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AN ANALYSIS OF THE COSTS ASSOCIATED WITH AN
INDUSTRIAL HEALTH PROGRAM

A dissertation submitted to the
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in partial fulfillment of the
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by

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PREFACE

Industry has always recognized the importance of maintenance of their machine tools of production. It has not hesitated to spend money to keep these machines in working order, for the failure of a machine meant lost production and increased costs.

Until the advent of protective social legislation, the worker in most cases was an expendable item to be replaced at little or no cost in the event of failure from illness or injury. Apparently, the Industrial Health Program was an unnecessary expenditure. However, social legislation in the form of Workmen's Compensation and later Disability Benefit Laws have placed the financial burden of illness and injury squarely on the shoulders of industry. This burden has proved to be a heavy one; thus, industry has turned to Industrial Health Programs to lighten the load. This change to Industrial Health Programs was not an abrupt one; indeed, it is still going on. There are many reasons for this slow pace. The extent to which an Industrial Health Program may lighten the burden of illness and injury has not been appreciated clearly either by industrial management or by its medical advisors. Much of this lack of

understanding has been because of a failure to define the costs associated with illness and injury on the one hand, along with failure to define the costs associated with an Industrial Health Program on the other hand. Therefore, there was little understanding of the financial savings that will result from a small expenditure for an Industrial Health Program. Insurance records have done much to clarify the direct costs of illness and injury. However, little has been done to evaluate the indirect costs of illness and injury, and much confusion still surrounds the cost of the Industrial Health Program. An important cause of this confusion results from the inability to decide what expenditures should be charged to the Industrial Health Program. To wit, frequently the cost of illness and injury and the cost of the program to reduce this illness and injury are indiscriminately lumped as Industrial Health Program expense, thus making it impossible to evaluate the effectiveness of the Industrial Health Program in reducing the costs of injury and illness.

It is the aim of this dissertation to define: the costs associated with injury and illness and the manner in which these costs came about; the manner in which an Industrial Health Program might reduce the cost of injury

and illness; the factors that influence the costs of Industrial Health Programs; the discrepancies that appear in Industrial Health Program costs that are reported in the literature; and finally, to show that these discrepancies are due in a large part to failure to agree about what should be charged as Industrial Health Program expense.

A better understanding of these problems will allow us more easily to evaluate the efficiency of our Industrial Health Program and place the program on an economically sound foundation.

CHAPTER I

INDUSTRIAL HEALTH PROGRAMS AND SOCIAL LEGISLATION

Humanitarianism has prompted the existence of very few industrial health programs. It has, of course, permeated a number of programs in varying degrees, but as a motivating force it has exerted a negligible influence. The economic factor has been the prime mover in the organization and growth of industrial health programs. Social legislation has brought industrial health programs to the point of being an economic necessity.

A. Workmen's Compensation Laws

Let us examine briefly the history of workmen's compensation.¹ No compensation law ever developed spontaneously. The constant stress of social, economic and labor problems in Europe gradually molded the various influences and philosophic opinions. This resulted in a more intelligent and widespread understanding of the principle of compulsory workmen's insurance, particularly in Germany during the Bismarckian era. Previously, the status of the injured workman in relation to his master or employer was considered to be a purely personal one. The employee was placed at a decided disadvantage because

¹C. W. Hobbs, Workmen's Compensation Insurance, (2nd Ed., New York and London: McGraw-Hill Book Co., 1939), pp. 12ff.

of the 3 common law defenses successfully used by the employer. "Contributory negligence" inferred the employee's own acts contributed to his injury. "Assumption of risk" inferred the employee was negligent if he accepted employment when the risk was so great that a person of ordinary prudence would not take the risk. The "fellow-servant rule" stated that one who enters the service of another takes upon himself the ordinary risks of the negligent acts of his fellow-servants in the course of his employment. In addition to these common laws, the employee had to prove the employer's liability through "personal negligence".

With the rapid growth of industry and the intricacy of corporate structure, the personal relationship between master and servant became so remote as to obliterate any chance to prove personal negligence. It was also impossible for an uninformed workman to determine the hazardous nature of the occupation before accepting employment. Finally, the complexity of growing mass production so obscured the identity of a fellow-servant that these doctrines became obsolete to the point of absurdity.

Switzerland, in 1881, was the first country to declare that for accidents in certain employments, the

employer was liable without proof of fault. Then, the rise in strength of the Socialist Party in Germany after the Franco-Prussian War led Bismarck to adopt the German Industrial Insurance Act of 1884 which is considered to be the first modern compensation law embodying the compulsory-insurance principle.² In this modern version of workmen's compensation, the obsolete employee liability status was abandoned and industry was saddled with the responsibility of compensating its injured employees as a part of its operating expense. This expense was passed on to the consumer just as would be the cost of wear and breakage of machinery.

Other countries followed Germany's lead, and the United States was one of the last countries to adopt the compensation principle. It was adopted by the United States in a piecemeal fashion, each state passing its own compensation law. Wisconsin, on May 3, 1911, was the first state whose compensation laws became effective.³ Only in the last few years have all the states adopted compensation laws, Mississippi being the last in 1948. Because of the lack of central control, the laws are so divergent that

²Columbia Law Review, (1911), XI, p 37.

³U.S. Bureau of Labor Statistics, Bulletin No. 496, (1929), p 5.

they do not always serve the best interests of the employer, the employee or the public.

With the passage of workmen's compensation laws, there was a definite economic value placed upon bodily injury and disability and the time loss suffered by an injured workman. One of the primary objectives of these laws was to provide automatic and prompt financial relief to the injured workman at a time when it was most needed. Industry immediately set about to reduce this added expense by introducing accident prevention measures and by providing better surgical care to lessen the disabilities or lost time from accidents.

This then, was the necessary stimulus for the development of Industrial Health Programs. It should be mentioned that a purely repair-shop type of surgical service lasted a long time. Undoubtedly, this was due to a general attitude of employers that they had met their total obligation for medical care when they paid their compensation insurance premium. It is being realized that this alone does not signify an efficient medical service.

In order to reduce the cost of industrial injuries and illness, the medical service must carry on a very active preventive health program, to insure that the

employee is placed on a job he is physically able to perform, in an environment which will have a minimum deleterious effect upon his health.

It is only in the range above personnel adequate to care for "finger wrapping" that management is justified in expecting returns on medical investments, such as would be reflected in reduced compensation insurance premiums.

B. Disability Benefit Laws

More recent legislation passed in several states relates to disability benefit laws.⁴ How will these laws affect the Industrial Health Program of the future? The cost of production is further increased by the addition of the cost of compensation for the time lost by the worker for "non-occupational illness". It is said that New York State, which so often has been the forerunner of advanced labor and health legislation, adopted a disability benefit act which will most likely set the pattern for the rest of the country. It will be worthwhile to spell out in some detail the outstanding provisions of this law. This law establishes a system of cash benefits, payable to

⁴L.J. Goldwater, "Sickness Disability Insurance Laws in Relation to Occupational Medicine", Industrial Medicine and Surgery, XVIII (Nov., 1949), pp. 473-475.

employees disabled as a result of "non-occupational injuries or illnesses". Medical care is not provided, only cash benefits to partially replace lost wages. The law is administered by the Workmen's Compensation Board and all employees who qualify under the Workmen's Compensation Law must be covered. A weekly benefit rate of 50 percent of the employee's average wage has been set, with an approximate minimum benefit of \$10.00 and a maximum of \$26.00. The duration of disability benefits may not exceed 13 weeks and there is a non-benefit waiting period of the first seven days of disability. In order to qualify, the claimant must show evidence of being under the care of an "authorized" licensed physician. Unemployed disabled workers also may qualify and are paid from a specially created fund. The cost is borne by a contribution of $\frac{1}{2}$ to 1 percent of weekly wages of the worker, but his total contribution may not exceed \$.30 per week. The cost above the employee's contribution is borne by the employer. Administration of the disability benefits plan is the responsibility of management.⁵

⁵Department of Labor, Bureau of Employment Security, "Unemployment Insurance Program Letter No. 186", (Jan., 1950), passim.

These laws provide a mandatory basis for establishing security for loss of wages due to illness. These efforts have been on a voluntary basis for a long time and many workers are covered by similar plans organized through industries, or by collective bargaining. At the present time, the disability benefit laws do not include payment for medical services. However, many of the voluntary plans carry provisions for any or all of the following: worker hospitalization, worker prepaid surgical expense, worker prepaid medical expense, dependent hospitalization, and dependent medical and surgical expense. There is reason to expect that amendments will be made to the original laws liberalizing them in regard to payment for medical services. California has already passed such an amendment to its disability benefit law, which now provides compulsory hospitalization insurance of \$8.00 a day for 12 days.⁶ Disability benefit provisions only partially cover the worker's daily needs and do not provide payment to the doctor. By comparison, however, workmen's compensation laws, when originally passed, provided for very limited medical and surgical service, but the laws generally have been liberalized to an extent that many states now give

⁶Ibid., passim.

unlimited medical service. May we not expect a similar trend in the disability benefit laws?

If we can make a further comparison between the effect of the workmen's compensation laws and the probable effect of disability benefit laws, we can predict that industry will become increasingly interested in preventive medicine of a non-industrial nature. The entire history of accident prevention followed this pattern. When industry recognized that every accident increased production cost, the safety movement grew. The achievements in industrial accident prevention have been notable and now many of our most hazardous industries are actually safer places than the home and the highway. Preventive medicine is the only way in which industry can reduce the financial burden which is being placed upon it by the sickness insurance. Industry is gradually being assessed for the cost of all illness, either by social legislation or through collective bargaining. Far-seeing managements have already realized that this burden may be a serious impairment and are taking increasing steps toward its control by supporting preventive medicine. These laws will work to penalize the employer whose people are subject to excessive illness, and will favor those who have less than average illness among their people.

CHAPTER II

OCCUPATIONAL AND NON-OCCUPATIONAL ILLNESS AND INJURY

It has become apparent in the discussion in the first chapter that Industrial Health Programs were born of necessity; the necessity to reduce the "economic burden" of industrial and non-industrial illness and injury imposed by social legislation and collective bargaining. Might it not be well to study this "economic burden" and thereby learn to understand its make-up and to what extent it weighs on the various industries? In this manner a better comprehension may evolve of the Industrial Health Program most appropriate to accomplish the need and also what might be a reasonable cost of such a program.

A. Occupational Injury and Illness Experience

Workmen's compensation laws have made industry responsible financially for occupationally produced injury and illness. The cost of occupational injury and illness is directly related to the accident and illness experience of a plant. Accident and illness is measured in terms of certain rates which are the "frequency rate" and "severity rate". The "frequency rate", as defined by the National Safety Council, is the number of disabling injuries per

million man-hours of exposure. The "severity rate" is the total time charged as a result of lost time injuries for every thousand man-hours of exposure. The accident and illness experience is related to the hazardous nature of the plant. That the frequency rate and the severity rate are not directly related to each other will be observed in Table I. In this table the industries are arranged in the order of increasing severity rates.

TABLE I. SEVERITY AND FREQUENCY RATES OF ACCIDENTS AND ILLNESS OF OCCUPATIONAL ORIGIN IN VARIOUS INDUSTRIES. REPORTED BY NATIONAL SAFETY COUNCIL, 1944.⁷

<u>Industry</u>	<u>Severity</u>	<u>Frequency</u>
Printing and Publishing	.48	10.79
Automobile	.54	10.01
Glass	.61	9.91
Leather	.62	17.81
Machinery	.63	14.64
Textile	.68	12.57
Rubber	.86	15.46
Chemical	.91	10.24
Meat Packing	1.05	30.44
Food	1.39	21.81
Petroleum	1.47	13.46
Non-Ferrous Metals	1.86	17.59
Steel	1.94	8.06
Paper and Pulp	2.36	21.36
Mining	8.46	50.53

⁷National Safety Council, Accident Facts, (1944), pp 16-17.

It will be noted that the steel industry has one of the highest severity rates but the lowest frequency rate, which may be interpreted as indicating a low potential of occurrence for injuries but a high potential of severity. In contrast to the steel industry, the leather industry has a high frequency rate but a relatively low severity rate. One should be willing to agree that the hazard of a serious injury appears less in the leather than in the steel industry. Is it not possible that the frequency rate in the leather industry might be favorably influenced by emphasis on preventive measures in a safety and hygiene program, while the severity rate in the steel industry might yield best to emphasis on a rehabilitation program? There is some evidence in the literature in the affirmative.

The National Safety Council in 1941 investigated the accident experience according to the size of the plant.⁸ They found that the large plants had better accident experience than small plants. The small plants had a 37 percent higher frequency rate and an 11 percent greater disability rate. It was intimated that this may have been the result of a better Industrial Health Program in the larger plants. Further evidence for the beneficial influence of an Indus-

⁸National Safety Council, Accident Facts, (1941), p. 76.

trial Health Program was shown from a study of 4,880 cases by an insurance company, from which it was concluded that the disability rate was 39 percent greater in plants with inadequate medical facilities.⁹ The Industrial Accident Commission of California also deduced from a study of 96,000 cases that the disability rate was 22 percent higher in plants with an inadequate medical service.¹⁰ The "disability rate" is defined as the number of days lost for each lost time accident or illness.

The number of Workmen's Compensation claims for injury and illness in New York State has increased since the initiation of Workmen's Compensation legislation. This is shown on the graph in Appendix A. This increase has not been steady, but tends to reflect the business cycle. When jobs were plentiful and there was relatively full employment the number of claims was larger. Conversely, when jobs were scarce and employment low the number of claims was smaller. It is felt that these increases not only reflect the status of national employment, but also the widening scope of the Workmen's Compensation Law

⁹Gaylord R. Hess, B.S., M.D., Medical Service in Industry and Workmen's Compensation Laws, (1st ed., Rev.; American College of Surgeons, 1946) p. 52.

¹⁰Ibid, p. 52.

and the greater recognition by the worker of his rights under the law. Hence, paradoxically, while preventive measures reduce the hazard in industry, the number of compensation claims increase.

To show the relative prominence of the occupational injury problem to the occupational disease problem, Workmen's Compensation claims were studied in a number of states by means of Compensation Commission reports. Table II is a compilation of these reports.

