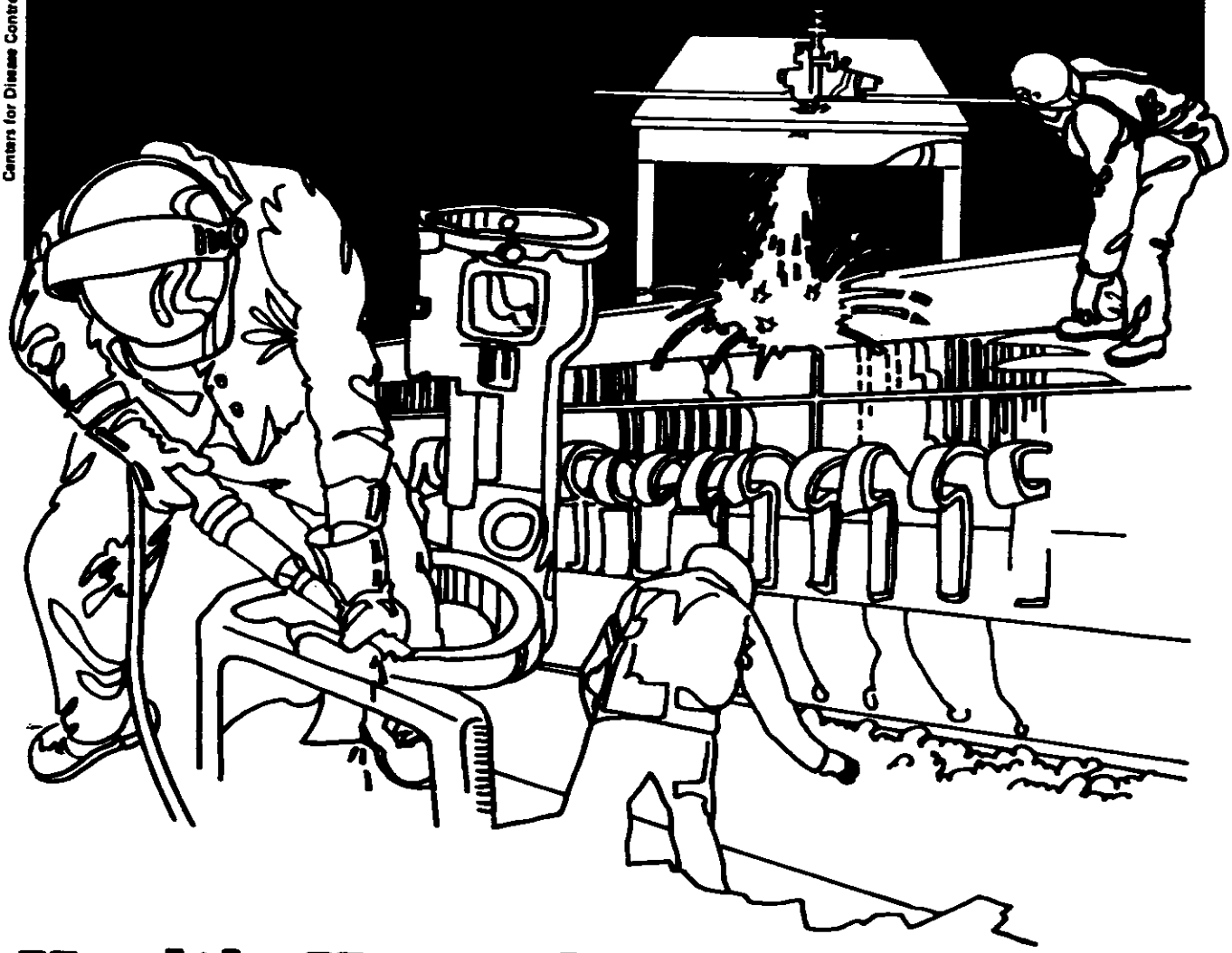
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health

NIOSH



Health Hazard Evaluation Report

MHETA 86-528-1889
MCGRAW-EDISON
CANONSBURG, PA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

MHETA 86-528-1889
MCGRAW-EDISON
CANONSBURG, PA
MARCH 1988

NIOSH INVESTIGATORS:
WAYNE SANDERSON, CIH
ELIZABETH KNUTTI, R.N.

I. SUMMARY

The National Institute for Occupational Safety and Health (NIOSH), the Division of Respiratory Disease Studies (DRDS) at Morgantown, West Virginia was requested to investigate a suspected clustering of cancer at the McGraw-Edison plant in Canonsburg, Pennsylvania. Large power transformers and various sizes of power circuit breakers are produced at this plant. The production and maintenance, and testers locals of the United Steelworkers Union submitted for investigation a list of 37 workers who had developed cancer.

Among the 37 cases, thirteen different types of cancer were represented. Lung cancer (16 cases) was the predominant form of cancer but was found to make up only a slightly higher proportion of the total number of cancers than would be expected to occur in the general population. No association between past occupational exposures or job categories and any particular type of cancer was discovered, however little information on historical occupational exposures was available. It is likely that this increasing number of cancers in recent years is the result of an aging cohort, and not the result of exposure to specific hazards at the plant.

KEYWORDS: SIC 3612 Cancer, cluster analysis, electrical equipment, electrical transformers.

II. INTRODUCTION

On September 19, 1986, the National Institute for Occupational Safety and Health (NIOSH) received a technical assistance (TA) request from the Occupational Safety and Health Administration (OSHA) - U.S. Department of Labor to investigate an apparent clustering of cancer cases at the McGraw-Edison plant in Canonsburg, Pennsylvania. OSHA submitted the request because a relative of a former McGraw-Edison employee believed that several employees had died of cancer and that common exposures to workplace carcinogens may have caused their cancers. By March of 1987 this individual developed a list of 17 former employees who had supposedly died of cancer between the years 1977-1986.

On September 15, 1987 investigators from NIOSH met with company officials, and officials from the United Steelworkers International, Local 3968, representing the production and maintenance staff; Local 4561, representing the electrical testing staff; and Local 6449, representing the clerical staff. During this meeting the presidents from Locals 3968 and 4561 presented lists of 51 and 6 employees, respectively, who were believed to have had cancer. Subsequently, the president from Local 4561 submitted one additional name; therefore, a total of 58 names were available for investigation. These 58 names represent the cases of cancer believed by fellow employees to have occurred among the testers, maintenance, and production workers. These lists were developed by fellow union members volunteering names of workers whom they believed had cancer, but union members were not able to provide confirming information. All of the 17 names originally presented by the concerned relative were included in the list from Local 3968.

