latent, or quiescent stage, lasting 2 to 20 or more years. . . (e) the late or symptomatic stages. . .[10]

This thesis is concerned with the primary and secondary stages of syphilis since those are the periods when the disease is most infectious.

Characteristics in the Contagion of Syphilis

As early as 1868, certain characteristics of syphilis were known to medical men. Berkeley Hill lists several of these by, what he refers to as "predisposing causes". They are climate, the condition of the individual, influence of race and the individual's liability to contagion.

Hill believed that "cold climates render the disease more severe, by lowering the vital energy of the patient, and promote its spread by encouraging dirty habits and promiscuous herding together."[11] Today there is little relationship found between cold weather and the severity of the disease but there is a geographical variation to its distribution. It is this variation which will be discussed in future chapters.

In the nineteenth century the importance of the general health of the individual in fighting syphilis was seen as being very important, especially since there were no "sure cures". The influence of insufficient food over the progress of syphilis was especially evident in congenital cases. Hill states that "among the Polish Jews the matted tufts of hair called plica polonica are often densely glued together by

the discharge of spreading syphilitic ulcers of the scalp."[12] Unsanitary habits greatly aggravate the disease no matter what country it's found in.

Hill states that "syphilis appears to afflict all races of mankind, but is reported to be usually less severe among the dark than the light races."[13] Races still appear to have some affect on the manifestations of syphilis. "Cutaneous, osseous and cardiovascular lesions occur more commonly in Negroes than in whites, but neurosyphylis is more common in white patients and in Indians and Pakistanis."[14] A recent author found

> . . .three times as many Negro as white patients with cardiovascular syphilis, which was in distinct contrast to the ratio in the overall hospital population which was one negro to white subjects. The same author found that neurosyphilis was particularly striking in the symptomatic varieties. . . which occurred more than twice as often in white than in negro syphilitic cardiacs.[15]

As well as the racial difference in syphilis attacks, there is a sexual variation in the severity of symptoms. It is well known that syphilis tends to be milder in women than in men, and "experimental evidence suggests that the action of the female sex hormone may account for this difference."[16] Also pregnancy is "known to have a benign influence on the manifestations of the disease and symptoms and signs are less obvious during pregnancy."[17]

The most serious problem concerning syphilis is that of letting it go untreated. This happens often for if left untreated, symptoms will disappear causing the infected person to believe him or herself cured. The more dangerous "latent" stages of syphilis may follow. It is these stages of syphilis which lead to tissue destruction and eventually to the death of the individual.

The most common of these stages are cardiovascular syphilis, neurosyphilis, tabes dorsalis and primary optic atrophy. Cardiovascular syphilis differs little from other heart and vascular disorders except for a positive serologic test for syphilis. Neurosyphilis, often called paresis or general paralysis of the insane, is the most serious of the latent stages of syphilis. It is caused by a widespread destruction of the nervous system which leads to changes of the personality, decreased ability to work, impairment of judgment and other abnormal behavior including convulsions and violent rages. Destruction of the spinal cord leading to failure of muscular coordination is referred to as tabes dorsalis. And finally, primary optic atrophy involves degeneration of the optic nerve and eventually blindness.[18]

It is to curb the destruction of these later stages of syphilis, that this work and others like it are important. The disease must be caught in the early stages for any control measures to be effective.

Scope of the Investigation

Syphilis is a serious problem in the United States and has the potential to become more serious as cases are left untreated. It is the purpose of this thesis, to provide some insight into present syphilis rates. It is known that there are variations in syphilis rates in the United States and that these rates vary from state to state. Variations in syphilis rates also exist from city to city, but cities with high syphilis rates are not necessarily found in states with high syphilis rates. This thesis attempts to link city syphilis rates with selected socio-economic variables. It is thought

that cities with similar syphilis rates will share similar socio-economic characteristics. By discovering which population segments have a greater tendency toward high syphilis rates, possibly some insight may be gained into strategies necessary to slow the rising venereal disease rates.

Objectives and Procedures

The overall objective of this thesis is to analyze the variables which may affect the differences in syphilis rates across the United States. Specifically, the objectives are: (1) to briefly discuss the historical significance of the disease, including a section on its controversial origin; (2) to analyze syphilis rates in seventy-five selected cities across the United States by means of selected socio-economic variables; and (3) to discuss the general trends of syphilis rates since 1925, by states.

The above objectives will be achieved by the following procedure: Chapter II reviews the major literary contributions that are concerned with venereal disease.

Chapter III discusses both the historical significance and the origin of syphilis. This includes both the Columbian and Unitarian theories of origin, an examination of ancient literature and an overview of the epidemic of the Middle Ages.

A description of the analysis and the actual analysis of syphilis rates in seventy-five United States cities are found in Chapters IV and V respectively. This analysis is done by comparing seventeen socio-economic variables with the syphilis rates of the selected cities.

Chapter VI is concerned with the more general variations of syphilis rates. The geographic patterns produced by the states are examined, including a review of the significance of syphilis in the South.

A final summary of the problem and proposed research will be included in the final chapter, Chapter VII. Also, a glossary has been added to explain the technical terms utilized in the explanation of syphilis as a disease.

FOOTNOTES

[1]U. S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Fact Sheet 1975: Basic Statistics on the Venereal Disease Problem in the United States, Edition 32, p. 13.

[2]The incidence of syphilis is defined as the number of new cases occurring in a given area within a specific time period, usually a year. The number of primary and secondary syphilis cases is the same as the incidence of syphilis.

[3]U. S. Department of Health, Education, and Welfare, VD Fact Sheet 1975, p. 3.

[4]Ibid., pp. 17-19.

[5]U. S. Department of Health, Education, and Welfare, VD Statistical Letter, May 1976, p. 19.

[6]Matt Clark, "Beta Gonorrhea," Newsweek, January 10, 1977, p. 41.

[7]Leslie Nicholas, Sexually Transmitted Diseases (Springfield, 1973), p. 27.

[8] R. D. Catterall, A Short Textbook of Venereology: The Sexually Transmitted Diseases (Philadelphia, 1974), p. 73.

[9]Ibid., p. 74.

[10]Nicholas, Sexually Transmitted Diseases, p. 27.

[11]Berkely Hill, Syphilis and Local Contagious Disorders (London, 1868), p. 34.

[12]Ibid.

[13]Ibid.

[14]Catterall, Textbook of Venereology, p. 75.

[15]Nicholas, Sexually Transmitted Diseases, p. 178.

[16]Catterall, Textbook of Venereology, p. 75.

[17]Ibid.

[18]Curtis Byer, Kenneth L. Jones and Louis W. Shainberg, VD (New York, 1974), pp. 64-65. A more thorough description of these stages of syphilis may be found in the glossary.

CHAPTER II

LITERATURE REVIEW

Syphilis has long been the concern of those in the medical circles of the world and sporadically has aroused interest in the literary fields, but it was not until recent times that it could be discussed openly. As late as 1939, Surgeon General Thomas Parran was not allowed to speak of syphilis on the radio. This was at a time when reported syphilis rates were over 350 cases per 100,000 population. A massive campaign to wipe out venereal disease was already underway before Dr. Parran's ill-fated radio broadcast. A large part of this campaign was to educate the public--giving rise to various types of literature on the subject.

On July 9, 1918, Congress passed a comprehensive law, establishing an Interdepartmental Social Hygiene Board composed of the Secretaries of War, Navy and Treasury, and setting up a Division of Venereal Disease in the Public Health Service.

> A million dollars was appropriated for aid to states in organizing such work, $200,000 for administration of the Public Health Service Division of Venereal Diseases, and $400,000 to the Interdepartmental Social Hygiene Board for research to develop better medical and education measures.[1]

This began the United States' campaign against a disease which was killing and maiming millions. Within a year after its adoption, 46 states joined the federal government in its fight against venereal

disease. This also brought a gradual lifting of the Victorian attitudes which made one of the most devastating diseases of the time "unmentionable". However, after the enthusiasm of the war years wore off, venereal disease programs were seen as unnecessary. By 1926, all aid to the states for venereal disease work was terminated. It was not to rise for another decade.

Since the sixteenth century, medical doctors who have seen the devastation of syphilis have been trying to educate the public in its control. They began a major writing campaign to combat the disease at the turn of the twentieth century. Berkeley Hill, a British medical doctor, wrote one of the first comprehensive books dealing solely with venereal diseases. In it, he included an in depth study of the origin of the diseases as well as a medical description of their cures and control. In 1881, Alfred Fournier's Syphilis and Marriage was published as a warning to those who were about to get married. It concentrated on case histories of married patients he had treated and how syphilis was spread from the husband to the unsuspecting wife then to their newborn children. He emphasized the need for counseling and proper treatment for those who were considering marriage. Dr. Fournier was ahead of his time in that he advocated mandatory tests for primary syphilis before two people could wed. It wasn't until much later that his thoughts finally became law.

Much of the early literature emphaiszed the disease and its disruption of family life. There was no "sure cure" for syphilis before the discovery of penicillin; thus, the best control measure was to influence the sexual activity of the people involved. "Continence is the only perfect safeguard against venereal contagion,"[2] is a rather

drastic statement made by Berkeley Hill stressing the feelings of the times. Dr. John H. Stokes wrote The Third Great Plague: A Discussion of Syphilis for Everyday People utilizing data collected from the shortlived programs of the World War I years. He spoke to the common man--pleading with him to assist in controlling the disease which was killing or retarding his children.

Another type of turn-of-the-century publication was meant to reach the doctor rather than the patient. It is typified by Jay Schamberg and Carrol Wright's Treatment of Syphilis. They dwell on the effectiveness of the available methods of treatment at the time including a discussion of the history of each method. They note that as early as the sixteenth century, the problems associated with mercury treatment (the most effective treatment until penicillin) were known. "From 1580 to 1655 every teacher in the University of Heidleberg was obliged to take an oath that he would never use this vicious poison."[3] There had been so much abuse of mercury at the time that doctors were killing as many patients as the disease itself. These two doctors also stressed the need for rapid and thorough treatment to prevent the spread of syphilis.

One of the most outstanding books of the time was written by Dr. Thomas Parran, then Surgeon General of the United States Public Health Service. Shadow on the Land was the first book to stress the problem the nation was facing rather than that of the individual. Parran explained how the United States could combat this disease which was taking its tool on the young and old, alike.

Dr. Joseph Earle Moore wrote two books and many articles on the subject of syphilis. The Modern Treatment of Syphilis was written

before the advent of penicillin while his later book Penicillin in Syphilis was written after its effectiveness had been proven. He was optimistic about the erradication of syphilis

> . . . in June 1943 . . . in that month Mahoney, Arnold, and Harris demonstrated that penicillin was effective in early syphilis in rabbit and man. This drug, for all practical purposes completely nontoxic, appeared to be curative in early syphilis when administered within the brief period of eight days. There was initial promise that a rapid cure of early syphilis had been discovered which was completely safe, lacking all the hazards of the poisons arsenic and bismuth.[4]

At the same time as a "sure cure" for syphilis was being discovered, syphilis rates were higher than ever. In 1943, there were 447.0 cases of syphilis reported for every 100,000 people in the United States. Moore projected the stamping out of venereal disease entirely, a goal that was almost reached by the mid 1950's.

The atmosphere was so optimistic that in 1955, the phrase "and syphology" was removed from the AMA Archives of Dermatology and Syphilology, Dr. J. E. Moore's "American Journal of Venereal Diseases" was scrapped and the "Journal of Chronic Diseases" replaced it; syphilology was deemphasized in medical school curricula--with doctor's graduating from medical school with little knowledge of the disease, and often without having seen a chancre; on January 28, 1956, the Board of Commissioners of the Joint Commission on Accreditation of Hospitals dropped routine admission blood tests for syphilis as a requirement for hospital accreditation; and Federal appropriations for VD control fell from $17 million to $3 million in 1955.[5]

This belief in the "death" of syphilis appeared everywhere: schools no longer required seriologies for admission, pregnant mothers were no longer tested for the disease, almost every precaution enacted

during the 1940's was lifted. The only testing that was not eliminated was that of mandatory blood tests before a marriage could be performed.

The "conquering" of venereal disease also appeared in the literature of the 1950's and the early 1960's. It was apparent more in the absence of literature than on what was written. By 1970 the reappearance of the syphilis was evident. Doctors and lay people alike began to notice the new higher rates of the disease everyone thought dead. This prompted a flood of literature on venereal diseases. New studies are now being conducted to try to curb the epidemic proportions which are striking the United States and the world today.

One of the few books written during the 1960's was that of The Doctor and His Enemy by Alan Wykes, a historical sketch on syphilis as well as a social comment on the spread of venereal disease. The doctor who appears in Wykes book is as much the subject as syphilis. He is a British physician who was forced into the study of syphology during the World Wars then continued the study on his own. The book is a statement on the ravages of just one disease on the world's history.

A Short Textbook of Venereology by R. D. Catterall, VD by Curtis O. Byer, Kenneth L. Jones and Louis W. Shainberg, Textbook of Virology by A. J. Rhodes and C. E. Van Rooyen and Sexually Transmitted Diseases by Leslie Nicholas are all concerned with the medical aspects of venereal disease. They relate the upswing in venereal disease rates to increasing sexual freedom and discuss what should be done to curb this epidemic.

In a different light, the books The VD Epidemic by Louis Lasagna, For People Who Make Love by John J. Secondi and Microbes and Morals by

Theodore Rosebury all emphasize what the individual as well as the professional should know for the prevention and spread of venereal diseases. They discuss the problem with a minimal amount of technical terms, enabling them to be understood by students as well as professionals.

Another type of literature which is as important as medically oriented studies, is that which stresses geographical patterns of diseases. There have been several attempts to combine the study of syphilis with that of geography. However, they have been on the macro level--using the worls as a base--rather than on a micro or semi-micro level--concentrating on one country or state. Studies on the micro level have been concentrated in the article stage such as "Veneral Disease and Urbanization in West Virginia" by Mary Ellen Mazey and Robert Davis. This article found in The Virginia Geographer specifically analyzes the problem and distribution of venereal diseases in West Virginia. Projects like this are important in that they can give a state a basis for concentrating its venereal disease programs in areas where they are most needed.

On the other hand, the books dealing with geography and disease are little more than overviews on the history and spread of particular diseases throughout history. Erwin H. Ackerknect, in his book History and Geography of the Most Important Diseases includes a chapter on syphilis. In this chapter, rather than discussing the seriousness of syphilis in the world today, he concentrates on the past geography of the disease. This is partly due to the fact that the origin of syphilis has fascinated many people for a long period of time. Folke Henschen also concentrated on the origin of syphilis in The History and

Geography of Diseases, but unlike Ackerknect, he also discussed the changed character of syphilis today. He states that:

> in recent generations the disease has to a certain extent changed character, at least in many placed in Europe and North America . . . The sever forms of syphilis which once were known in Europe and North America are nowadays found in remote countries where the disease is still widespread and treatment is ineffective or nonexistant.[6]

but Henschen also evades the issue of syphilis and its geography in today's world.

There is a growing realization that disciplines other than medicine can aid in disease control. This idea is presented in the Proceeding of the Conference on Genetic Polymorphisms and Geographic Variations in Disease. The Conference on Genetic Polymorphisms and Geographic Variations in Disease created a section on Geographic Medicine and Genetics, headed by Blumberg,

> to explore ways in which the rapidly expanding discipline of biochemical genetics can be linked effectively with other laboratory, clinical and epidemiological approaches to the study of the unequal distribution of disease, and particularly metabolic disorders, in different population groups.[7]

Jacques M. May only touches on the subject of syphilis in The Ecology of Human Disease, but he does make an important statement on the relationship between geography and medicine. "That geography has important medical aspects was obvious from the very beginning of the science."[8] This emphasizes the need for research combining the two disciplines.

The importance of Medical Geography to May is made obvious by his attempt to establish a following among geographic circles. Articles appearing in Geographical Review in the early 1950's are typified by such titles as "Map of the World Distribution of Leishmaniasis",

"Map of the World Distribution of some Viral Encephalitides", "Maps of the World Distribution of Rickettsial Diseases" and "Map of the World Distribution of Poliomyelitis,"[9] all of which are based on his Atlas of Diseases. In a 1950 article "Medical Geography: Its Methods and Objectives", May explains what Medical Geography is to him. He links diseases with climate, water, soil and culture. He also states that "Medical Geography could become a preliminary step to the redemption of backward countries throughout the world."[10] This, he feels could be done because of the close correlation between "diseases of the land and diseases of the people."[11]

A reply to May's plea for an increased emphasis on medical geography came some sixteen years later in an article in International Pathology by N. D. McGlashan entitled "The Medical Geographer's Work." He states briefly that the medical geographer's tasks are to "prepare and collate disease data and map it to show where a certain condition is rife (or absent)."[12] Then he adds that it is necessary:

> to apply tests to the distribution of diseases to assess whether or not the pattern is likely to have occurred by chance; to measure the degree of coextensiveness between that disease and other spatially varying factors; and then to apply a number of subjective tests to decide whether any associations he has shown could be causative.[13]

McGlashan feels that all studies are important for "the initiation of even a single new hypothesis can be of immense value in the alleviation of suffering and the improvement of human health."[14]

Several authors have begun ths utilization of data available for medical geography. Malcolm A. Murray is among those who have done the most work in the area. Articles to his credit are "Geography of Death in the United States and the United Kingdom", "The Geography of Death

in England and Wales" and "Medical Geography in the United Kingdom."[15] Related work has been done by John Hunter and Johnathan Young in "Diffusion of Influenza in England and Wales."[16] Two earlier articles which appeared in Geographical Review are "A Medical Survey of the Kali Gandak and Pokhara Valleys of Central Nepal" by Carl Taylor and "A German Atlas of Epidemic Diseases" by Gaylord Anderson.[17] These analyses of diseases are all similar in that mapping techniques are used as a basic means of explanation.

An article appearing in the Annals of the Association of American Geographers entitled "Standardized Class Intervals and Rate Comutation in Statistical Maps and Mortality"[18] by R. W. Armstrong discusses the choice of categories for cartographic display of data and other technical problems which may occur. He is concerned with how to approach the problem of mapping disease rates rather than actually working with a specific disease. L. Schuyler Fonaroff's "Man and Malaria in Trinidad: Ecological Perspectives of a Changing Health Hazard" and C. Gregory Knight's "The Ecology of African Sleeping Sickness",[19] on the other hand, are concerned with the effects and patterns of a particular disease. They like the articles already mentioned rely on mapping as a major technique in analyzing the data.

David Fox approaches the analysis of disease trends from a idfferent angle, however. In the article "Patterns of Morbidity and Mortality in Mexico City"[20] he utilizes a correlation matrix to analyze relationships between death rates and disease rates in Mexico City.

