A STUDY OF THE PREDISPOSITION FOR MYCOBACTERIUM KANSASII INFECTIONS IN DALLAS AND TARRANT COUNTIES DUE TO "INFLUENZA-LIKE" INFECTIONS

THESIS

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements For the Degree of

MASTER OF SCIENCE

By

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Good, Willis E., *A Study of the Predisposition for Mycobacterium Kansasii Infections in Dallas and Tarrant Counties Due to "Influenza-Like" Infections*. Master of Science (Health Education), May, 1978, 55 pp., 6 tables, bibliography, 22 titles.

The problem of this study was to review within Dallas and Tarrant Counties the relationship between an "influenza-like" illness within six months prior to contracting Mycobacterium kansasii disease. An interview instrument was developed and used during personal interviews to collect data. Additional data of case rates and reported cases was compiled from local and national governmental public health agencies.

Analysis of the data indicated no significant difference between an individual contracting an "influenza-like" illness within six months prior to the acquiring of Mycobacterium kansasii disease. Therefore, there is no relationship between having had influenza-like symptoms within six months of contracting Mycobacteria kansasii.
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CHAPTER I

INTRODUCTION

Since the first classification by Timpe and Runyon, 1954 (8), the atypical mycobacteria, kansasii, has been recognized as a potential pathogen. Persons of all ages and races have been infected. The outstanding features of the pathogen are (1) its confinement to certain specific geographical areas, and (2) its characteristic position of the same signs, symptoms and prognosis as Mycobacteria tuberculosis disease.

The apparent geographical distribution of Mycobacterium kansasii suggests that the organism may be able to survive outside of hosts and may, possibly, be free-living (3). The few studies of soil and water cultures available (6, 7), as well as research currently in progress throughout the United States, make it probable that Mycobacterium kansasii, in fact, does exist in an open environment. The route of transmission, however, is unknown. Studies have shown that it is unlikely that the disease is passed from one individual to another (3, 4, 5). Epidemiological evidence has done little to support evidence for the source or spread of the organism. To the contrary,
most studies conclude that there is no possibility of the disease being passed from person to person.

This study was undertaken to review the problem of Mycobacteria *kansasii* illness and reveal insight as to why some individuals, in a given geographic area, become infected with the disease. This investigation, it is hoped, may encourage others to more closely scrutinize the ill-defined habitat and to seek a source reservoir and mechanism of transmission.

Statement of the Problem

The problem of this study was to review, within Dallas and Tarrant Counties, the relationship of an "influenza-like" illness within six months prior to the contracting of Mycobacterium *kansasii* disease.

Purpose of the Study

The study was undertaken to investigate the possible relationship between an individual in the Dallas-Tarrant Counties area contracting an "influenza-like" illness and acquiring within a six-month period afterward acute "active" Mycobacterium *kansasii* illness.

Need for the Study

Communicability of Mycobacteria *kansasii* infection has not been established nor has there been any published research as to why the organism becomes pathogenic at times
for some persons and yet is apparently harmless to others. Person-to-person contagion has never been proven. Due to the absence of a disease rate among family members of infected cases, environmental factors are considered the primary suspects of infection source (5).

Dr. John S. Chapman, who has devoted the greater part of the last twenty years of his medical practice to "unlocking" the mysteries of atypical pulmonary infections, has suggested that, due to the geographic features of the disease (the majority of such reported cases involving Mycobacteria kansasii have been found in three sharply defined areas: Kansas City, Kansas; Dallas, Texas; and Chicago, Illinois) (1, 2), Mycobacteria kansasii may survive quite well outside of the host and may be free-living (3, 4, 5). Chapman has also speculated that, since the effects of viral infections can alter the body's defense mechanism and promote death in the tuberculosis patient, why can not viruses, such as influenza, produce similar effects on immunological defense systems and invite the invasion of "atypical" mycobacterial disease (3)? From the review of related literature and professional observations, the researcher concluded that previous viral infections may allow the body to be susceptible to an attack from a previous nonchallenging pathogen.
Hypothesis

The hypothesis under test for this study was that there was no significant difference between the incidence of Mycobacteria kansasii disease in Dallas and Tarrant Counties and the occurrence of an "influenza-like" infection within the preceding six months.

Delimitations

The specific regional occurrence of Mycobacteria kansasii disease provides certain designated boundaries for any attempted study, since it predominantly occurs in only three geographical areas within the United States: Chicago, Illinois; Kansas City, Kansas; and Dallas, Texas (1, 2, 3, 4, 5).

Officially, only in the state of Texas are Mycobacteria kansasii infections reportable diseases; thus the Dallas-Tarrant Counties area is the only logical, as well as official, delineated area available for study.

Additional delimitations of the investigation are,

1. This study includes only those Mycobacteria kansasii pulmonary-infected individuals officially reported to governmental health agencies within the Dallas-Tarrant Counties area during the years 1974 and 1975.

2. Exclusions were made of those cases of disease not documented with positive cultural findings of Mycobacteria kansasii.
3. Exclusion was made of all cases not in Dallas or Tarrant Counties.

4. Further exclusions were made of those diagnosed individuals who, by reason of medical findings made by a physician, were deemed mentally incompetent to respond to a verbal interview.

Limitations

The following conditions determine the limitations of the study:

1. A period of two years has limited the number of infections available for study. If an extended time span were employed, perhaps ten years, and data were collected at the time of diagnosis, a more convincing conclusion might be drawn.