III. BACKGROUND

The McGraw-Edison plant in Canonsburg, Pennsylvania was originally built by the federal government in 1943 as a metal forging plant for war production. At the end of the war, production was halted and the War Assets Administration made it available to private companies. In 1946 the Pennsylvania Transformer Company took over part of the plant and moved operations from Pittsburgh to Canonsburg. In 1949 more of the plant was purchased and employment reached 987 workers. In 1952 the Pennsylvania Transformer Company merged to become a division of the McGraw Electric Company and in 1957 McGraw Electric merged with the Thomas A. Edison Company to become McGraw-Edison. In 1985 McGraw-Edison was purchased by Cooper Industries. Since 1946 there have been many additions and renovations made to the original facility.

The Canonsburg plant produces large power transformers in sizes up to 745,000 volts and various sizes of power circuit breakers. Operations are not

of the assembly line type but products are built as units to meet the specifications of the customer. Production is roughly divided into three phases. In phase I the iron cores for the transformers are produced and copper wires are insulated and wound about these cores; in phase II the housing and connectors for the transformers are built; and in phase III the transformers are assembled, tested, and prepared for shipment. Environmental exposures include welding fume, high voltage electricity, paint solvent vapors, noise, and transformer oils. Polychlorinated biphenyl (PCB) containing oils were used in the past, as was asbestos as an insulating material. Records on total numbers of workers employed have only been consistently kept since 1971. Figure 1 presents the number of production and maintenance workers and testers employed by year. In 1963, 1150 people were employed in these two groups, but it is unknown how many were employed in the years between 1963 and 1971. It was speculated by company management that the numbers of employees gradually increased to a peak about 1970 and then gradually decreased to the present level of 725.

IV. EVALUATION OF CANCER CLUSTERS

Cancer is not a single disease, but is a term which reflects the occurrence of unrestricted growth of a body tissue or cell type. All cancers have the common feature of having cells which continue to replicate oblivious to normal regulatory growth controls.[1] These cells lose their original function, become an autonomous mass, and compete with normal cells for their metabolic needs. Their encroachment on the function of normal tissues often leads to death. However, cancers which arise from different tissues or cell types in the body must be considered different diseases; they have different causes and prognoses. For example, lung cancer may be caused by cigarette smoking and asbestos inhalation, and even when treated is usually a fatal disease; neither of these agents has been associated with testicular cancer which has a relatively high cure rate.

The distribution of cancer cases in space and time at a workplace can be affected by various environmental causal factors, the composition and peculiarities of the workforce, or by chance alone.[2] It is quite difficult to evaluate most perceived occupational cancer clusters in an epidemiologically definitive way, but if an excess of cancer occurs as a result of workplace carcinogens, it usually has several distinctive characteristics.

1. Since carcinogens rarely are associated with more than one or two types of cancer, generally only one or two types of cancer are found in excess in an exposed group of workers. For example, asbestos causes lung cancer, vinyl chloride causes liver cancer, and radiation and benzene cause leukemia. Each site specific cancer should be considered a separate disease. Workers would have to be exposed to a wide array of carcinogens in relatively high concentrations in order to see many different types of

cancers represented. This is rarely the case in industry. If a suspected cluster includes cancers of many different types, it is generally not the result of occupational exposures, but reflects particular characteristics of the population and their general environment.

2. Cancer cases may represent a greater proportion of total deaths in the workforce than in the general population and the number of deaths due to some site specific cancer may be greater than expected based on rates from the general population.

3. There are often plausible explanations for the occurrence of a greater number of cancers than expected. For example, workers are exposed to materials known to be associated with the particular type of cancer in question.

4. The presentation of cancer occurs after a long latency or period of time between initial exposure to a carcinogen and manifestation and detection of the cancer. Cancers caused by workplace exposure are generally diagnosed 10 to 30 years after date of initial exposure. If a worker developed cancer after working only a few years it would be unlikely this cancer was the result of workplace exposure.

5. A cancer type tends to occur more frequently among workers with highest exposures and longer tenures working with a suspected carcinogen. Therefore, cancers tend to aggregate in work areas and job categories with highest levels of exposure to suspected carcinogens.

V. METHODS

Although other cases of cancer may have occurred yet remain unknown by the workforce, it is this group of 58 suspected cases which has aroused concern. The only way to discover unknown cases would be to conduct a complete follow-up of all people who have ever worked at McGraw-Edison to determine their vital status and whether they have ever had cancer. This would be both time consuming and costly. It is prudent to first investigate this apparent clustering of cases to see if it indicates an unexpected occurrence for this population.

NIOSH investigators were given access to employee personnel and medical records. Records were available for all currently active employees, and any employee who had terminated employment after 1960. Investigators reviewed and copied the personnel and medical records of workers from the lists supplied by union officials. In particular, investigators collected birthdates, gender, race, job, and medical histories. If there was no confirmation in the files as to type and occurrence of cancer, the physicians or surviving relatives of an individual were contacted. For each worker who had cancer, the age at diagnosis or death if the specific date of diagnosis was unknown, type of

cancer based on site of origin, job history, tenure (number of years employed at McGraw-Edison), and latency (number of years between date of first hire and date of diagnosis or death) were determined.

Company officials and union leaders were consulted regarding past exposures to environmental contaminants. Also, the regional office of the Occupational Safety and Health Administration (OSHA) was contacted for review of industrial hygiene survey reports from McGraw-Edison.

VI. RESULTS

From the list of 58 workers, no records could be found for three of the names. It was suspected that one of these names was a misspelling of another name on the list for which records were found. It is unknown why no records could be found for the other two names. Death certificate, medical records, and contact with families revealed that 18 individuals never had cancer; therefore, 37 workers were confirmed to have had cancer (Table I). All seven of the names submitted by the testers local were confirmed to have had cancer, and 30 of the 51 names submitted by the production and maintenance local were confirmed to have had cancer.

Table II lists the cancer cases by year of diagnosis or death if the specific date of diagnosis is unknown, the original site of cancer, jobs the worker held, tenure, and latency. Among the 37 confirmed cases, thirteen different types of cancer were represented. Types of cancer by year of diagnosis or death are presented in Figure 2. There is an apparent clustering of cancer in recent years.