Even though none of the works involving medical geography have used stepwise regression as a model, it was felt that it would prove a satisfactory method of examining disease rates. Examples of using

stepwise regression as a means of comparing different variables are found in Bourne's "Urban Structure and Land Use Decisions"[21] found in the December 1976 issue of the Annals of the Association of American Geographers and by an article appearing in the American Sociological Review by Raymond D. Castil entitled "Homicide and a Regional Culture of Violence."[22]

Several other books consulted for techniques in using stepwise regression are Quantitative Techniques in Geography by R. Hammond and P. S. McCullagh, An Introduction to Quantitative Analysis in Human Geography by Maurice Yeates and Statistical Inference by H. M. Walker and J. Lev.

This thesis will combine both the medical background material provided by the books and articles dealing with syphilis and the technical material provided by medical geographers into a working model. It will greatly expand the work begun by Mazey and Davis in West Virginia.

FOOTNOTES

[1]Thomas Parran, Shadow on the Land: Syphilis (New York, 1937), p. 83.

[2]Berkeley Hill, Syphilis and Local Contagious Disorders (London, 1868), p. 263.

[3]Jay F. Schamberg and Carrol S. Wright, Treatment of Syphilis (New York, 1932), p. 1.

[4]Joseph Earle Moore, Penicillin in Syphilis (Springfield, 1946), p. 3.

[5]Louis Lasagna, The VD Epidemic: How it Started, Where it's Going, and What to do About it (Philadelphia, 1975), pp. 1-3.

[6]Folke Henchen, The History and Geography of Diseases (New York, 1962), p. 132.

[7]Jacques M. May, The Ecology of Human Disease (New York, 1958) p. xi.

[8]Baruch S. Blumberg, ed., Genetic Polymorphisms and Geographic Variations in Disease (New York, 1961), p. v.

[9]May, "Map of the World Distribution of Leishmaniasis," Geographical Review XLIV (Octiber, 1954), pp. 583-584; "Map of the World Distribution of Some Viral Encephalitides," Geographical Review XLIV (July, 1954), pp. 408-410; "Maps of the World Distribution of Rickettsial Diseases," Geographical Review XLIV (January, 1954), pp. 133-136; and "Maps of the World Distribution of Poliomyelitis," Geographical Review XL (October, 1950), pp. 646-648.

[10]May, "Medical Geography: Its Methods and Objectives," Geographical Review XL (January, 1950, p. 40.

[11]Ibid.

[12]N. D. McGlashan, "The Medical Geographer's Work," International Pathology VII (July, 1966), pp. 83.

[13]Ibid.

[14]Ibid.

[15]Malcolm A. Murray, "Geography of Death in the United States and the United Kingdom," Annals of the Association of American Geographers LVII (June, 1967) pp. 301-314; "The Geography and Death in England and Wales," Annals of the Association of American Geographers LII (June, 1962), pp. 130-149; and "Medical Geography in the United Kingdom," Geographical Review LIV (October, 1964), pp. 582-584.

[16]John M. Hunter and Johnathan C. Young, "Diffusion of Influenza in England and Wales," Annals of the Association of American Geographers LXI (December, 1971) pp. 637-653.

[17]Carl E. Taylor, "A Medical Survey of the Kali Gandak and Pokhara Valleys of Central Nepal," Geographical Review XLI (July, 1951), pp. 421-437 and Gaylord W. Anderson, "A German Atlas of Epidemic Diseases," Geographical Review XXXVII (April, 1947), pp. 307-311.

[18]R. W. Armstrong, "Standardized Class Intervals and Rate Comutation in Statistical Mpas and Mortality," Annals of the Association of American Geographers LIX (June, 1969), pp. 382-290.

[19]L. Schuyler Fonaroff, "Man and Malaria in Trinidad: Ecological Perspectives of a Changing Health Hazard," Annals of the Association of American Geographers LVIII (September, 1968), pp. 526-556 and C. Gregory Knight, "The Ecology of African Sleeping Sickness," Annals of the Association of American Geographers LXI (March 1971), pp. 23-44.

[20]David J. Fox, "Patterns of Morbidity and Mortality in Mexico City," Geographical Review LXII (April, 1972), pp. 151-185.

[21]Larry S. Bourne, "Urban Structure and Land Use Decisions," Annals of the Association of American Geographers LXVI (December, 1976), pp. 531-547.

[22]Raymond D. Castil, "Homicide and a Regional Culture of Violence," American Sociological Review XXXVI (June, 1971), pp. 412-427.

CHAPTER III

THE HISTORY OF SYPHILIS

In the Beginning

Syphilis has drawn more argument and speculation about its origin than most diseases. Its history is fascinating and many of the greatest physicians and surgeons have studied the disease and contributed to our knowledge of it.

There are two main theories to explain the origin of syphilis, the Columbian or New World Theory and the Unitarian or African theory. Closely related to the African Theory is that of the mutation of the treponema pallidum.

Columbian Theory

The essence of the Columbian theory is that syphilis was unknown in Europe before 1492. In the opinion of many medical historians, syphilis was thought to have been introduced into Europe by the members of Columbus' crew, said to have contracted the disease on the island of Hispaniola, in the West Indies, from local women. On the way home many of his sailors developed a disease, which was described as "Indian measles". There are those who think Columbus himself may have been infected because during his second voyage in the early months of 1494 "he began having attacks of fever, possibly the febrile secondary

stage of syphilis."[1] The third voyage in 1498 brought on a case of gout and the first evidence of a mental disorder appeared--"he began to hear voices and to regard himself as 'Ambassador of God'."[2]

With respect to the hypothesis, that Columbus' seamen brought syphilis to Europe from America, there is no doubt that an epidemic of some kind raged in many countries of Europe about the time of the discovery of America; but it is clear also, that this plague reached its height in several countries before Columbus returned, a fact over looked by those who advocate the Columbian theory. The astrologers had foretold a Scorpio epidemic, i.e., an epidemic of venereal diseases, for 1492 to 1500. And, in fact, there was one. It was recorded in "France in 1488-92, in Spain in 1493-95, in Italy in 1492-96, in Germany in 1493-95, and in England in 1496."[3]

This epidemic was thought to have been given impetus by the campaign which the young French king, Charles VIII, led against Naples in 1494-95. His troops composed of French, German, Swiss, English, Hungarian, Polish, Italian, and Spanish men, abandoned the seige and retreated through Italy, taking the disease with them. Whatever the disease, it soon reached the areas where it hadn't been before.

Some authorities believe that this was a mild endemic syphilis which was known and treated successfully with mercury as early as 1429.[4] Another suggestion is that the plague of 1490-96 was not syphilis at all, but a "malignant typhus, complicated with sloughing of the nates, genitals, and extremities."[5] But proving that this plague was typhus is as impossible as proving it was syphilis.

There is other evidence supporting the theory that spyhilis had been around before Columbus' discovery of America, but most of the authors who advocate this theory do so on the basis of a literature review of the Middle Ages, i.e., Hill, Parran, Rosenbury, etc.

Endemic syphilis "seems to have been noted as a new disease about 1431"[6] in Switzerland. While, "at Dijon in 1363 a prostitute testified in court that she had disposed of an unwelcome client by claiming that she was suffering from Le Gros Mal."[7] A similar disease appeared in March 1493, "the town crier of Paris ordered from the city all afflicted with La Grosse Verole--the great pox. Anyone neglecting this instruction was to be thrown in the Seine. . ."[8] such was the seriousness of the disease. In effect there was a disease resembling a mild form of syphilis in Medieval Europe which flared and assumed epidemic proportions in the fifteenth century, but there is no evidence it was related to the contact which Columbus brought about between civilized and primitive races.

Unitarian Theory

The Unitarian or African theory of origin holds that syphilis, yaws and the other treponematoses are manifestations of a single disease, but that the clinical picture has been modified in less primitive peoples by improved hygiene and other circumstances. "The theory postulates that the disease has existed since ancient times and maintains that descriptions of conditions identical with syphilis occurred in the Old Testament."[9] The treponemal disease or treponematoses are thought to have been spread by races emigrating from by the slave trade. Improved standards of personal cleanliness and the

colder climates made it impossible for the treponemes to live on the skin and be passed from person to person by skin contact as happens in yaws. This forced the spirochete to adapt by "moving to the warm, moist genital area of the body and the disease became one that was transmitted by sexual intercourse."[10]

The only feasible argument against this theory is the lack of skeletal changes in the bones of Europeans before the sixteenth century, while, at the same time, there is evidence to support syphilitic bones in the Americas. Henschen states that the "skeletal changes produced as evidence in support of the incidence of the disease in Europe before Columbus have been completely uncharacteristic."[11] They are rare and of questionable authenticity, while the evidence in favor of the Americanists is much stronger.

> The well-known English anthropologist Elliot Smith, who examined about 25,000 Egyptian crania, found not a single case of characteristic syphilitic periostitis . . . Peruvian mummies which were examined . . . showed some skeletal changes, but no definite syphilitic periostitis, and there were no skeletons of value from the West Indies. . . however. . . examination of bone remains, especially skulls, showed that syphilis had had a considerable distribution in North, Central and South America before the arrival of Europeans.[12]

But the "skeletal" evidence has not gone unchallenged by the Unitarianists. Alex Hrdlica, a distinguished anthropologist, "has offered the opinion that not one of the thousands of pre-Columbian skulls and skeletons found in America can be thoroughly authenticated as syphilitic."[13] Another argument is that syphilitic lesions do not appear in pre-Columbian American Indian art.

If syphilis if of American origin, there are two very different theories about its beginning the New World. A somewhat bizarre

explanation comes from a few South American scientists who have attempted to prove it had originally been a disease of the "South American llamas, and that these llamas had infected the natives who had a great affection for these animals."[14]

A somewhat more believable explanation comes from Henschen. He includes a theory advocated by Russian researchers who assert that syphilis was imported to the Americas from extreme northeast Siberia "where there are said to be tribes who in fact should be described as ancient American as they are quite distinct from other Asian peoples (Boas)."[15] It is thought that these pre-Mongoloid tribes migrated over the dired-up or very narrow Bering Straits bringing syphilis with them. This means that if it is an American disease, "then its age goes back some tens of thousands of years, inasmuch as America is thought to have been colonized possibly as late as 15,000 years ago."[16] If this theory is true, the origin of syphilis vanishes into a remote Asiatic past.

There is not enough evidence to prove any of the theories, thus the Peruvian llama legend has as much of a chance of being true as either the Columbian or Unitarian theories. Probably the most believable of the origins of syphilis is that it is an evolution from other, less serious, treponematoses.

Mutation of the Treponemes

It is considered that, once they came to be carried by man, the ancestral treponemes underwent mutations consequent upon slightly customary variations in the DNA genetic code, and natural selection ensured the continued line of those variants which were capable of

producing lesions best suited to continued transmission in the prevailing environment.[17]

It has been hypothesized that the first treponematoses to evolve was similar to pinta, found today among primitive underprivileged Indians of Central and South America. Today pinta is most prevalent in Mexico, Venezuela, Colombia, Peru and Ecuador. It has been suggested that pinta came to the Americas from across the Bering Straits in the same manner as the Russian origin of syphilis. "Its present localization in a single global area has been attributed to this region being largely excluded from the mainstream of migration and evolutionary change."[18]

It has been speculated that when the humid warm environment developed in Afro-Asia around 10,000 B. C. pinta evolved into yaws, which is still prevalent today in the area around the tropics of Cancer and Capricorn. Yaws further evolved around 8,000 B. C. The warm dry climate with cool evenings necessitated both the wearing of cloths and a new mode of contacting the disease. Thus came endemic syphilis which is a treponemal disease occurring in the Middle East, especially in Iraq, Syria, Israel and the Arabian peninsula. It is commonest among nomadic tribes and in primitive villages.[19]

> Infection occurs in childhood and is usually transmitted by personal contact, eating utensils and possibly by insects. It is a disease of primitive, backward people whose standard of hygiene is low.[20]

From endemic syphilis, it has been postulated, venereal syphilis evolved. When primitive customs and unhygienic habits are discarded the disease must find new modes of transportation, thus the treponema pallidum now moves from person to person by means of sexual intercourse.

It was this endemic syphilis which was thought to have evolved into venereal syphilis in Fifteenth Century Europe. "With the improvement of social conditions, and the advancement and dissemination of knowledge following the introduction of the printing press, syphilis came to be recognized as a venereal infection."[21] It is this theory which is gaining acceptance in the medical field. It also explains the lack of syphilitic bones in pre-Columbian Europe. Systematic research by many authorities has led to the belief that syphilis is a disease as ancient as that of gonorrhea.

Historical Geography of Syphilis

One of the earliest records of diseases consequent on sexual intercourse with infected persons was that of the ancient medical literature of China. Captain Dabry, an early French consul to China, published a book in which he says that:

> the Emperor, Ho-Ang-Ti, who reigned more than two thousand six hundred years before the Christian era, had the medical writings of that day collected into a systematic treatise, which has since been added to from time to time, and that a very complete description of venereal diseases may be found therein. Gonorrhea was distinctly described by Ho-Ang-Ti himself four thousand five hundred years ago, and the later editions contain clear accounts of cancre, phimosis, bubo ulcers of the tonsils, and cure of them by mercury.[22]

Those authorities who base their decision of the origin on syphilis on ancient literature, believe syphilis as well as other venereal diseases have been around since remote antiquity. "They are mentioned in the oldest myths known, i.e., in the Gilgamesh epic of Babylon, the Greek myths of Dionyses, and in other early myths."[23] The Bible reads that "the sons of Israel has worshipped Baal-peor and had committed whoredome with the daughters of Moab, who infected them

with venereal diseases."[24] Moses, inturn, ordered all the sick to be put to death. Similarly, after the victory over the Medianites, all adults with the exception of virgins were put to sword to control the spread of the disease. Authorities agree that the Biblical "zaraath" was probably venereal skin infections, although it is known that "zaraath" may have been in part, "leprosy, it did include skin diseases that could show an improvement within a week."[25]

"In China syphilis is said to have occurred at the time of Confucius, about 500 B. C., and in Japan even as early as the ninth century B. C."[26] Hippocrates mentions various afflictions which correspond to those belonging to syphilis, but he never describes them as having a venereal origin. The Greek and Latin physicians whose works remain, also describe local ulcerations of the genital organs.

> Celsus . . . describes phimosis, and the ulcers one often finds on turning back the foreskin, which he even separates into the clear dry ulcer, and the moist suppurating one . . . Aretaeus mentions, without giving it a venereal origin, sloughing of the uvula and soft palate. In Galen, the two following constitutional affections are mentioned, psoriasis scroti and periosteal pain of so deep and fixed a kind, that the patient believed the disease was in the interior of the bone. Oribasis described two moist and dry ulcers of the pudends and anus. Aetius also ascribes to aloes, used as a local application, the cirtue of healing sluggish ulcers, fissures, and carbuncles of the anus and pudenda. Lastly, Marcellius Empiricus speaks of ulcers of the tibia, which eac their way inwards.[26]

These quotes show that there was, indeed, a disease of venereal origin similar to if not syphilis. It was often called "curable lepra". The ancients thought that eunuchs could not catch leprosy which eventually led "to the treatment of leprosy by castration."[27] This would not seem so strange if leprosy was actually a form of syphilis.

Supposedly, the soldiers of Pompius brought lepra from the Near East but when the incubation period of true leprosy is considered, this allegation seems improbable. It is agreed, though, that the soldiers did bring some form of skin disease--"curable lepra".

In a treatise on the mode of treatment practiced in India for the cure of venereal disease, it is stated that "malabar physicians, who wrote about the tenth century, describe . . . not only the disease syphilis, but also its cure by mercury."[28]

The Middle Ages were no more specific in divulging information about syphilis than Greece and Rome, except for the fact that material was somewhat more abundant. Again, there were two forms of lepra described, the curable and the incurable. There is also mentioned a form of lepra curable by mercury. Salicent and St. Hildegarde tell that this form is also transmitted by sexual contact. The crusaders were infected with "curable lepra" by prostitutes. ". . . this curable lepra is distinguished from the incurable lepra form, incurable ignis sacer or St. Anthony's fire, i.e., probably erogotism, and from incurable lupus."[29]

There is also evidence to support the theory that some form of syphilis did exist in the Middle Ages. For instance, curable lepra was known to become congenital.

> Petrus Hispanus and Gentle de la Foligno treated successfully with mercury ointments, a skin disease they called scabies grossa or variola grossa. Chancres on genitals were described by Salicet and Lanfranco. Gerard de Berry referred, in the thirteenth century to a disease that first affects the genitals and later destroyed the entire body.[30]

Most data from the late Middle Ages regarding syphilis is found in French authors of the twelfth and thirteenth centuries. This is

believed to be the reason why the disease was called the "French Disease" or morbus gallicus, "not because it had originated in France or had been more common there than elsewhere, but because it had been researched there more thoroughly."[31]

The "French Pox" was the name used for this disease on perscriptions for antisyphilitic drugs. These prescriptions were dated 1470 in Italy, 1457 in Germany and 1455 in England. Occurrence of the "French Disease" was also reported in Mainz in 1473, by Gruenspeck in 1490, and by Peter Martyr and Delgado from France and Spain prior to 1490.[32]

The disease did move throughout Europe and eventually to the rest of the world. It reached Scandinavia quickly as is witnessed by "skull changes which have been found in Danish graveyards of the last years of the fifteenth century."[33] The disease is thought to have been brought to Sweden by the Danish armies--Christian II's army was especially notorious. "In 1499 syphilis spread via Poland into Russia where the disease is supposed to have appeared first in Smolensk in a particularly severe form."[34] The explorers of the sixteenth century made the spread of syphilis both eastward and westward a rapid occurrence. The following map gives the dates of the first mention of syphilis in various parts of the world. The dates are based on the preceding research.