TABLE II. THE PERCENTAGE OF THE TOTAL WORKMEN'S COMPENSATION CLAIMS DUE TO OCCUPATIONAL DISEASE, AS REPORTED BY THE VARIOUS STATE COMPENSATION COMMISSIONS.¹¹

<u>State</u>	<u>Year Reported</u>	<u>Per Cent of Total Claims That Are Produced By Occupational Disease</u>
Illinois	1937-1944	1.4
Michigan	1940-1945	3.5
New York	1940-1944	2.8
Ohio	1940-1944	1.5
Wisconsin	1936-1943	4.0
Average		2.4

¹¹Gaylord R. Hess, B.S., M.D., Medical Service in Industry and Workmen's Compensation Laws, (1st ed., Rev.; American College of Surgeons, 1946), p. 52.

It will be observed that an average of 2.4 percent of the total number of claims were for occupational disease. All states in the table have general coverage for occupational diseases. General coverage laws would tend to compensate a greater number of occupational disease claims than "schedule laws". "Schedule laws" limit compensation to those cases that are designated on the schedule. A more recent study of occupational disease cases in New York showed that of 115,930 compensation cases closed in 1948, 3,551 were occupational disease cases, yielding an average of 3 percent of occupational disease cases.¹² This favorably compares with the average of the reports from Table II.

Further knowledge concerning the effect of industrial allergens, physical hazards and poisons, as well as recognition of these hazards by the states, will increase the percentage of awards for occupational disease.

B. Cost of Industrial Injury and Illness

Now that the accident and illness experience has been examined, it seems natural to inquire into the cost of this experience. What is meant by the cost of accident and illness experience? Is it the money received by the injured workman and his doctor or is it the amount paid

¹²Workmen's Compensation Board, State of New York, Research and Statistics Bulletin No. 6, (1950), p. 69.

by the plant to an insurance carrier to protect the plant against the accident risk? As it will be shown later, these amounts differ;¹³ the premium cost is almost twice as great as the medical and indemnity costs.

1. Cost of Awards Granted by the Workmen's Compensation Board

Let us first examine the medical and indemnity costs associated with the accident, or the amount awarded to the injured worker by the Workmen's Compensation Board.

The Compensation Insurance Rating Board of New York State analyzed Workmen's Compensation benefits for the policy year 1948. The summary of the analysis is presented in Table III.

TABLE III. ANALYSIS OF LOSSES INCURRED IN
NEW YORK STATE IN 1948.¹⁴

<u>Type of Case</u>	<u>No. of Claims</u>	<u>Indemnity</u>	<u>Medical</u>	<u>Total</u>
Compensation	100,725	79,136,144	20,552,310	99,688,454
Non- Compensation Medical	398,865	-	7,525,048	7,525,048

¹³See below, p. 23.

¹⁴Compensation Insurance Rating Board, New York Workmen's Compensation Classification Experience, Policy Year 1948, Second Report, (March 1952), p. 1.

Claims are classified as "Compensation" or "Non-Compensation Medical". "Compensation" cases are made up of both medical and indemnity expense, while "Non-Compensation Medical", as the name implies, include only medical costs. It will be observed that although "Non-Compensation Medical" cases occur four times more frequently than "Compensation" cases, the total cost of Non-Compensation Medical cases is only one-thirteenth the total cost of Compensation cases. In other words, even though the number of minor injuries seen by the physician which do not result in time lost or disability is large, the relative cost of these minor cases is quite small.

Another interesting finding, observed from the table, is the cost ratio between indemnity costs and medical costs. Indemnity costs appear to be four times as large as medical costs. From this, it is suggested that lost time and disability of the injured worker are of much greater economic significance than the costs of medically treating this worker. Does this not suggest "penny-pinching" on medical facilities and personnel which may result in more lost time and greater disability¹⁵, recalling the old adage, "Penny wise and pound foolish"?

¹⁵See above, pp. 11-12.

To further demonstrate the relationship between indemnity costs and medical costs, Table IV is presented.

TABLE IV. RATIO OF INDEMNITY COSTS TO MEDICAL COSTS AS REPORTED BY THE COMPENSATION INSURANCE RATING BOARD OF NEW YORK STATE FOR THE POLICY YEAR 1948.¹⁶

<u>Industry</u>	<u>Percent Indemnity Costs</u>	<u>Percent Medical Costs</u>
Automobile	60	40
Printing and Publishing	66	34
Leather	66	34
Machinery	68	32
Meat packing	70	30
Food	71	29
Glass	72	28
Steel	74	26
Textile	75	25
Petroleum	75	25
Paper and Pulp	76	24
Rubber	81	19
Non-Ferrous Metal	93	7
Mining	99	1

The table is arranged in the order of increasing percentages in indemnity costs. It will be observed that in the mining industry 99 percent of the cost of the accident is made up of indemnity costs. This is a further indication of the hazard~~ous~~ of a mining occupation and the death and disability that results from exposure of the workers in the mine.¹⁷ Presumably, an immediately fatal accident

¹⁶ Compensation Insurance Rating Board, op. cit., pp 3-61

¹⁷ See above, p. 10.

would give an indemnity cost of 100 percent. In contrast to the mining industry, the automobile industry pays only 60 percent of the compensation costs for indemnity, which indicates a greater number of cases of the "Non-Compensation Medical" variety.

The average cost per case for occupational injuries varies with the type of industry. The manner in which this variation is manifest will be observed from Table V. The industries are arranged in order of increasing costs

TABLE V. THE AVERAGE COST PER SETTLED COMPENSATION CLAIM BY INDUSTRY IN NEW YORK STATE¹⁸

<u>Industry</u>	<u>No. of Cases</u>	<u>Av. Cost Per Case</u>
Meat Products	757	468
Leather	1,330	474
Textile	2,210	483
Machinery	4,031	506
Paper and Pulp	2,356	512
Food	6,474	519
Printing and publishing	2,159	524
Non-Ferrous Metal	704	534
Glass	308	562
Chemical	2,127	582
Automobiles	1,219	671
Rubber	263	691
Steel	2,622	707
Petroleum	164	1,199
Mining	616	1,200
For all industries	112,389	605

¹⁸Workmen's Compensation Board, State of New York, Research and Statistics Bulletin No. 6, (1950), pp 46-53.

per case. The number of cases that the average cost per case is based on is also shown. The average cost for all occupational injury cases is \$605.

A comparison between this table and Table I,¹⁹ which shows the severity and frequency rates of the accident experiences, indicates a correlation between the average cost per case and the severity rate. In the steel, petroleum and mining industries, high costs appear to result from high severity rates; in the leather, textile and machinery industries, low costs are associated with low severity rates.

The correlation appears to fail in the paper industry where a low cost per case is associated with a high severity rate. This may be explained by the high frequency rate in the paper industry. It will be remembered from the definition of severity rate²⁰ that it is made up of the total time charged per unit of man-hours' exposure; therefore, a large number of relatively minor cases would tend to increase the severity rate.

The average cost per case for occupational disease, as determined by the New York Compensation Commission in 1948, was found to be \$831 as compared to \$605 for occupa-

¹⁹See above, p. 10.

²⁰See above, p. 10.

tional injury. Table VI shows the average cost per case for a few of the occupational diseases reported.

TABLE VI. AVERAGE COST PER CASE FOR VARIOUS
OCCUPATIONAL DISEASES IN NEW YORK
STATE²¹

<u>Occupational Disease</u>	<u>No. of Cases</u>	<u>Av. Cost of Case</u>
Dermatitis Venenata	1,821	281
Conditions Due to Harmful Occupational Activity	1,134	432
Mercury Poisoning	8	1,677
Carbon Monoxide Poisoning	8	1,845
Lead Poisoning	54	1,916
Benzene (and Derivatives) Poisoning	5	2,977
Compressed Air Illness	12	6,113
Cancer	4	7,400
Silicosis	92	9,422

²¹Workmen's Compensation Board, op. cit., p. 69.

The diseases have been arranged in order of increasing costs. The number of cases of the disease that the average cost per case is based on is also shown.

Dermatitis Venenata, it will be noticed, occurs with the greatest frequency but is the least expensive of all the diseases. On the other hand, Silicosis is the

most expensive occupational disease on a case basis. Interestingly enough, Silicosis is more expensive on a "total cost" basis than Dermatitis Venenata in spite of the very much greater frequency of the Dermatitis Venenata. The "total cost" was calculated by multiplying the average cost per case by the total number of cases of the occupational disease. For Silicosis the "total cost" was \$866,000 as compared to \$511,000 for Dermatitis Venenata.

A study was made by New York State of the average cost per case of all claims settled each year by the Workmen's Compensation Board between the years 1924 and 1948. The graph in Appendix B demonstrates the manner in which the average cost per case during this period changed. It will be noted that there was a gradual increase in the cost per case from 1927 until the period of 1945-1948 where there was a marked acceleration in the increase. Several reasons were suggested for this sharp increase in the cost per case. During the later period the maximum weekly benefit rate was increased on July 1, 1948, which probably had the most significant influence. The amount of cash compensation was also increased by the rise in average weekly earnings of the factory worker. Finally, an additional number of the most costly cases, such as deaths

and permanent total disabilities, were closed during this period.

The cost of occupational injury to industry is increasing rapidly year by year. Not only is the average cost per case increasing but it will be remembered that the number of cases is also rising.²² Using the figures shown in Appendixes A and B as a basis for calculation, we can compare the "total cost" of occupational injury for 1936 to that of 1948, a period of 12 years. The "total cost" in this case will be the average cost per case for the year multiplied by the number of cases compensated for the year. The "total cost" in 1936 was approximately 26 million dollars as compared to 68 million dollars in 1948 in New York State.

2. Cost of Workmen's Compensation Premiums

It should be re-emphasized at this time that the cost figures we have been discussing are the amounts of money awarded to injured or ill employees by the Compensation Board. The expenditures are composed of both medical and indemnity costs. As was mentioned,²³ this is not the amount industry pays for its occupational accident and illness experience, unless it is a self-insured plant.

²²See above, p. 12.

²³See above, p. 15.

The amount industry pays for its occupational accident and illness experience is represented by the insurance premium that industry pays to the insurance carrier for protection against the risk of this experience. It is necessary to understand the relationship between the cost of illness, as represented by the Compensation Board awards, and the Workmen's Compensation insurance premiums, as paid by the industry to an insurance carrier. A study of a report of the Compensation Insurance Rating Board of New York State indicates the portion of industry's premium dollar used by the insurance carriers to pay the costs resulting from occupational illness and injury.²⁴ In the second report on the policy year 1948, approximately 194 million dollars were paid to the insurance companies by industries in premiums while the insurance companies estimated that they would ultimately have to pay 107 million dollars for the occupational illness and injury incurred during that year. This would indicate that 55 cents of the premium dollar is used to pay for the cost of occupational illness and injury.

It is the insurance premium that indicates what industry pays for its accident and illness experience.

²⁴Workmen's Compensation Board, op. cit., p. 69.

The insurance company determines the premium cost on the basis of a "manual rate" which is the premium that a plant must pay per hundred dollars of payroll. The "manual rates" used by an insurance company may be determined by the insurance company itself or the insurance company may accept the "manual rates" established by the Compensation Insurance Rating Board. The "manual rates" are based on the injury and illness experience of an occupational group within an industry. Some examples of manual rates are presented in Table VII.

TABLE VII. MANUAL RATES FOR VARIOUS INDUSTRIES
AS REPORTED BY THE COMPENSATION INSURANCE RATING BOARD OF NEW YORK STATE
FOR JANUARY 1952.²⁵

<u>Industry</u>	<u>Manual Rate</u> <u>Cost Per \$100 of Payroll</u>
Leather	1.26
Printing and Publishing	1.38
Textile	2.19
Automobile	2.70
Food	2.96
Glass	3.01
Steel	3.04
Machinery	3.28
Rubber	3.88
Meat Packing	5.05
Non-Ferrous Metals	5.31
Petroleum	5.31
Paper & Pulp	6.16
Mining	14.32

²⁵ Compensation Insurance Rating Board, Manual Rates in New York State, (Jan. 1952), passim.

The illness and accident experience of a plant may alter the "manual rate" so that the plant's premium may be more than the "manual rate" if their experience has been bad, or less than the "manual rate" if their experience has been better than average. It will be observed from Table VII that there is considerable variation in the "manual rates" for the various industries. The cost of the Industrial Health Program is usually expressed in annual per capita costs. To facilitate comparison of annual per capita costs and costs per \$100 of payroll, a conversion table is presented later.²⁶

C. Absenteeism Produced by Non-Occupational Injury and Illness

The Disability Benefit Laws have made industry bear part of the "financial burden" of non-occupational illness and injury. The worker, through disability benefit insurance, is partially remunerated for the wages lost due to absence from non-occupational illness and injury. The financial burden is directly related to the non-occupational injury and illness experience and the absence thereby produced. Special provisions of the Disability Benefit Laws, namely, the waiting period of seven days and limitation time for providing benefits to 13 weeks, have an important effect on the compensable absence.

²⁶See below, p. 53.

Absence experience is measured by "disability", "severity" and "frequency" rates. The "disability rate" is the average annual number of days lost per worker. The "severity rate" is the average number of days lost per absence. The "frequency rate" is the average annual number of absences per thousand workers. The three rates are related and any of the three may be obtained from the other two. For example, the "disability rate" equals the product of the "frequency" and "severity" rates divided by 1000.²⁷

Apparently, the most important factor determining the absence experience for a plant is the ratio of male to female employees. That women have more absences than men is shown in Table VIII.

TABLE VIII. FREQUENCY OF ABSENCES LASTING ONE DAY OR LONGER DUE TO INJURIES AND ILLNESS FROM THE EXPERIENCE IN A PUBLIC UTILITY 1938-1941 INCLUSIVE²⁸

<u>Rate</u>	<u>Male</u>	<u>Female</u>
Frequency Rate	919.7	1,851.2
Disability Rate	8.2	11.9
Severity Rate	8.9	6.4

²⁷ W.M. Gafafer, D.Sc., Manual of Industrial Hygiene, (1st Ed., Philadelphia: W.B. Saunders Co., 1944), p. 421.
²⁸ Ibid, p. 436.