2. Asking patients to recall events six to twelve months prior to an interview has inherent limitations, although every attempt was made to thoroughly interview patients as soon after diagnosis as practical.

3. Patients may have had preconceived beliefs, or bias, concerning their infection and its cause.

4. Some patients, or patient's physicians, did not allow the investigator to perform an appropriate interview.

5. Both interviewee and interviewer found difficulty in communicating, particularly as to the meaning of "influenza-like" symptoms.
6. The most significant limitation was the limited amount of published information concerning the organism *Mycobacteria kansasii* or resulting *Mycobacteria kansasii* infections. Few individuals, or institutions, have significant amounts of information available, and only one directly related publication of a previous epidemiological study was available.

**Definition of Terms**

The following terms are defined in the manner used throughout the study:

"Active" **infection** -- The rapid multiplication and spread of a pathogenic micro-organism that has invaded the host body and overcome its defense.

**Acute** -- Having a sudden onset of symptoms with a sharp rise in severity.

"Atypical" **Mycobacterium disease** -- Several infectious conditions akin to tuberculosis caused by several different *Mycobacteria* similar to *Mycobacteria tuberculosis*.

**Body defenses** -- Any of a number of ways, including antibody production, which protects the body from invasion by alien elements.

**Dallas and Tarrant Counties** -- Subdivisions of the State of Texas adjacent to each other and located in the north central part of the state. They encompass 1,752 square miles with an approximate population of 2,108,594.
Diagnosis -- The act of identifying a disease from its signs and symptoms.

Diseased population -- The total of individuals occupying an area who possess a definite morbid process with a characteristic train of symptoms.

Incidence -- Number of new cases of a disease within a specified period of time.

Infected individual -- A member of the population who has had its body invaded successfully by a potentially pathogenic organism.

"Influenza-like" or Influenza symptoms -- Any functional evidence or condition marked by acute infection, distressing fever, acute catarrhal inflammation of the nasal passages, neuralgic and muscular pains, accompanied by gastrointestinal disorders, headaches, occasional convulsions, and a general feeling of malaise.

Interview -- The controlled conversation between an investigator and a respondent to elicit survey information.

Mentally incompetent -- Lacking the ability to communicate rationally and verbally with the interviewer.

Mycobacteria kansasii -- A member of the genus Mycobacterium having an irregular rod shape, distinguishable from other mycobacterium by cultural growth and metabolism.

Nonchallenging pathogen -- An organism capable of causing disease, but which does not cause disease.
Open environment -- There is no narrow range of climate, humidity or acidity that is a precondition for existence.

Patients -- Individuals under medical care.

Pathogenic -- Capable of causing disease.

Population -- A group of individuals, objects, or items from which samples are taken for measurement.

Positive cultural findings -- The growth of a given organism in a prepared laboratory medium.

Physician -- An individual licensed to practice medicine in Texas.

Reportable disease -- The requirement, by law, to report to the government any condition of the living animal which impairs the performance of a vital function.

Sign -- Visible objective evidence of disease.

Symptom -- Any functional evidence of disease.

Viral infections -- The establishment of a pathogenic group of minute infectious agents not resolvable in the light microscope, and characterized by a lack of independent metabolism and by the ability to replicate only within living host cells.

Source of Data

The primary source of the data was all cases of Mycobacterium kansasii disease reported to the Texas
Department of Health from Dallas and Tarrant Counties for the years 1973, 1974 and 1975. Additional data were obtained by a record search and compilation of program records of the Texas Department of Health Regional Office in Arlington, Texas.


CHAPTER II

REVIEW OF RELATED LITERATURE

The genus Mycobacterium comprises bacteria with irregularly rod-shaped cells that resist decolonization with dilute inorganic acids after staining with aniline dyes (16). Included in this genus are two extremely important human pathogens, Mycobacteria tuberculosis, the etiological agent for tuberculosis in warm-blooded animals, and Mycobacteria leprae, which causes leprosy (16). The least known of this genus, and yet increasingly more problematic, is the so-called "atypical" Mycobacteria kansasii (14).

The disease caused by Mycobacteria kansasii mimics tuberculosis in every respect save two: contagiousness and source. Although Mycobacterial agents of this disease are coughed up and discharged into the air via the mouth, as in tuberculosis, individuals in close contact with those having the active pulmonary infection are not attacked by the disease (8, 9, 11, 12).

The pathogenicity and epidemiology of Mycobacteria kansasii are unclear. Mycobacteria kansasii has been isolated from raw milk (6), pasteurized milk (10, 13), water (2), and gastric washings of health personnel in a
hospital setting (1, 12), but no method of transmission of predictable vector has been found. Although found in milk and milk products (8), attempts to recover it from the soil have been generally unsuccessful (15). The spread of the disease between humans apparently does not occur (4, 8). In studies by Chapman and associates, there was no significant evidence of spread of the disease by contact with infected persons (3, 7, 9).

Pathogenic studies in laboratory animals have shown Mycobacteria kansasii to rarely cause disease (5). Why, then, does it cause significant disease in man? What explains the invasion of tissue by organisms which usually are nonpathogenic?

According to Chapman (8), Mycobacteria kansasii disease attacks the lower middle to middle income groups most often, has no clear occupational association, follows no ethnic distribution, and is not associated with any pre-existing disease, nor is there a history of any unusual childhood diseases. Chapman also characterized the average Mycobacteria kansasii patient as a male suburban dweller with a rural or semi-rural background who has a slightly better than high school education, works hard, and consumes a lot of dairy products (8).