All but one cancer case were white males between the age of 43 and 69. One lung cancer occurred in a black male, age 51. Approximately 43% of the cases were of eastern European ancestry, 16% Italian, and 41% other. Six cases (16.2%) occurred among workers in their forties (3 lung, 1 colon, 1 larynx, and 1 adrenal gland).

Table III presents the number of cases by cancer type. Lung cancer was by far the most common type of cancer, accounting for 16 of the 37 cancers. Lung cancer is also the most common form of cancer among U.S. white males between 40 and 69 years old.[3] The next most common forms of cancer were colon and lymphoma, accounting for 4 and 3 cases, respectively. There were no more than two cases of any other cancers.

If a cancer is occurring in a population due to the influence of an environmental agent, it is likely to represent a greater proportion of the deaths or types of cancer than would be found in the general population. The proportionate mortality ratio reflects the relative importance of a specific cause of death in relation to all other causes of death in a population.[4]

In Table III the proportion (percentage) of the total cancer deaths among white males between the ages of 40-69 in the United States (1983) is presented for each type of cancer occurring in the McGraw-Edison population.[3] The proportion of lung and colon cancers in the McGraw-Edison population is very similar to the proportion that would be expected to occur in the general population. The proportion of lymphoma cases is greater than would be expected. One or two cases of any particular type of cancer are likely to occur in a given population by chance alone. Therefore, it is not practical to compare the relative proportions of cancers represented by only one or two cases to the proportion in the general population.

The ages, tenures, and latencies of the cancer cases at the time of diagnosis or death are presented in Figures 3, 4, and 5, respectively. Also listed are the means and ranges of ages, tenures, and latencies by 4-year intervals. The mean ages, tenures, and latencies for each 4-year interval increase with time.

The number of cancer cases by year of hire is presented in Figure 6. This figure suggests there were two time periods of more intensive hiring: 1) the late forties and early fifties; and 2) the mid sixties. Each case is represented by the workers age at the time of hiring. Between 1947 and 1953 the average age of 19 cancer cases at the time of hiring was 26 years. Between 1960 and 1967 the average age of 14 cancer cases was 36 years. The age of each lung cancer case at the time of hire is inscribed within a circle, each colon cancer within a square, and each lymphoma within a triangle. The three lymphoma cases were hired in the early fifties, but the colon and lung cancer cases demonstrated no pattern by year of hire.

The number of cancer cases by year of hire is again presented in Figure 7, but each case is represented by the number of years of latency from time of hire to date of cancer diagnosis or death. Between 1947 and 1953 the average latency of 19 cancer cases was 31.1 years and between 1960 and 1967 the average latency of 14 cancer cases was 16.1 years.

Company officials and union leaders noted that workers may have been exposed to the following hazardous environmental agents:

Polychlorinated biphenyls (PCBs) - were used as a nonconducting, thermally-stable insulating fluid in high voltage transformers; PCBs are known to cause skin irritation and liver damage; PCBs have been shown to cause liver tumors in experimental animals but the relevance to humans has yet to be established; NIOSH recommends that PCBs be regulated as an occupational carcinogen.[5]

Welding fume - was a common contaminant in the production of cores and casings for electrical products; fume may contain many different metals depending on the types of rods and fluxes used and the content of the metal

welded upon; exposure to chromium and nickel has been linked to nasal and lung carcinoma, but it is not known whether workers were exposed to these metals during welding operations; welding fume in general is not considered carcinogenic.[6]

Asbestos - a mineral which was used as a thermally stable insulating material, has conclusively been linked to lung cancer and mesothelioma.[7]

Paint solvents - paints used in the paint spray areas were known to contain butanol, toulene, xylene, methyl ethyl ketone, butyl acetate, butyl cellusolve, methyl cellusolve, ethyl benzene, aliphatic naphtha, and lead; none of these materials are considered carcinogenic.

Unfortunately, no records of concentrations of environmental contaminants were discovered except for paint solvents. Records of an OSHA survey in 1986 for paint solvents vapors around a painting booth were available. Workers were not found to be over exposed to concentrations of paint solvents or lead.

VII. DISCUSSION

Undoubtedly, awareness among workers of this increasing number of cancer cases in recent years prompted concern that they were being exposed to cancer causing agents. Workers began to express concern over the number of cancer cases in 1984, the year wherein the greatest number of cases were diagnosed. It is assumed that this group of cancers represents all or nearly all the cases occurring in the workforce in recent years. Although other cases may have occurred that remain unknown, it is this group of cases which has aroused concern. It is the purpose of this investigation to determine whether this distribution of cancers, which has aroused concern among the employees, represents an unexpected occurrence in the McGraw-Edison population. Before this can be determined however, the characteristics of the population from which these cases came should be known. Since investigation of the entire McGraw-Edison population would be costly and time consuming, in this preliminary investigation it is assumed that these 37 cases reflect the general characteristics of the McGraw-Edison population.

Review of the cancer cases indicates that the workforce is predominantly white males. Also, there were apparently two periods of intensive hiring in the late forties and early fifties, and the mid sixties. The workforce census has not remained stable but has fluctuated with consumer demand for McGraw-Edison products. The number of workers apparently reached a peak in the late sixties and has steadily declined since then to approximately 750 workers, presently.

If the cancer cases reflect the characteristics of the plant population, then the plant population may be an "aging cohort". That is, much of the workforce may have hired on in the late 1940's and early 1950's and remained

for 20 to 30 years tenure. Those workers who were hired in the 1960's were on average about 10 years older at the time of first hire than their predecessors. The risk of developing cancer increases with age, therefore as these workers aged their risk of cancer and thereby the number of cancer cases increased. It was noted that as the number of cancer cases increased with time, so did the ages, tenures, and latencies of those cancers. This would be expected if we were seeing the effects of an aging cohort. It is probable that the effect of age and not some occupational hazard is the cause of this apparent clustering of cancer.

There is little information available on the environmental contaminants to which workers have been exposed. Polychlorinated biphenyls (PCBs) which were used in the past as insulating oils in transformers and asbestos which was used as an insulation material are the only clearly recognized carcinogens to which workers may have been exposed. However, PCBs have been associated only with liver cancer in experimental animals and no liver cancers were detected in the McGraw-Edison population. Since no records exist for individual exposure to asbestos, it is unknown what influence asbestos has had on the occurrence of lung cancer in this population. There is no known exposure to other carcinogens which may be associated with the other types of cancer discovered in the McGraw-Edison population.