After Columbus

When syphilis appears in a district where previously unknown, it is said to assume a quasi-epidemic form. This epidemic is taken as proof of its newness to an area. When syphilis came to the Americas

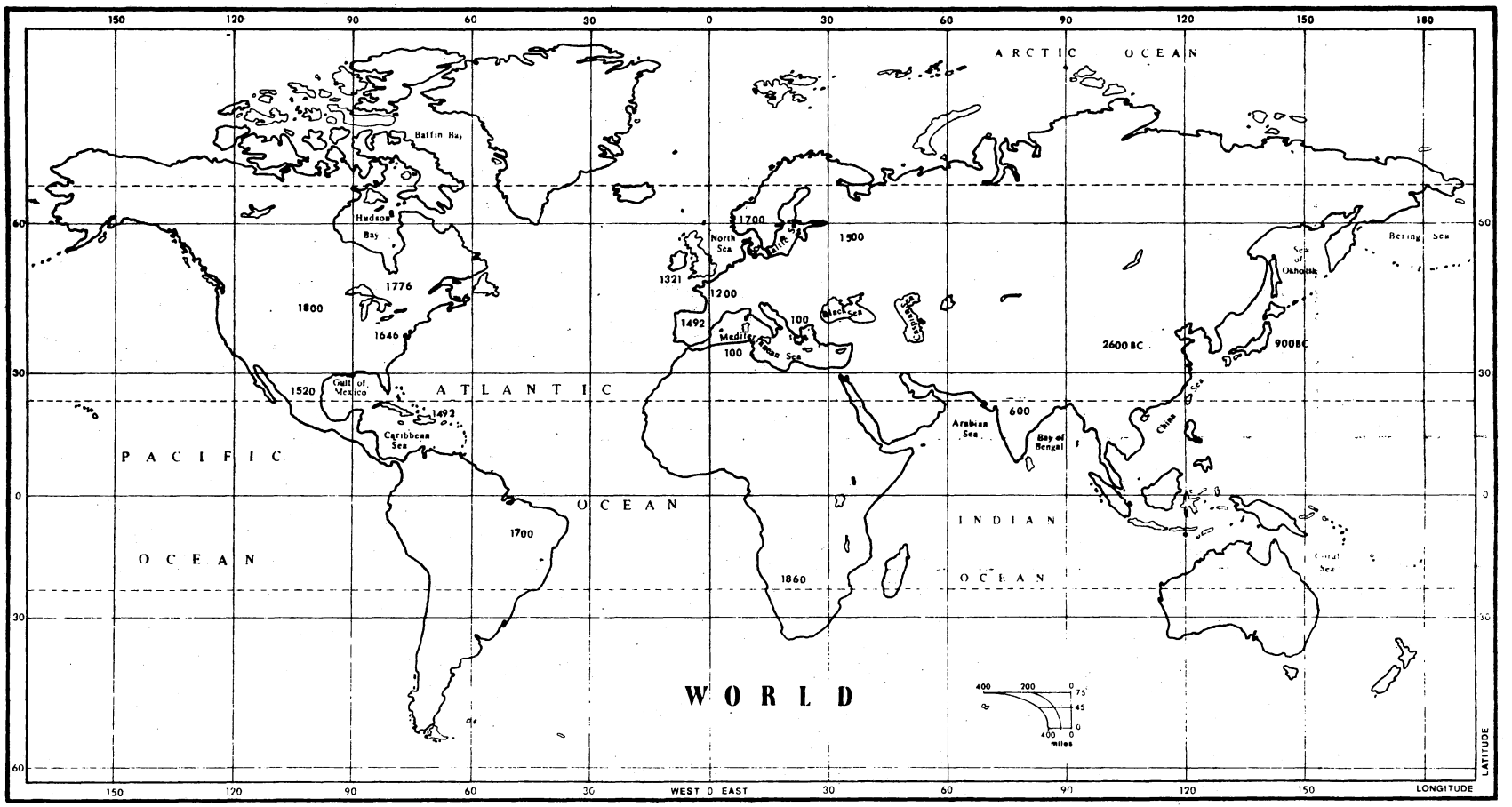


Figure 1. First Recorded Occurrence of Syphilis

by way of European settlers in the 1600's it devastated Indians in the same manner as it did any other "virgin" land. In 1646 a "loathsome disease" lues venera appeared in America. It was not "restricted to any one area or group, and it moved westward with the various races and ethnic groups."[35] It took its greatest toll on the American Indians. It decimated them, "killing complete villages in some areas of the Dakotas."[36]

The conquistadors carried syphilis to South America, giving rise to the statement "It would appear Brazil was syphilized before it was civilized."[37] During the 1800's, American trading vessels carried the disease to the Pacific Islands where the British had not yet been.

When syphilis was introduced into the Society Islands, it spread with great severity and became so general as to threaten the population with extermination. Luckily for the Islanders, the French immediately initiated programs to control its spread. The Hawaiian Islands did not fair as well for not only were they hard hit by the disease, but no country offered to help them control it. Othe quasi-epidemic were the "Scot sivvens in the seventeenth century, the Norwegian radesyge in the eighteenth century, and the Canadian epidemic of 1776."[38] They go on and on--a new epidemic for each new land. Syphilis was not particular about which race it struck next.

Those Who Suffered

A disease so widespread was bound to have some consequences on people of the world. Almost everyone who was sexually active at all had syphilis sometime in their life. Only guesses can be made

on its influence over philosophy and art. Both world wars have been attributed to the syphilis of Kaiser Wilhelm and Hitler respectively.[39]

Syphilis has caused an enormous amount of human suffering, some of which has been passed on to others in a manner that did not entail transmission of the disease itself--as in the instance of Ivan the Terrible. However, the results were not always harmful to others. Congenital syphilis caused Beethoven's deafness and led him to an early death. Nietzche's later works were influenced by his progress toward general paralysis of the insane. Another great literary disaster of modern times was the mental derangement of Oscar Wilde.[40]

But the lists go back to the days of the Bible. Job was perhaps the most famous of the Biblical characters to suffer from what is suspected to be syphilis. From a nonbiblical source, Ramses V's mummy shows signs of what might be congenital syphilis. The list grows longer. Heading it are two, Julius Caesar and Cleopatra followed later by Charlemagne and Charles V of France. Several popes were known to have the disease: Sixtus IV who lived before Columbus and Alexander VI, Julius II and Leo X, all who reigned in the sixteenth century. Henry VIII was probably the most famous syphilitic in history. His cruelty in executing most of his wives and sizeable number of Londoners is attributed to general paresis or syphilitic insanity.[41]

A list of later rulers suffering from syphilis includes Peter the Great of Russia, Frederick the Great of Prussia, Catherine the Great of Russia and Napoleon Bonaparte. The fine arts were also influences by syphilitic sufferers: Goya, Goethe, John Keats, Franz Schubert, and Hugo Wolfe were all known to have syphilis in one form or another. The list goes on and on too numerous to mention in this thesis.[42]

Summary

Syphilis takes its place along with malaria and the bubonic plague as an important factor in the shaping of history. Men and women alike have suffered under its influence affecting the lives of even those who never had the disease themselves. It may have been a direct cause of the advocated fidelity during the Victorian era, since by then "abstinence" was known as the only way to prevent the spread of syphilis.

Unfortunately, medical science has not been able to stop the spread of the disease but it has slowed the seriousness of it immensely. The disease, today, seldom gets beyond the early stages and help is available when it does. It was almost under control when, in the mid 1950's, syphilis rates were at an all time low throughout the world. By the late 1960's the rates had managed to rise to high proportions once again. Concern for the control of syphilis is increasing in all countries of the world but none have been able to put a stop to the rise in rates.

It is to help provide insight into these areas where control programs are needed, that this thesis has been undertaken. Attacking the problem from a purely geographical point of view has never been done for the United States. Hopefully, this method of examination will lead to a better understanding of the problem. The results of the analysis are found in the following chapters.

FOOTNOTES

[1]Alan Wykes, The Doctor and His Enemy (New York, 1966), p. 24.

[2]Ibid., p. 25.

[3]Folke Henschen, The History and Geography of Diseases (New York, 1962), pp. 126-27.

[4]Harvey Graham, Eternal Eve: The History of Gynaecology and Obstetrics (Garden City, 1951), p. 133.

[5]Berkeley Hill, Syphilis and Local Contagious Disorders (London, 1868), p. 10.

[6]Graham, p. 133.

[7]Ibid.

[8]Ibid.

[9]R. D. Catterall, A Short Textbook of Venereology, The Sexually Transmitted Diseases (Philadelphia, 1974), p. 70.

[10]Ibid.

[11]Henschen, p. 124.

[12]Ibid.

[13]Louis Lasagna, The VD Epidemic: How it Started, Where It's Going, and What to Do About It (Philadelphia, 1975) p. 13.

[14]Erwin H. Ackerknect, History and Geography of the Most Important Diseases (New York, 1965), p. 188.

[15]Henschen, p. 125.

[16]Ibid.

[17]Leslie Nicholas, Sexually Transmitted Diseases (Springfield, 1973), pp. 4-12.

[18]Ibid., p. 7.

[19]Ibid.

[20]Catterall, p. 145.

[21]Nicholas, p. 9-10.

[22]Hill, p. 6.

[23]Ackerknect, p. 119.

[24]Deuteronomy 4:25.

[25]Ackerknect, p. 119.

[26]Ibid.

[27]Hill, pp. 3-5.

[28]Ibid.

[29]Ibid., pp. 5-6.

[30]Ackerknect, p. 121.

[31]Ibid, p. 123.

[32]Ibid.

[33]Henschen, p. 128.

[34]Ibid.

[35]Curtis O. Byer, Kenneth L. Jones and Louis W. Shainberg, VD (New York, 1974), p. 55.

[36]Ibid.

[37]Ibid.

[38]Ackerknect, p. 123.

[39]Theodore Rosebury, Microbes and Morals: The Strange Story of Venereal Disease (New York, 1971), pp. 145-164.

[40]Ibid.

[41]Ibid.

[42]Ibid. Rosebury devotes several chapters to those who have suffered from syphilis. If further information is sought on historical figures who have had the disease, his book is recommended.

CHAPTER IV

METHODOLOGY OF THE ANALYSIS FOR SYPHILIS RATES IN SEVENTY-FIVE UNITED STATES CITIES

Determining the Sample

The Sample Cities

Seventy-five United States incorporated cities were selected for analysis. They were chosen from the 332 cities listed in the VD Statistical Letter.[1] Thirty of the cities have populations over 200,000 while forty-five of the cities have populations between 50,000 and 200,000.

Since the sixty-three cities with pouplations of 200,000 or more, comprising only 28 percent of the nation's population, accounted for 62.4 percent of the reported cases of syphilis during fiscal year 1975, an effort was made to include as many of these cities as possible.[2] The division of the United States into ten HEW regions made the process of insuring spatial representation more simplified. For these large cities, at least two from each HEW region were included in the sample.[3] The number of cities chosen from each region was determined by the number of cities listed for that particular region. The regions with the most cities listed provided a larger proportion for the sample, for example, ten cities are listed for Region VI so four cities were selected from it while Region VII had five cities listed so the minimum

of two cities were selected from it.[4] A systematic sampling procedure was utilized in extracting the cities from each region. In the case of the cities with a population over 200,000, every third city listed in the VD Statistical Letter in each HEW region was included in the sample. The regions and the cities chosen from those regions are found in Table XV of the Appendix.

Forty-five cities from the 269 cities with populations between 50,000 and 200,000 found in the VD Statistical Letter were chosen using a systematic sampling procedure. Every seventeenth city listed from each region was chosen. Only eight states were not represented in the sample.[5] They are Montana, Wyoming and North Dakota from Region VIII; South Carolina from Region IV; Maryland and West Virginia from Region III; and Vermont and Maine from Region I.

The proportion of cities listed for a particular region to the total number of cities with population between 50,000 and 200,000 determined the number of cities selected from that region. To insure the representation of each region, a minimum of three cities from a region was set. This did result in the more populous regions having a larger sample but because all areas of the United States were included, this was not seen as a problem. A list of the forty-five cities with populations between 50,000 and 200,000 which were selected are found in Table XVI of the Appendix by HEW region.

The locations of the seventy-five selected cities are found in Figure 2. The cities are plotted by means of graduated circles representing the syphilis rates for each city.

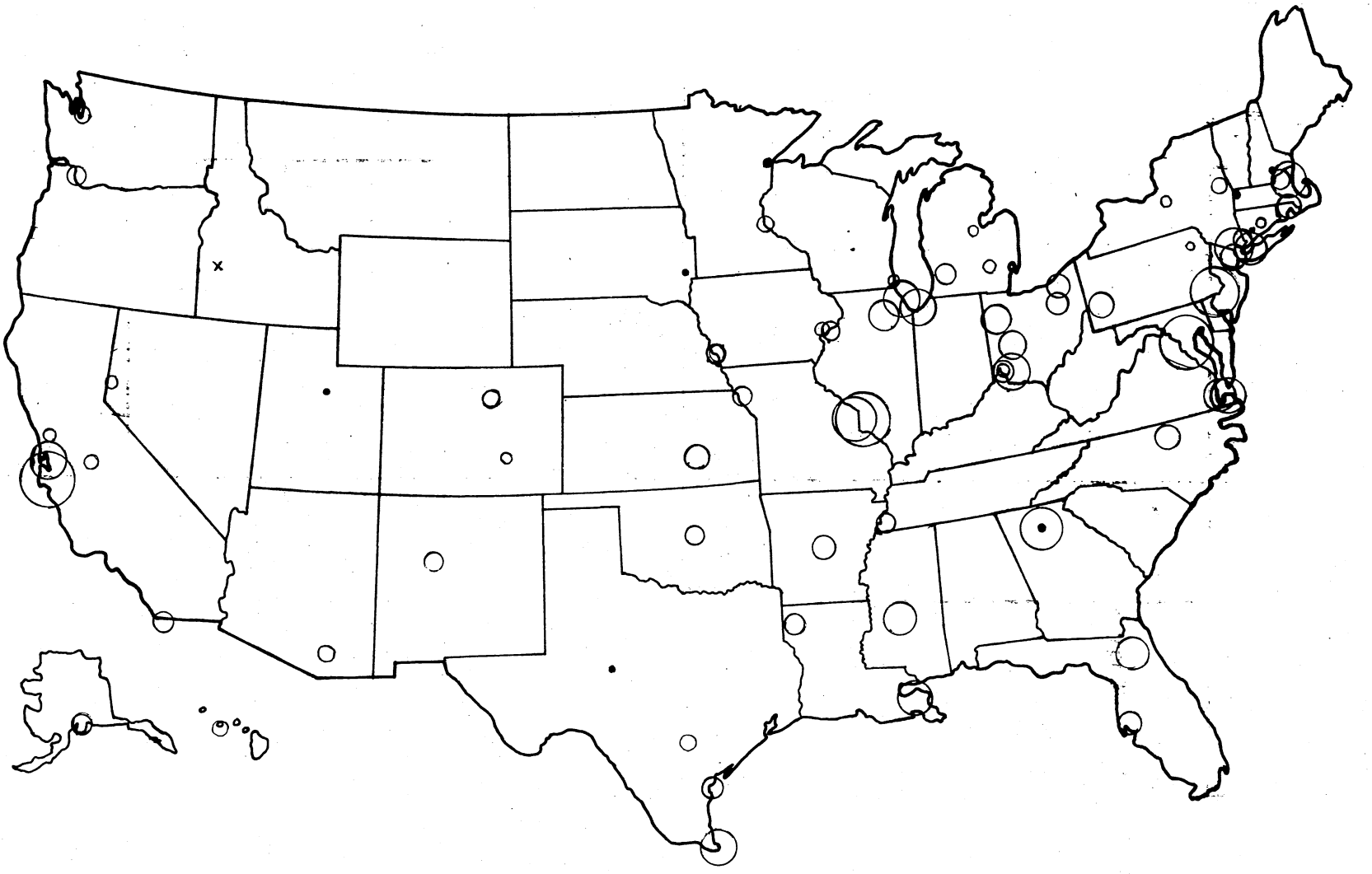


Figure 2. Syphilis Rates and the Location of the Seventy-five Cities in the Sample

Independent Variables

Description. Seventeen socio-economic variables were selected from those listed in the County and City Data Book 1972.[6] These were picked because of their relationship to variables which have been linked to syphilis rates.

There are twelve variables which are demographic in character. Population density per square mile was chosen because it is assumed that the more people there are in an area, the greater the chance of contracting the disease. Also the supposition was made that densely populated areas would be more tolerant of prostitution and homosexuality--both of which contribute to syphilis rates. It has been hypothesized that the denser the population, the higher the syphilis rates.

Another major factor contributing to the incidence of venereal disease is that of race. In 1965, there was a study conducted in the United States which found that "the gonorrhea rate . . . among non-whites was 999.2 per 100,000 as compared to 51.6 per 100,000 for whites,"[7] making the non-white rates nearly twenty times greater than the white rates. Since the race factor is much the same for syphilis rates, it can be assumed that similar ratios exist for both diseases. It is hypothesized that the greater the Negro population, the higher the syphilis rates.

The percent population of foreign stock and the percent population of Spanish heritage were included in the selection as surrogates for ethnicity. It is hypothesized that the higher the value of foreign stock, the lower the syphilis rate. This relationship is expected because of social controls characteristic of ethnic populations. The

same type of relationship is expected between syphilis rates and percent population of Spanish heritage--a special measure of ethnicity.

Since syphilis has long been considered a disease of the "lower classes", several variables were included to test for the economic status.[8] These variables are percent population unemployed, percent population below the low income level and percent population with incomes of 25,000 dollars or more per year. These variables include both the poor population and that portion of the population with above average incomes.

The education level of the sample population is also important.[9] It is hypothesized that the higher the education level, the lower the syphilis rates. The education variables included in the examination are percent of population with five years of formal education and less and the percent of population with four years of college or more.

Since age-specific case rates show young adults to be at greatest risk of acquiring syphilis, the variable of percent population between ages eighteen and sixty-five was included in the sample.[10] It is hypothesized that the larger this value, the higher the syphilis rate.

The percent population living in group quarters and the percent of families with female heads of households are the final two demographic variables. It is assumed that prostitution will be higher in those cities where more females are heads of the household--and if prostitution is more prevalent, syphilis rates will be higher. The same type of relationship is expected with increased numbers of people living in group quarters.[11]

There are three government spending variables also included in the selection. These were chosen to measure the influence of public health

facilities on reporting bias of syphilis rates. Since no specific information was available concerning government spending on venereal disease programs in the selected cities, three variables regarding city government spending on public programs were included instead. They are the percent of city government spending on education, the percent of city government spending on public welfare and the percent of city government spending per capita.[12] It is hypothesized that the greater the spending, the higher the syphilis rates.

Finally, since the southern states of the United States have had traditionally higher syphilis rates, two variables were added to give attention to this geographic factor. They are the mean January and the mean July temperatures. It has been hypothesized that the lower the mean January temperatuare, the lower the syphilis rates; and the higher the mean July temperature, the higher the syphilis rates.

A complete list of the seventeen independent variables is found in Table II.

Procedure

To determine the relative importance of the independent variables in relationship to the dependent variable, a form of multiple linear regression was used.[13]

The computer program used computes multiple linear regression parameters in a stepwise manner, entering first, the independent variable that best helps to predict the dependent variable. The program continues to enter each variable in sequence according to importance until the prediction of the dependent variable does not improve notably. To ensure a maximum number of steps, value limits were set

TABLE II

INDEPENDENT VARIABLES

SYMBOL	VARIABLE
POPXSQMI	Population per square mile
NEGROPOP	Per Cent Negro population
BETWEENA	Per Cent of population between ages 18 and 65
LIVGRQUT	Per Cent of population living in group quarters
FORSTOCK	Per Cent of population of foreign stock
SPANHERG	Per Cent of population of Spanish heritage
LOSCHOOL	Per Cent of population with 5 years of schooling or less
COLLEGES	Per Cent of population with 4 years of college or more
UNEMPLOD	Per Cent of population unemployed
FAMEHEAD	Per Cent of families with a female head
RICHONES	Per Cent of pop. with incomes of 25,000 dollars or more per year
FMLOWINC	Per Cent families below the low income level
CTGOVPED	Per Cent City government spending on education
CGPUBWEL	Per Cent City government spending on public welfare
CGPERCAP	Per Cent City government spending per capita
JANTEMPT	Mean January temperature
JULYTEMP	Mean July temperature

Source: U.S. Dept. of Commerce, Bureau of the Census, County and City Data Book, 1972 (A Statistical Abstract Supplement). "Table 6-Cities," Washington, D. C.: U. S. Government Printing Office, 1972, pp. 630-797.

for the F-to-enter and F-to-remove at the 0.05 and 0.04 levels respectively. A program without these restrictions was also run to determine the amount of variation in the independent variables which add notably to the prediction of syphilis rates.