The "frequency rate" is twice as great for women as men. The "disability rate" is approximately one and one-half times as high for women as men. However, men have a greater severity rate than females. The reason for this sex difference will not be discussed except to say that hospital admission records do not support the fact that there is a difference in frequency of illness between males and females.²⁹

Other studies of absenteeism in industry have shown disability rates of 7.3, 9, and 5.2. The disability rate of 7.3 was in an all-male population³⁰, while the latter two disability rates were in a mixed population.³¹ It will be noticed that the last disability rate of 5.2 is lower than the other rates. The reason is that this study was made from insurance company records. The insurance company required a seven-day waiting period before the workers received benefits; therefore, only absences that were eight days or longer were recorded. The effect of a waiting period on disability and frequency rates will be shown again later.

²⁹ W.M. Gafafer, and E.S. Frasier, "Studies on the Duration of Disabling Sickness", U.S. Public Health Report No. 2404, 57, (Sept. 1942), pp. 1378 ff.

³⁰ Gafafer, Manual of Industrial Hygiene, p. 454.

³¹ Hess, Medical Service in Industry, p. 55.

In considering the financial burden associated with the Disability Benefit Laws we are not interested in the frequency and disability rates of non-occupational injury or illness per se but in these rates as they are modified by the special provisions of the Laws, which in the case of the New York Law are a seven-day waiting period and a limited duration of benefits of 13 weeks. So, to examine the effect of these special provisions on the frequency and disability rates, two tables are presented. Table IX demonstrates the effect of the duration of the absence on the frequency rate.

TABLE IX. THE ANNUAL NUMBER OF ABSENCES PER 1000 MALES ON ACCOUNT OF NON-OCCUPATIONAL ILLNESS OR INJURY FOR A SPECIFIED NUMBER OF DAYS (t) OR MORE.³²

<u>Length of Absence</u> <u>In Days (t)</u>	<u>Annual Number of Absences Per 1000 Males</u> <u>Lasting (t) Days or More</u>
1	903.4
2	691.3
3	539.9
4	405.5
5	319.4
6	254.0
7	198.1
8	144.4
9	127.6
10	116.1
11	104.9
12	95.4
13	87.5
14	80.9
15	70.3

³² Gafafer and Frasier, op. cit., pp. 1378 ff.

Table X shows the effect of the duration of the absence on the disability rate.

TABLE X. ANNUAL NUMBER OF DAYS OF DISABILITY PER MALE RESULTING FROM ALL DISABILITIES CONTRIBUTING t DAYS OR LESS*

<u>t Days</u>	<u>Annual No. of Days of Disability Per Male Resulting from All Disabilities Contributing t Days or Less</u>
1	0.903
2	1.595
3	2.135
4	2.540
5	2.860
6	3.113
7	3.312
8	3.456
9	3.584
10	3.700
11	3.805
12	3.900
13	3.987
14	4.068
15	4.139
91	6.302
98	6.370
182	6.839
273	7.128
365	7.336

*Gafafer and Frasier, op. cit., pp. 1378 ff.

What is the effect of a seven-day period on the frequency and disability rate? Consider first the effect on the frequency rate by referring to Table IX. If there

were no waiting period, then the frequency rate would be 903.4. With a seven-day waiting period, only those absences of 8 days or longer would be compensated, thereby eliminating the absences of 7 days or less. The frequency rate with the seven-day waiting period is 144.4. Therefore, adopting the seven-day waiting period eliminates 83 percent of the absences that would be compensated if there were no waiting period.

The effect of a seven-day waiting period on the disability rate can be observed from Table X. Absences of seven days' duration or less produce a disability rate of 3.312. With the waiting period, none of these absences would be compensated. Therefore, if all absences of 8 days or longer were compensated the disability rate would be 7.336 minus the 3.312 days that were lost by the waiting period, or 4.024 days.

What is the effect of a limitation of benefits to 13 weeks on the frequency and disability rates?

Limiting the number of weeks that benefits are paid will not effect the frequency rate because the frequency rate is determined by the number of absences that occur per 1000 workers per year and is not concerned with the duration of the absence once it occurs. However, the

disability rate will be effected by eliminating from the records the length of absence that goes beyond 14 weeks, because no record of absences will be kept beyond 14 weeks. Referring to Table X the disability rate for absences of 98 days (14 weeks) or less is 6.370. Since the disability rate would be 7.336 for the 365 days if there were no limit on the length of benefits, a limited benefit period reduces the disability rate by 7.336 days minus 6.390 days or .966 days.

The combined effects on the disability rate of introducing both the waiting period of seven days and limiting the length of disability payments to 13 weeks would be to reduce the disability from 7.334 days, which would be the male disability rate with no limitations, to 3.058 days. This is a reduction of 59 percent in the disability rate. Therefore, only 41 percent of the non-occupational illness or injury is compensable under the Disability Benefit Law of New York State.

The premium costs for Disability Benefit Insurance could not be obtained from the Workmen's Compensation Board of New York. These figures may eventually be available from this source, but as yet insufficient time has elapsed since the initiation of the legislation in 1950 for the

Board to publish this information. However, information was obtained from a large disability benefit insurance carrier in New York State. The original benefits, stipulated in the law, to the worker were 50% of his salary with a minimum of \$10.00 and a maximum of \$26.00 per week. Based on these benefits, the premium rates for the plants varied from \$.66 to \$1.07 for each 100 dollars of payroll.³³ The variation was produced by varying ratios of female to male populations in the different plants. The greater the proportion of females, the more nearly the premium rate approached the maximum of \$1.07 per \$100 of payroll. These premium rates are very much like the manual rates established for Workmen's Compensation Insurance, inasmuch as when each plant builds up longer records of absenteeism experience the manual rate of the plant will be altered according to the experience of the plant.

D. Indirect Costs of Occupational and Non-Occupational Injury and Illness

So far, we have been dealing with direct cost of occupational and non-occupational illness and injury as imposed by law. It has been said that the indirect costs

³³ Unpublished personal communication.

to industry are much greater than the direct costs. The indirect costs are not easily analyzed or measured and are therefore open to considerable question in regard to what should be considered an indirect cost and how it should be measured in dollars and cents.

Presented below are two attempts to demonstrate the relationship between direct and indirect costs. The first presentation deals with the indirect costs associated with occupational illness and injury while the second presentation is concerned with the indirect costs associated with non-occupational absenteeism. The figures used in these comparisons of direct and indirect costs are not presented as definitive figures, but only to indicate that the indirect costs associated with occupational and non-occupational injury and illness may be of some economic importance to industry.

A large insurance company that carries many Workmen's Compensation risks attempted to analyze the indirect cost of occupational injury and illness.³⁴ The study was carried on in a moderate size plant of approximately 2,000 employees and for a duration of 15 months, beginning in 1945.

³⁴Unpublished personal communication.

The following costs were analyzed in connection with each occupational injury.

1. The material damage at the time of the accident.
2. The idle time of the machine immediately following the accident.
3. The damage to machinery and equipment as a result of the accident.
4. The difference in productivity between the uninjured experienced worker and the injured experienced worker, or a relatively inexperienced replacement. This includes both the difference in the quantity produced and the ratio of scrap material to the completed work.
5. The time lost by other employees, including fellow-workers, foreman and investigators as a result of the accident.

Upon analysis of these data the company concluded that the indirect costs of the accident were five times greater than the direct, or compensation costs.

In a study by the National Association of Manufacturers in 1941 under Victor Heiser, it was concluded that production loss resulting from absences of a worker was approximately one and one-half times greater than the wage of the absent worker.³⁵ Calculations are presented in the Appendix M demonstrating the indirect cost of non-occupa-

³⁵ Heiser, "Industrial Health Practices", passim.

tional absenteeism in terms of production loss using the National Association of Manufacturers figure. It will be observed that the indirect costs were estimated to be four times greater than the direct costs.

These are interesting observations because it will be remembered that the direct costs imposed on industry by social legislation were the main stimuli for the establishment of Industrial Health Programs. However, it is suggested by these observations that more money may have been saved in indirect costs than in the direct costs that the programs were initiated to reduce.

CHAPTER III

BENEFITS OF AN INDUSTRIAL HEALTH PROGRAM

In the preceding chapter an effort has been made to define the cost of industrial and non-industrial illness and injury. It has been indicated that these costs would be amenable to reduction if preventive measures were brought to bear on them.

The National Association of Manufacturers in a study of Industrial Health Practices in 1941 questioned 2,064 industries regarding the effect that their industrial medical program had on various factors in the industrial environment.³⁶ An analysis of these questionnaires showed the following:

1. The frequency rate of industrial accidents was reduced, on an average, by 44.9 percent.
2. The frequency rate of occupational illness was reduced, on an average, by 62.8 percent.
3. The insurance premium for Workmen's Compensation was reduced, on an average, by 28.8 percent.
4. Labor turnover was reduced, on an average, by 27.3 percent.
5. The frequency rate of absenteeism was reduced, on an average, by 29.7 percent.

The National Association of Manufacturers described the hypothetical experience of a plant of 500 employees to

³⁶ V. G. Heiser, "Industrial Health Practices", National Association of Manufacturers, (Oct., 1941), *passim*

demonstrate the actual savings from an industrial medical program. The plant had reduced its industrial accidents and illnesses by 47 percent and absenteeism by 28 percent. Appendix N shows the calculation involved. It will be observed that for an investment of \$6,730 for the medical program a saving of \$12,341 was realized, or a net saving of \$5,611.

Dr. C. O. Sappington cited the actual experience of a chemical plant with 1200 workers and the benefits that they derived from their medical program. The report appeared in "Industrial Health Department Functions and Relationships", Bulletin No. VIII, 1948, a publication of the Industrial Hygiene Foundation. Doctor Sappington's report of the plant and his comments are directly quoted:

"There have been many attempts to show economic savings with respect to the result of industrial health department services. It should be stated that no one should expect to make a profit on industrial health services, although in some instances there have been tabulations available with respect to savings or economies. We encountered one of these in our study of costs where economic benefits could be fairly accurately computed.

In this example of expenditures and credited savings, the plant was one of approximately 1200 employees in the chemical industry excellently supervised and maintained.

The Health Department Expenses (and all of these figures are based upon an annual experience for a number of years as the average) were as follows:

TABLE XVIII

THE MEDICAL DEPARTMENT

SALARIES - DOCTOR -----	\$ 7,200
SALARIES - NURSES (2) -----	4,680
MEDICAL SUPPLIES -----	1,460
MISCELLANEOUS (HEAT, LIGHT) ----	<u>2,200</u>
TOTAL -----	\$15,540

The Safety and Health Activities other than the Medical Department Expenses were listed as follows:

TABLE XIX

SAFETY AND HEALTH ACTIVITIES

LITERATURE -----	\$ 850
DUES AND MEMBERSHIPS -----	450
SAFETY AWARDS -----	1,000
DINNERS AND MISCELLANEOUS ----	<u>3,100</u>
TOTAL -----	\$5,795

One of the officials at this plant computed the cost ratios which are shown in the following table:

TABLE XX

COST RATIOS

TOTAL COST -----	\$ 21,335.00
AVERAGE NUMBER OF EMPLOYEES--	1,225.00
COST PER EMPLOYEE -----	17.42
ANNUAL PAYROLL -----	3,125,000.00
COST PER \$100 OF PAYROLL ----	0.68

It will be observed that the total cost of these activities per year was \$21,335 and with an average number of employees of 1,225, the cost per employee per year was \$17.42. On a payroll basis, the annual payroll being \$3,125,000, the percentage of wages paid out for industrial health activities was \$0.68.

Now comes what one of the plant officials is pleased to call "The payoff". This is shown in the following table:

TABLE XXI

THE PAYOFF

	<u>NATL. AVG.</u>	<u>THIS CO.</u>	<u>ANNUAL SAVING</u>
ACCIDENTS -----	36	1.3	\$17,350
DAYS LOST -----	3000	425	20,600
INSURANCE PREMIUM--	--	42%	16,250
			<u>\$54,200</u>
SICK ABSENTEEISM--	7 Days	4.16 Days	27,832
REDUCED TURNOVER		50	5,000
			<u>\$87,032</u>

$$\text{RETURN} = \frac{87,032}{21,335} = \$4.08 \text{ Per } \$100 \text{ SPENT}$$

It will be observed that the annual savings in the column at the right were based on national experiences. That is to say, in this company the average for the past 5 years has been 1.3 accidents, whereas the national average was 36, resulting in a saving of \$17,350 (Based on an average cost of \$500 for each accident).

The number of days lost annually (The National Average) in a plant of this size and kind of industry was 3000 according to various experiences in accident figures, whereas this plant lost 425 on an average annually, resulting in a saving of \$20,600 based on the rate of one dollar an hour.

The insurance premium is only 42% of the National Average for a plant of this size and type of industry, resulting in a saving of \$16,250.

Proceeding now to sickness absenteeism, the rate in this plant was 4.16 days per year per employee as compared with the National Average of 7 days, resulting in a saving of \$27,832, based on an average charge of one dollar per hour.

A consequent reduction in labor turnover annually showed a figure of approximately 50 persons at \$100 each; this resulted in a saving of \$5,000.

. Weighing then the monetary outlay of \$21,335 annually against the saving of \$87,032 annually, this shows what the official chooses to call a return or saving of \$4.08 per \$1.00 spent.

This is, of course, a very unusual instance of computation of monetary outlay for industrial health services as compared with return or savings. A word of warning should be given: One should be very careful as to his computations and as to the inferences which he draws from figures in his own plant and if it is not possible to make comparisons with national averages based upon size of plant and kind of industry, it is very doubtful whether sound conclusions may be reached."

A question arises in the study of Dr. Sappington's figures. The report showed savings in both the cost of accidents and the insurance premium. If the company considered the direct costs of the accidents this would be evident in the insurance premiums, and should not be shown again as accident costs because this would be repeating the same saving twice. It appears that the report shows the indirect costs of absence and associated accidents. This is indicated by the observation that a charge of a dollar an hour has been made for the absences associated with accidents. Showing the indirect costs of absence associated with injury and the direct cost of the insurance premium would not be a duplication of saving.