It is improbable that the work environment would be responsible for 13 different types of cancer. The hazardous agents listed so far yield plausible associations only to liver, nasal, pleural and lung cancers. The predominant cancer was lung cancer, which has been associated with asbestos and some welding exposures, but is also the predominant form of cancer in white males between the ages of 40 and 69. In a population of 1000 white men between the ages of 40 and 69, 35 deaths from cancer would be expected in a ten year period, 14 of these deaths would be expected to have been caused by lung cancer. Out of 37 cancer cases from a population of white males in this age group, about 15 would be expected to be lung cancer; there were 16 observed in this group. Thus, about the same number of lung cancers was observed as expected. Three cases would be expected to be colon cancer (4 observed) and one lymphoma (3 observed). The other kinds of cancers would not be expected on the basis of known exposures, and the number of cases is too small to make meaningful observations.

It is difficult to evaluate proportions in a small population. In a small population relative proportions are quite unstable. That is an increase or decrease of one or two cases of a particular type of cancer would change the proportional value to a greater extent than it would in a larger population. For example, in the McGraw-Edison population of 37 cancer cases, if one more case of cancer was detected this would increase the relative proportion of that type of cancer by 2.6%. However, if 300 cancer cases were being investigated and one more case was detected this would increase the relative proportion of that type of cancer by only 0.3%. Little can be said about the

occurrence of one or two cases of even rare cancers in a small population, since one or two cases may occur by chance alone in any given population.

Because there are too few cases of any other type of cancer, only lung cancer, colon cancer, and lymphoma may be studied in any greater detail. Lung cancer did not cluster among workers who were hired in the earlier history of the plant, but occurred with relatively equal frequency among workers hired in the early fifties and workers hired in the mid sixties. If an occupational contaminant were causing lung cancer, workers with a greater tenure or time since first exposure would be expected to experience a greater risk of lung cancer than would workers with shorter tenures and latencies. Among 19 cancer cases who were hired between 1947 and 1953, 7 (36.8%) developed lung cancer; among 14 cancer cases who were hired between 1960 and 1967, 8 (57.1%) developed lung cancer. Although the mean latencies for these cases were 33.6 and 14.9 years respectively, the mean ages at the times of diagnosis or death were 57.6 and 52.6 years. The ages were quite similar although the latencies were much different. The same is true for the colon cancers, although lymphoma appears to cluster among workers who were hired in the early fifties. Leukemia and lymphoma cancers have been shown to occur in time-space clusters; researchers have suggested this may be caused by common exposure to viral agents circulating in the population.[8,9]

Three cancers (2 lung and 1 adrenal gland) occurred in workers with less than a ten year latency. It is unlikely that these cases could have been caused by an environmental contaminant in the workplace.

Unfortunately, information was not available which would allow cancer cases to be categorized by work area. Several cases had had many different jobs during their tenure at McGraw-Edison. There were too few cases and the total number of workers per job category were unknown. Therefore, no evaluation of cancer type by job category could be made.

Lung cancer alone accounts for fully 25 percent of all cancer deaths in this country and 85 percent of lung cancer cases are due to cigarette smoking.[10] Overall smokers are 10 times more likely to die from lung cancer than are nonsmokers. Heavy smokers are 15 to 25 times more at risk. It is not known how many lung cancer cases had a history of smoking; smoking information was not kept in personnel or medical records. Therefore, the influence cigarette smoking has had in causing lung cancer in this population has not been assessed.

VIII. CONCLUSION

There is an apparent increase in the number of cancer cases occurring in the McGraw-Edison population in recent years, however it is likely that the increasing number of cancers is the result of an aging cohort. A large proportion of the workforce which has been with the company for a number of years is beginning to enter late middle age. As this population ages, the risk of developing cancer is increasing. Lung cancer was the most predominant

form of cancer, but the proportion of lung cancer cases in the total number of cancer cases was about that expected to occur in the general population. No other type of cancer occurred in great enough number to warrant consideration as a cluster.

This investigation indicates that cancer is probably occurring at no greater rate than would be expected to occur in a population of similar age, sex, and racial characteristics. Workers may have been exposed to carcinogens in the past, but due to lack of information no clear association between past exposures and job categories could be determined for any type of cancer. Little can be done at this point in time about exposure to carcinogens in the past; it is more prudent to determine whether workers are currently at risk of over exposure to carcinogens.

IX. RECOMMENDATIONS

1. A thorough industrial hygiene survey of the McGraw-Edison plant should be conducted to determine worker exposure to occupational contaminants. Workers should be given the results of this survey, advised of the dangers, and how to protect themselves from hazardous exposures. Such an investigation and subsequent training should help allay the fears of the workforce in the future. Workers should be periodically reevaluated and retrained to insure the continued effectiveness of the health and safety program.

2. Although investigation of the cancer cases presented by the labor unions does not demonstrate characteristics of a clustering due to occupational exposures, a more detailed study may reach a different conclusion. A concentrated study of the entire McGraw-Edison population may reveal other cases of cancer which were not included in this investigation. Also, enumeration of the people who have ever worker at the plant would allow calculation of the cancer specific rates for the workforce and comparison with the rates of the general population. This report indicates that the results of a more detailed study will probably demonstrate no greater occurrence of cancer than is found in the general population, but we cannot be absolutely certain. Cooper Industries has already initiated a more detailed investigation through the Industrial Health Foundation of Pittsburgh, Pennsylvania. The results of this study should be shared with the workforce.

X. REFERENCES

1. Robbins S, Angell M, and Kumar V. Basic Pathology. W. B. Saunders Co. Philadelphia; 3rd Edition pp. 81, 390-392, (1981).

2. Schulte P et al. Investigation of occupational cancer clusters: Theory and practice. Am. J. Public Health. 77:52-56, (1987).

3. National Center for Health Statistics. Vital Statistics of the United States 1983. U.S. Department of Health and Human Services, Vol 11, Part A:Table 1-25. Hyattsville, Maryland (1987).

4. Mausuer J and Kramer S. Epidemiology. W. B. Saunders Co. Philadelphia; 2nd Edition, pp. 320-322, (1985).

5. NIOSH (1981). Occupational health guidelines for chemical hazards: Chlorldiphenyls. Washington, DC: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, NIOSH Publication No. 81-123

6. ACGIH (1986). Documentation of threshold limit values (TLV's). 5th edition. Cincinnati, OH: American Conference of Governmental Industrial Hygienist, pp. 634.