At present, when public health officials consider the dangers of Mycobacterium disease, Mycobacteria kansasii
infections are assigned a secondary role. However, as we see a marked reduction in Mycobacteria tuberculosis disease in the United States, as illustrated in Table I, the problems of Mycobacteria kansasii infections become more critical. The table shows that over a twenty-year span the United States has shown a reduction in the number of tuberculosis cases as well as a reduction of over 14,000 deaths. These figures are even more impressive when the comparison of reduction in cases and deaths is based on the rate per population, as may be examined in the percentage change columns. The 79,775 cases in 1954 were based on a population of 161,815,541 persons. On the lower end of the table the figure for 1974 of 30,210 is drawn from a population of 211,258,740 persons. These reductions were the results of improved treatment of source cases, the prevention of further cases through alert examinations, and applying the knowledge of how tuberculosis is spread.

The epidemiology of Mycobacteria kansasii infection has only been partially elucidated, and the pathogenesis is not known. It is well established that Mycobacteria kansasii organisms are abundant in the gastric washings and pharynges of healthy people (1). The question that haunts the researcher, then, is when and why does it suddenly invade the human body? The possibility of
<table>
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<td>1970</td>
<td>37,137</td>
<td>18.3</td>
<td>5,560*</td>
<td>2.7</td>
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<td>35,217</td>
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<td>4,380*</td>
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<td>1972</td>
<td>32,882</td>
<td>15.8</td>
<td>4,550*</td>
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<td>1973</td>
<td>30,998</td>
<td>14.8</td>
<td>3,875*</td>
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<td>1974</td>
<td>30,210</td>
<td>14.3</td>
<td>3,218*</td>
<td>1.6</td>
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</table>

All case rates per 100,000 population.

*Provisional data.
infection from lower animal to man cannot be excluded since fowl are known to transmit avian tuberculosis to hogs, but no predictable vector or method of transmission has been identified.
CHAPTER BIBLIOGRAPHY


CHAPTER III

PROCEDURES USED IN THE DEVELOPMENT OF THE STUDY

The problem of this study was to review the relationship in Dallas and Tarrant Counties between individuals contracting an "influenza-like" illness within six months prior to their having been attacked by "active" Mycobacterium kansasii disease.

Selection of Subjects

The subjects were 168 persons who were reported to the Texas Department of Health as diagnosed cases of Mycobacterium kansasii disease from Dallas and Tarrant Counties during the years 1974 and 1975. Exclusions were made of the subjects who had moved out of the geographical area or were deceased. Names of the individuals considered were obtained from the two Texas Department of Health Regional Offices: Arlington and Tyler. A list was then compiled of the population to be used denoting name, address, diagnosis date, and physician or facility in attendance.

An alphabetized list was compiled for potential subjects in each of the two selected years, 1974 and 1975.
The random sampling method suggested by Ostle (2), which incorporates a table of random numbers, was used to complete the randomized selection for each of the two years. A 50 per cent selection was made from each of the lists, using this method. Thirty-six potential subjects were chosen from the 1974 population of seventy-one, and forty-nine from the 1975 population of ninety-seven.

An additional fourteen and nineteen subjects were chosen from the respective list as an additional 25 per cent selection to be used as alternates when any initially selected subjects were eliminated as uninterviewable. Eight of the fourteen and twelve of the nineteen of those selected were used as alternates.

Preparation for Data Gathering

A letter was sent to each physician of record, who reported each of the selected subjects (patients), asking permission to seek an interview with his patient (see Appendix A). Accompanying this letter, as an introduction, was a letter from Dr. John S. Chapman also soliciting the physician's cooperation in the study (see Appendix B). These letters explained briefly that a study was being carried out and that part of the study required interviewing Mycobacteria kansasii patients. A self-addressed, stamped envelope was enclosed along with a permission slip for signature (see Appendix C). If no reply was received
within ten days, a follow-up telephone call was made to the physician to assure him of the need for the study, to answer any questions he might have in regard to the study, and to ask again for his assistance.

A second letter was mailed to those patients whose physicians gave approval to contact them for an interview (see Appendix D). This letter explained the need to investigate the disease and how they could help with a few minutes of their time. A follow-up telephone call was made to each of these patients, if a telephone was available. For those with no telephone, a personal visit was made and either an interview was performed at that time or a convenient time was arranged. Those who were contacted directly by telephone, as a whole, were very willing to cooperate, and many insisted on being interviewed by telephone.

Interview Instrument

The instrument to be used as the interview form was designed for a brief person-to-person discussion of the subject matter (see Appendix E). A rough draft was first devised and submitted to the faculty advisor for review and comment. Additional suggestions were drawn from the thesis committee during their oral review of the preliminary preparation for the study, from numerous chest
physicians with whom the researcher worked, and from Bradborn's "Selecting the Questions to be Asked in Surveys" (1).

Description of the Instrument

The instrument used to record the interview information was divided into two parts: general information and disease-associated questions (see Appendix E).

The first part dealt mainly with background information for identification. Areas of concern included

1. Personal information such as subject's name, address, Social Security number, and birthdate.
2. Diagnosis date for reference.
3. Name of the physician who handled the case.
4. Physician's approval to interview.

The second part of the interview form, which was designed to be separated from the identifying part, consisted of four key questions to which there were simple "yes" and "no" answers and three questions in relationship to sex, marital status, and previous exposure to the disease.