I do not agree with Dr. Sappington's opinion, and I quote, "No one should expect to make a profit on industrial health services." I believe that the profit motive in industrial medicine is just as necessary for the development of industrial medicine as it is for the development of the other segments of industry. Furthermore, the fact that an industrial medical program pays economically should be emphasized and the emphasis should not be placed on the often heard basis "that it is the right thing to do for philanthropic reasons".

Admittedly, some of the benefits are difficult or impossible to measure, but there are sufficient tangible costs that can be affected to show that the medical department is an economically sound part of the business organization.

The studies discussed above represent two methods of approach to the problem of demonstrating that Industrial Medicine pays. Each of the studies approaches the problem in a different way. The first study compares the effect on the costs before and after a medical program has been established in the plant. The other study compares the plant experiences in occupational injury and illness and absenteeism with national averages and in this manner estimates the savings effected by their medical program. Both methods have limitations, as all things human, and probably a better method will be discovered.

The first method compared past against present experiences, which is difficult and probably unreliable. Some of the reasons for this unreliability will be recalled from an earlier chapter. First, the accident experience varies with the general economic pattern of the nation. When jobs are plentiful and there is full employment the number of accident claims will increase. Accident claims

also increase with extensions in the workmen's compensation law and better understanding by the worker of their rights under the law.³⁷ Second, the cost per case increases from year to year.³⁸

The second method which compares the plant experience with national averages is an improvement but as pointed out by Dr. Sappington, is only good if plants of the same size and type are compared.

Insurance companies carrying Workmen's Compensation and Disability Benefit risks carefully analyze data on accident experience and absenteeism from various sizes and types of industry. From this analysis they establish manual rates for determining premium charges. If these rates are too high they lose business; if they are too low they lose money. Therefore, insurance companies should furnish fairly reliable accident and illness rates for different types of industry. The credit or charge in the manual rate for a given plant is a good indication of how the plant experience compares with other plants in the same type industry, or in other words, how effective the Industrial Health Program is functioning.

³⁷ See above, p. 12.

³⁸ See above, p. 21.

CHAPTER IV

INDUSTRIAL HEALTH PROGRAM COSTS

A. Factors That Influence the Cost of an Industrial Health Program

In order to decrease the costs associated with occupational and non-occupational illness and injury, as was indicated in the previous chapter, it is necessary to provide an Industrial Health Program. The Industrial Health Program will itself constitute a cost. The cost of this program is dependent on factors which will be described in the following discussion.

A fundamental factor in determining the expenditure for an Industrial Health Program is the consideration of the basic needs of the industry. Basic needs are dependent upon several things: the type, size, and location of the industry; whether or not it is part of a larger corporation; the ratio of male to female employees, and the proportion of older workers in the plant.

Another fundamental factor is the conception of the various members of the industrial team, including the management, labor union and physician, as to what constitutes an Industrial Health Program, and further, what items should be charged to the Industrial Health Program.

Let us consider the first fundamental factor - the basic needs of industry and the manner in which these needs influence the cost of the Industrial Health Program.

The type of industry determines the extent of the demands made on the workers and also the various hazards to which they are exposed. In the manufacture of precision instruments good vision is necessary. There would therefore be a need for an extensive vision testing program. In industries where the eye hazards are great, such as in welding or work involving the use of caustic or acid solutions, the emphasis must be placed on protecting the vision and the prompt adequate treatment of ocular injuries when they occur. The chemical industry presents exposure to a multitude of toxic chemicals and would thus demand a good toxicological program. Certain industries have employees spread over large areas such as construction companies or public utilities. This presents a special challenge as to the manner in which proper industrial health measures can be provided. Excessively noisy operations require emphasis on evaluation and preservation of hearing. All of the foregoing examples present special problems that will probably require increased expenditures of funds for industrial health services.

The size of the industry has been said to be an important factor in determining the cost of an industrial health plan, lower costs being associated with a larger industry.³⁹ This relationship, however, was not demonstrated in an analysis of the costs of the survey reported below.⁴⁰ It seems logical that a small industry by itself could not provide the same services that are offered by a larger company without incurring a cost that the smaller industries could not afford; therefore, the services are more limited in small plants.

There are a number of examples where a group of small companies joined together to provide a very complete industrial health program at a cost that is no greater on a per capita basis than found in large industries.⁴¹

³⁹C. O. Sappington, M.D., Dr.P.H., "Industrial Health Department Functions and Relationships", Industrial Hygiene Foundation Medical Series Bulletin, VIII (1948), pp. 29-32.

⁴⁰See below, p. 84.

⁴¹F.B. Watkins, "Cost of Medical Care to Five Philadelphia Manufacturers", Factory Management and Maintenance, IV: 2 (Feb. 1947) pp 252-254; N. Millman, F. A. Calderone, and L. Greenburg, "Cooperative Plan for the Development of a Small Plant Health and Industrial Hygiene Program in New York City", Industrial Medicine, XV (June 1946), pp 375 ff; L. M. Petrie and J. W. Lemon, "A Health Program for Industry", Industrial Hygiene Newsletter, X (Dec. 1950), pp 5-6; R.F. Buchan, "Medical Service for Small Industrial Companies", Occupational Medicine, V (April 1948) pp. 403-06.

Usually the services of an industrial health clinic are provided either on a proportional fee basis, where each company pays a share of the costs based on the relative amount of time devoted by the clinic to the plant, or on a fee-for-service basis.

The location of the plant can have an important bearing on the cost of the program. The plant may be in an isolated area where there are insufficient medical personnel or facilities to care for the general medical needs of the worker or his family. In this case it will be necessary for the plant to provide for almost the complete medical care which might even include the construction of hospital facilities. An example of this situation exists in the "Manhattan Project" in Oak Ridge, Tennessee.

In contrast to the isolated location the plant may be located in a metropolitan area where there are sufficient medical personnel and facilities available which would make the furnishing of such services by the plant both unnecessary and undesirable. Furthermore, the plant would have available free-of-charge many of the community health facilities and the state or local industrial hygiene laboratory.

There can be economic advantages if the plant is part of a large corporation consisting of a number of plants. Central purchasing of supplies and equipment in large quantities reduces the unit cost of the items. Various services such as ~~hygienic engineering~~ safety, nutrition, health education, etc., can be furnished by the parent organization at no cost to the plant.

A large proportion of female workers present problems that tend to increase the cost of the program.⁴² Women incur more absenteeism than men, which would require greater emphasis on an absentee prevention program in order to reduce the costs associated with absenteeism. This program might entail periodic physical examinations, home visits to the ill employees and an educational program directed at those particular physical conditions that cause increased disability among women. Women visit the dispensary more frequently than men, which may require additional first aid facilities and personnel to handle the larger load. It will also probably be necessary to provide certain separate medical facilities for the men and women. For example, examining rooms, restrooms, physical therapy rooms and recovery rooms.

⁴² Anna M. Baetjer, Women in Industry, (Philadelphia: W.B.Saunders Co., 1946), pp. 250-253.

All of these things tend to increase the cost of the Industrial Health Program.

Lastly, a large proportion of older workers adversely influence medical costs. A higher proportion of the aged are employed in industries where skill and experience are prerequisites for employment. Age is becomingly an increasingly important problem to industry generally because of the marked increases in longevity experienced by the population of the country as a whole. With increased age comes the degenerative diseases with their toll of greater absenteeism, particularly in absences of longer duration. These disabilities produce placement problems because of the often severe limitation they impose on the capacities of the worker.

Much of the disability of the aged can be minimized by early recognition of the condition, and where indicated, prompt treatment. But of equal importance is education of the aged as to how best to live within their capacities. Thus, the industrial health program, along with an educational program, should include frequent periodic examinations to detect disability and to insure proper job placement.⁴³

⁴³ H. Kempfer, "Education For A Long and Useful Life", Federal Security Agency Bulletin No. 6, (1950), pp 1-6; Gafafer, Manual of Industrial Medicine, p. 429.

Let us next consider the second fundamental factor - the concepts of personnel and the manner in which these concepts influence the cost of the Industrial Health Program. The key personnel in this regard are the management, labor union, and physician. One important concept is what constitutes an adequate Industrial Health Program.

Management's opinion regarding the relative importance of industrial medicine to their industry and therefore the sums of money they wish to expend for such a program is of paramount importance. If the union is sufficiently impressed with protecting the health of their workers they may by collective bargaining make their demands felt by management. The physician's interests and training will play no small part in determining where the emphasis will be placed, or to what extent the services will be broadened.

The program can vary from the extremes of a purely surgical repair type of program in which no preventive techniques are employed, to an extremely elaborate and costly program under which complete medical care is provided for the worker and members of his family. The best program would be, of course, one that considers the basic needs of the industry, and plans the program to meet these needs.

Another important concept and a most controversial subject is what should be considered in Industrial Health Program costs.⁴⁴ Some companies consider only the expense of operating the industrial dispensary, including supplies, equipment and salaries. Other companies include any or all of the following: hygienic engineering, safety, workmen's compensation, medical care plans and pension plans. The cost of the industrial health program will vary in direct proportion to the number of these services included.⁴⁵

B. Analysis of Studies on Industrial Health Program Costs

Earlier in the text it has been shown how social legislation has imposed a financial burden associated with occupational and non-occupational illness and injury upon industry. This burden has been defined mainly in terms of direct costs. Evidence has been presented to demonstrate that these direct costs may be favorably influenced by an Industrial Health Program. Finally, some of the things that influence the cost of an Industrial Health Program have been discussed.

Next, a number of studies of Industrial Health Program costs appearing in the literature, will be analyzed

⁴⁴See below, pp. 60-62

⁴⁵See below, p.82.

and the following topics will be considered: the various methods used to express Industrial Health Program costs; the relationship between the cost of the Industrial Health Program and the extent and variety of occupational hazard, and also the size, of the plant; the manner in which Industrial Health Program costs have changed over a period of years; the comparison of three large studies of Industrial Health Program costs; and some of the difficulties encountered in cost analysis.

There are various ways of expressing the costs associated with an Industrial Health Program.⁴⁶ Three of the methods are listed in Table XI.

TABLE XI. UNIT RATING OF COSTS

1. Annual per capita costs
2. Per capita costs per 1,000 man hours of experience
3. Cost per \$100 of payroll

The most commonly used method is the annual per capita cost. Probably the most desirable method would be the cost per \$100 of payroll, since this is the method employed by Workmen's Compensation and Disability Benefit Insurance carriers and therefore would allow the easiest

⁴⁶Sappington, "Industrial Health Department Functions and Relations", p. 19.

comparison of Industrial Health Program costs with the direct costs of occupational and non-occupational illness and injury, and as expressed by insurance premiums. To show the relationship between the annual per capita costs and the costs per \$100 of payroll, the following table has been inserted.

TABLE XII. TABLE OF CONVERSION FOR TWO METHODS OF RATING COSTS

<u>Cost in Dollars</u>	
<u>Annual Per</u> <u>Capita</u>	<u>Per \$100 of</u> <u>Payroll</u>
5	.19
10	.39
20	.77
40	1.54
80	3.77
160	6.15

The relationship in the table is based on an hourly rate of \$1.25 with the employee working a 5-day week for 52 weeks of the year, thus earning \$2,600 annually.

There have been several studies relating the cost of the Industrial Health Program to different types of industries.⁴⁷ The figures presented by the National Association of Manufacturers in 1941 are used in the graph in

⁴⁷ P.A. Brehm, "Cost Analysis of a Medical Department in Industry", Industrial Hygiene News Letter, IX : 1, (Jan. 1949), pp 6-7; Heiser, "Industrial Health Practices", passim; Hess, Medical Service in Industry and Workmen's Compensation Laws, passim.

Appendix C. In order that a comparison of costs of the program and the severity of the hazards of the industries could be made, the industries were rated in relation to hazard by using the manual rates for Workmen's Compensation Insurance as established by the New York Compensation Insurance Rating Board.⁴⁸

It will be observed from the line graph in Appendix C that there is some correlation between the cost of the Industrial Health Program and the severity of the hazards of the industry. This is not a straight line relationship, for there is considerable variation present.

However, it is impressive to compare the cost of the least hazardous industry, which is the printing industry, with the cost of the most hazardous industry, represented by the mining industry. The printing industry, which has a manual rate of \$1.34 per hundred dollars of payroll, spends \$4.66 per capita annually (or approximately \$0.19 per hundred dollars of payroll), for an Industrial Health Program, while the mining industry, which has a manual rate of \$14.32 per hundred dollars of payroll spends \$22.92 per capita annually (or approximately \$0.77 per hundred dollars of payroll).⁴⁹

⁴⁸ Compensation Insurance Rating Board, Manual Rates in New York, passim.

⁴⁹ See above, p. 53.

There have been several studies relating the cost of the Industrial Health Program to the size of the plant.⁵⁰ The figures presented by the National Association of Manufacturers in 1941 are used in the graph in Appendix D. Plants are grouped by sizes and the average annual per capita cost is determined for each size group. It will be observed that there does not appear to be a relation between the size of the plant and the annual per capita cost for the Industrial Health Program.

The studies of the American College of Surgeons and the Wisconsin State Board of Health,⁵¹ which are both smaller studies than the study shown in the graph in Appendix D, indicate that there is a relation between the plant size and the annual per capita cost - the larger the plant the less the Industrial Health Program costs. They believe that the reason for this relationship is because the larger plants can spread their costs over a greater number of employees.

The graph in Appendix E was prepared from data contained in a publication by the American College of Surgeons,

⁵⁰ Sappington, "Industrial Health Department Functions", p. 28; Brehm, "Cost Analysis of a Medical Department in Industry", p. 6; Heiser, "Industrial Health Practices", passim; Hess, Medical Service in Industry and Workmen's Compensation Laws, p. 57.