7. Merchant J. Occupational respiratory diseases. DHHS(NIOSH) Publication No. 86-102. Washington, DC; September 1986. pp 310-313

8. Greenwald P, Rose JS, Daitch PB. Acquaintance networks among leukemia and lymphoma patients. Am J Epidemiol 1979;110:162-177.

9. Burke TA, Gray S, Krawiec CM et al. An environmental investigation of clusters of leukemia and Hodgkin's disease in Rutherford, NJ. J Med Soc NJ 1980;77:259-273.

10. A report of the Surgeon General, The Health Consequences of Smoking - Cancer, U.S. Department of Health and Human Services, Rockville, MD. (1982).

XI. AUTHORSHIP AND ACKNOWLEDGMENTS

Report prepared by: Wayne Sanderson, CIH
Clinical Investigations Branch

Elizabeth Knutti, R.N.
Clinical Investigations Branch

Originating Office: Mining Hazard Evaluation and
Technical Assistance Program
Division of Respiratory Disease
Studies, NIOSH
Morgantown, West Virginia

XII. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Publications Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45526. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. McGraw Edison
2. Cooper Industries
3. OSHA
4. United Steel Workers Locals 3968; 4561 and 6449
5. Honorable R. R. Fischer, House of Representatives

For the purpose of informing affected employees, copies of this report should be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE I

FOLLOW-UP OF POSSIBLE CANCER CASES SUBMITTED BY
PRODUCTION/MAINTENANCE AND TESTERS UNION LOCALS
MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528

58	Alleged Cancer Cases
- 3	No Records Found
-18	Confirmed Never Had Cancer
37	Confirmed Cases of Cancer

TABLE II

CONFIRMED CANCER CASES
MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528

Year Diagnosis/Death	Cancer Site	Jobs*	Age at Diagnosis/Death	Tenure (years)	Latency (years)
1965	larynx	storeroom mgr(4) expeditor(10) receiver(1)	47	15	15
1970	lung	tester	43	4	4
1971	adrenal gld	truck driver(6) switch gearman(1) grinder/labor(1)	48	8	8
1972	lung	welder	54	9	9
1976	larynx	machine oper(10) insulator layout(9) winder helper(2)	52	21	23
1977	lung	welder(22) painter/labor(3) shot blaster(2)	49	27	27
1978	lung	foreman power parts(13) welder(1) fabricator(1) switchgearman(1)	51	16	18
1979	sm intestine	foreman tank shop(25) expeditor(2)	57	27	27
1979	lung	welder	60	15	16
1980	lung	tester	53	32	32
1980	testicle	steel fab(16) welder(5) fork trk driver(3) laborer(2)	62	26	28
1980	lymphoma	steel fab(14) welder(7) paint shop/labor(2)	62	23	30

TABLE II (con't)

CONFIRMED CANCER CASES
MCGRAW-EDISON -- CANONSBURG, PENNSYLVANIA
MHETA 86-528

Year Diagnosis/Death	Cancer Site	Jobs*	Age at Diagnosis/Death	Tenure (years)	Latency (years)
1981	lung	foreman	50	17	17
1981	lung	welder	63	29	30
1981	lung	tester	46	15	15
1981	pancreas	steel fab(12) fitter layout(8) laborer(5) shearman(1)	58	26	33
1981	colon	welder	60	17	17
1983	lung	assembler	58	20	20
1983	lung	laborer(5) machine oper(2) winder(1)	51	8	12
1983	prostate	steel fab(17) fitter layout(10)	59	27	34
1983	colon	dist builder(11) machine oper insul(6) collar wrapper(2) truck driver(6)	57	25	31
1984	lung	welder	59	20	20
1984	lung	elect assembler	62	37	37
1984	lung	fabricator(21) fitter layout(16)	59	37	37
1984	stomach	assembler(19) laborer(2)	53	21	21
1984	stomach	assembler(11) switch gearman(2) machine oper tank shop(5) elect helper/labor(2)	68	20	27

TABLE II (con't)

CONFIRMED CANCER CASES
MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528

Year Diagnosis/Death	Cancer Site	Jobs*	Age at Diagnosis/Death	Tenure (years)	Latency (years)
1985	leukemia	steel fab(13) welder(1) grinder/labor(2) winder helper(2)	51	18	18
1985	multiple myeloma	assembler(22) laborer(3) fitter layout(3) switch gearman(2)	61	30	33
1986	lung	tester	59	35	38
1986	prostate	tester	57	31	31
1986	colon	tester	48	3	26
1986	bone/articular cartilage	machinist(24) fitter layout(5) tool&dye maker(5)	64	34	38
1987	lung	tester	58	34	34
1987	sm intestine	expeditor(13) switchgearman(3)	52	16	20
1987	lymphoma	shearman	58	35	35

* - Number in parentheses when multiple jobs were held indicates number or years held that particular job.

TABLE III

NUMBER AND PROPORTION OF TOTAL NUMBER OF CANCER CASES BY
CANCER TYPE -- COMPARED TO PROPORTION OF TOTAL BY CANCER TYPE
AMONG WHITE MALES IN 1983
MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528

Cancer Type	N	% of Total Number of Known Cancer Cases	% of Total Number of Cancer Cases in U.S. White Male Population Age 40-69 - 1983
Lung	16	43.3	39.9
Larnyx	2	5.4	1.5
Stomach	2	5.4	3.1
Sm Intestine	2	5.4	0.2
Colon	4	10.8	8.6
Pancreas	1	2.7	4.9
Leukemia	1	2.7	3.2
Lymphoma	3	8.1	2.2
Mult Myeloma	1	2.7	1.4
Endorine Gld	1	2.7	0.3
Prostate	2	5.4	4.7
Testis (Seminoma)	1	2.7	0.1
Bone/Articular Cartilage	1	2.7	0.2
Total	37	100.0%	70.3%