In addition to analyzing the variables by the use of multiple linear regression, a second technique was used as a purely descriptive method for illustrating the relationships between syphilis rates and the independent variables. Chi-square analysis was chosen to compare the observed and expected frequencies of low, medium and high syphilis

rates to independent variables values above and below the mean for that particular variable. It was also utilized to compare several independent variables with each other. The categories chosen for low, medium and high syphilis rates are:

Low = less than twenty-five cases of syphilis per 100,000 population

Medium = between twenty-five and sixty cases of syphilis per 100,000 population

High = greater than sixty cases of syphilis per 100,000 population

These particular categories were chosen because when the data are ranked in order from the highest to the lowest number then divided into tritiles, twenty-five and sixty are the cut-off points for the second and third categories. These made reasonable dividing points for the different categories of syphilis rates.

FOOTNOTES

[1]U. S. Department of Health, Education and Welfare, Public Health Service Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Statistical Letter, May 1976, pp. 3, 30-36.

[2]U. S. Department of Health, Education and Welfare, VD Fact Sheet 1975: Basic Statistics on the Venereal Disease Problem in the United States, ed. 32, p. 13.

[3]An exception was made in the case of Regions I and VIII since only one city in each region was listed. Region IX had only two cities listed so they were both included in the sample.

[4]The largest number of cities from any one region is five.

[5]No cities from Wyoming, Maryland or Vermont were listed in the VD Statistical Letter.

[6]U. S. Dept. of Commerce, Bureau of the Census, County and City Data Book, 1972 (A Statistical Abstract Supplement). Washington, D. C. U. S. Government Printing Office, 1972.

[7]U. S. Department of Health, Education and Welfare, VD Fact Sheet 1975, p. 13.

[8]Berkeley Hill. Syphilis and Local Contagious Disorders (London, 1868), p. 34.

[9]Thomas Parran, Shadow on the Land: Syphilis (New York, 1937), p. 103.

[10]This was the smallest division of ages most susceptible to venereal disease available due to the nature of the data. U. S. Department of Health, Education and Welfare, VD Fact Sheet, 1975, p. 24.

[11]Hill, p. 35.

[12]Some difficulty was encountered in the use of the spending variables for some of the cities do not have welfare programs or education funds. They are managed by state or county. Those states which are missing data for welfare and education both are Honolulu, Tucson, Rome, New York--welfare only are Yonkers, New York, Albuquerque, New Mexico, Albany, New York, and Shreveport, Louisiana.

These cities all had very low syphilis rates so their affect on the results are expected to be minimal.

[13]The data were coded, punched on cards and then analyzed by the BIOMED P2R computer program version of stepwise regression. W. J. Dixon, ed., BMDP: Biomedical Computer Programs (Berkeley, 1975) pp. 491-539.

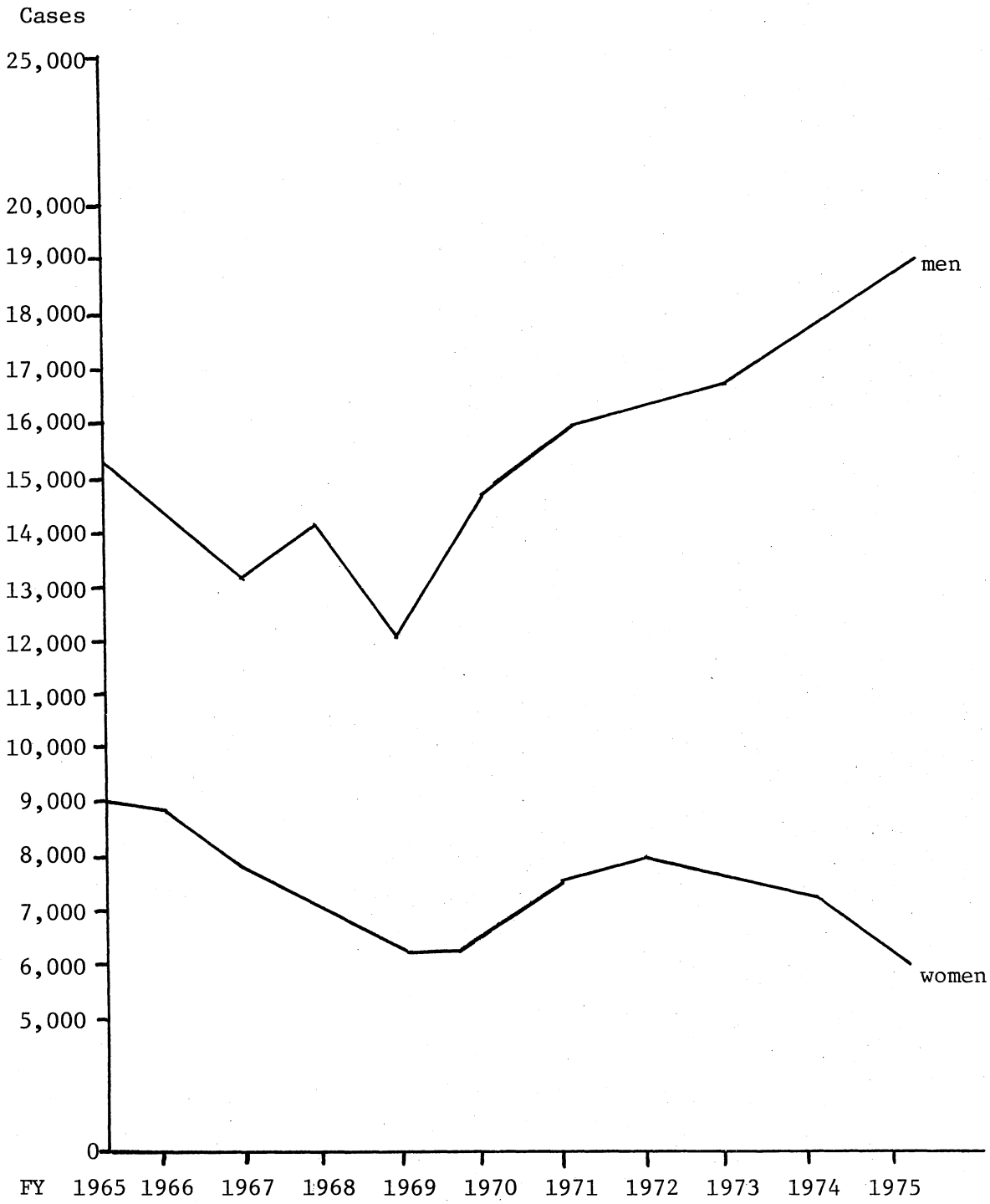
CHAPTER V

RESULTS OF THE ANALYSIS

Importance of Variables

At one time there were thought to be certain "predisposing causes" linked with the spread and severity of syphilis. They are climate, starvation, dirt, overcrowding, new districts or races, age and individual liability.[1] Today it is known that anyone may contact syphilis but there is a higher incidence of the disease in certain segments of the population. Men account for far more reported cases than women. The division of reported cases by sex for the years 1965 to 1975 is shown in Figure 3. In FY 1975, 71.5 percent of the cases reported were from men while women accounted for only 28.5 percent of the cases. At the same time, male contagion increased by 7.8 percent over FY 1974 and female contagion decreased by 4.2 percent. There is no explanation for the difference in rates unless it can be attributed to the difference in reporting methods.[2]

Primary and secondary syphilis is reported most often from large urban areas. This fact was further established by research presented in a paper by Mary Ellen Mazey and Robert Davis, entitled "Venereal Disease and Urbanization in West Virginia." It was found that there was a significant positive correlation between venereal disease rates, physicians per 1,000 population and an urbanization factor.[3]



Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Fact Sheet, 1975, ed., 32.

Figure 3. Primary and Secondary Syphilis Cases by Sex, United States: FY 1965-1975.

This chapter examines the results of correlating seventeen independent variables with syphilis rates for seventy-five United States cities.

Variable Organization

For simplicity in handling the seventeen independent variables they have been divided into thre major categories: those which are demographic in character; those concerned with city government spending; and those of geographical variation.

A list of the variables by their computer code name, their step in the stepwise regression analysis, the improvement in R and R-square and the F-ratio for each variable is found in Table III. It is seen that only three of the seventeen variables explain any notable amount of the total variance. They are percent Negro population, percent of families with a female head of household and city government spending per capita. However, when the percent Negro population was controlled for, the percent of population of foreign stock and population density per square mile also added notably to the explanation.

A correlation matrix of the seventeen independent variables is found in Table IV. This matrix has been separated into the three major categories mentioned above. These correlations will be discussed along with the results of the analysis in the following text, beginning with the variables of demographic concern.

TABLE III

R, R-SQUARE AND F-RATIO'S FOR SIXTEEN SIGNIFICANT INDEPENDENT VARIABLES

Step Number	Variable	Improvement in R	Improvement in R-square	F-ratio
1	NEGROPOP	0.7640	0.5838	102.376*
2	FAMFHEAD	0.8125	0.6601	69.917*
3	CGPERCAP	0.8453	0.7146	59.249*
4	CGPUBWEL	0.8537	0.7288	47.026*
5	JULYTEMP	0.8588	0.7376	38.783*
6	JANTEMPT	0.8636	0.7457	33.241*
7	UNEMPLOD	0.8659	0.7498	28.687*
8	CTGOVPED	0.8673	0.7522	25.038*
9	SPANHERG	0.8684	0.7540	22.242*
10	POPXSQMI	0.8694	0.7559	19.815
11	FMLOWINC	0.8710	0.7587	18.004
12	FORSTOCK	0.8722	0.7608	16.429
13	COLLEGES	0.8726	0.7615	14.981
14	BETWEENA	0.8736	0.7631	13.808
15	LIVGRQUT	0.8746	0.7650	12.805
16	RICHONES	0.8749	0.7655	11.831

*Significant at the .05 level or above.

TABLE IV

A CORRELATION MATRIX FOR THE INDEPENDENT VARIABLES AND SYPHILIS RATES

	SPHRATES	BETWEENA	LIVGRQUT	COLLEGES	RICHONES	POPXSQMI	UNEMPLOD	LOSCHOOL	FMLOWINC
Demographic Variables									
BEWTEENA	0.10								
LIVGRQUT	0.00	0.68*							
COLLEGES	-0.04	0.81*	0.52*						
RICHONES	0.06	0.60*	0.23*	0.63					
POPXSQMI	0.49*	0.36*	0.04	0.04	0.10				
UNEMPLOD	0.20*	-0.02	0.06	-0.12	-0.08	-0.08			
LOSCHOOL	0.31*	-0.30*	-0.13	-0.28	-0.22*	--.09	-.15		
FMLOWINC	0.46*	-0.32*	-0.12	-0.19	-0.19	-0.02	0.25*	0.81	
NEGROPOP	0.76*	0.03	0.06	-0.15	0.00	0.34*	0.17	0.21*	0.43*
FORSTOCK	-0.03	0.23*	0.06	0.08	0.11	0.51*	-0.15	0.21*	-0.14
SPANHERG	0.04	-0.28*	-0.17	0.52*	0.23*	0.04	0.05	-0.13	-0.12
FAMFHEAD	0.64*	-0.13	-0.05	-0.16	-0.16	0.39	0.24*	0.71	0.78*
Government Spending Variables									
CTGOVPED	-0.21*	-0.31*	-0.11	-0.12	-0.25*	-0.28*	-.12	-0.03	0.03
CGPUBWEL	0.23*	0.15	0.05	0.03	0.02	0.27*	0.29*	-0.08	-0.08
CGPERCAP	0.36*	0.33	0.08	0.17	0.27*	0.55*	-0.03	-0.19	-0.23*
Geographic Control Variables									
JANTEMPT	0.21	0.09	0.01	0.13	0.08	-0.07	0.09	0.50*	0.60*
JULYTEMP	0.06	-0.33	-0.16	-0.19	-0.26*	-0.15	-0.22	0.46*	0.53*

TABLE IV (Continued)

	NEGROPOP	FORSTOCK	SPENHERG	FAMFHEAD	CTGOVPED	CGPUBWEL	CGPERCAP	JANTEMPT	JULYTEMP
FORSTOCK	-0.36*								
SPANHERG	-0.019	-0.17							
FAMFHEAD	0.54*	0.16	0.44*						
Government Spending Variables									
CTGOVPED	-0.03	-0.33*	0.03	-0.07					
CGPUBWEL	0.01	0.18	0.09	-0.02	-0.25*				
CGPERCAP	0.19	0.31*	-0.12	0.06	-0.36*	0.56*			
Geographic Control Variables									
JANTEMPT	0.16	-0.02	0.40*	0.31*	-0.27*	-0.02	-0.10		
JULYTEMP	0.28*	-0.37	0.29*	0.23*	0.06	-0.31*	-0.31*	0.46*	1.00

*Significant at the .05 level or above.

Demographic Variables

A list of the twelve demographic variables and their computer code names is found in Table V. The first four variables included in this group of demographic variables have strong correlations with each other and very weak correlations with syphilis rates of the seventy-five sampled cities as can be seen from Table IV. In this case, weak correlations can be nearly as valuable as the presence of strong correlations, for it eliminates these variables as major factors contributing to high syphilis rates in the United States.

TABLE V

THE DEMOGRAPHIC VARIABLES AND THEIR COMPUTER CODE NAMES

Code Name	Variable
BETWEENA	Percent of population between ages 18 and 65
LIVGRQUT	Percent of population lining in group quarters
COLLEGES	Percent of population with four years of college or more
RICHONES	Percent of population with incomes of $25,000 or more
POPXSQMI	Population density per square mile
UNEMPLOD	Percent of population unemployed
LOSCHOOL	Percent of population with 5 years of education or less
FMLOWINC	Percent of families below the low income level
NEGROPOP	Percent Negro population
FORSTOCK	Percent of population of foreign stock
SPANHERG	Percent of population of Spanish heritage
FAMFHEAD	Percent of families with a female head of household

The first variable BETWEENA (percent of population between the ages of eighteen and sixty-five) was chosen for its hypothetical relationship to the higher "risk" ages found in contracting syphilis. Age was assumed to be important because "age-specific case rates for primary and secondary syphilis show young adults (20-24) to be at a greater risk of acquiring the disease."[4] A more specific age variable was not available for all cities in the sample. A younger age group would have been preferred. However, the percent of population between ages eighteen and sixty-five does eliminate the very young and very old, who have characteristically low syphilis rates, but age is becoming less and less of a factor in explaining syphilis rates.

The variable BETWEENA may not be related to syphilis rates but it is important when compared to the variables LIVGRQUT, COLLEGES and RICHONES. There are strong correlations between those living in group quarters with four years of college or more, who have incomes of 25,000 dollars or more per year and are between the ages of eighteen and sixty-five. These correlations help to support the theory that syphilis is not necessarily limited to the poor and the uneducated.

The next four variables characterize the lower income segment of the population. They are the percent of the population unemployed (UNEMPLOD), the percent of the population with five years or less of formal education (LOSCHOOL), the percent of families below the low income level (FMLOWINC) and the population density per square mile (POPXSQMI). It was hypothesized that each of these variables would have a strong correlation with syphilis rates. It can be seen from Table IV that the variables do, in fact, have significant correlations with syphilis rates.

The variable POPXSQMI showed a highly significant relationship with syphilis rates. This is a relationship which was not mentioned in any of the more recent research concerned with venereal disease.[5] It can then be assumed that the denser the population of a city, the more likely it will have high syphilis rates.

A variable more commonly associated with syphilis rates is the size of the city. As indicated earlier, primary and secondary syphilis is reported most often from large urban areas. Yet when the data for the seventy-five cities in the sample were examined by the chi-square analysis method--Table XVII in the Appendix--no relationship was found between city size and syphilis rates. This finding tends to disprove a relationship hypothesized by several previous authors.[6]

The percent of families below the low income level (FMLOWINC), the percent of the population with five years or less of formal education (LOSCHOOL) and the percent of the population unemployed (UNEMPLOD) are all significantly related to syphilis rates. However, these variables alone do not contribute notably to the explanation of the variance in the stepwise regression analysis as indicated by Table III. Combining the four variables, it can be assumed that low incomes, high unemployment rates, low education levels and densely populated areas all contribute to high syphilis rates.

Percent population of foreign stock (FORSTOCK) and percent population of Spanish heritage (SPANHERG) has no significant relationship with syphilis rates, except when NEGROPOP was forced last in the stepwise regression analysis (shown in Table VIII). In addition, its partial r at entry is negative, thus when the number of people of foreign stock increases, syphilis rates decrease. Process of forcing

NEGROPOP last will be discussed to a greater extent in the following pages.

NEGROPOP and FAMFHEAD, on the other hand, have strong positive correlations with syphilis rates and are entered first and second in the regression analysis. It also is important to note that these two variables have strong correlations with each other, which supports the well-known fact that the Negro population contains numerous female heads of households.

The eight cities in the sample with twenty percent or more of families having females as heads of household, the Negro population and the corresponding syphilis rates are found in Table VI. It is noted that all of these cities have syphilis rates of over 100 per 100,000 population. Five of the cities also have high Negro populations.

TABLE VI

CITIES WITH TWENTY PERCENT OR MORE OF FAMILIES HAVING FEMALES AS HEADS OF HOUSEHOLD AND THE CORRESPONDING SYPHILIS RATES

City	FAMFHEAD	NEGROPOP	SPHRATES
Brownsville, Texas	49.3	0.0	123.3
East St. Louis, Illinois	29.1	69.1	275.9
Washington D.C.	25.2	71.1	268.1
Wilmington, Delaware	24.1	10.0	222.1
Boston, Massachusetts	22.5	16.3	110.9
New Orleans, Louisiana	21.3	45.0	105.1
Atlanta, Georgia	21.3	51.1	164.0
St. Louis, Missouri	21.2	40.9	183.0
East Orange, New Jersey	21.0	15.1	133.5

TABLE VII

RELATIONS OF SYPHILIS RATES
TO SELECTED VARIABLES

Variable	Increase in Explained Variance %	Partial r at Entry	Simple r
NEGROPOP	58.4	.76	.76*
FAMFHEAD	66.0	.43	.64*
CGPERCAP	7.15	.40	.36*
CGPUPWEL	72.9	.22	.23*
JULYTEMP	73.8	-.18	.06
JANTEMPT	74.6	.18	.21*
UNEMPLOD	75.0	-.13	.20*
CTGOVPED	75.2	-.10	-.21*
SPANHERG	75.4	.09	.04
POPXSQMI	75.6	.09	.49*
FMLOWINC	75.9	.11	.46*
FORSTOCK	76.1	-.09	-.03
COLLEGES	76.2	.06	-.04
BETWEENA	76.3	-.08	.10
LIVGRQVT	76.5	.09	.00
RICHONES	76.6	.04	.06

*Significant at the .05 level or above.