The four primary questions asked were

1. Did you have an influenza immunization within a year prior to your diagnosis date?
2. Did you have influenza within the six months before your diagnosis?
3. Did you have influenza within a year before your diagnosis?
4. Did you have a "bad cold" several months (six months) before you were told you had this infection?

**Interview Procedure**

A formal interview was carried out with each subject after a brief introduction was made to the interviewee and his family. Each interviewee was given a brief review of why the research was important to finding the source of the disease which he had contracted. No discussion was made of a possible connection between an "influenza-like" disease and subsequent *Mycobacteria kansasii* infection until after the interview was complete. Most interviewees were more responsive when the term "influenza" was defined for them prior to questioning. The operational influenza definition used by the interviewer was "an acute infection marked by depression, distressing fever, acute inflammation of the nose, larynx and bronchi, accompanied by neuralgic and muscular pains, gastrointestinal disorder and discomfort, and nervous disturbances such as headaches."

To refresh the patient's memory, the researcher attempted to associate time with events in the patient's life. The resultant rapport helped the researcher to define "influenza-like" symptoms for the patient. Significant circumstances or events in the subject's medical history that would have a bearing on the research were not disclosed during the interview.
After all interviews were completed, the two parts of each instrument were given matching numbers, then separated. Part I of the instrument was kept for population verification; Part II, with pertinent questions, was statistically treated and examined along with additional data collected from governmental agencies. The supplemental data includes

1. "Influenza-like" illnesses reported to the Texas Department of Health during 1973, 1974, and 1975 from Dallas and Tarrant Counties;

2. Pneumonia-influenza deaths reported to the United States Government Center for Disease Control from 1968 to 1975; and

3. Mycobacteria kansasii cases reported to the Texas Department of Health for Dallas and Tarrant Counties from 1966 to 1975.
CHAPTER BIBLIOGRAPHY


CHAPTER IV

PRESENTATION OF DATA

This chapter presents data compiled from interviews with eighty-five Mycobacteria kansasii diseased cases reported to the Texas Department of Health from Dallas and Tarrant Counties for 1974 and 1975. The interview instrument used was composed of two parts: (1) the general background information of each participant, and (2) the participant's medical history as it relates to the Mycobacteria kansasii illness.

Additional data presented is a compilation from local, state, and national governmental health agencies regarding (1) "influenza-like" illnesses reported to the Texas Department of Health during 1973, 1974 and 1975 from Dallas and Tarrant Counties; (2) pneumonia-influenza deaths reported to the United States Government Center for Disease Control from 1968 to 1975; and (3) Mycobacteria kansasii cases reported to the Texas Department of Health for Dallas and Tarrant Counties from 1966 to 1975.
Background Information of Related Data and Participants

All participants for this study were selected from the 168 cases of Mycobacteria kansasii disease reported to the Texas Department of Health for 1974 and 1975 in Dallas and Tarrant Counties. For this study, a 50 per cent random selection was drawn from the 71 cases reported in 1974 and the 97 cases reported for 1975, making a total of 85 primary selections (36 from 1974 and 49 from 1975). Thirty-three additional selections were made as the 25 per cent alternates required in the random selection method (14 from 1974 and 19 from 1975).

The 71 cases for 1974 and the 97 cases for 1975 represent 61.2 per cent and 68.3 per cent of the atypical Mycobacterial disease reported for those years. Table II shows the number of reported atypical Mycobacterial disease cases reported since 1966, the first year such diseases were reportable. The table breaks these diseases down into two categories, one for the Mycobacteria kansasii cases reported, and the second as "Other," which constitutes a wide assortment of all known Mycobacteria. Further, the table indicates that there was a wide range in both the number of Mycobacteria kansasii cases reported and other Mycobacterial-type diseases reported.
TABLE II
NUMBER OF CASES OF ATYPICAL MYCOBACTERIA DISEASE REPORTED IN DALLAS - TARRANT COUNTIES FOR A TEN-YEAR PERIOD

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<tr>
<td>Mycobacteria kansasii</td>
<td>33</td>
<td>61</td>
<td>78</td>
<td>88</td>
<td>25</td>
<td>56</td>
<td>81</td>
<td>85</td>
<td>71</td>
<td>97</td>
</tr>
<tr>
<td>% Total reported</td>
<td>80.5</td>
<td>81.3</td>
<td>80.4</td>
<td>77.9</td>
<td>78.1</td>
<td>78.9</td>
<td>73.6</td>
<td>59.0</td>
<td>61.2</td>
<td>68.3</td>
</tr>
<tr>
<td>Others</td>
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<td>19</td>
<td>25</td>
<td>7</td>
<td>15</td>
<td>29</td>
<td>59</td>
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<td>Total cases</td>
<td>41</td>
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<td>97</td>
<td>113</td>
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<td>71</td>
<td>110</td>
<td>144</td>
<td>116</td>
<td>142</td>
</tr>
</tbody>
</table>

*Insufficient reporting system prior to this year.

Mycobacteria kansasii showed a fluctuation from a low of 25 cases in 1970 to a high of 97 in 1975. Other Mycobacterial disease cases (M. avium, M. scrofulocicum, M. intercellulare, M. marinum, M. xenopi, M. fortuitum and M. chelonei), varied from a low of 7 in 1970, the same year as the Mycobacteria kansasii low, to a high of 59 in 1973. There seemed to be no apparent relationship between Mycobacteria kansasii disease cases reported in any year and the total number of Mycobacterial diseases reported for the same year. In 1967, 81.3 per cent of those reported were Mycobacteria kansasii, while in 1973 only 59.0 per cent of the total were of the same classification.
A consideration not in evidence in the table is the likelihood that many cases were, or are, not being reported to public health authorities. All physicians are asked to report cases in Texas; however, this is not required by law.