FIGURE 1

NUMBER OF EMPLOYEES WORKING IN PRODUCTION/MAINTENANCE

AND TESTING BY YEAR

MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528

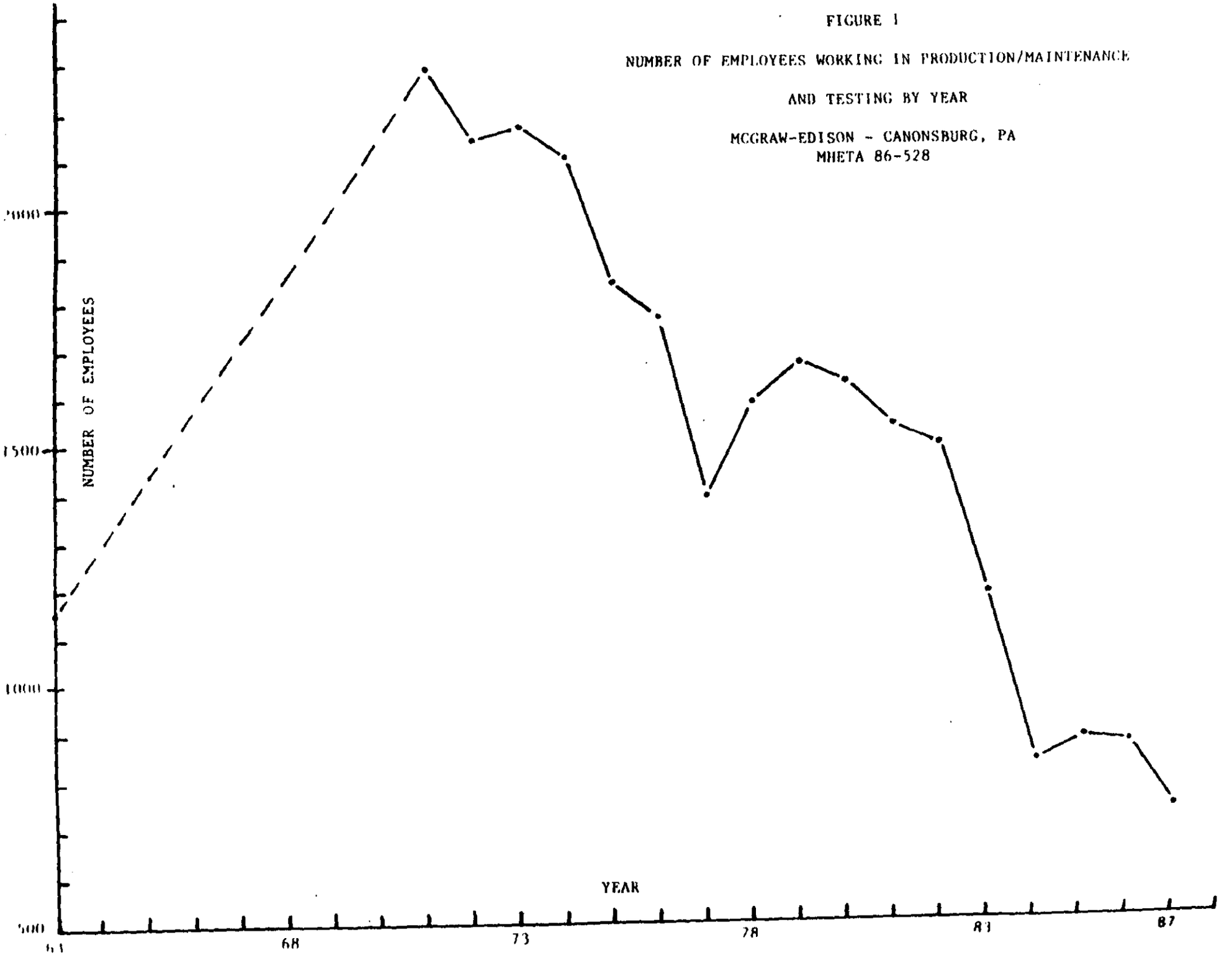
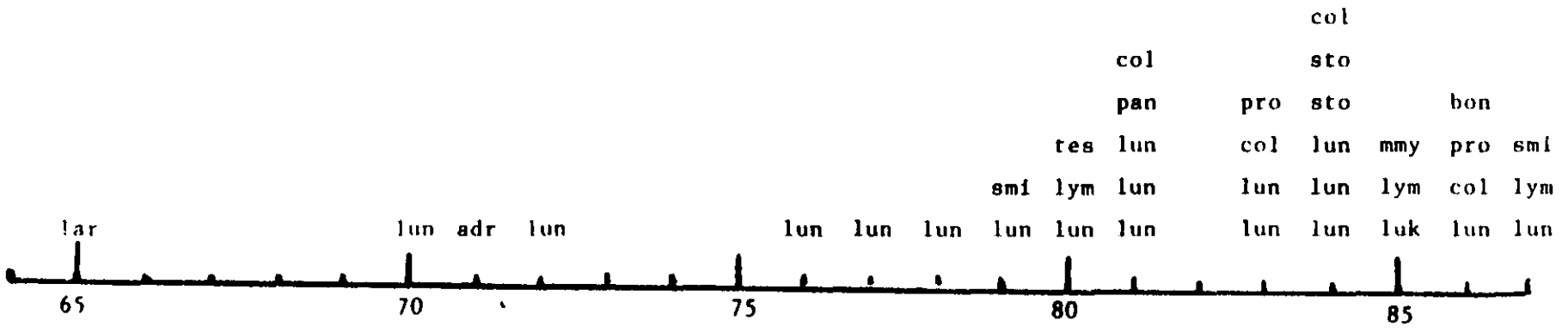


FIGURE 2

TYPE OF CANCER CASE BY YEAR OF DIAGNOSIS/DEATH

MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528

lar = larynx
lun = lung
adr = adrenal gland
smi = small intestine
tes = testis
lym = lymphoma
col = colon
pan = pancreas
pro = prostate
sto = stomach
mmy = multiple myeloma
luk = leukemia
bon = bone