⁵¹ Brehm, "Cost Analysis of a Medical Department in Industry", p. 6-7; Hess, op.cit., p. 57.

which compares the annual per capita Industrial Health Program costs in industry from 1915 through 1943.⁵²

It will be observed that between the years 1930 and 1936 there was a rapid rise of the line graph followed by an abrupt decline. The explanation given by the American College of Surgeons for these phenomena was that during the depression years there was a sharp curtailment of employment, which was not accompanied by as marked a reduction in industrial medical services; therefore, the medical costs were spread out over comparatively few employees. It will further be observed that since 1936 there has again appeared a sharp rise in costs. There were several factors said to be responsible for this rising per capita cost. Since 1940, the use of full-time physicians in industry has increased 10 percent and the employment of full-time registered nurses has increased 32 percent. There has also been a marked increase in the remuneration received by these medical employees for their services along with a substantial increase in the costs for hospitalization, medical supplies, administration of the department and clerical services.

⁵² Hess, Medical Service in Industry and Workmen's Compensation Laws, p. 59.

A study of the annual per capita costs for various industries has been made by three separate investigators. There were only four industries that the investigators studied in common; the food, steel, machinery, and paper and pulp industries. The figures that they obtained from these industries are presented in bar graph form in Appendix F.

One of the studies was made by Victor Heiser and the National Association of Manufacturers in 1941. It included the analysis of cost figures from 344 plants. The costs included in the calculation of these figures were medical, hygiene, and safety. A second study was made by the American College of Surgeons and reported by Gaylord Hess, M.D., in 1936. It analyzed cost figures from 345 plants and only medical costs were included in the calculation of these figures. A third study was made by Paul A. Brehm, M.D., and the Industrial Hygiene Division of the Wisconsin State Board of Health. This study was made in 1948 and includes reports from 40 plants. The costs included in the calculation of these figures were medical, hygiene, safety, workmen's compensation premiums and group accident and health insurance premiums.

The three studies differ in two important respects. In the first place, different costs have been considered in each study to calculate the Industrial Health Program expense. One study considers only medical costs. Another study combines medical, hygiene, and safety, and the third combines medical, hygiene, safety, workmen's compensation premiums and group health and accident insurance premiums.

The second major difference is in regard to when the studies were done. One was completed in 1936, another in 1941, and the last in 1948.

It would be expected that the greater number of services used to calculate the Industrial Health Program cost would be associated with a greater cost for the program. This trend can be observed by comparing bar graph A, which contains only medical expenses, with bar graphs B and C, which contains medical expenses in addition to a number of other expenses. The costs are greater in B and C in the steel, machinery, and paper industries. However, it will be observed that in the food industry, bar graph A, which represents only medical costs, is greater than B, which combines medical, safety, and hygiene. Further, it appears that in all but one industry bar graph B, which includes medical, safety, and hygiene, is greater than bar graph C which includes medical, safety, hygiene, workmen's com-

pensation, and general health and accident insurance premiums. Therefore, there apparently is not always a relationship between the number of services used to calculate the cost of Industrial Health Program and the actual cost of the program.

It is believed that this is an important observation and indicates that similar items are not being used in the calculation of cost of the various services such as medical, safety, hygiene, etc.

The question is raised, if this is true, if there is any value in attempting to compare the Industrial Health Program costs in one plant against another, because the figures would not be comparable unless each plant used similar factors in the calculation of their costs.

What effect should be expected because of the difference in the year the studies were made? In referring again to the graph shown in Appendix E it will be observed that since 1936 there has been a steady increase in annual per capita costs of Industrial Health Programs. Since the studies under comparison were done in 1936, 1941 and 1948 you might expect to see a similar effect. However, it will be observed that bar graph B, representing the studies done in 1941, which also has included fewer services in the

calculation of its costs than bar graph C done in 1948, is greater than bar graph C in three out of the four industries studied. Therefore, it can be concluded that the effect of increasing Industrial Health Program costs seen in Appendix E cannot be observed in this case.

The unsuccessful attempt at comparison of the above three studies gives some indication of the lack of reliability of cost data that are available in the literature at the present time. Further doubt of the reliability of cost figures, also possibly an indication of a reason, will be observed from the following quotations of persons who have analyzed Industrial Health Program expense.

The National Industrial Conference Board stated in regard to Industrial Health Program Expense, "A controversial subject and opinion varies widely concerning items to be included".⁵³

Dr. Paul Brehm of the Industrial Hygiene Division of the Wisconsin State Health Department stated:

"Most of the plants found it difficult to uncover all of the expenditures which directly or indirectly result from the medical department. It is hard to under-

⁵³ National Industrial Conference Board, "Personnel Activities in American Business", Studies in Personnel Policy No. 86, (1947), passim.

stand how a business otherwise most proficient in accounting for expenses to run every other department has not followed the same practice for the medical department. To be sure, all these costs had been charged against plant operations but they were buried in the expense of other departments."⁵⁴

Dr. C. O. Sappington who directed the study accomplished by the Industrial Hygiene Foundation stated,

"There has been a great deal of difficulty in securing true cost values from industrial establishments, and an example will be given of the kind of difficulty that has been encountered. The following table shows the difference in safety and medical costs in a very well organized and maintained division of a large national organization."

VARIATION IN PER CAPITA COSTS

	<u>SAFETY</u>	<u>MEDICAL</u>
1944	5.60	9.60
1943	.30	2.40
Cost Ratio 1944-43	18	4

⁵⁴ Brehm, op.cit., p. 6.

"As indicated, there was a difference of 18 times the amount of cost per capita per year for safety services on the one hand and a difference of 4 times in cost for medical costs per capita per year during two consecutive years in the same organization. The fallacy of using average per capita costs per year is well demonstrated here. One can easily see that this average is not a true measure of the cost fluctuations in two consecutive years. The same kind and quantity of service was rendered during each of the two years. Officials attributed these differences in cost solely to a change in concept by the accounting department as what the same report form requested. If this can occur in a well managed corporation, what can be said of others? Early in the survey, therefore, when these figures were obtained, we expressed considerable doubt as to the validity of cost figures previously quoted by many of us in various reports."⁵⁵

It would appear from the preceding analysis that, at present, it is not possible to compare cost figures of Industrial Health Programs with any assurance that the comparison has a meaning. It has been shown that even when comparing industries of similar type and size, there are differences in what these industries include in Industrial Health Program expense. This difference exists not only in regard to such major items as salaries, equipment, operating expense, hygienic engineering and safety, etc.,

⁵⁵ Sappington, "Industrial Health Department Functions and Relations", p. 19.

Workmen's Compensation and Disability Benefit Insurance costs, as was seen in the comparison of the three surveys, but must also exist in the items included in the makeup of these major items, because, as pointed out above, when comparing the Wisconsin survey, which included more major items than the National Association of Manufacturers Survey, the average costs were higher in the latter.

It is true that there are many things that influence the cost of the Industrial Health Program,⁵⁶ and it might be interesting to analyze the effect of such things as the type of industry, the size of the plant, relative numbers of male to female employees, and the proportion of older workers, much in the same manner that the insurance company analyzes the cost of occupational illness and injury and absenteeism from non-occupational illness and injury. However, this cannot be done until there is greater uniformity in deciding what should be included as Industrial Health Program expense.

⁵⁶ See above, pp. 44 - 50.

CHAPTER V

SURVEY OF PLANTS REGARDING WHAT IS INCLUDED IN THE CALCULATION OF THEIR INDUSTRIAL HEALTH PROGRAM EXPENSE

Industrial Health Programs were developed as a result of the stimulus of Workmen's Compensation Laws which placed the financial burden associated with occupational illness and injury squarely on industry. These expenses were assimilated as production costs which, in the final analysis, were passed on to the consumer in the price of the product. Since business is for the most part highly competitive, the plant producing at the lowest cost had an economic advantage. It was therefore the purpose of the Industrial Health Program to reduce the cost of accidents and illness as greatly as possible.

More recently, Disability Benefit Laws have been passed in several states. These laws, in effect, place the financial burden of absenteeism from non-occupational illness and injury upon industry. Again, it will be a function of the Industrial Health Program to reduce the cost from absenteeism.

The direct costs associated with occupational illness and injury and absenteeism associated with non-occupational illness can be measured rather accurately by premium costs of Workmen's Compensation and Disability Benefit Insurance.

The indirect costs can also be measured, but with somewhat less accuracy.

The efficiency of an Industrial Health Program may be judged by the savings effected in direct and indirect costs. These savings should be examined in the light of the cost of the Industrial Health Program. A fair return on the money invested in the Industrial Health Program should be expected.

If the savings of an Industrial Health Program are to be evaluated in terms of the cost of the program, it is necessary that an accurate record be kept of the expenditures. To accomplish this, it must be decided what items should be included as Industrial Health Program expense. As mentioned above, the literature exhibits little unanimity on the point.⁵⁷ Since this is such a basic problem, if the Industrial Health Program is to be put on a sound financial footing, the writer was determined to obtain first-hand information on what industry included under Industrial Health Program costs. A preliminary survey was made of nine large, well organized industrial plants. The replies from this inquiry varied

⁵⁷ See above, p. 62.

considerably, so much so that it was felt that it would be worthwhile to see what a larger sampling of plants would demonstrate.

The answers from the preliminary survey were the basis for the preparation of a questionnaire which was sent to 150 plants. The items included in the questionnaire were items that had been used by one or more of the nine surveyed industries in the calculation of their Industrial Health Program expense. In addition, information was requested regarding the plant's size and the annual per capita costs. The questionnaire is shown in Appendix G.

The responses to the questionnaire were to be analyzed for the broad factors most generally used by industry in the calculation of Industrial Health Program expense and also for the specific items that made up the various broad factors. It was also desired to know the relationships between the broad factors and the plant size and the annual per capita costs.

A. Method

150 plants in New York State were sent questionnaire accompanied by form letters which explained the purpose of the questionnaire. Eleven of these plants had been

visited by the writer previous to sending the questionnaires. Of this group, seven plants were in the 1-499 employee group and four plants were in the 5000 or more employee group. The remaining 139 plants surveyed had not previously been visited..

The selection of plants was made on the basis of size and type of industry. The plants were chosen from the 1949 edition of the Industrial Directory of New York State.

The Directory grouped the plants according to the size of groups shown in Table XIII.

TABLE XIII. CODE CLASSIFICATION OF PLANTS
ACCORDING TO SIZE

A	1-9
B	10-24
C	25-49
D	50-99
E	100-199
F	200-499
G	500-999
H	1000-1999
I	2000-4999
J	5000 and over

The plants in groups G, H, I, and J were selected with the purpose of increasing the number of responses to the questionnaire, because it was felt that plants smaller than 500 would be less likely to have a medical program.

The directory grouped plants into various industrial classifications. Table XIV shows the classification of the plants selected. The classification selection was made on the basis of the industries cited by other authors who have reported Industrial Health Program costs.⁵⁸ Although no attempt was made to ascertain the classification of the plants replying, an account was kept of the number of questionnaires sent to each type of industry.

To facilitate the analysis of the information obtained on the questionnaires, the data were transferred to 5 by 7-inch punch cards of the McBee type as the questionnaires were received. However, it was found that the coding and punching of these cards was too time-consuming for the small number of questionnaires received, so the cards were hand-sorted without the aid of the coding and punching.

⁵⁸ See above, pp. 10, 17-18, 24.

TABLE XIV. CLASSIFICATION OF PLANTS BY
TYPE OF INDUSTRY

<u>Industry</u>	<u>Number of Plants Surveyed</u>
Apparel & Other Finished Textile Products	3
Chemical & Allied Products	16
Electrical Machinery, Apparatus and Supplies	12
Food & Kindred Products	8
Furniture, Lumber & Wood Products	7
Stone, Clay & Glass Products	10
Leather & Leather Products	5
Machinery	28
Metal and Metal Products	20
Paper Industries	10
Petroleum & Coal Products	3
Printing & Allied Industries	5
Rubber Products	6
Textile Mill Products	5
Transportation Equipment	12
Total	150

These responses to the questionnaire were analyzed in the following manner:

1. The percentage of the plants using each broad factor was determined.

2. The plants were divided into three size groups. Within each size group the percentage of the plants using each broad factor was determined.

3. The items used under each broad factor were analyzed to demonstrate the makeup of the broad factor.

4. The plants were classified by the number of broad factors that they included. Then the average plant population was determined for each separate classification.

5. The plants were grouped by the number of broad factors that they included. Then the average annual per capita cost was determined for each group.

6. The plants were classified by the combination of broad factors that they included. Then the frequency of occurrence of each of the combinations was determined.

7. The plants were arranged into five cost groups according to annual per capita cost. Then the average plant population was determined for each of the cost groups.

B. Findings and Conclusions

A discussion of the results and the conclusions will follow each separate analysis. Therefore, no attempt will be made at the end of the thesis to draw any but the most general conclusions from the various analyses.

There were 68 responses from the 150 plants surveyed, which is a return of 45 percent.

1. First it was desired to know the percentage of the plants that used each of the broad factors. This is shown on the graph in Appendix H. A table of the figures graphed is presented with the graph. It will be observed that 50 percent or more of the plants included factors I, II, III, and IV in the calculation of their Industrial Health Program costs. These factors are respectively Salaries and Fees, Equipment and Supplies, Operating Expense and Industrial Hygiene Services. However, 100 percent of the plants included Salaries and Fees and Supplies and Equipment.

2. Next it was desired to find out what effect the size of a plant might have on which of the broad factors would be used to calculate Industrial Health Program expense.

The graph in Appendix I shows the percentages of the plants, in each of three size groups, that include each of the seven broad factors. The plants were divided into size groups of 1-499 employees, 500-4,999 employees and 5,000 or more employees. A table containing the figures graphed is shown with the graph.

It will be observed from the graph that when considering factors III and IV, which are Operating Expense and Industrial Hygiene Service respectively, that the larger the size group of plant the greater likelihood there is that it will include these two broad factors in the calculation of its Industrial Health Program expense.

It will further be observed when considering factors V and VII, which are Industrial Safety Service and General Welfare Services respectively, that the plant in the size group of 1-499 would be more likely than the larger plants to include these two broad factors in the calculation of its Industrial Health Program expense.

In other words, by combining these two observations, it appears that as the plant size increases there is a greater likelihood of including operating expense and industrial hygiene, while there is less likelihood of including safety and general welfare services.