The National Morbidity and Mortality Statistical Branch, Bureau of Epidemiology, of the Center for Disease Control (CDC), in Atlanta, Georgia, recognizes that some 50 per cent of the general population in the United States exhibits some of the recognizable symptoms of influenza in a year's time; therefore, they have tried to devise a method of assessment which is valid when measuring epidemics. The distinguishing characteristic is severity. The total number of deaths due to pneumonia and "influenza-like" illness on a national basis, plus the number of deaths reported from 121 selected cities in the country, provide the best indicator available as to the presence or absence of an influenza epidemic (Graph I, Morbidity and Mortality Weekly Report Summaries).

As a product of the deduction that the distinguishing characteristic for measuring epidemics is severity, Graph I was compiled from weekly and yearly data supplied by the Center for Disease Control for this study, showing deaths per year from pneumonia and "influenza-like" diseases from 1968 through 1975. Also identified are the
Graph 1: Pneumonia-influenza--Reported Deaths in 121 Selected Cities, United States, 1967-1976

*Figures drawn from US CDC, Atlanta, Georgia, Weekly Morbidity & Mortality Summaries - 1973-1976*
particular times, in weeks and months, in the 121 selected cities, of deaths reported due to pneumonia and influenza-like diseases.

Epidemic periods on a national basis are shown by the jagged, heavy, solid line as it takes sharp rises above the expected number of deaths for a period which is shown by the lighter, "even-flowing" solid line. The significant time period for this study (1973, 1973, and 1975), shows no apparently large epidemics appearing during this time (accelerated number of reported deaths). The total number of deaths from pneumonia and influenza-like diseases on a national basis for 1975 (4,272), however, exceeds by almost twice the same number for 1974 (2,201).

Although national sources (CDC) make no attempt at counting the actual number of influenza-like cases occurring in an area, some local and state governments do, Texas being one of them. All physicians and local health departments are requested, not required, to report all "influenza-like" illnesses they diagnose to the Texas Department of Health. Table III shows the results of such reporting for Dallas and Tarrant Counties during 1973, 1974, and 1975.

During 1974, in Dallas and Tarrant Counties, there were 64 per cent fewer cases reported than for 1973, down from 4,652 in 1973 to 1,713 for 1974. Again, in 1975 there
## TABLE III

**INFLUENZA-LIKE ILLNESSES REPORTED TO THE BUREAU OF COMMUNICABLE DISEASES SERVICE—TEXAS DEPARTMENT OF HEALTH**

<table>
<thead>
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</tr>
<tr>
<td>1973</td>
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<td>1636</td>
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<td></td>
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<td></td>
<td>3</td>
<td>9</td>
<td>287</td>
<td></td>
<td>4615</td>
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<td>1974</td>
<td>533</td>
<td>878</td>
<td>36</td>
<td>2</td>
<td>3</td>
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<td></td>
<td></td>
<td>54</td>
<td>204</td>
<td></td>
<td>1710</td>
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<tr>
<td>1975</td>
<td>815</td>
<td>423</td>
<td>166</td>
<td>16</td>
<td>14</td>
<td>6</td>
<td></td>
<td></td>
<td>1</td>
<td>26</td>
<td>9</td>
<td>98</td>
<td>1574</td>
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<tr>
<td>1973</td>
<td>35</td>
<td>2</td>
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<td></td>
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<td></td>
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<tr>
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<td></td>
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<td></td>
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<td>3</td>
</tr>
<tr>
<td>1975</td>
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<td>1</td>
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<td></td>
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<td><strong>Dallas &amp; Tarrant</strong></td>
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<tr>
<td>1973</td>
<td>145</td>
<td>2572</td>
<td>1636</td>
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<td>1974</td>
<td>533</td>
<td>881</td>
<td>36</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
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<td>54</td>
<td>204</td>
<td></td>
<td>1713</td>
</tr>
<tr>
<td>1975</td>
<td>817</td>
<td>423</td>
<td>167</td>
<td>16</td>
<td>14</td>
<td>6</td>
<td></td>
<td></td>
<td>1</td>
<td>26</td>
<td>9</td>
<td>98</td>
<td>1577</td>
</tr>
</tbody>
</table>
was a reduction in reported cases of about 7.2 per cent from 1974. The wide differences between Dallas County and Tarrant County reporting may simply have to do with the attitudes expressed by the local medical societies, and their physicians, toward public health during that particular year.

Data from Interviews

Part I

Of the 85 patients interviewed, 60 were males and 25 were females. This was consistent with the sex distribution in the total population of 116 males to 52 females. Of the total population interviewed, 68 were married, 9 were divorced, 6 were single, and 2 were separated.

In the 1974 population, the mean age of both sexes was 58, while that of males was 62, and that of females was 50. In the 1975 population, the mean age of both sexes was 52, while that of males was 53, and that of females was 47.