TABLE VIII

RELATIONS OF SYPHILIS RATES TO SELECTED VARIABLES, 1975, NEGRO POPULATION FORCED LAST

Variable	Increase in Explained Variance %	Partial r at Entry	Simple r
FAMFHEAD	41.4	.64	.64*
CGPERCAP	52.1	.43	.43*
FORSTOCK	57.9	-.35	-.35*
POPXSQMI	62.1	.31	.31*
CTGOVPED	63.4	-.18	-.18
JULYTEMP	64.6	-.18	-.18
FMLOWINC	66.1	.21	.21*
SPANHERG	66.8	-.14	-.14
JANTEMPT	67.1	.08	.08
CGPUPWEL	67.3	.09	.09
LOSCHOOL	67.5	.07	.07
UNEMPLOD	67.6	-.07	-.07
RICHONES	67.8	.06	.06
BETWEENA	67.8	-.04	-.04
NEGROPOP	76.1	.51	.51*

*Significant at the .05 level or above.

Since it is characteristic of the stepwise multiple regression that the first variable entered seems stronger than it actually is, an attempt was made to control this bias. Another regression problem was run to control for NEGROPOP by forcing it last in the regression analysis. Also limitations were lifted so only those variables which contribute notably to the variance would be entered. The results of three separate analyses are presented in table form for ease in comparing them, Tables VII, VIII and IX respectively. The increase in explained variance, the partial r at entry and the simple r are included in each table.

TABLE IX

RELATIONS OF SYPHILIS RATES WITH SELECTED VARIABLES WHEN ONLY THOSE WHICH NOTABLY PREDICT SYPHILIS RATES ARE INCLUDED: NEGRO POPULATION FORCED LAST

Variable	Increase in explained Variance %	Partial R at entry	Simple R
FAMFHEAD	41.4	.64	.65*
CGPERCAP	52.1	.43	.36*
FORSTOCK	57.9	-.35	-.03
POPXSQMI	62.1	.31	.49*
NEGROPOP	71.8	.51	.76*

*Significant at the .05 level or above

When NEGROPOP was forced last the percent families with female heads entered first in the stepwise regression, as was expected. FAMFHEAD explains 41.4 percent of variance in Tables VIII and IX compared to only 7.6 percent in Table VII. This difference accounted for by the large number of Negro families that have females as heads of the household.

There are several reasons why FAMFHEAD is significantly related to high syphilis rates. First of all, there is a strong relationship between this variable and economic indicators. It can be seen from Table IV that FAMFHEAD is strongly related to the poor and uneducated who are often found in densely populated areas. These are also three variables which have high correlations with syphilis rates. It also can be assumed that many of these women are public welfare recipients since it is already known that many of them are living below the poverty level. This means that they must utilize public health facilities to the maximum. They would use abortion clinics, obstetric facilities and regular health facilities , all of which require venereal disease testing for various ailments. Plus many women not living in areas where public facilities are available will travel to these areas of gynecological reasons. This tends to raise rates in low income areas and lower them in the areas without such facilities.

The strong correlation bewteen syphilis rates and families with female heads of household is curious since the number of women being treated for syphilis is decreasing. There is a possibility that the number of asymptomatic cases is increasing causing a larger number of men to be infected before the disease is suspected. There is also a possibility that prostitution may influence the rising syphilis rates,

but since this a difficult variable to measure--no proof is available at the present time.

NEGROPOP. The single most important variable in explaining syphilis rates of the United States in 1975 is percent Negro population. It explains over one half of the entire variance (58.4 percent). This supports the theory that the non-white population has a higher syphilis rate than the white population of the United States.

Table IV shows that NEGROPOP is positively related to FAMFHEAD. At the same time, it is negatively correlated to FORSTOCK and SPANHERG, indicating that very few people of Spanish decent and from other foreign countries are located in the same cities where there are high ratios of Negro populations.

According to the correlation coefficients of Table IV, NEGROPOP is strongly related to SPHRATES, POPXSQMI, FAMFHEAD, FMLOWINC and to a lesser degree, LOSCHOOL--all of which are related to the poor in densely populated areas. It is important to note that high syphilis rates are related to all the same variables as NEGROPOP, and in every case they are correlated to SPHRATES stronger than to NEGROPOP. This raises the question of whether or not Negroes are contracting more syphilis, or is their socio-economic status the reason for the higher syphilis rates.

When NEGROPOP was controlled for as illustrated in Table VIII, nearly all the variables entered were insignificant. Eight of the independent variables explain only 1.7 percent of the variance in the forced run and ten of them explain 1.6 percent of the variance in the non-forced run. Also Table IX shows the results of forcing

NEGROPOP when no enter or remove constraints are present, so only those variables which contribute notably to the variance are entered. It explains an additional 8.3 percent of the variance in the forced runs whether there are fifteen or five variables entered.

It would seem from the analysis of NEGROPOP that the higher the Negro population of a city, the higher its syphilis rates. However, not all cities with high Negro populations have high syphilis rates. Table X shows eight cities in the sample which have lower than the mean syphilis rates and higher than the mean NEGROPOP. It is interesting to note that six of the eight cities are located in the states which are considered traditionally Southern--a fact which will be discussed in greater extent in Chapter VI.

TABLE X

CITIES WITH SYPHILIS RATES LESS THAN THE MEAN AND NEGRO POPULATION GREATER THAN THE MEAN

City	Syphilis Rates	Negro Population
Durham, North Carolina	55.3	38.7
Little Rock, Arkansas	51.5	25.0
Tampa, Florida	49.3	19.7
Akron, Ohio	49.8	17.5
Louisville, Kentucky	42.4	23.8
Shreveport, Louisiana	40.3	33.5
Memphis Tennessee	35.8	38.9
Saginaw, Michigan	9.1	24.3

Government Spending Variables

The variables referred to as government spending variables include city government spending on education (CTGOVPED), city government spending on public welfare (CGPUBWEL) and city government spending per capita (CGPERCAP). It has been hypothesized that the higher the city government spending, the higher the syphilis rates.

It is assumed that the more a city spends on public programs, the higher the syphilis rates will be. This is a possible indication of increased public health facilities which have higher reporting rates and better follow-up success than private physicians.

An important variable, possibly giving some insight into the control of venereal diseases, is that of city government spending on education. Where the spending is greater the syphilis rates were found to be less. This might indicate that an educated society has a better chance of controlling the disease. This also might be typified by the large amount of money spent on educating the public about the seriousness of venereal disease prior to the near eradication of syphilis in the mid 1950's.

City government spending per capita and on public welfare, on the other hand, are positively related to syphilis rates. Thus, the higher the spending--the higher the rates. Much of this variance is expected to be related to increased reporting from public health facilities. CGPUBWEL and CGPERCAP are also negatively correlated to CTGOVPED, and are positively correlated to each other. It is interesting to note that none of the spending variables are significantly correlated to NEGROPOP or FAMFHEAD.

The spending variables do take on more importance when examined in the stepwise regression analysis. CGPERCAP and CGPUBWEL are the third and fourth steps, respectively, in the regression results, as can be seen in Table VII.

When NEGROPOP is controlled for, CGPERCAP explains more of the variance as shwon in Tables VIII and IX. It becomes the second variable entered, explaining 11.7 percent of the total variance in syphilis rates, while CGPUBWEL is no longer significantly correlated to syphilis rates.

An additional method of testing was necessary to determine why syphilis rates increase with increased government spending. Since the stepwise regression analysis did not provide any insights into this problem, a chi-square test was used to compare several sets of independent variables.

First NEGROPOP was compared to CGPERCAP, but this test proved to be insignificant--consistent with the results of Table IV. The results for this test are in Table XXIX of the Appendix.

Since government spending has been the key to reduced syphilis rates in the past, it is considered too important of a variable to be dismissed so easily. It is felt that "the nonreporters are, private physicians protecting their patients against disclosure,"[7] a statement which is supported by the fact that in 1975, 62 percent of all cases of syphilis reported in the United States were reported by public health facilities. This is further influenced by the fact that in the same year, 71.7 percent of all primary and secondary cases of syphilis were reported by such facilities.

The chi-square analyses proved to be insignificant in controlling for public health reporting. They are NEGROPOP and percent private cases and percent private cases and CGPERCAP. These results are in Tables XXX and XXXI of the Appendix.

One successful test is the comparison of total syphilis rates with latent and late latent syphilis rates--the stage which lasts from two to twenty years and has no clinical signs or symptoms. When the late and late latent syphilis rates of the thirty sample cities with populations over 200,000 were compared to the total syphilis rates of those same cities, a significant relationship was found. The results of which are in Table XXXII of the Appendix. As can be expected, as the total syphilis rates rise, so do the late and late latent stages of the disease. Thus, those cities with higher syphilis rates have all stages of the disease.

Another positive relationship was found when comparing percent private cases with total syphilis rates. As the percent private cases increases so does the percent of total syphilis cases--contrary to the expected relationship. It was expected that the percent of private cases would decrease with rising syphilis rates due to the availability and use of public health facilities. The results of this test are in Table XXXIII of the Appendix.

Geographic Control Variables

The final pair of variables are those which were included to attempt to control for geographis variations--in particular, to distinguish the South from the North, because the South has been

traditionally associated with higher syphilis rates. These two variables are the mean January and July temperatures (JANTEMPT and JULYTEMP).

JANTEMPT and JULYTEMP were found to be relatively insignificant in their relationship to high syphilis rates. They were the fifth and sixth steps in the regression model and did not contribute notably to the variance in syphilis rates. However JANTEMPT does have a significant correlation with syphilis rates in the correlation matrix--Table IV. This means that the higher the mean January temperature, the higher the syphilis rates. This reinforces, to some extent, the hypothesis that the southern states have higher syphilis rates than the northern states. The geographic variations of syphilis rates will be discussed to a greater extent in Chapter VI.

Chi-Square Analysis

In addition to the chi-square analyses already mentioned, several other tests were also made. Stepwise regression was used for the initial discovery of relationships between syphilis rates and the independent variables, and chi-square tests were used for further analysis of the significant variables.

In most cases the chi-square analysis reinforced the results of the regression analysis but there were several interesting contradictions. For instance, the percent of the population unemployed was significant in the correlation matrix but insignificant when a chi-square analysis was used, as indicated by Table XXIV in the Appendix. On the other hand, FAMFHEAD was the second most important variable in the stepwise regression model but when it was tested by the chi-square

method, it proved to be insignificant. However, this difference may be due to the way in which the variables were grouped.

Chi-square was also valuable in comparing variables which were not in the original seventeen with significant variables of the stepwise regression. This provided some insight into why these variables were significant. In example of this use was illustrated in the section on government spending variables.

The results of the chi-square analysis tests are found in Tables XVII through XXXV of the Appendix.

Summary

A review of the seventeen independent variables does give some insight into the areas where stronger syphilis control programs are needed. It shows that syphilis rates are highest in densely populated areas where there are high proportions of Negroes and females are heads of households. Per capita spending by government is also higher in these cities but the relationship could not be directly correlated to welfare spending.

A possible factor in high syphilis rates may be due to higher rates of prostitution in the centers of densely populated areas. Also homosexuals are more often found in these areas. Male homosexuality is known to have a direct relationship to the high syphilis rates in San Francisco.[8] This may also help to explain why males have much higher syphilis rates than females. Both homosexuality and prostitution may be contributors to high rates, but not until one controls for these factors, will reasons for high syphilis rates become more clear.

It is felt that this chapter contributes to the present knowledge of syphilis rates in several ways. First, it is found that syphilis rates are not as directly related to the size of a city as they are related to the density of population of that city. Secondly, syphilis rates are found to be higher in cities where there are a larger number of females as sole supporters of a family--a trend that may be a key to controlling syphilis rates as the number who choose to remain unmarried increases. This may be related to an increasing number of untreated syphilis cases because no symptoms are present. Better education and better public health facilities are necessary to combat this trend. Finally, Negro population is still found to be a major factor in high syphilis rates. Further research is needed to determine if this is due to socio-economic reasons or perhaps a heredity susceptability to the disease.

FOOTNOTES

[1]Berkeley Hill, Syphilis and Local Contagious Disorders (London, 1968), p. 34.

[2]U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Fact Sheet 1975, Ed. 32, p. 17.

[3]Robert Davis and Mary Ellen Mazey, "Venereal Disease and Urbanization in West Virginia," The Virginia Geographer VIII, Fall-Winter, 1973, p. 5.

[4]U. S. Department of Health, Education and Welfare, VD Fact Sheet 1975, Ed. 32, p. 17.

[5]Hill mentions the relationship bewteen density of population and syphilis rates in 1868, but no later references to this variable have been found.

[6]Lasagna, Parran, Moore, etc.

[7]Theodore Rosebury, Microbes and Morals: The Strange Story of Venereal Disease (New York, 1971), p. 267.

[8]Curtis O. Byer, Kenneth L. Jones and Louis W. Shainberg, VD (New York, 1974), p. 8.

CHAPTER VI

GEOGRAPHIC VARIATIONS IN SYPHILIS RATES, SELECTED YEARS 1925-1975

General Trends

Wide variations in reported case rates characterize the geographic distribution of syphilis in the United States. Berkeley Hill, in 1868, felt that climate was a major factor in contracting syphilis. He felt cold climates rendered the disease more severe by "lowering the vital energy of the patient,"[1] and they promoted its spread by "encouraging dirty habits and promiscuous herding together."[2] This idea, however, was reversed in the United States for venereal disease in the southern states surpassed that of the northern states immensely. Once possible reason for the high rates in the southern states is the confusion of syphilis with another treponeme, yaws, which is a non-sexually transmitted disease common in the warmer climates. Before Nelson and Mayer developed the treponemal immobilization test for syphilis in 1949, yaws was often misdiagnosed as syphilis for it reacted positively to blood tests commonly used in the detection of syphilis.[3]

Yaws is a disease most often found in warmer climates. "Before the WHO assisted, mass campaigns with penicillin were mounted on any great scale, it was estimated that 50 million cases existed, half of them in

Africa."[4] The slave trade introduced the disease in the United States, concentrating it in those areas of high ratios of Negro population. It is a disease which is very rare in people of European stock even when they are living in those areas of high infection. Since the southern states have a higher Negro population than the northern states, there is a possibility that yaws could have contributed to the high syphilis rates before testing methods were improved. However, this cannot be proven for it is impossible to retest earlier cases.

Today the Southern and East Coast states still have the highest syphilis rates, leaving a core of north central and western states with relatively low rates. An examination of Figures 4 through 9 shows that these differences were much greater in those years before and immediately after the discovery of penicillin. The years after 1945 show a rapid decrease in syphilis rates due to a combination of government programs to combat the disease and an effective method of treatment.

The decrease in syphilis rates since 1925 can be seen in Table XVII. In 1975 the syphilis rate per 100,000 population for the United States was 39.9 cases compared to 282.3 cases in 1945. This is a difference of over 700 percent in thirty years.

There is even a more pronounced change in syphilis rates when the data on individual states is taken into consideration. When those states with the highest syphilis rates in each ten year interval are examined, it can be seen that the percent difference between the earlier year and the 1975 rate for that same state is considerable. Mississippi had the highest syphilis rates for both 1935 and 1945--757.6 and 1026.6 respectively. This made the percent change in rates over 2,000 and 3,000