In speculating on the cause of these observations, increasing the size of a plant should increase the number of services it renders. This effect will be observed in the case of operating expense and industrial hygiene, but since the reverse appears in the case of safety and general welfare services, there must be a reason. The reason might be that the larger plants, because of their more complex administrative organization, include safety and general welfare services under budgets other than Industrial Health.

3. In order to gain a further knowledge of what is considered in the calculation of Industrial Health Program expense, the various items under each factor were analyzed. A series of seven tables are presented, one table pertaining to each of the seven broad factors. Each table lists the items considered in the calculation of the broad factors. The tables show the number of plants including each item, and also the percentage of plants that this number represents. The percentage is figured only on the plants considering the particular broad factor being analyzed and not on the total number of plants in the survey.

Table XV pertains to the broad factor, Salaries and Fees.

TABLE XV. SALARIES AND FEES FACTOR

ITEM	NO. OF PLANTS USING SALAR- IES AND FEES FACTOR	NO. OF PLANTS INCLUDING ITEM	PERCENT OF THOSE PLANTS USING SA- LARIES AND FEES THAT INCLUDE THE ITEM
PHYSICIANS	68	56	83
DENTISTS	68	2	3
NURSES	68	62	91
TECHNICIANS	68	18	26
CLERKS AND STENOGRAPHERS	68	45	66
JANITORS	68	8	12
CONSULTANT	68	28	41

It will be observed that all of the 68 plants in the survey included this broad factor. A majority of these 68 plants included the salaries of physicians, nurses and clerical help in the calculation of their Industrial Health expenditures. It is presumed that janitorial service was needed in all the plants; still, only 12 percent included it in the medical budget. It is further presumed that the reason more plants did not include the other items listed was because they did not have need for the services of

this type of personnel. It appears that all the plants consider the salaries of the professional and allied personnel in the medical department as legitimate Industrial Health Program expense.

Table XVI pertains to the broad factor Equipment and Supplies.

TABLE XVI. EQUIPMENT AND SUPPLIES FACTOR

ITEM	:NO. OF PLANTS: :USING EQUIP- :MENT AND :SUPPLIES :FACTOR	:NO. OF PLANTS :INCLUDING ITEM	:PERCENT OF THOSE :PLANTS USING :EQUIPMENT AND :SUPPLIES THAT IN- :CLUDE THE ITEM
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EQUIPMENT

INITIAL COST	68	53	77
MAINTENANCE	68	34	50
DEPRECIATION	68	19	27
INSURANCE	68	3	4
<u>SUPPLIES</u>	68	68	100

TYPE OF EQUIP-
MENT & SUPPLIES

MEDICAL	68	68	100
LABORATORY	68	43	63
OFFICE	68	62	91
TRANSPORTATION	68	5	7

It will be observed that all of the 68 plants in the survey included this broad factor. A majority of these 68 plants included the initial cost and maintenance of equipment. One hundred (100) percent of them included the cost of supplies. The equipment and supplies considered by more than 50 percent of the plants ~~were~~ medical, laboratory and office.

Only a few of the plants included the depreciation and insurance on the equipment.

Table XVII pertains to the broad factor operating expense.

It will be observed that 57 plants in the survey included this broad factor. The items are grouped into three main groups: utilities, staff, and additional services. Laundry was the only one of the fifteen items, included under this broad factor, which was considered by more than 50 percent of the plants who considered the broad factor, operating expense. Travel was considered by 49 percent of the plants. All of the other items were considered by between 12 and 36 percent of the plants.

Table XVIII pertains to the broad factor, industrial hygiene.

TABLE XVII. OPERATING EXPENSE FACTOR

ITEM	: NO. OF PLANTS : : USING OPERA- : : TING EXPENSE : : FACTOR :	: NO. OF PLANTS : : INCLUDING ITEM :	: PERCENT OF THOSE : : PLANTS USING OP- : : ERATING EXPENSE : : THAT INCLUDE THE : : ITEM :
<u>UTILITIES</u>			
RENT	57	12	21
HEAT	57	19	33
LIGHT	57	19	33
PHONE	57	14	24
<u>STAFF</u>			
TRAVEL	57	28	49
INSURANCE	57	7	12
COURTESY	57	10	17
PROFESSIONAL BOOKS AND MAGAZINES	57	21	36
PROFESSIONAL SOCIETY DUES	57	17	29
PROFESSIONAL TRAINING	57	9	15
LAUNDRY	57	30	52
<u>ADDITIONAL SERVICES</u>			
CHEST SURVEY	57	12	21
OUTSIDE HOSPITAL	57	13	22
HEALTH EDUCATION	57	22	38
REHABILITATION	57	19	33

TABLE XVIII. INDUSTRIAL HYGIENE FACTOR

ITEM	: :NO. OF PLANTS: :USING INDUS- :TRIAL HYGIENE: : FACTOR :	: :NO. OF PLANTS :INCLUDING ITEM: :	:PERCENT OF THOSE :PLANTS USING IN- :DUSTRIAL HYGIENE :THAT INCLUDE THE : ITEM
OWN SERVICE	34	29	85
OUTSIDE SERVICE	34	6	17
<u>CONTROL METHOD</u>			
INSTALLATION	34	8	23
MAINTENANCE	34	6	17

It will be observed that of the 34 plants using this broad factor, 85 percent had their own Industrial Hygiene Service while only 17 percent called on an outside service. Less than 25 percent of the group included the cost of installation or maintenance of Industrial Hygiene controls.

Table XIX pertains to the broad factor, Industrial Safety.

It will be observed that of the 23 plants using Industrial Safety in the calculation of their Industrial Health Program expense, all had their own service. A much higher portion included the cost of control methods under Industrial Safety than under Industrial Hygiene. Forty-three (43) percent of these plants included both the installation

and maintenance costs.

TABLE XIX. INDUSTRIAL SAFETY FACTOR

ITEM	NO. OF PLANTS USING INDUS- TRIAL SAFETY FACTOR	NO. OF PLANTS INCLUDING ITEM	PERCENT OF THOSE PLANTS USING IN- DUSTRIAL SAFETY THAT INCLUDE THE ITEM
OWN SERVICE	23	23	100
OUTSIDE SERVICE	23	6	26
<u>CONTROL METHOD</u>			
INSTALLATION	23	10	43
MAINTENANCE	23	10	43

Table XX pertains to the broad factor, Workmen's Compensation.

TABLE XX. WORKMEN'S COMPENSATION FACTOR

ITEM	NO. OF PLANTS USING WORK- MEN'S COMPEN- SATION FACTOR	NO. OF PLANTS INCLUDING ITEM	PERCENT OF THOSE PLANTS USING WORK- MEN'S COMPENSATION THAT INCLUDE THE ITEM
PREMIUM	16	13	81
ADMINISTRATION	16	8	50

It will be observed that the majority of the plants that use the broad factor of Workmen's Compensation include both the premiums and administration costs.

Lastly, Table XXI pertains to the broad factor, General Welfare Services.

TABLE XXI. GENERAL WELFARE SERVICES FACTOR

ITEM	:NO. OF PLANTS: :USING GENERAL: :WELFARE SER- :VICES FACTOR :		:PERCENT OF THOSE :PLANTS USING GEN- :ERAL WELFARE SER- :VICES THAT IN- :CLUDE THE ITEM
	:NO. OF PLANTS :INCLUDING ITEM:		
MEDICAL CARE PLAN	20	17	85
PENSION PLAN	20	7	35

It will be observed that of the 20 plants that use this factor, 85 percent of them include the cost of a medical care plan, while 35 percent of them include the cost of the pension plan under Industrial Health Program costs.

It should be re-emphasized that the percentage figures shown in these tables are calculated only on the basis of plants considering the particular broad factor being analyzed, and not on the total number of plants in

the survey. This was done to represent more clearly the makeup of each of the broad factors.

There were only 6 items in the entire survey that were included by more than half of the plants replying. These were the salaries of physicians, nurses, and clerks; the initial cost and maintenance of equipment; the cost of supplies.

This analysis shows very clearly the diversity of opinion as to what should be included as Industrial Health Program expense.

4. To demonstrate the relationship between the number of broad factors included and the plant size, the plants were grouped by the number of factors they included, and the average population was determined for each group. The graph in Appendix J shows the average population for the various groups containing from two to seven factors. It will be observed that there is only a very general correlation between the number of factors that a plant includes and the size of the plant. It is interesting to note, however, that plants considering just two factors have an average population of 987 while the plants considering seven factors have an average population of 8,295.

5. There is a much better correlation between the number of factors considered by a plant and the average per capita cost of the Industrial Health Program. The plants were grouped by the number of factors they included, and the average annual per capita cost was determined for each group. The graph in Appendix K shows the average annual per capita cost for the various groups containing from two to seven factors. It will be observed that the average per capita cost was \$4.35 in the plants considering only two factors, while it was \$37.12 in plants considering all seven factors.

6. So far, we have dealt with both the number of plants that have considered each factor and the number of factors that the plant used in calculating their Industrial Health Program costs. It should be further pointed out that every plant used a certain "combination of factors"; for instance, some plants used Factors 1 and 11 while others used all seven factors. Table XXII shows the "combination of factors" considered by the plants and the frequency with which each combination occurred.

It will be observed that there were 16 different combinations of factors used. The most frequently used combination was 1, 11, 111, and 1111, which occurred in 13

TABLE XXII. FREQUENCY WITH WHICH VARIOUS
COMBINATIONS OF BROAD FACTORS
WERE USED BY THE PLANTS SURVEYED

COMBINATIONS OF FACTORS CONSIDERED IN CALCULATING INDUSTRIAL HEALTH PROGRAM EXPENSE	: NUMBER OF PLANTS : CONSIDERING COMBIN- : ATION OF FACTORS
1, 11, 111, 1v	13
1, 11, 111	11
1, 11	10
1, 11, 111, 1v, v, v1, v11	4
1, 11, 111, 1v, v, v1	4
1, 11, 111, v, v1	3
1, 11, 111, 1v, v11	3
1, 11, 111, v, v1, v11	3
1, 11, 111, v11	2
1, 11, 111, v	2
1, 11, 111, v, v11	2
1, 11, 111, 1v, v1, v11	2
1, 11, 111, 1v, v, v11	2
1, 11, 111, 1v, v1	2
1, 11, 111, 1v, v	2
1, 11, v	1
TOTAL - 16 COMBINATIONS	TOTAL - 68 PLANTS

plants. There were 34 plants using the three combinations 1, 11, 111, 1v and 1, 11, 111, and 1, 11. These combinations are used by 50 percent of all the plants surveyed.

7. Finally, we will examine the relationship between the plant size and the annual per capita cost of the Industrial Health Program. This was accomplished by arranging the plants into annual per capita cost and then determining the average plant population for each group. The plants were placed in five cost groups as shown in the graph in Appendix L. The table containing the figures employed in the graph is shown with the graph. It will be observed that the average plant population increases as the per capita cost increases up through the per capita cost group of \$30-\$39.99. However, in the per capita cost group of \$40 and up, there is a marked drop in the average plant population. This would seem to indicate that the cost increase up through plants of about 8,000 employees was probably due to a more extensive Industrial Health Program. As the plants became larger than 8,000 there was no further increase in cost; in fact, the most costly programs were found in plants of the 4,000 employees group. It is possible that that two factors accounted for this phenomena. First, the larger plants divided the cost among a greater number of

employees and therefore showed a lower per capita cost. Second, the larger plants have a more complex administrative organization and therefore would include some of the broad factors such as Safety, Workmen's Compensation and General Health Services under separate budgets.

C. Summary and Conclusions

Some interesting trends were observed from the analysis of the data gathered in the survey.

There were four broad factors that were considered by at least half of the plants - Salaries and Fees, Equipment and Supplies, Operating Expense and Industrial Hygiene Services. The larger a plant, the less likely it was that it would include Industrial Safety Services or General Welfare Services.

A more detailed analysis of the items that make up each broad factor showed that there were only 6 items in the survey that were used by the majority of the plants. These were the salaries of physicians, nurses and clerks, the initial cost and maintenance of equipment and the cost of supplies.

There was a direct relationship between the number of broad factors included and the cost of the Industrial Health Program. There was also a direct relationship

between factors included and the size of the plant. In other words, an increase in the number of broad factors is associated with both an increase in the annual per capita cost and the plant population.

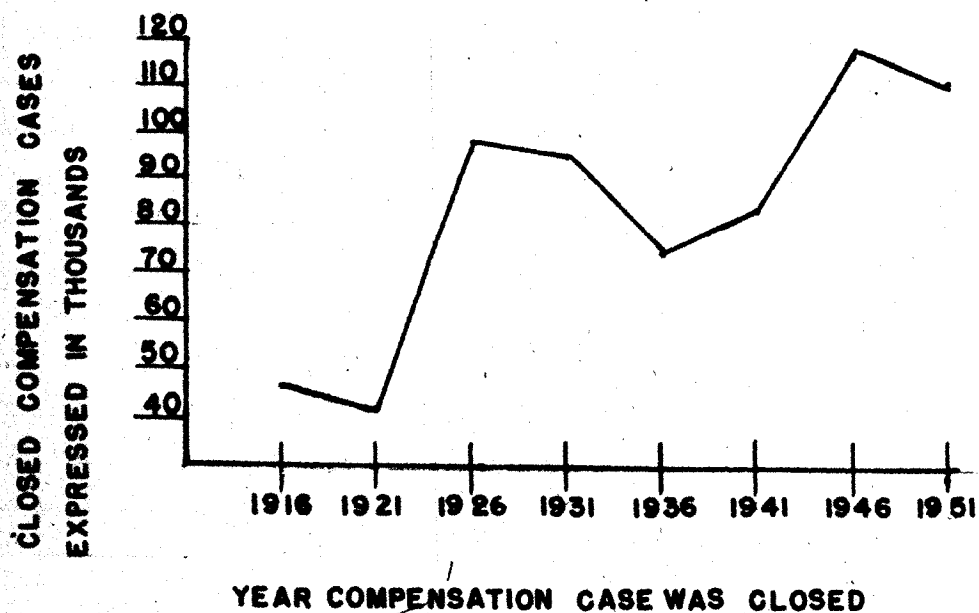
There were 16 different combinations of factors used among the 68 plants surveyed. The most frequently occurring combinations were 1, 11, 111, 1v and 1, 11, 111 and 1, 11 which occurred 13, 11, and 10 times respectively.