The mean age of the total male population was 57, and of the female population, 48. This gave an overall mean age of 54, due to the preponderance of male participants. However, the oldest participant interviewed was an 83-year-old female, and the youngest was a 22-year-old female.
Part II

The response to the question, "Did you have an influenza immunization within the year prior to the onset of your Mycobacteria kansasii infection?" showed a large majority (89.4 per cent), 76 of 85 participants of both populations (1974 and 1975), who were not immunized against influenza. Of note was that 5 (83.3 per cent) of the 6 participants who received the immunization had no "influenza-like" illness prior to the onset of their Mycobacteria kansasii illness.

Of the 36 1974 participants, 11 (30.6 per cent) claimed to have had an "influenza-like" illness within six months of their Mycobacterial kansasii disease. Twenty (55.6 per cent) of this population claimed to have had some "influenza-like" illness of recollection within twelve months or less of becoming ill with the Mycobacteria kansasii disease, and one participant for the 1974 population claimed to have had an "influenza-like" illness in both the six-month and twelve-month periods. Twenty-one (58.3 per cent) of these same participants claimed to have had "bad colds" six months prior to diagnosis also.

Although the 1974 population is the smaller of the two populations (36 for 1974 versus 49 for 1975), all 4 participants who could not recall the six months prior to their Mycobacteria kansasii illness came from this
population. In the total population, 3 (75 per cent) of the 4 who could not recall the twelve-month period came from this population. This lends credence to the importance of interviewing participants as soon as possible after diagnosis. Both populations (1974 and 1975) had one participant who could not recall clearly if he had ever had a "bad cold."

The majority of the 1974 participants gave negative answers to all questions except when asked about "bad colds"; 30 (83.3 per cent) had not had an influenza immunization, 21 (58.3 per cent) had not had influenza within six months of diagnosis, and 23 (63.9 per cent) had not had influenza within twelve months. As referred to previously, 21 (58.3 per cent), however, had in fact had "bad colds" within the six-month period.

In the 1975 population, 19 (38.8 per cent) claimed to have had an influenza illness within six months prior to their Mycobacteria kansasii illness. Of the total 34 affirmative responses to having had influenza within twelve months of diagnosis, 7 (14.3 per cent) of these participants claimed to have had an influenza illness during both intervals. Therefore, only 27 (55.1 per cent) of the population had influenza within the twelve months preceding their Mycobacteria kansasii illness. Thirty-three (67.4 per cent) of the 1975 population gave an
affirmative answer to having had a "bad cold" within six months of the illness.

The negative responses to the four questions for the 1975 population were similar to those of the preceding year. Forty-six (93.9 per cent) of these participants had not received an influenza immunization, 30 (61.2 per cent) had not had influenza within six months of diagnosis, and 33 (64.4 per cent) had not had influenza within the twelve months. As with the previous population (1974), the 1975 population showed a large number, 33 (67.4 per cent) who had suffered "bad colds" within six months of diagnosis.

In Table IV, the responses to the questions asked in Part II are presented to show the resultant responses of the interviews by divisional populations and the results of the total population.

Eleven (30.6 per cent) of the 36 participants interviewed in the 1974 population compared to nineteen (38.8 per cent) of the 49 in the 1975 population gave a total population result of 30 (35.3 per cent) who would show a positive response to the descriptive study supposition of having had an influenza illness within six months of their Mycobacteria kansasii illness.
<table>
<thead>
<tr>
<th>Questions Asked</th>
<th>Yes All Years</th>
<th>Yes 1974</th>
<th>Yes 1975</th>
<th>No All Years</th>
<th>No 1974</th>
<th>No 1975</th>
<th>No Recollection</th>
<th>No Recollection 1974</th>
<th>No Recollection 1975</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you have an influenza immunization within the year prior to the onset of your M. kansasii infection?</td>
<td>6 7.1</td>
<td>4 11.1</td>
<td>2 4.1</td>
<td>76 89.4</td>
<td>30 83.3</td>
<td>46 93.9</td>
<td>3 3.5</td>
<td>2 5.6</td>
<td>1 2.0</td>
</tr>
<tr>
<td>Did you have influenza within six months of your diagnosis?</td>
<td>30 35.3</td>
<td>11 30.6</td>
<td>19 38.8</td>
<td>51 60.0</td>
<td>21 58.3</td>
<td>30 61.2</td>
<td>4 4.7</td>
<td>4 11.1</td>
<td>0 ...</td>
</tr>
<tr>
<td>Did you have influenza within twelve months of your diagnosis?</td>
<td>25 29.4</td>
<td>10 27.8</td>
<td>15 30.6</td>
<td>56 65.9</td>
<td>23 63.9</td>
<td>33 67.4</td>
<td>4 4.7</td>
<td>3 8.3</td>
<td>1 2.0</td>
</tr>
<tr>
<td>Did you have a &quot;bad cold&quot; six months before you were told you had your infection?</td>
<td>54 63.5</td>
<td>21 58.3</td>
<td>33 67.4</td>
<td>29 34.1</td>
<td>14 38.9</td>
<td>15 30.6</td>
<td>2 2.4</td>
<td>1 2.8</td>
<td>1 2.0</td>
</tr>
</tbody>
</table>
To give a broader descriptive view, the researcher consolidated the objective answers as asked in the interviews into nine categories, as in Table V.