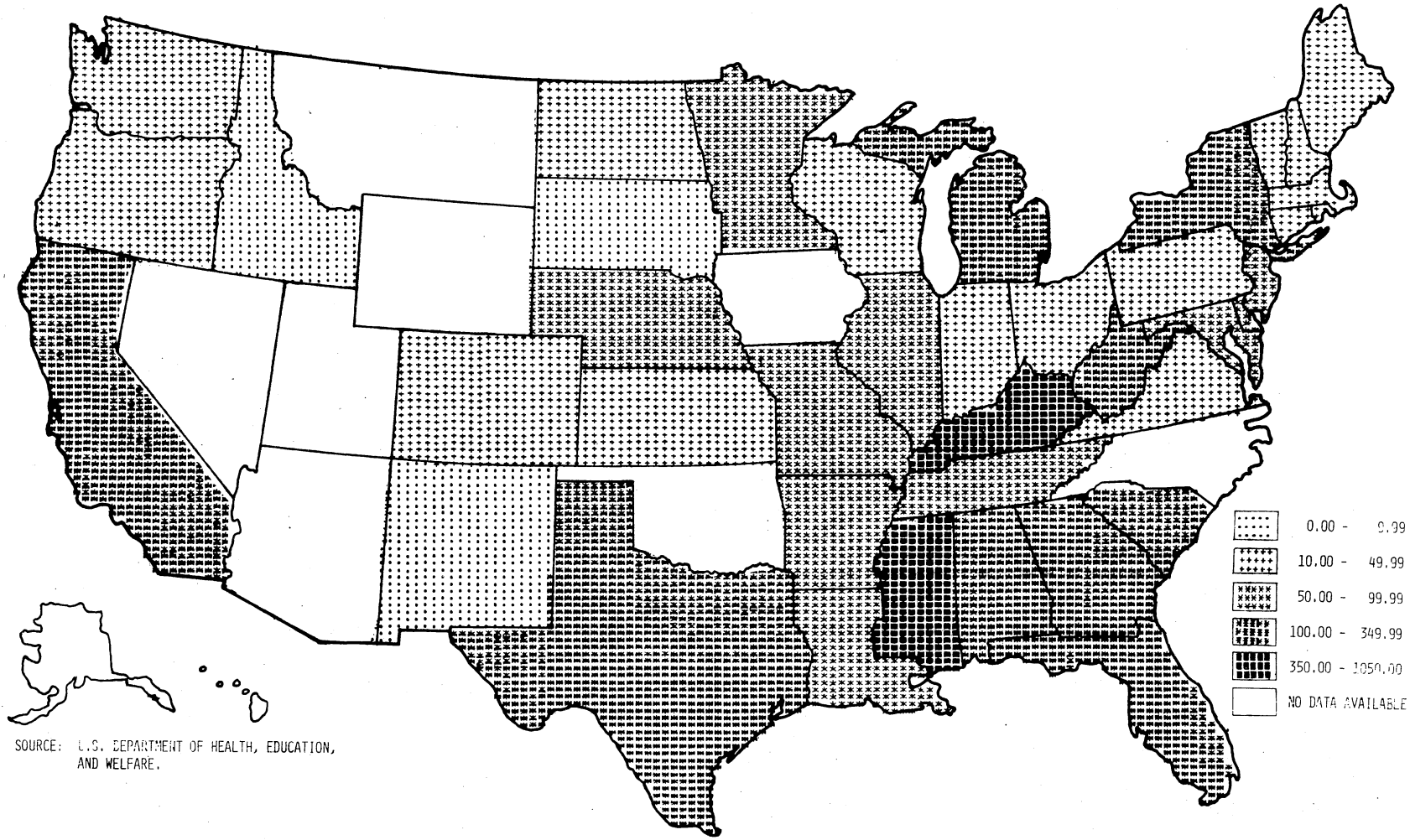


Figure 4. Total Syphilis Rates per 100,000 Population by State for 1925

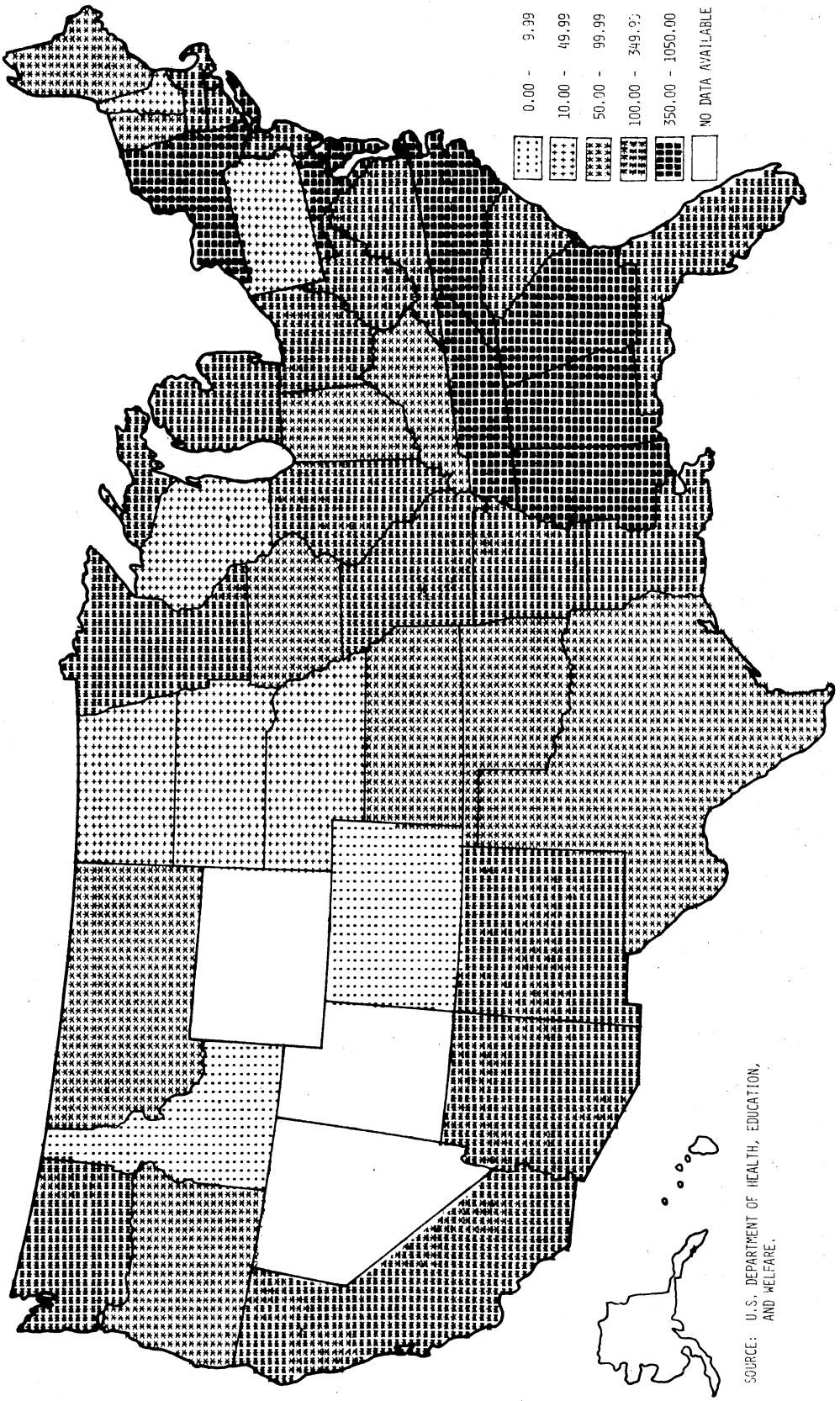


Figure 5. Total Syphilis Rates per 100,000 Population by State for 1935

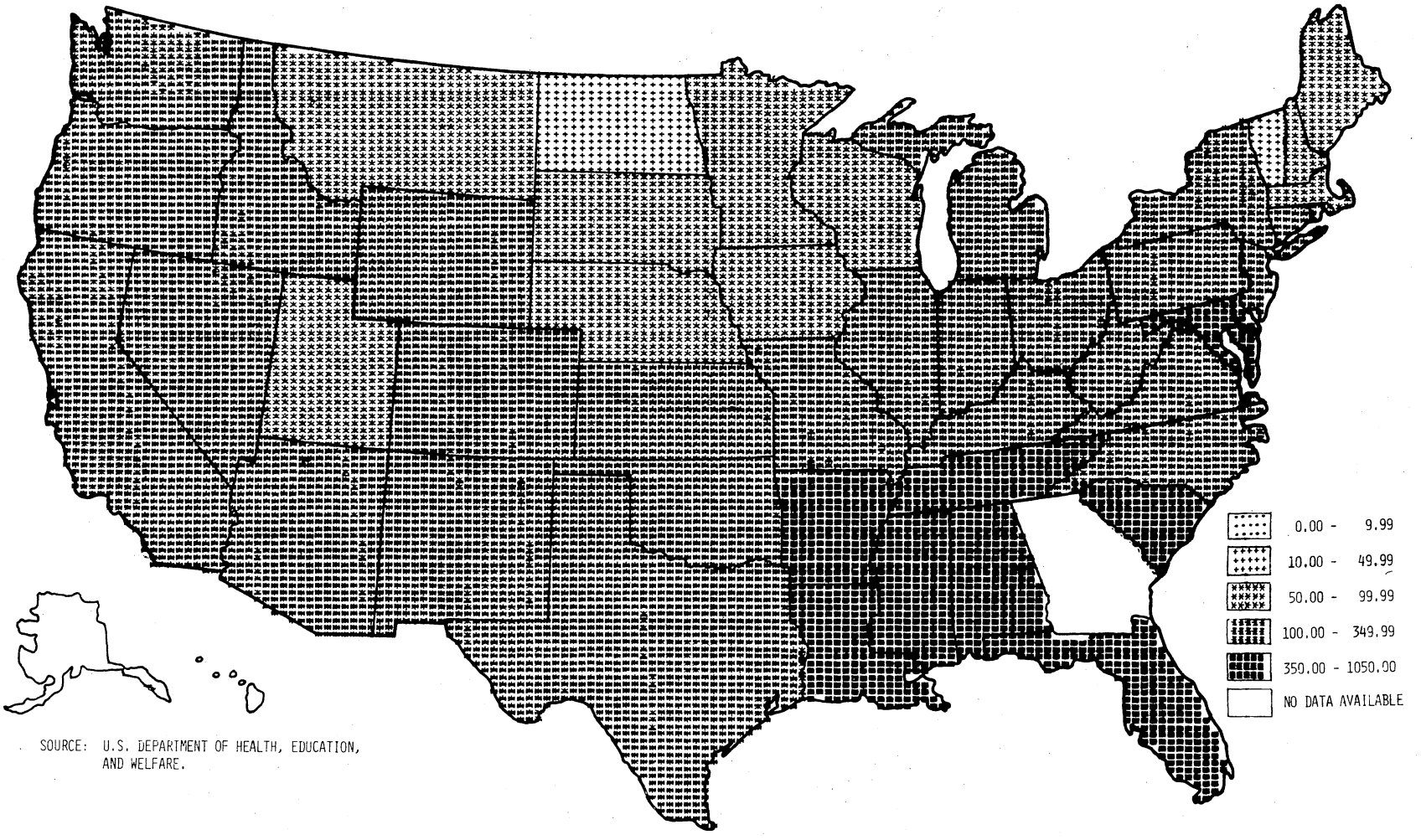


Figure 6. Total Syphilis Rates per 100,000 Population by State for 1945

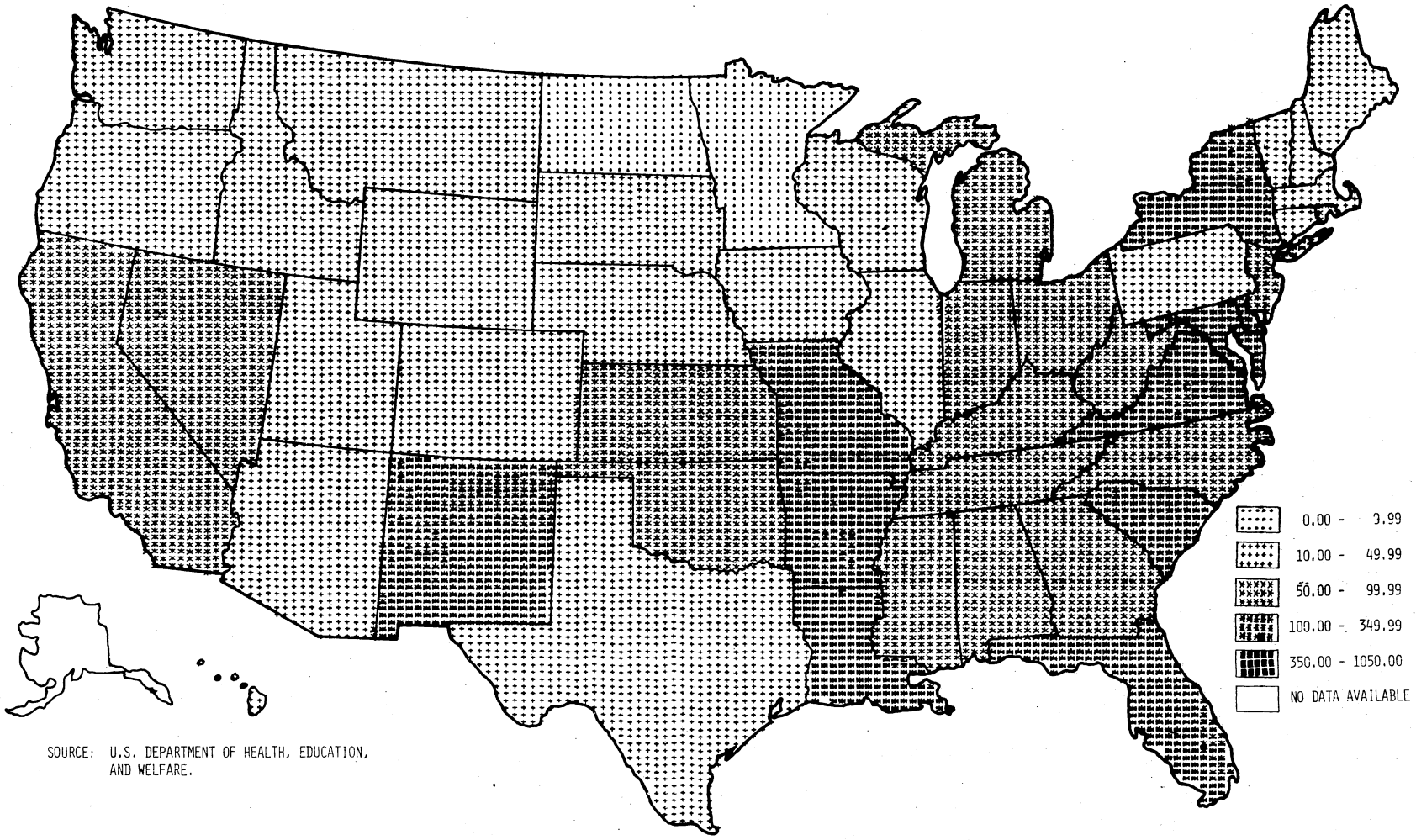


Figure 7. Total Syphilis Rates per 100,000 Population by State for 1955

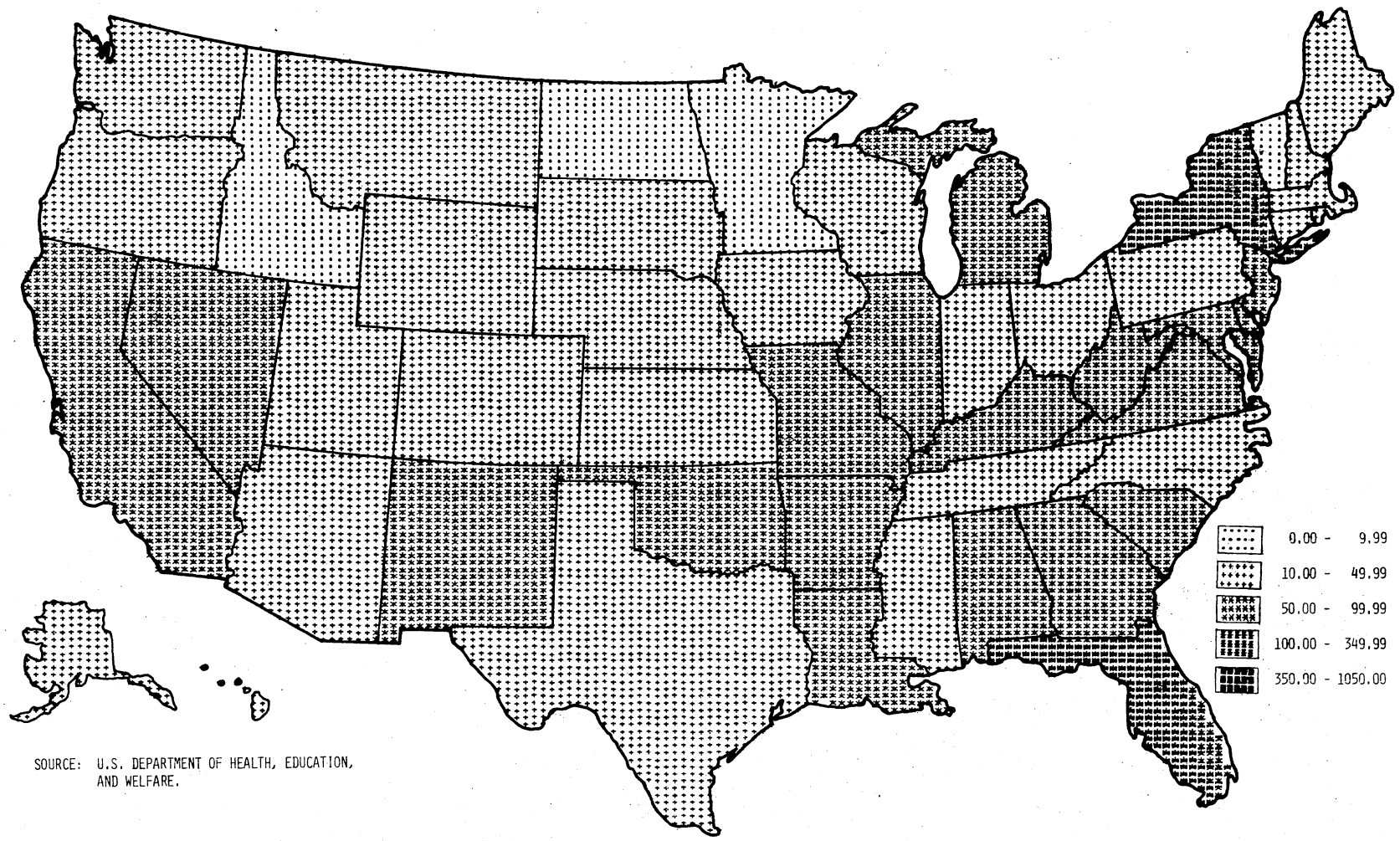


Figure 8. Total Syphilis Rates per 100,000 Population by State for 1965

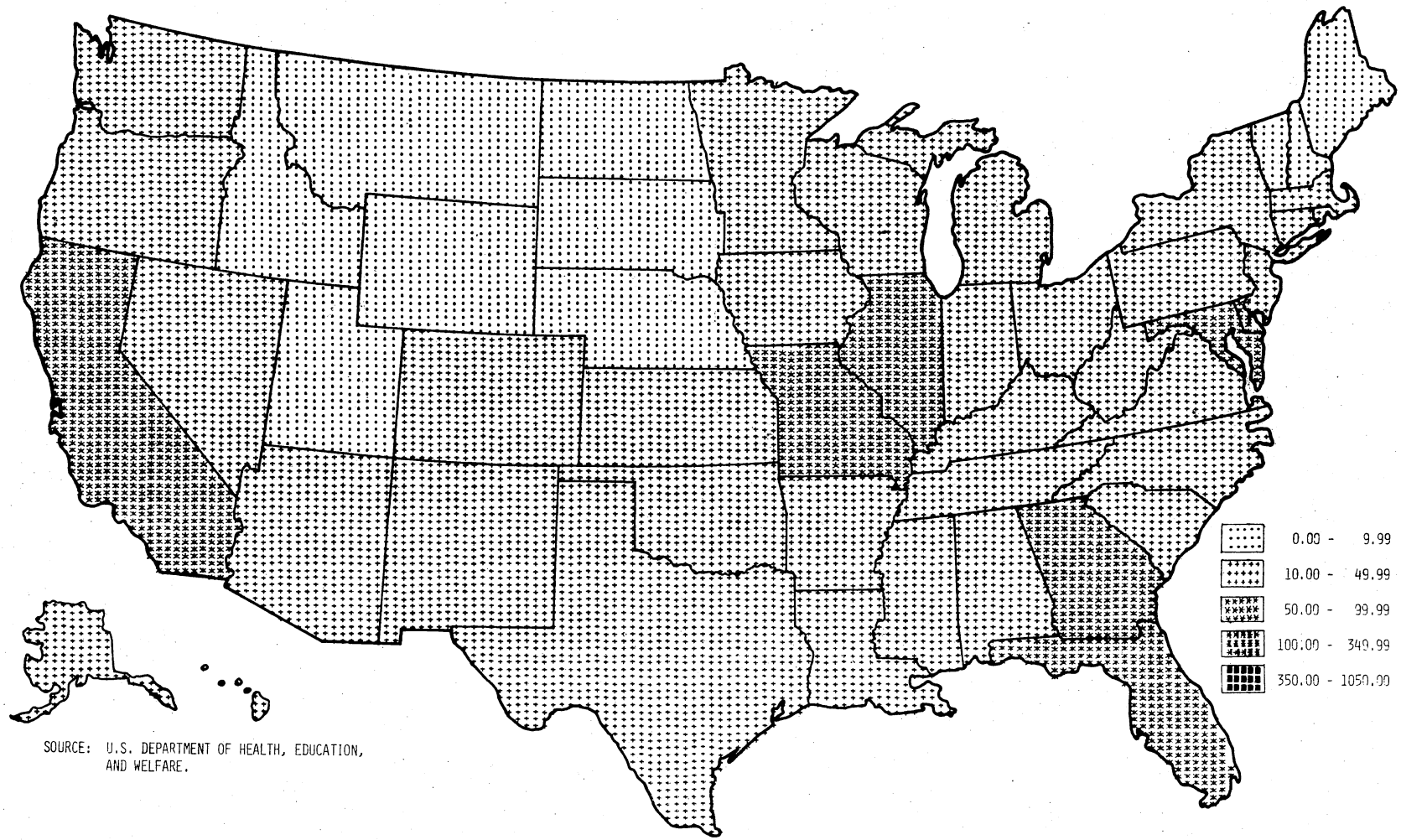


Figure 9. Total Syphilis Rates per 100,000 Population by State for 1975

TABLE XI

PERCENT DIFFERENCE BETWEEN TOTAL SYPHILIS RATES FOR 1975 AND TOTAL SYPHILIS RATES FOR TEN YEAR INTERVALS SINCE 1925

Year	Rates	Percent Difference
1925	181.2	461.1%
1935	205.6	523.2
1945	282.3	718.3
1955	76.0	193.4
1965	59.7	151.9
1975	39.3	-----

Source: U. S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Fact Sheet 1975 (1975).

percent. The greatest percent change in syphilis rates comes from Kentucky, however. In 1925, it led the United States in total syphilis cases reported with a syphilis rate of 610.9, while in 1975 it had reduced its syphilis rate to 17.5 cases per 100,000 population. These percent changes in syphilis rates are found in Table XVIII, and Table XIX includes the percent change in syphilis rates for additional states with unusually high syphilis rates (rates over 300 per 100,000 population).