Finally, it was observed that as average plant population increased, the average annual per capita cost of the Industrial Health Program also increased. However, when the average annual per capita cost reached \$40 or more, a sharp decrease appeared in the average plant population.

Generally, the survey has given further evidence of the diversity of opinion regarding what items should be included in the calculation of Industrial Health Expense.

APPENDIX A

COMPENSATION CASES CLOSED ANNUALLY BETWEEN 1916 AND 1948 IN NEW YORK STATE*

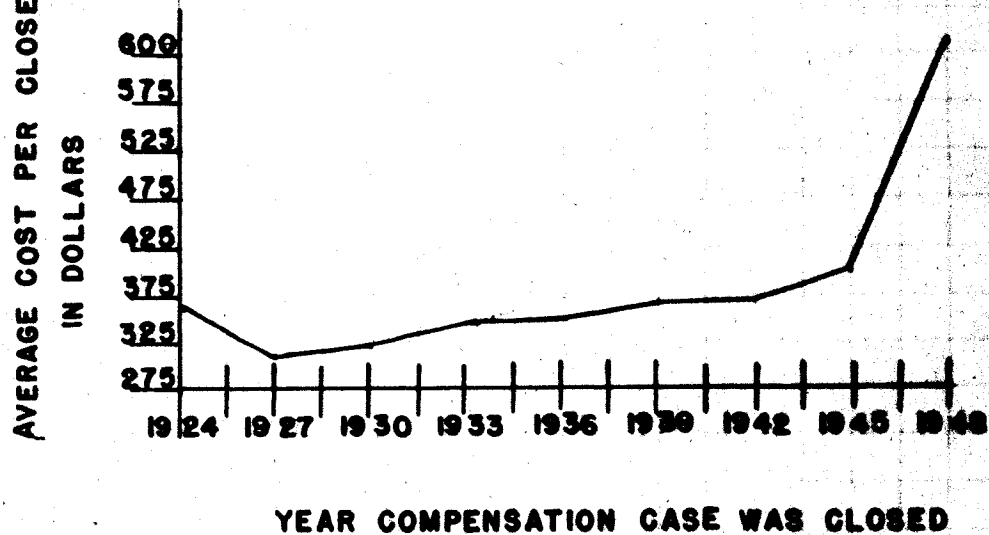


Year of Closing	No. of Cases Closed
1916	47,474
1921	44,982
1926	99,673
1931	98,424
1936	75,458
1941	84,799
1946	118,272
1948	112,389

*Workmen's Compensation Board, State of New York,
Research and Statistics Bulletin No. 6, (1950), p. 35.

APPENDIX B

AVERAGE COST PER CLOSED CASE AWARDED BY NEW YORK COMPENSATION BOARD DURING THE YEARS 1924 THROUGH 1948*

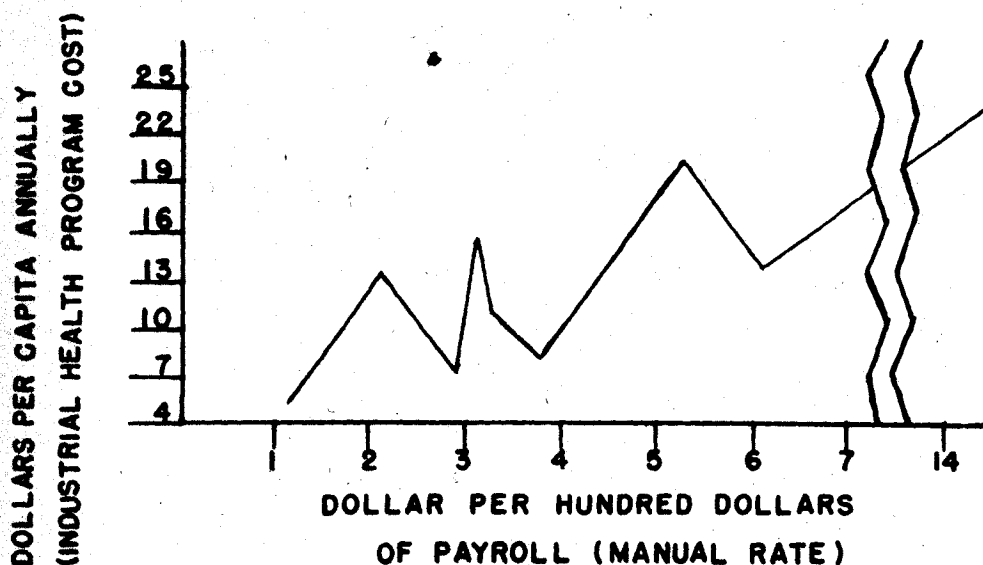


Year of Closing	Average Cost Per Case
1924	364
1927	285
1930	321
1933	331
1936	346
1939	362
1942	369
1945	402
1948	605

*Workmen's Compensation Board, State of New York, Research and Statistics Bulletin No. 6, (1950), p. 35.

APPENDIX C

ANNUAL PER CAPITA COST OF INDUSTRIAL HEALTH PROGRAMS
IN INDUSTRIES OF VARIOUS HAZARDNESS AS EXPRESSED BY
THE MANUAL RATE OF WORKMENS COMPENSATION INSURANCE



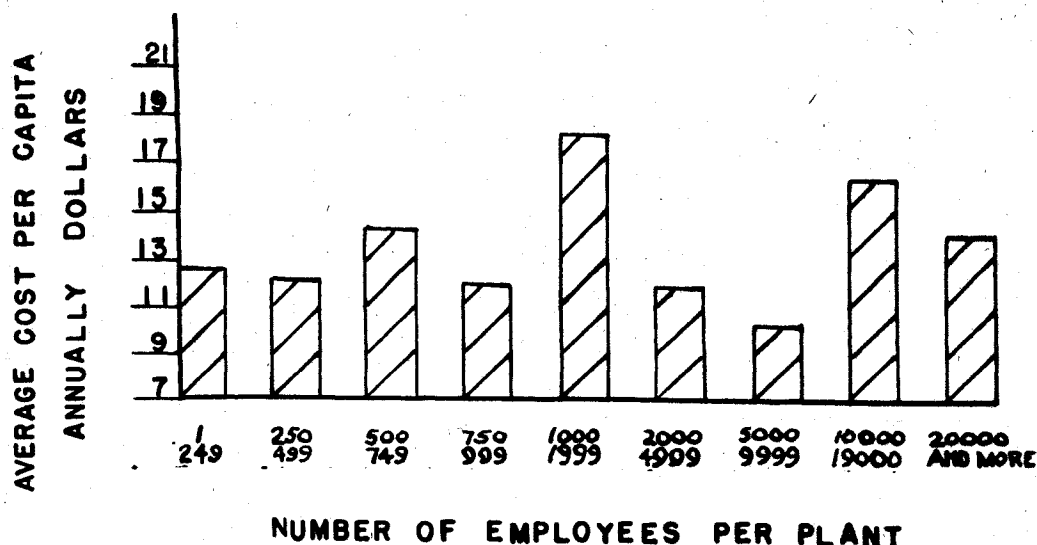
Industry	Manual Rate Dollars/100 Payroll**	Annual Per Capita Cost - Dollars*
Printing	1.34	4.66
Textile	2.20	13.01
Food	2.96	7.13
Steel	3.04	15.35
Machinery	3.28	12.07
Rubber	3.88	8.21
Petroleum	5.31	19.45
Paper	6.16	13.34
Mining	14.32	22.92

*Heiser, "Industrial Health Practices", passim.

**Compensation Insurance Rating Board, Manual Rates in New York State, passim.

APPENDIX D

AVERAGE ANNUAL PER CAPITA COST OF INDUSTRIAL HEALTH PROGRAMS IN VARIOUS SIZE GROUPS OF PLANTS*



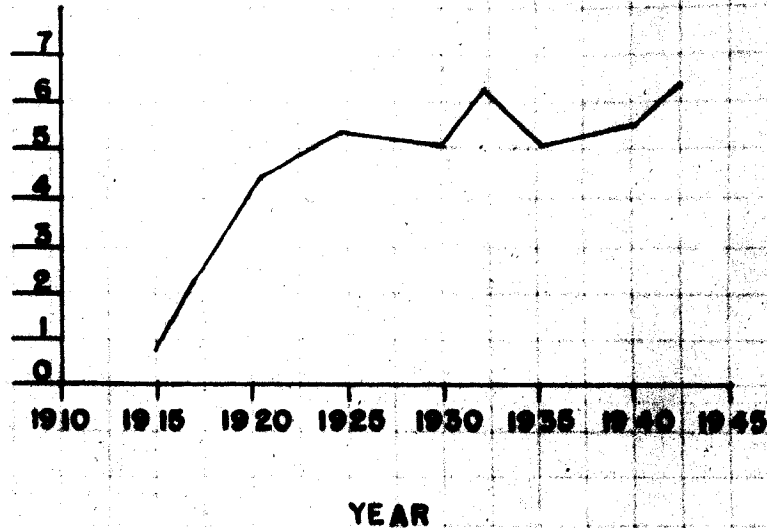
Plant Size	Annual Per Capita Cost
1 - 249	12.85
250 - 499	12.42
500 - 749	14.52
750 - 999	11.68
1,000 - 1,999	18.19
2,000 - 4,999	11.38
5,000 - 9,999	9.85
10,000 - 19,999	15.68
20,000 and over	14.00

*Heiser, "Industrial Health Practices", *passim*.

APPENDIX E

COMPARISON OF ANNUAL PER CAPITA COSTS FOR INDUSTRIAL HEALTH PROGRAMS DURING THE PERIOD 1915-1943*

ANNUAL PER CAPITA COST OF INDUSTRIAL HEALTH PROGRAM IN DOLLARS



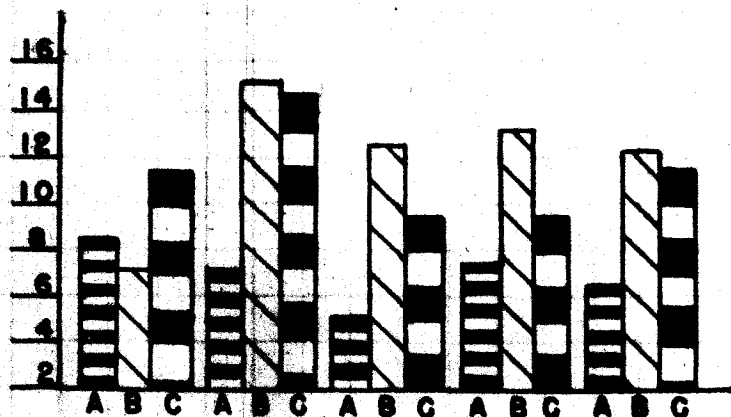
Year	Annual Per Capita Cost in Dollars
1915	.88
1917	2.21
1921	4.43
1924	5.14
1930	5.10
1932	6.30
1936	5.10
1941	5.46
1943	6.21

*Hess, Medical Service in Industry and Workmen's Compensation Laws, p. 57.

APPENDIX F

COMPARITIVE STUDY OF INDUSTRIAL HEALTH PROGRAM COSTS BY THREE SEPARATE INVESTIGATORS

AVERAGE ANNUAL PER CAPITA COST
IN DOLLARS



FOOD STEEL MACH. PAPER AVER. OF
4 INDUSTRIES

Symbol	Study	No. of Plants in Study	Services Included in Calculation of Costs	Date Study Performed	AVERAGE ANNUAL PER CAPITA COST IN FOUR INDUSTRIES IN DOLLARS			
					Food	Steel	Machinery	Paper and Pulp
A	American College of Surgeons	345	Medical	1936	8.20	7.08	4.71	6.83
B	National Assn. of Manufacturers	344	Medical, Safety, Hygiene	1941	7.13	15.35	12.07	13.34
C	Ind. Hyg. Div., Wisconsin	40	Med., Safety, Hyg., Comp., Group Ins.	1948	11.54	14.41	9.81	9.66

¹Hess, Medical Service in Industry and Workmen's Compensation, P. 59.

²Heiser, "Industrial Health Practices", passim.

³Breim, "Cost Analysis of a Medical Department in Industry", p. 6.

APPENDIX G

ase check only those items which you use in computing the cost of
e industrial medical program. After each major division there is
space marked "comments" which may be used to express reasons why
ems should or should not be included.