**TABLE V**

**COLLECTIVE RESPONSES TO INFLUENZA AND COLD QUESTIONS OF THE INTERVIEWS**

<table>
<thead>
<tr>
<th></th>
<th>All %</th>
<th>% of Years</th>
<th>1974 %</th>
<th>1975 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>No influenza immunization, no influenza illness, no cold in given periods</td>
<td>17</td>
<td>20.0</td>
<td>7</td>
<td>19.4</td>
</tr>
<tr>
<td>No influenza illness either during 6 or 12 month periods</td>
<td>35</td>
<td>41.2</td>
<td>13</td>
<td>36.1</td>
</tr>
<tr>
<td>Had influenza immunization but no influenza illness or &quot;cold&quot; in given times</td>
<td>5</td>
<td>2.4</td>
<td>3</td>
<td>8.3</td>
</tr>
<tr>
<td>Had influenza both during 6 and 12 month periods</td>
<td>8</td>
<td>9.4</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>Had influenza during 6 or 12 month periods</td>
<td>47</td>
<td>55.3</td>
<td>20</td>
<td>55.6</td>
</tr>
<tr>
<td>Had influenza or &quot;cold&quot; during 6 month period</td>
<td>39</td>
<td>45.9</td>
<td>15</td>
<td>41.7</td>
</tr>
<tr>
<td>Had influenza or &quot;cold&quot; during 12 month period</td>
<td>68</td>
<td>80.0</td>
<td>29</td>
<td>80.6</td>
</tr>
<tr>
<td>Had &quot;cold&quot; but no influenza during 6 month period</td>
<td>9</td>
<td>10.6</td>
<td>4</td>
<td>11.1</td>
</tr>
<tr>
<td>Had &quot;cold&quot; but no influenza within the 6 or 12 month periods</td>
<td>20</td>
<td>23.5</td>
<td>8</td>
<td>22.2</td>
</tr>
</tbody>
</table>
Treatment of the Data

The data compiled from the instrument was reported in raw figures and percentages. To test the hypotheses of having had an "influenza-like" illness within six months prior to the onset of Mycobacteria kansasii illness, the Chi-square statistical treatment was used. The resultant calculation is shown in Table VI for the years 1974 and 1975.

**TABLE VI**

CHI-SQUARE ANALYSIS OF "INFLUENZA-LIKE" ILLNESS
SIX MONTHS PRIOR TO THE ONSET OF
MYCOBACTERIA KANSAII DISEASE

<table>
<thead>
<tr>
<th></th>
<th>1974</th>
<th>1975</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>fo</strong></td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td><strong>fe</strong></td>
<td>36</td>
<td>49</td>
</tr>
<tr>
<td><strong>fo - fe</strong></td>
<td>-25</td>
<td>-30</td>
</tr>
<tr>
<td>((fo - fe)^2 / fe)</td>
<td>625</td>
<td>900</td>
</tr>
</tbody>
</table>

\[ x^2 = 17.36 + 18.36 \]

\[ x^2 = 35.72 \]
The Chi-square significance for this study was 35.72. Applying the degrees of freedom of one at the 0.01 level, the Chi-square significance level is 6.635 (Appendix F).
CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS
AND RECOMMENDATIONS

Summary

The purpose of this study was to investigate by interviewing Mycobacteria kansasii diseased individuals within Dallas and Tarrant Counties to determine if there is a relationship between an individual's contracting an "influenza-like" illness within a six-month period prior to having "active" Mycobacteria kansasii disease. A relationship was sought between two similar populations, one for reported cases in 1974 and a second for reported cases in 1975. A second pursuit to collaborate the primary purpose was to seek a relationship between "influenza-like" illnesses reported during 1973 and 1974 for Dallas and Tarrant Counties with the incidence of Mycobacteria kansasii disease reported during 1974 and 1975 for the same geographical area.

The study involved 168 males and females who had been diagnosed and reported by a physician as having "active" Mycobacteria kansasii disease during 1974 and 1975 while a resident of Dallas and Tarrant Counties. By random
selection, as set forth in Chapter III, 85 interviewees were selected. Interview information was collected on a two-part interview instrument consisting of (1) the general background information of the participants, and (2) questions directly related to the medical history of the individual.

Part I of the interview instrument concerned the general background of the participant and included inquiry into such areas as the name, address at present and at the time of diagnosis, Social Security number, date of birth, diagnosis and date, telephone number, physician's name, and physician's permission to interview.

Part II of the interview instrument asked medical history, as it related to his or her Mycobacteria kansasii disease. The participants were asked (1) their marital status, (2) their sex, (3) if they had had an influenza immunization within a year prior to their diagnosis date, (4) if they had had influenza within six months of their diagnosis date, (5) if they had had influenza within twelve months of their diagnosis date, and (6) if they had had a "bad cold" six months before the onset of the Mycobacteria kansasii illness.

In Part I of the interview instrument, it was found that the mean age was 54 for the total population, 58 for the 1974 population, and 52 for the 1975 population.
Physician's permission to interview their patients was unanimous and, in general, relatively few of the participants were reluctant to cooperate to the fullest with the researcher.

In Part II it was found that most participants (60 per cent) had not had influenza six months prior to the onset of their Mycobacteria kansasii infection; only 35.3 per cent had had influenza in this time period. The overall lack of recollection by participants (4.7 per cent) to the basic premise question was much less than anticipated by the researcher.

An extremely large percentage of the total population (89.4 per cent) had not taken influenza immunizations within a year of their Mycobacteria kansasii illness. This might be viewed from two aspects: (1) it might prevent influenza as it did in 83.3 per cent of those immunized in the study, or (2) it might serve the same function as having an influenza illness and make the individual more susceptible, as supposed in the study supposition.