YEAR

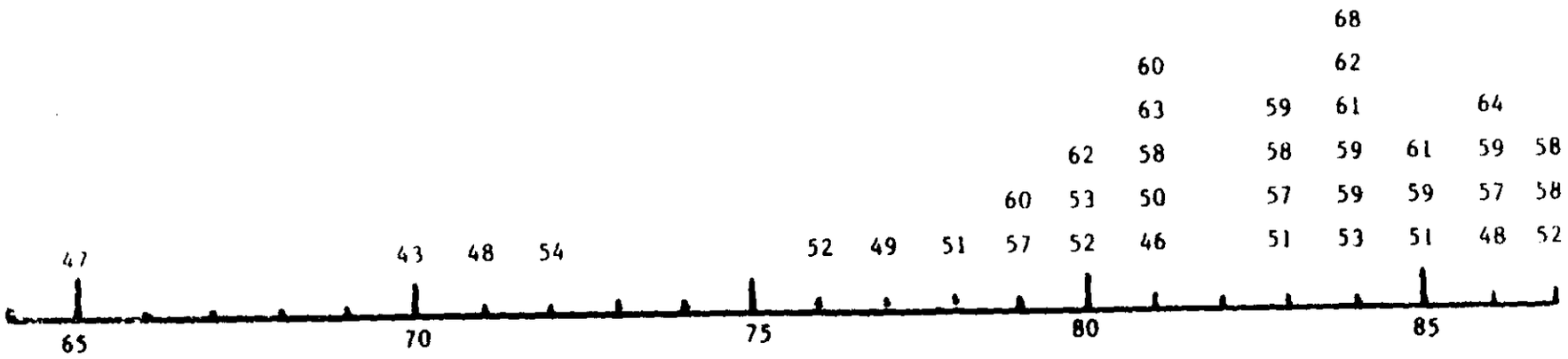
FIGURE 3

AGES OF CANCER CASES AT TIME OF DIAGNOSIS/DEATH BY YEAR

MCGRAW-EDISON - CANONSBURG, PA

MHETA 86-528

YEAR	N	MEAN AGE(YR)	RANGE(YR)
1984-87	16	58.1	48-68
1980-83	12	55.8	46-62
1976-79	5	53.8	49-60
<1975	4	48.0	43-54
OVERALL	37	55.6	43-68



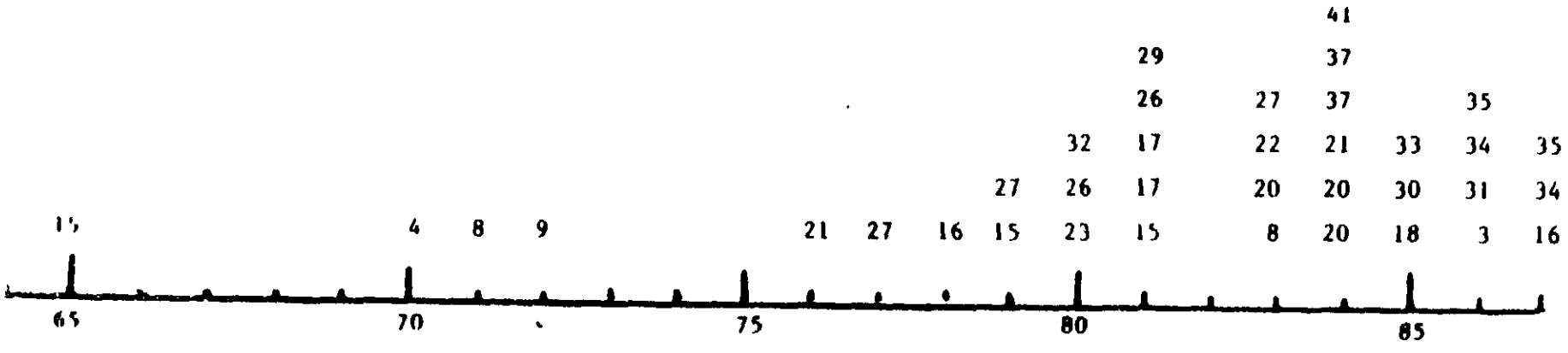
YEAR OF DIAGNOSIS/DEATH

FIGURE 4

TENURE OF CANCER CASES AT TIME OF DIAGNOSIS/DEATH

MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528

YEAR	N	MEAN TENURE (YR)	RANGE (YR)
1984-87	16	27.8	3-41
1980-83	12	21.8	8-32
1976-79	5	18.8	15-27
<1975	4	9.0	4-15
OVERALL	37	22.9	3-41



YEAR OF DIAGNOSIS/DEATH

FIGURE 5

LATENCY OF CANCER CASES AT TIME OF DIAGNOSIS/DEATH BY YEAR

MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528

YEAR	N	MEAN LATENCY (YEARS)	RANGE (YEARS)
1984-87	16	30.6	12-41
1980-83	12	24.8	12-33
1976-79	5	22.2	16-27
<1975	4	9.0	4-15
OVERALL	37	25.2	4-41