It would seem from an examination of the maps and tables that the syphilis problem in the United States has been all but eradicated. However, a more careful look at the statistics shows that this decline in syphilis rates is due primarily to the decrease in the later stages

TABLE XII

PERCENT DIFFERENCE BETWEEN TOTAL SYPHILIS RATES FOR STATES WITH THE HIGHEST SYPHILIS RATES FOR EACH EXAMINED YEAR AND THE SYPHILIS RATES FOR THE SAME STATE IN 1975

Year	State With Highest Rate	State Rate	1975 State Rate	Percent Change
1925	Kentucky	610.9	17.5	3490.9%
1935	Mississippi	757.6	33.8	2241.4
1945	Mississippi	1026.6	33.8	3037.3
1955	South Carolina	234.5	43.6	537.8
1965	Delaware	121.2	46.3	261.8

Source: U. S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Fact Sheet 1975 (1975).

TABLE XIII

PERCENT DIFFERENCE BETWEEN TOTAL SYPHILIS RATES FOR STATES WITH UNUSUALLY HIGH SYPHILIS RATES FOR EACH EXAMINED YEAR AND THE SAME STATE IN 1975

Year*	State	State Rate	1975 State Rate	Percent Change
1925	Mississippi	335.5	33.8	992.6%
1935	Alabama	370.7	14.7	2521.8
	Georgia	455.6	50.7	898.6
	North Carolina	518.9	41.6	1247.7
	Tennessee	455.8	24.5	1860.4
	California	328.9	62.1	529.6
	New York	576.0	48.1	1197.5
	Delaware	521.5	46.3	1126.3
	Maryland	567.6	62.8	903.8
1945	Maryland	510.3	62.8	812.6
	California	314.2	62.1	505.9
	Nevada	305.4	16.3	1873.6
	Alabama	385.2	14.7	2620.4
	Florida	650.5	76.6	849.2
	South Carolina	359.4	43.6	824.3
	Tennessee	412.7	24.5	1684.5
	Arkansas	829.2	18.0	4606.7
	Louisiana	482.8	38.8	1244.3
	New Mexico	348.2	43.9	793.2
	Oklahoma	318.7	13.4	2378.4

*Syphilis rates for the years 1955, 1965 and 1975 were not considered unusually high for any of the states. Unusually high rates were those over 300 cases per 100,000 population.

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Fact Sheet, 1975 (1975).

of syphilis. Table XX shows the changes in syphilis rates for the different stages of the disease.

TABLE XIV

RATES FOR ALL STAGES OF SYPHILIS, PRIMARY AND SECONDARY SYPHILIS, EARLY LATENT SYPHILIS, LATE AND LATE LATENT SYPHILIS AND CONGENITAL SYPHILIS FOR SELECTED YEARS FROM 1925 TO 1975

Year	All Stages	Primary and Secondary	Early Latent	Late and Late Latent	Congenital
1925	181.2	NA	NA	NA	NA
1935	205.6	NA	NA	NA	NA
1945	282.3	60.5	79.9	111.8	9.7
1955	76.0	4.1	13.4	52.7	3.4
1965	59.7	12.3	9.1	35.7	1.9
1975	39.3	12.3	12.5	14.0	0.5

Note: NA means Data Not Available.

Source: U. S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Fact Sheet 1975 (1975).

It can be seen from Table XX that the decrease in the more serious, later stages of syphilis has decreased tremendously since the discovery of penicillin. In 1945, there were 111.8 cases per 100,000 population of late and late latent syphilis reported, compared to only 14.0 cases per 100,000 in 1975. The drop in congenital syphilis rates also reflects the improvement in prenatal care.

The change in the rates for the early latent stage is also interesting. There was a fairly steady decline in this stage of the disease with a low rate of 7.7 in 1970, but it has been on the increase since. The 1975 rates are comparable to those of 1956. This illustrates the laxing of venereal disease control measures since the low rates of the mid 1950's. More and more cases are not being detected until they are a year or more in duration. If this trend continues, the late and late latent stage rates can be expected to rise in the future. Also, this means that more people have the disease longer and are able to infect others for a longer period of time. These undetected cases may be an indicator as to why the venereal disease rates are on the rise in the United States.

The case rates of primary and secondary syphilis have also been on the rise, though not a steady rise due to increased efforts to control the disease in the mid 1960's. The efforts to control the disease are apparent from Table XX. The rates for 1965 and 1975 are the same but if a complete table was available, it would show that these rates have decreased and increased within the ten year period. It can be concluded from this table that more emphasis needs to be placed on earlier detection and treatment of the disease.

Comparison of Total Syphilis Rates at Ten Year Intervals From 1925 to 1975

A look at Figures 4 and 5 shows that in the years before the Venereal Disease Control Division of the Center for Disease Control was established in 1938 and made reporting of venereal disease mandatory, a lack of reporting by individual states was common. In

1925 eight of the contiguous forty-eight states did not report venereal disease cases to the Center for Disease Control. By 1935, only three of the sparsely populated western states lagged in the reporting of venereal diseases. Finally, in 1945, data was missing from only Georgia, a state which had formerly submitted disease reports.

The venereal disease trends in Figures 4 and 5 are interesting but they cannot be considered accurate for federal guidelines concerning venereal disease reporting were not yet in existance. This made for inconsistency in reporting.

The year 1945 deserves special emphasis for its syphilis rates were affected by the advent of World War II. Total syphilis rates were the highest in 1943, with rates of 447.0 per 100,000 population, though the rates for primary and secondary syphilis continued to rise until 1947. Due to the discovery of penicillin, the upsurge in syphilis rates was not as high as it was expected to be. The rise in syphilis rates for the war years is contributed to the draftee records for men aged eighteen to forty.[4]

An examination of Table XIX and Figure 6 shows that high syphilis rates were the greatest for a block of southern states which include Mississippi, Alabama, Florisa, South Carolina, Tennessee, Arkansas and Louisiana. Georgia did not report venereal disease statistics for 1945 but it can be assumed that its rates resembled those of its neighbors. These eight states had the highest syphilis rates for any single area in the country.

Maryland is the only state outside this area which had syphilis rates of over 350 cases or more per 100,000 population. Several other states did have high syphilis rates, however. They are located in

the West and Southwest, including the states of California, Nevada, New Mexico and Oklahoma.

A comparison of Figures 6, 7, 8 and 9 shows some interesting changes. From 1945 and 1955, the block of southern states had dropped to half its original number, with only South Carolina, Florida, Arkansas and Louisiana having higher syphilis rates than the rest of the country. Mississippi had dropped from a rate of 1026.6 cases per 100,000 population to 51.6 cases. This was a decrease of 975 cases in ten years. Mississippi has continued to keep fairly low syphilis rates since. Similar drops in syphilis rates are also found in Alabama and Tennessee.

By 1955, the pattern of syphilis rates previously established had been broken. However, those states which had low syphilis rates in 1945 continued to have low syphilis rates in the following years. Those states with the highest syphilis rates were still found mainly in the more established states east of the Mississippi River, with few exceptions. They were New York, Maryland, Delaware, Virginia, South Carolina and Florida, along the eastern seaboard; Missouri, Arkansas and Louisiana, in the south central part of the United States; and New Mexico in the southwest. The pattern of high syphilis rates was no longer common to one particular area of the country.

By 1965, only Florida and New York had syphilis rates of over 100, and those states with rates over 50 had also decreased in number. One interesting addition to the group of between 50 and 100 cases per 100,000 population is that of Illinois. It is the only state whose rates have actually been increasing notably in the past twenty years.

The 1975 syphilis rates found in Figure 9 show the continued decrease in all stages of syphilis. Presently, California, Missouri, Illinois, Maryland, Georgia and Florida have the highest syphilis rates in the United States. These are rates included in the group of between 50 and 100 cases per 100,000 population. The areas of high and low syphilis rates seen in Figure 9 correspond somewhat to those found in the city data in Figure 2. However, there are exceptions since city syphilis rates are not necessarily reflected in the state data.

Trends in Syphilis Detection

Some interesting correlations are noted with the comparison of Figures 6 and 10. The large block of Southern states which had syphilis rates of over 350 cases per 100,000 population (including Georgia) in 1945, are the same states with the lowest percentage of the total cases of the late and late latent type of syphilis. Conversely, those states which had low syphilis rates in 1945, have a high percent of their total syphilis cases of the late and late latent type in 1975.

If an overlay was made of Figure 6, the states of Montana, North Dakota, South Dakota, Minnesota, Nebrasks, Iowa, Wisconsin, Utah, Vermont, New Hampshire, Main and Massachusetts, would appear as having the lowest syphilis rates in the nation. If this overlay was placed over Figure 11, a similar pattern would be found except the intensity of the shading would be reversed. The exceptions are Missouri, Arkansas, West Virginia and Pennsylvania which also have high syphilis rates of the later stages of the disease.

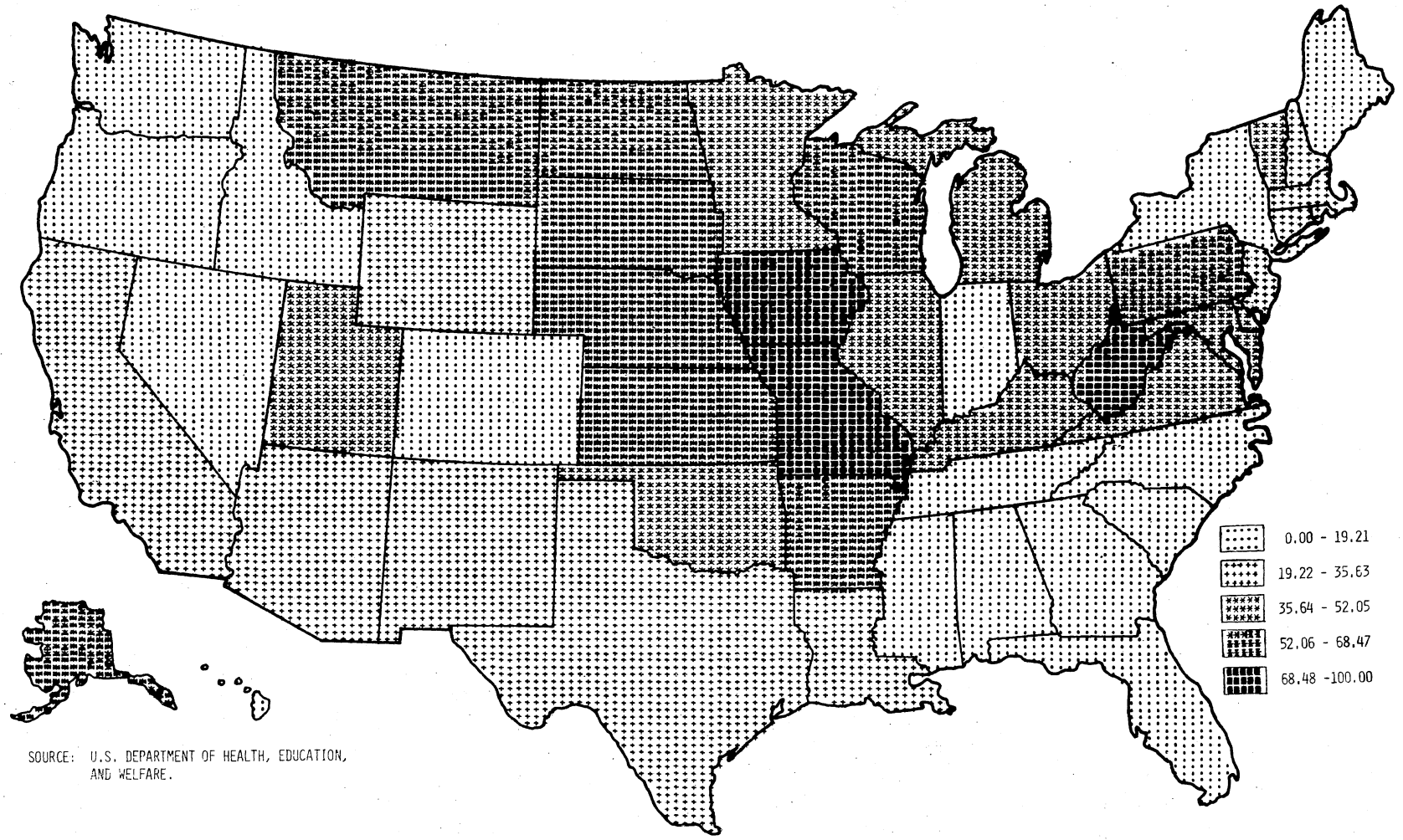


Figure 10. Percent of Total Syphilis Cases Which are of the Late and Late Latent Type

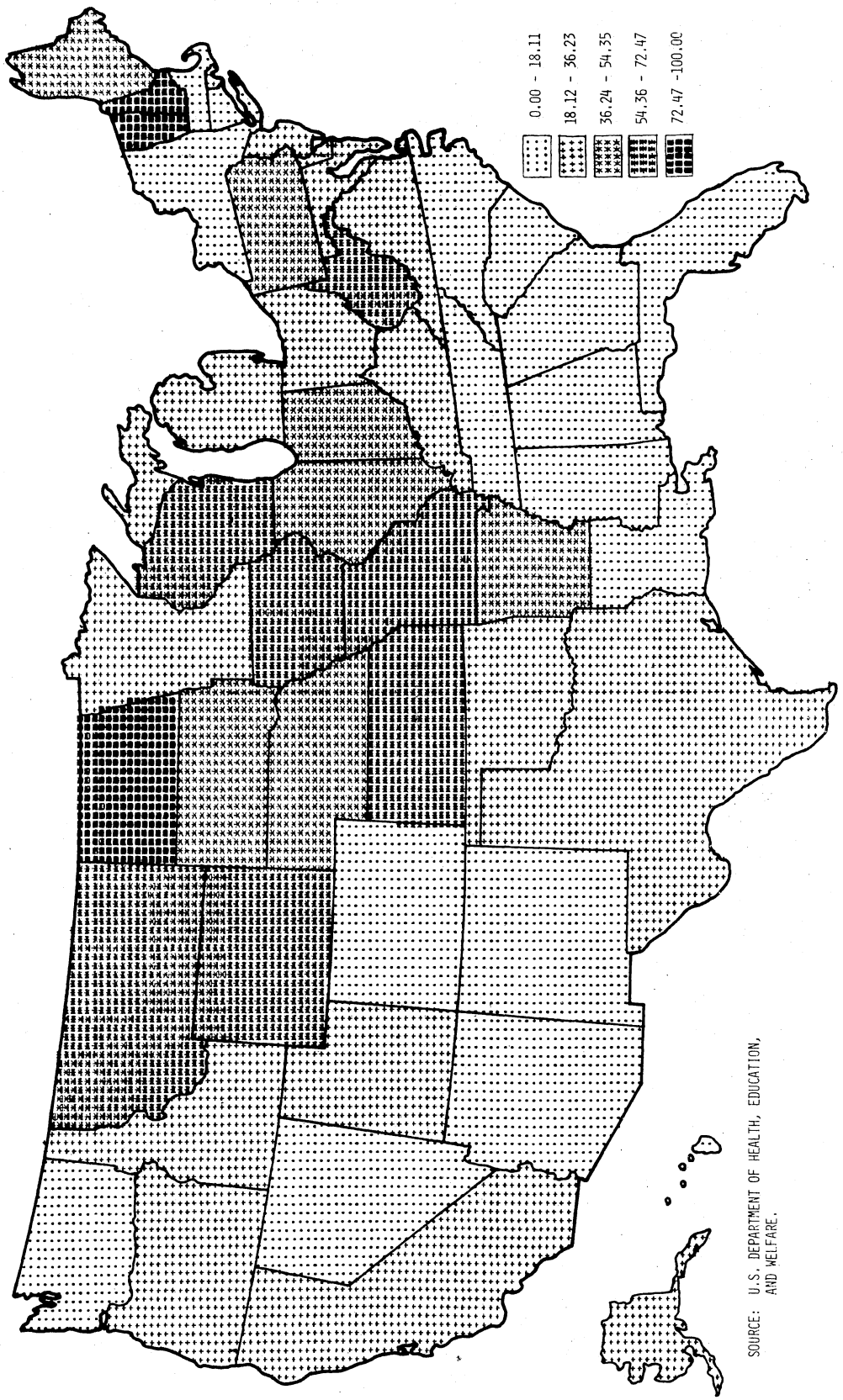


Figure 11. Percent Syphilis Cases Treated by Private Physicians by State for 1975

The comparison of the two maps shows the effectiveness of measures taken during the formative years of the Venereal Disease Control Program. Those states with the strongest public health programs in the 1930's and 1940's have done more to curb the destructiveness of syphilis than the other states. The southern states have done a commendable job in reducing syphilis rates and their early example could be a factor in reducing future syphilis rates.

The southern states with low rates for late and late latent stages of syphilis, also have a low percentage of their total cases reported by private physicians. This means that most people being treated for syphilis are being treated by the public health facilities in these states. Since public health facilities have better records tracking down contacts, it can be assumed that this is a major factor in the control of the later, more destructive stages of syphilis.

A comparison of Figures 10 and 11 also shows that the states with high percentages of total cases of syphilis which are of the late and late latent type, are the same states which have a high percentage of total cases of syphilis reported by private physicians. Missouri and West Virginia have over 80 percent of their total cases of syphilis reported by private physicians and they are two of the three states with the highest percentage of the later stages of syphilis. Iowa is the third state in the group and 72.1 percent of its cases are reported by private physicians.

The above information indicates, to some extent, the effectiveness of public health programs over private physicians in controlling the spread of venereal diseases. It can then be expected that a more concentrated effort to control syphilis on the part of public programs, would be successful.

FOOTNOTES

[1]Berkeley Hill, Syphilis and Local Contagious Disorders (London, 1868), p. 34.

[2]Ibid.

[3]R. D. Catterall, A Short Textbook of Venereology, The Sexually Transmitted Diseases (Philadelphia, 1974) p. 71.

[4]Louis Lasagna, The VD Epidemic: How It Started, Where It's Going, and What to Do About It (Philadelphia, 1975) p. 20.