The two remaining questions of primary importance did not, and were not intended to, provide primary information for the study. They were given the role of developing rapport, recall, and possible inferential evidence for further study. Twenty-five (29.4 per cent) of the participants had contracted influenza within a year prior to
diagnosis and 54 (63.5 per cent) had contracted a severe cold six months prior to diagnosis.

To further assist in an assessment of the supposition of the study, public health records were consolidated regarding the incidence of influenza and Mycobacteria kansasii disease in Dallas and Tarrant Counties. Morbidity and mortality figures for both diseases were gathered from the Center for Disease Control of the United States in Atlanta, Georgia; Texas Department of Health in Austin, Texas, and its satellite hospitals and offices; and Dallas and Tarrant Counties Public Health Divisions. In the assessment of public health records, the researcher was aware of the fact that there is no system or procedure in Dallas and Tarrant Counties that assures one that records constitute all cases of disease in an area or all known cases of disease; they are simply those reported.

Conclusion

Based upon the 85 participants used in the study and an assessment of the available data, the hypothesis of the study is rejected at the Chi-square 0.01 level of significance. Therefore, there is no relationship between having had influenza-like symptoms within six months of contracting Mycobacteria kansasii.
Implications

In Chapter II, the lack of knowledge or interest in the Mycobacterium *kansasii* was discussed and it was noted that a public health problem, likely to follow the reduction or eradication of tuberculosis, will be the atypical Mycobacteria disease. Therefore, this investigation was needed and will be beneficial in the future. Cow's milk, person-to-person transmission, and soil have been explored by public health people as to the source and spread question of this "pathogen." These, too, provided no affirmative answers, but they answered the question, with a degree of satisfaction, that another avenue had been explored and eliminated for the future seekers pursuing the quest to conquer disease.

After reviewing this study, Dr. John Chapman, the author of most of the background literature, indicated in conversations with the researcher that he feels water is the next most likely area in need of investigation.

Recommendations for Further Study

It is imperative to public health in Dallas and Tarrant Counties that further studies be made of all possibilities relative to answering the following questions:

1. Why does Mycobacteria *kansasii* colonize in Dallas and Tarrant Counties?
2. Why does Mycobacteria kansasii become a pathogen here more so than elsewhere in Texas and the United States?

3. If Mycobacteria kansasii is a free-living agent that survives in nature, does it survive in waters unique to Dallas and Tarrant Counties?
APPENDIX
Dear Doctor:

You have previously reported a number of Mycobacteria kansasii infections to Tuberculosis Control, Public Health Region 5, of which I am Program Manager. I would appreciate permission to talk to all such patients whom you reported in the year 1974 and 1975 to see if we might discover any factors that might relate to the source or spread of such infections.

We would simply like to ask a random sampling of Mycobacteria kansasii patients if they exhibited any flu-like diseases several months (six months, or longer) prior to their illness with Mycobacteria kansasii.

Thank you for your help.

Sincerely,

Willis E. Good
Program Manager
Tuberculosis Control
Public Health Region 5
Texas Department of Health
APPENDIX B

May, 1976

Dear Doctor:

As a part of a special project, Mr. Willis E. Good is undertaking a study of factors that may lead to infection of Mycobacteria kansasii (photochromogen). This letter is to request your permission for Mr. Good to interview your patients who have this infection.

Questions will be directed toward predisposing diseases, precipitating non-mycobacterial infections and possible environmental sources of Mycobacteria kansasii.

We shall very much appreciate your consent and shall be most pleased to recive suggestions or observations you yourself may have had.

Sincerely,

John S. Chapman, M.D.
Professor of Medicine
Southwestern Medical School of Dallas
APPENDIX C

Interview Permission Slip

PLEASE RETURN TO: Willis E. Good
Tuberculosis Control
2000 E. Randol Mill Road,
Suite 611
Arlington, Texas 76011

Telephone: 817 460-8281

My permission is given to Willis E. Good to interview my reported cases of Mycobacteria kansasii for years 1974 and 1975 in the interest of research as to the source and spread of this disease.

SIGNED: _____________________________
Dear Patient:

Your physician, and I, have been discussing the unusual chest disease that he has been treating you for in the last year or so. As you know, there is a great deal of speculation as to where this infection comes from, what causes it to be a disease, and why only in our area.

Hopefully, with your cooperation, we may be able to pursue the answers to some of these questions. At your convenience, I would like to discuss the disease you had and ask you several questions. It should not take over twenty minutes of your time.

I will be in touch with you by telephone in the next several days for an appointment. If this is inconvenient, please call me at 273-2965 in Arlington.

Sincerely,

Willis E. Good
Program Manager
Tuberculosis Control
Texas Department of Health
APPENDIX E

PART I

PATIENT INTERVIEW SHEET

Patient's Name:__________________________________________

Diagnosis: ____________________________ Date: ____________

Social Security Number: ___________ Birthdate: ____________

Address: ____________________________________________

Telephone Number: ____________________________________

Physician's Name: ______________________________________

Physician's Approval: ___ Yes ___ No Date: ____________

PART II

___ Male ___ Female

___ Married ___ Single ___ Divorced ___ Separated

Did you have an influenza immunization within a year prior to your diagnosis date? ___ Yes ___ No

Did you have influenza within 6 months before your diagnosis? ___ Yes ___ No

Did you have influenza within 1 year before your diagnosis? ___ Yes ___ No

Did you have a "bad cold" several months (6 months) before you were told you had this infection? ___ Yes ___ No
### APPENDIX F

#### PARTIAL CHI-SQUARE TABLE

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<td>6</td>
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