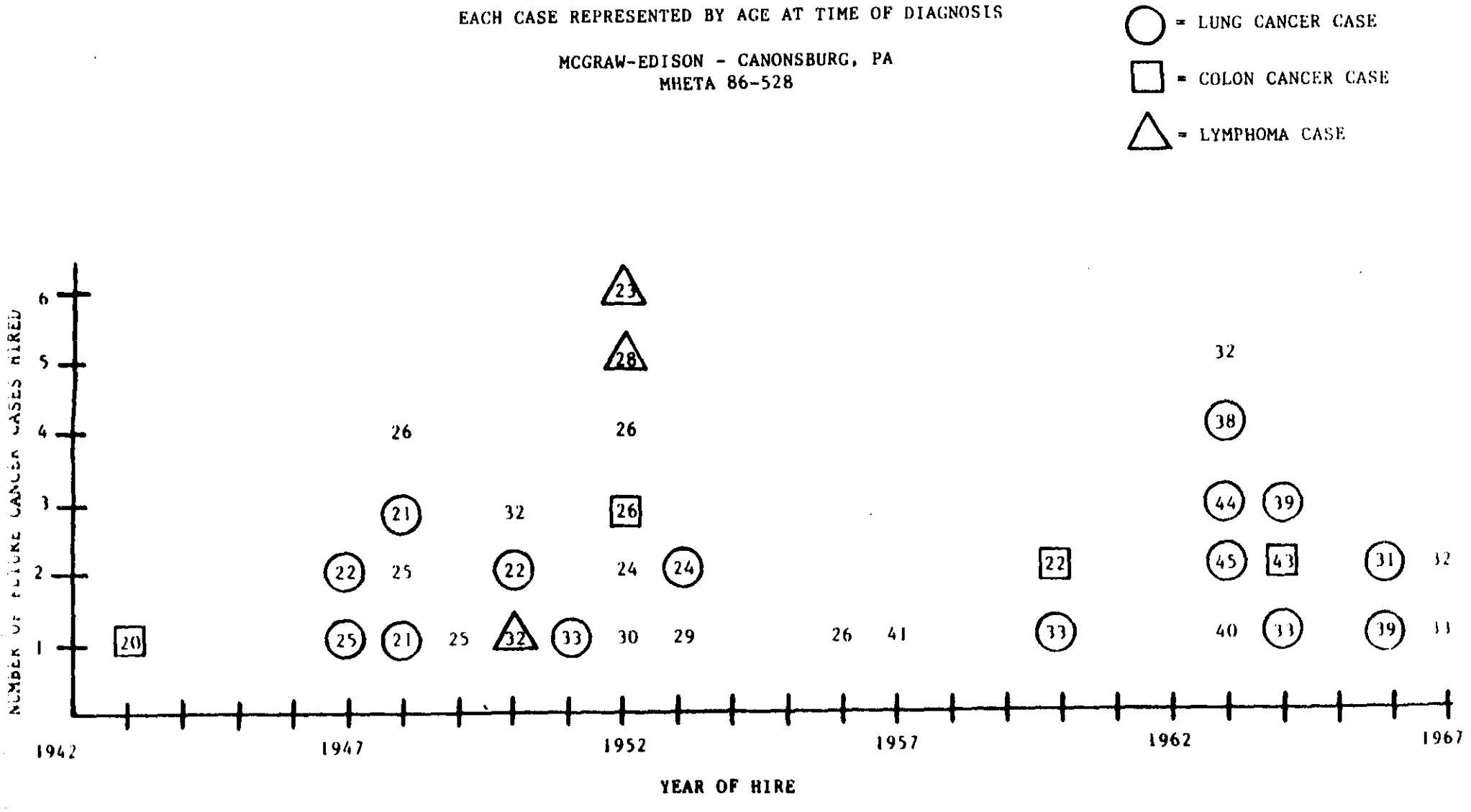
YEAR OF DIAGNOSIS/DEATH

FIGURE 6

NUMBER OF CANCER CASES BY YEAR OF HIRE

EACH CASE REPRESENTED BY AGE AT TIME OF DIAGNOSIS

MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528



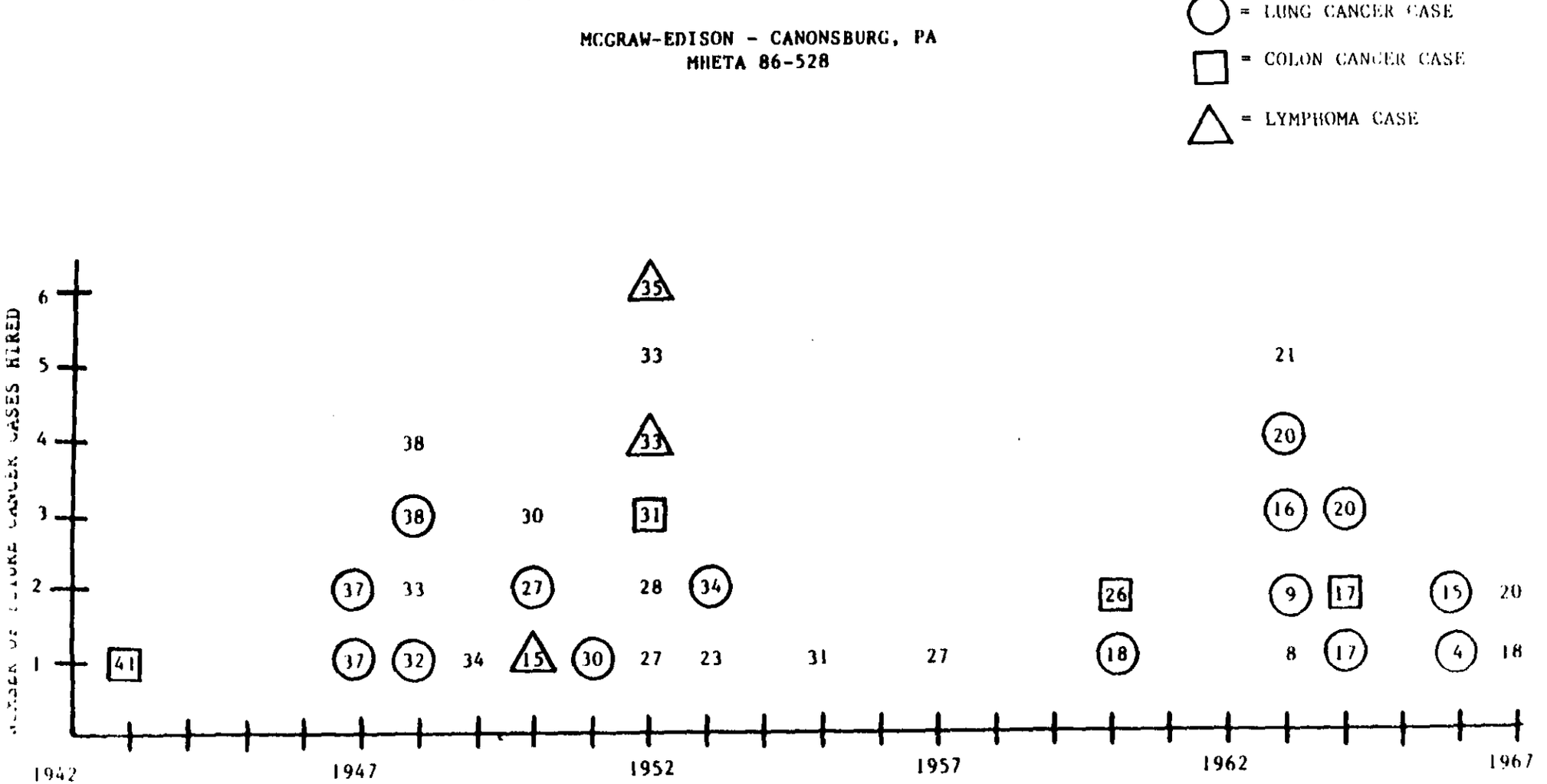
*ONE LUNG CANCER CASE HIRED IN 1971 IS NOT INCLUDED

FIGURE 7

NUMBER OF CANCER CASES BY YEAR OF HIRE

EACH CASE REPRESENTED BY LATENCY AT TIME OF DIAGNOSIS

MCGRAW-EDISON - CANONSBURG, PA
MHETA 86-528



*ONE LUNG CANCER CASE HIRED IN 1971 IS NOT INCLUDED