CHAPTER VII

SUMMARY, IMPLICATIONS AND FURTHER RESEARCH

Summary

The major objective of this thesis was to provide some insight into the present syphilis rates of the United States. The "insight" was expected to be a discovery of which population segments have a greater tendency toward high syphilis rates. The syphilis rates of seventy-five United States cities were chosen to be compared to seventeen socio-economic variables of those same cities. Information on the syphilis rates of the cities was obtained from the VD Statistical Letter and the socio-economic variable information was obtained from the County City Data Book, 1972.

The History of Syphilis

The fascinating history of syphilis and the theories behind its origin were presented in Chapter III. Both the Columbian and the Unitarian theories were explained along with a discussion of the possible mutation of the treponemes. It was considered that once the treponemes came to be carried by man, they underwent mutations which ensured their continued existence. The theory states that these mutations went from pinta to yaws to endemic syphilis and finally to venereal syphilis. Venereal syphilis was thought to have evolved into

its present form in Fifteenth Century Europe. It is this theory which is gaining rapid acceptance in the medical field. Syphilis is believed to be a disease as old as gonorrhea.

The historical geography of syphilis was also discussed in this chapter. Evidence was presented which suggested that syphilis has been traced to the ancient medical literature of China--some twenty-six hundred years before the Christian era. A disease known as "curable lepra", which appears in much of the ancient literature, is suspected to be that of syphilis.

The quasi-epidemics which appear when syphilis is first introduced into an area, were also discussed. The massive destruction that these quasi-epidemics caused was taken as further proof of the seriousness of the disease.

Finally a short discussion of the historical figures whose lives were influenced by syphilis was included in the chapter.

Methodology

To determine the relative importance of the independent variables in relationship to the dependent variable, the BIOMED computer program version of stepwise regression was used. A chi-square analysis was also used as a descriptive model to compare the observed and expected frequencies of low, medium and high syphilis rates to independent variable values above and below the mean for that particular variable. Correlation matrices were also utilized to determine the relationships of the variables to each other.

The results of the analysis showed that three of the seventeen variables explained a notable amount of the total variance in syphilis

rates of the seventy-five selected cities. It was indicated that syphilis rates are highest in densely populated cities where there are high proportions of Negroes and females as heads of households. City government spending per capita was also higher in these cities.

Though measures were taken to control for reporting bias in syphilis rates, it could not be proven that this bias accounted for the higher syphilis rates in certain cities.

Variations in Syphilis Rates by State

It was found that there are wide variations in reported syphilis rates when state data is examined. The southern and east coastal states have the highest syphilis rates, levaing a core of northcentral and western states with relatively low rates. These differences in syphilis rates were more pronounced in the years before the discovery of penicillin. Since then, the more serious stages of syphilis have decreased but primary and secondary syphilis rates have been on the increase since 1958.

A direct relationship between the states with high syphilis rates in 1945 and states with low late and late latent syphilis rates in 1975 was observed. Conversely, those states which had low syphilis rates in 1945, have a high percent of late and late latent syphilis in 1975. This indicates that control measures taken twenty and thirty years ago may have been effective in reducing the more harmful stages the disease.

The states with low late and late latent syphilis rates also have a low percentage of their total syphilis cases reported by private physicians. This indicates that most people who are treated

for syphilis in these states are being treated by public health facilities. It would seem that public health facilities are more effective in controlling for the later stages of syphilis than private physicians.

Implications

Given the above results, several questions arose: (1) Do Negroes have a tendency toward contracting syphilis more easily than other races or is the correlation due to other factors? (2) If fewer women are contracting syphilis, why are females as heads of households related to higher syphilis rates? Is it because female heads of the household is a surrogate for Negro population or are other factors involved? and (3) What extent does reporting bias skew the influence of the significant variables?

General Tendencies

Since the advent of the "sexual revolution" in the 1960's, it can be expected that the contracting of venereal disease no longer is limited to the lower classes. Yet, the poor and the Negro population seem to have significantly higher syphilis rates. Since the states with the highest syphilis rates have the greatest percentage of their cases reported by public health facilities, it is assumed that these rates are influenced by the lack of reporting by private physicians in the states with low syphilis rates. If this bias can be better controlled for, the results of a similar analysis may prove to be different.

The relationship between syphilis rates and females as heads of household is interesting, especially since fewer cases of syphilis are being reported by females. A portion of this relationship is possibly due to female heads of household acting as a surrogate for Negro population but several other interesting implications arise from this relationship also: (1) Prostitution may be higher in the cities which have more females as sole providers for a family; (2) The prostitution may be a direct result of the low income and poor education of the females in these cities; (3) The prostitute who walks the street has a much greater chance of contracting and spreading venereal disease than the expensive call girl whose clientele is from the middle and upper class; and (4) Is there more promiscuity among women who are heads of households as compared to women who are married?

Possible Control Measures

It would seem from the above information, that the present venereal disease control measures are not sufficient to stop the increase in syphilis rates. Several solutions to this problem are suggested by the analysis of the data in this thesis.

First, better cooperation is needed between private physicians and public health facilities and state health departments who collect the data. If all venereal disease cases which are seen by private physicians were reported, a more accurate picture of the actual distribution of syphilis cases could be obtained. Also, follow up procedures would be able to catch more syphilis cases before they have a chance to advance to the more serious later stages of the disease.

Second, a return to control measures initiated in the early days of the Venereal Disease Control Programs, would help to detect asymptomatic cases of syphilis. These measures consisted of such things as mandatory venereal disease tests for entrance to college, venereal disease tests before the obtaining of marriage licenses and routine venereal disease tests on admission to a hospital.

Finally, educating the public about, not only syphilis, but also the less serious venereal diseases such as gonorrhea, herpes simplex and PID (pelvic inflamatory disease). This education would include measures the individual as well as the public as a whole can take to stop the spread of these diseases.

Further Research

Syphilis has been studied in one form or another since Columbus returned from his first trip to the Americas. These studies have concentrated mostly on the effects of the disease and the areas where it has been the most serious problem in the past. Little has been done to predict where syphilis rates will increase in the future. This thesis has provided some insight into the characteristics of cities with high syphilis rates. Now each of the significant variables needs to be considered individually. Further research in the following areas would be of some significance.

(1) A case study of the female population in those cities with high syphilis rates and a high percentage of families with females as head of households, would provide some insight into why this variable is strongly correlated to syphilis rates. By discovering why this relationship exists, measures to control it could be instigated.

(2) A study concentrating on the effectiveness of individual venereal disease control programs would show which type of programs will best decrease syphilis rates. This type of study would also aid in the discerning of the influence of reporting bias in venereal disease rates.

(3) A geographical analysis of syphilis rates within a city may show which segments of the population are reporting the majority of the syphilis cases for that city. This type of microanalysis may prove to be more accurate than a similar study on a larger scale.

Each of these avenues of research could contribute to the overall understanding of the rising syphilis rates in the United States and the world, today. They could lead to effective venereal disease control programs.

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APPENDIXES

TABLE XV

SYPHILIS RATES PER 100,000 POPULATION FOR SELECTED U.S. CITIES WITH POPULATION OVER 200,000 ACCORDING TO HEW REGION 1975

HEW Region	Cities	Rates
Region I	Boston, Massachusetts	110.0
Region II	Jersey City, New Jersey	61.5
	New York City, New York	95.5
	Yonkers, New York	31.4
Region III	Norfolk, Virginia	109.5
	Pittsburgh, Pennsylvania	61.0
	District of Columbia	268.1
Region IV	Atlanta, Georgia	164.0
	Louisville, Kentucky	42.4
	Memphis, Tennessee	35.8
	Tampa, Florida	49.3
Region V	Akron, Ohio	48.9
	Chicago, Illinois	126.9
	Cincinnati, Ohio	123.8
	Minneapolis-St. Paul, Minnesota*	24.1
Region VI	Albuquerque, New Mexico	34.6
	Corpus Christie, Texas	42.2
	New Orleans, Louisiana	105.1
	Oklahoma City, Oklahoma	33.6
	San Antonio, Texas	22.7
Region VII	Omaha, Nebraska	24.6
	St. Louis, Missouri	183.0
	Wichita, Kansas	57.7
Region VIII	Denver, Colorado	24.6
Region IX	Honolulu, Hawaii	21.7
	San Diego, California	42.8
	San Francisco, California	287.5
	Tucson, Arizona	25.3

TABLE XV (Continued)

HEW Region	Cities	Rates
Region X	Portland, Oregon	34.0
	Seattle, Washington	23.6

*Minneapolis and St. Paul have been combined in this case because of their proximity and their similar syphilis rates.

Source: U. S. Department of Health, Education and Welfare, Public Heatlh Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Statistical Letter, May 1976, pp. 3.

TABLE XVI

SYPHILIS RATES PER 100,000 POPULATION FOR SELECTED U.S. CITIES WITH POPULATION BETWEEN 50,000 AND 200,000 ACCORDING TO HEW REGION (1975)

HEW Region	Cities	Rates
Region I	Milford, Connecticut	1.9
	West Haven, Connecticut	10.8
	Cambridge, Massachusetts	36.8
	Pittsfield, Massachusetts	5.2
	Waltham, Massachusetts	6.4
	Nashua, New Hampshire	4.7
	Providence, Rhode Island	50.8
Region II	East Orange, New Jersey	133.5
	Albany, New York	22.8
	Rome, New York	10.4
Region III	Wilmington, Delaware	222.1
	Wilkes-Barre, Pennsylvania	6.7
	Portsmouth, Virginia	93.0
Region IV	Huntsville, Alabama	6.3
	Gainesville, Florida	98.6
	Covington, Kentucky	15.7
	Jackson, Mississippi	96.0
	Durham, North Carolina	55.3
Region V	East St. Louis, Illinois	275.9
	Joliet, Illinois	89.1
	Rock Island, Illinois	29.2
	Gary, Indiana	122.5
	Ann Arbor, Michigan	13.6
	Kalamazoo, Michigan	38.0
	Saginaw, Michigan	9.1
	Duluth, Minnesota	7.1
	Canton, Ohio	46.0
	Lima, Ohio	77.4
	Springfield, Ohio	67.3
	Kenosha, Wisconsin	10.7
Region VI	Little Rock, Arkansas	51.5
	Shreveport, Louisiana	40.3
	Brownsville, Texas	123.3
	San Angelo, Texas	4.1

TABLE XVI (Continued)

HEW Region	Cities	Rates
Region VII	Davenport, Iowa	18.9
	St. Joseph, Missouri	36.0
Region VIII	Pueblo, Colorado	11.8
	Sioux Falls, South Dakota	3.7
	Provo, Utah	3.6
Region IX	Berkeley, California	127.6
	Modesto, California	20.0
	Santa Rosa, California	16.8
	Reno, Nevada	15.5
Region X	Anchorage, Alaska	36.9
	Boise, Idaho	0.0

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, Venereal Disease Control Division, VD Statistical Letter, May 1976, pp. 30-36.

TABLE XVII

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR CITY SIZE

	Population Over 200,000		Population 50,000-200,000		
SPHRATES	O	E	O	E	Total
<25	7	12.0	23	18.0	30
25-60	11	8.4	10	12.6	21
>60	12	9.6	12	14.4	24
Total	30		45		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 5.93 with 2d.f., p = .10.

TABLE XVIII

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR POPULATION DENSITY PER SQUARE MILE (POPXSQMI)

	POPXSQMI	5262.39	POPSQMI	5262.39	
SPHRATES	O	E	O	E	Total
< 25	22	19.04	6	8.96	28
25-60	17	14.96	5	7.04	22
>60	12	16.99	13	7.99	25
Total	51		24		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service. Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 6.89 with 2d.f., p = .05.

TABLE XIX

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR PERCENT OF FAMILIES BELOW THE LOW INCOME LEVEL (FMLOWINC)

	FMLOWINC	11.16	FMLOWINC	11.16	
SPHRATES	O	E	O	E	Total
<25	21	17.00	8	11.99	29
25-60	15	12.91	7	9.09	22
>60	8	14.08	16	9.92	24
Total	44		31		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 9.45 with 2 d.f., p = .01.

TABLE XX

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR PERCENT OF POPULATION WITH FIVE YEARS OF EDUCATION OR LESS (LOSCHOOL)

	LOSCHOOL	5.69	LOSCHOOL	5.69	
SPHRATES	O	E	O	E	Total
< 25	20	16.63	9	12.37	29
25-60	14	12.61	8	9.39	22
>60	9	13.76	15	10.24	24
Total	43		32		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 5.84 with 2 d.f., p = .10.

TABLE XXI

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR PERCENT OF POPULATION UNEMPLOYED (UNEMPLOD)

	UNEMPLOD	5.04	UNEMPLOD	5.04	
SPHRATES	O	E	O	E	Total
<25	22	21.49	9	9.50	31
25-60	14	13.87	6	6.13	20
>60	16	16.64	8	7.36	24
Total	52		23		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = .65 with 2 d.f., p = .75.

TABLE XXII

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR PERCENT OF POPULATION OF FOREIGN STOCK (FORSTOCK)

	FORSTOCK	18.17	FORSTOCK	18.17	
SPHRATES	O	E	O	E	Total
<25	14	17.01	15	11.99	29
25-60	16	13.49	7	9.51	23
>60	14	13.49	9	9.51	23
Total	44		31		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 3.58 with 2 d.f., p = .25.

TABLE XXIII

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR PERCENT OF POPULATION OF SPANISH HERITAGE (SPANHERG)

	SPANHERG	6.03	SPANHERG	6.03	
SPHRATES	O	E	O	E	Total
< 25	7	6.96	22	22.04	29
25-60	5	5.28	17	16.72	22
> 60	6	5.76	18	18.24	24
Total	18		57		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 0.16 with 2 d.f., p = .95.

TABLE XXIV

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR PERCENT OF FAMILIES WITH A FEMALE HEAD OF HOUSEHOLD (FAMFHEAD)

	FAMFHEADS	X 14.7	FAMFHEADS	X 14.7	
SPHRATES	O	E	O	E	Total
< 25	3	2.98	4	4.01	7
25-60	9	9.38	13	12.61	22
> 60	20	19.61	26	26.37	46
Total	32		43		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 0.04 with 2 d.f., p = .98.

TABLE XXV

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR PERCENT NEGRO POPULATION (NEGROPOP)

	NEGROPOP		NEGROPOP		
SPHRATES	O	E	O	E	Total
< 25	18	18.56	1	10.44	29
25-60	14	14.08	8	7.92	22
> 60	6	15.36	18	9.36	24
Total	48		27		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 29.238 with 2 d.f., p = .0001.

TABLE XXVI

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR CITY GOVERNMENT EXPENDITURE ON EDUCATION (CTGOVPED)

	CTGOVPED	17.4	CTGOVPED	17.4	
SPHRATES	O	E	O	E	Total
<25	11	11.6	18	17.4	29
25-60	8	8.8	14	13.2	22
> 60	11	9.6	13	14.4	24
Total	30		45		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 1.870 with 2 d.f., p = .50

TABLE XXVII

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR PERCENT CITY GOVERNMENT SPENDING ON WELFARE (CGPUBWEL)

	CGPUBWEL	4.6	CGPUBWEL	4.6	
SPHRATES	O	E	O	E	Total
< 25	22	21.60	8	8.40	30
25-60	47	15.12	4	5.88	21
> 60	15	17.28	9	6.72	24
Total	54		21		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 1.934 with 2 d.f., p = .50.

TABLE XXVIII

OBSERBED AND EXPECTED FREQUENCIES OF SYPHILIS RATES FOR CITY GOVERNMENT SPENDING PER CAPITA (CGPERCAP)

	CGPERCAP		CGPERCAP		
SPHRATES	O	E	O	E	Total
< 25	22	22.04	7	6.96	29
25-60	17	16.72	5	5.28	22
> 60	18	18.24	6	5.76	24
Total	57		18		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 0.16 with 2 d.f., p = .95.

TABLE XXIX

OBSERVED AND EXPECTED FREQUENCIES OF PERCENT NEGRO POPULATION (NEGROPOP) AND CITY GOVERNMENT SPENDING PER CAPITA (CGPERCAP)

	CGPERCAP	259.8	CGPERCAP	259.8	
NEGROPOP	O	E	O	E	Total
16	30	30.66	20	19.33	50
16	16	15.33	9	9.66	25
Total	46		29		N= 75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 0.111 with 2 d.f., p = .95.

TABLE XXX

OBSERVED AND EXPECTED FREQUENCIES OF PERCENT NEGRO POPULATION (NEGROPOP) AND PERCENT PRIVATE CASES

	% PRIVATE	25	% PRIVATE	25	
NEGROPOP	O	E	O	E	Total
< 25	10	11.20	6	4.80	16
25-60	11	9.80	3	4.20	14
> 60	21		9		N=30

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 0.90 with 2 d.f., p = .975.

TABLE XXXI

OBSERVED AND EXPECTED FREQUENCIES OF CITY GOVERNMENT SPENDING PER CAPITA (CGPERCAP) AND PERCENT PRIVATE CASES

	% PRIVATE 25		% PRIVATE 25		
CGPERCAP	O	E	O	E	Total
45.63	12	12.60	9	8.40	21
45.63	6	5.40	3	3.60	9
	18		12		N=30

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

TABLE XXXII

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES AND PERCENT OF TOTAL CASES OF SYPHILIS OF THE LATE AND LATE LATENT TYPE

	% LATE 26.2		% LATE 26.2		
SPHRATES	O	E	O	E	Total
< 25	6	4.60	0	1.40	6
25-60	12	9.97	1	3.03	13
> 60	5	8.43	6	2.56	13
	23		7		N=30

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 9.56 with 2 d.f., p = 0.1.

TABLE XXXIII

OBSERVED AND EXPECTED FREQUENCIES OF TOTAL SYPHILIS RATES AND PERCENT PRIVATE CASES

	% PRIVATE 25		% PRIVATE 25		
SPHRATES	O	E	O	E	Total
< 25	3	1.80	3	4.20	6
25-60	1	3.30	10	7.70	11
> 60	5	3.90	8	9.10	13
Total	9		21		N=30

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 7.34 with 2 d.f., p = .05.

TABLE XXXIV

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES AND MEAN JANUARY TEMPERATURE (JANTEMPT)

	JANTEMPT 34.78		JANTEMPT 34.78		
SPHRATES	O	E	O	E	Total
< 25	22	18.17	7	10.83	29
25-60	12	14.41	11	8.59	23
> 60	13	14.41	10	8.59	23
Total	47		28		N=75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 3.58 with 2 d.f., p = .90.

TABLE XXXV

OBSERVED AND EXPECTED FREQUENCIES OF SYPHILIS RATES AND MEAN JULY TEMPERATURE (JULYTEMP)

	JULYTEMP	75.39	JULYTEMP	75.39	
SPHRATES	O	E	O	E	Total
< 25	20	13.53	9	15.47	29
25-60	9	11.20	15	12.80	24
> 60	6	10.27	16	11.73	22
Total	35		40		N= 75

Source: U. S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, Bureau of State Services, VD Control Division, VD Statistical Letter, May 1975.

Chi-square = 9.91 with 2 d.f., p = .01.

VITA

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