Salaries or Fees

Physicians _____ Dentists _____ Nurses _____ Technicians _____
Clerks or Stenographers _____ Janitors _____ Consultants _____
Other (please list) _____

Comment

. Equipment and Supplies

Initial Cost of Equipment _____ Building _____ Supplies _____
Maintenance of " _____ " _____ " _____
Depreciation of " _____ " _____ " _____
Insurance on " _____ " _____ " _____

Types of Equipment and Supplies

Medical _____ Laboratory _____ Office _____ Transportation _____
Other (please list) _____

Comment

II. Operating Expense

Utilities _____ Rent _____ Heat _____ Light _____ Telephone _____
Other (please list) _____

Staff _____ Travel _____ Insurance _____ Courtesy _____
Professional Magazines and Books _____ Professional Society _____
Dues _____ Professional training _____ Laundry _____
Other (please list) _____

Additional Services: Chest survey _____ Outside Hospital (not
including compensation cases) _____ Health Education (including
lectures, films, pamphlets) _____ Rehabilitation Program _____
Other (please list) _____

Comment

IV. Industrial Hygiene Services

Own Service _____ Outside Service _____
Installation of Control Method _____
Maintenance of Control Method _____

Comment

. Industrial Safety Services
Own Service _____ Outside Service _____
Installation of Safety Equipment _____
Maintenance of Safety Equipment _____
Comment _____

/I. Workmen's Compensation
Premiums _____ Administration Costs _____
Comment _____

/III. General Welfare Services
Medical Care Plans Administrative Costs _____
 Others (please list) _____

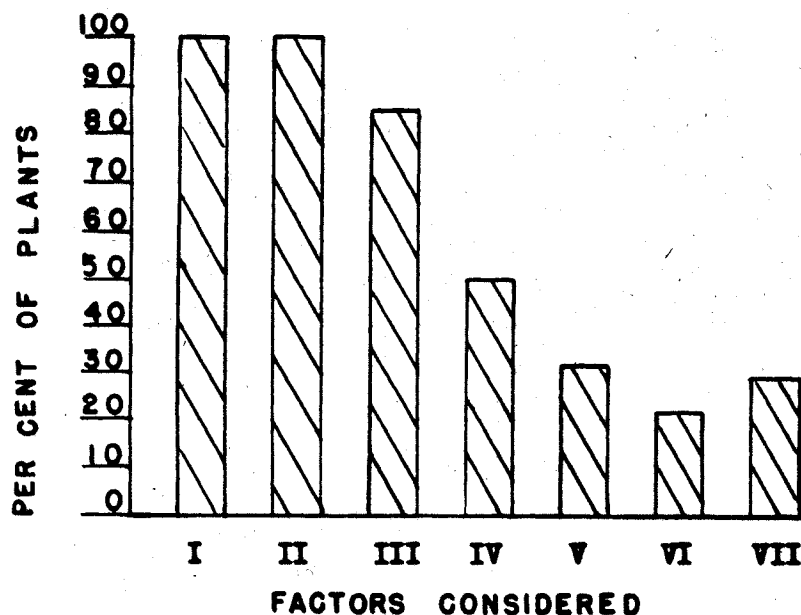
Pension Plan Administration Costs _____
 Other (please list) _____

Other Plan (please list)

VIII. Would you please indicate the cost of the industrial medical
program per employee per annum _____

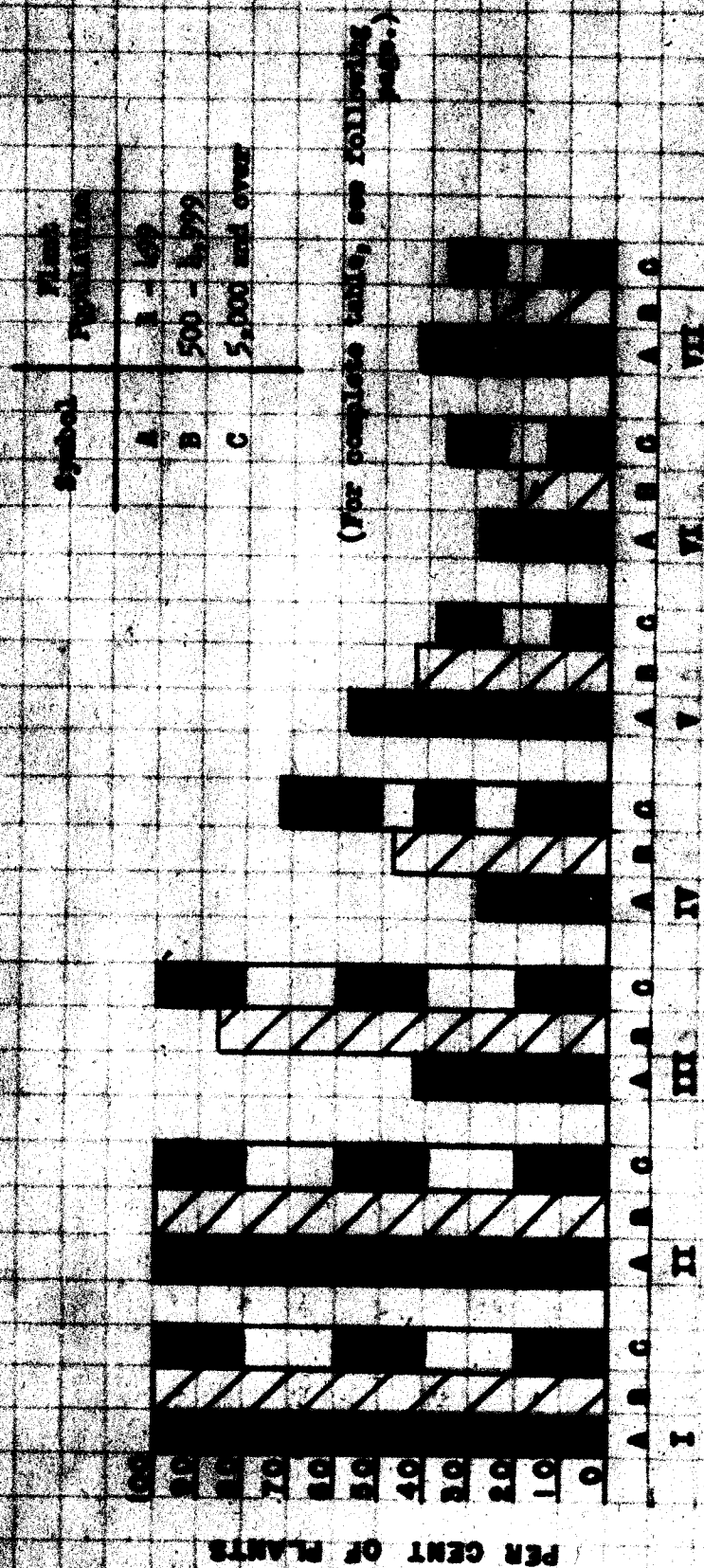
APPENDIX H

PLANTS INCLUDING BROAD FACTOR IN CALCULATING INDUSTRIAL HEALTH PROGRAM COSTS



Broad Factor	No. of Plants in Survey	No. of Plants Considering	% of Plants Considering
I. Salaries and Fees	68	68	100
II. Equipment and Supplies	68	68	100
III. Operating Expense	68	57	84
IV. Industrial Hygiene Services	68	34	50
V. Industrial Safety Service	68	23	31
VI. Workmen's Compensation	68	16	21
VII. General Welfare Services	68	20	29

APPENDIX I **PLANTS ARRANGED BY SIZE GROUPS INCLUDING BROAD FACTORS IN CALCULATING** **INDUSTRIAL HEALTH PROGRAM COST**



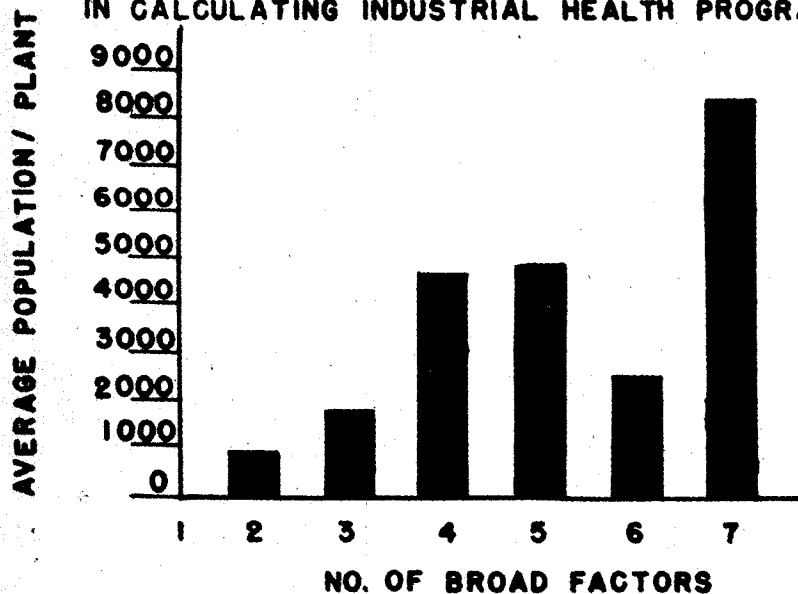
FACTORS CONSIDERED

TABLE FOR APPENDIX I

			FACTORS														
Plant Group	Plant Population	No. of Plants in Group	I	II	III	IV	V	VI	VII								
			No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.	No. : Per : Cent.		
A	1 - 499	7	7 : 100 : 7	100 : 100 : 100	3 : 42 : 2	29 : 29 : 29	4 : 57 : 2	2 : 29 : 3	43								
B	500 - 4999	50	50 : 100 : 50	100 : 100 : 100	43 : 86 : 24	48 : 16 : 32	10 : 20 : 13	26									
C	5000 and over	11	11 : 100 : 11	100 : 100 : 100	11 : 100 : 8	73 : 3 : 27	4 : 36 : 4	36									

APPENDIX J

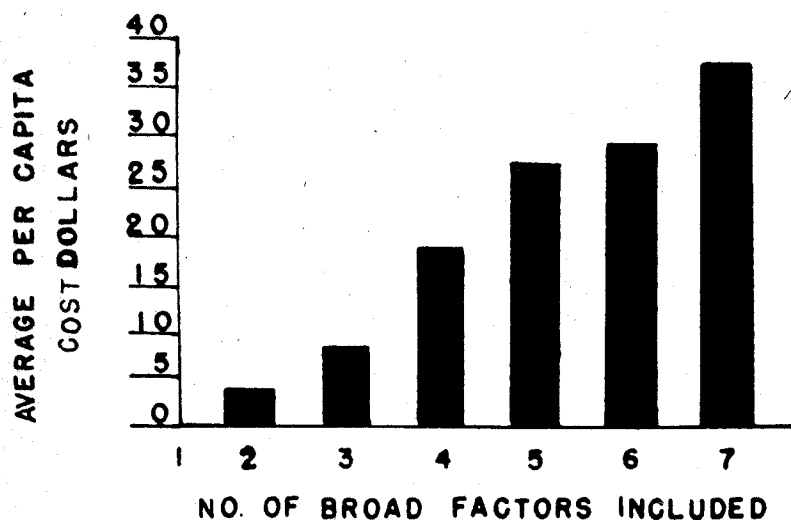
THE AVERAGE PLANT POPULATION IN PLANTS
GROUPED BY THE NUMBER OF BROAD FACTORS USED
IN CALCULATING INDUSTRIAL HEALTH PROGRAM COST



No. Broad Factors Included	No. Plants in Group	Average Plant Population
2	10	987
3	12	1,866
4	19	4,758
5	12	4,775
6	11	2,848
7	4	8,295

APPENDIX K

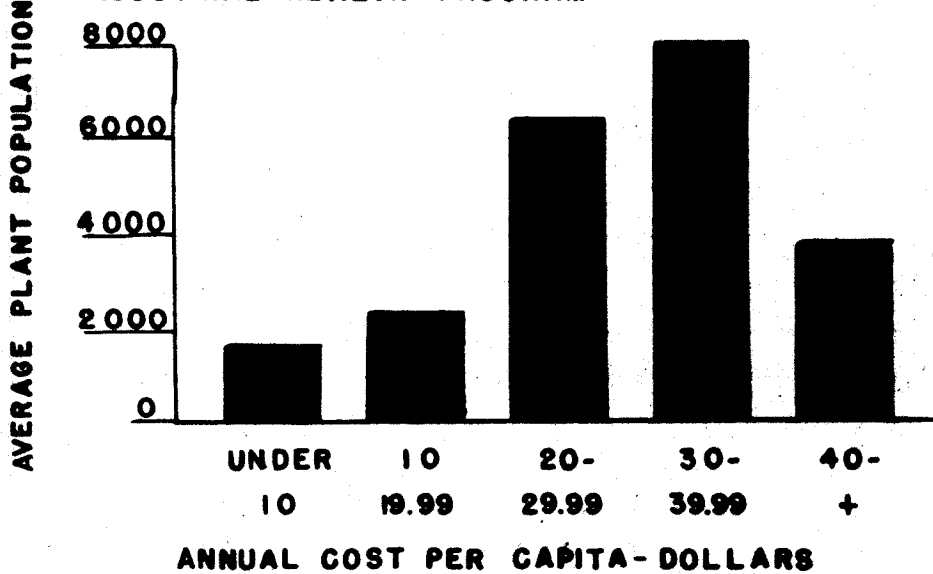
AVERAGE ANNUAL PER CAPITA COST IN PLANTS GROUPED
BY THE NUMBER OF BROAD FACTORS USED IN CALCULATING
INDUSTRIAL HEALTH PROGRAM COST



No. Broad Factors Included	No. Plants in Group	Average Per Capita Costs
2	8	4.37
3	9	9.72
4	17	19.65
5	12	27.90
6	9	29.33
7	4	37.12

APPENDIX L

THE AVERAGE PLANT POPULATION IN PLANTS
GROUPED BY ANNUAL PER CAPITA COST OF
INDUSTRIAL HEALTH PROGRAM



Per Capita Cost-Dollars	No. Plants	Average Plant Population
Under 10	21	1,090
10-19.99	11	2,492
20-29.99	9	6,472
30-39.99	10	8,021
40 +	7	3,994

APPENDIX M

CALCULATION OF THE INDIRECT COST OF ABSENTEEISM
ON THE BASIS OF PRODUCTION LOSS

Assumptions:

- 1.) Average disability rate for male employees of 7 days' absence annually per employee.
- 2.) Average hourly rate for employees of \$1.25 for an eight-hour day and a five-day week.
- 3.) Production loss is one and one-half times the wage loss of the absent employee.
- 4.) Direct cost of the absenteeism as measured by the Disability Benefit Premium is \$1/\$100 of payroll.

I. Annual Wage Loss of Employee Resulting from Absenteeism

The wage loss for the employee annually would be the product of the hourly rate, the number of hours worked daily, and the number of days lost per year.

$$1.25 \times 8 \times 7 = 70 \text{ dollars per employee per yr.}$$

II. Annual Cost of Production Loss Per Employee Resulting from Absenteeism

The production loss per employee annually would be the annual wage loss per employee times the assumed factor.

$$\begin{aligned} \$70 \times 1.5 &= 105 \text{ dollars production loss} \\ &\text{annually per employee.} \end{aligned}$$

III. Average Annual Wage of Employee

The average annual wage of the employee would be the product of the hourly wage, the number of hours worked per day, the number of days worked

per week and the number of weeks worked
per year.

$$1.25 \times 8 \times 5 \times 52 = \$2,600 \text{ annual wage of employee}$$

IV. Cost of Production Loss Per 100 Dollars of Payroll

The cost of the production loss per \$100 of payroll would then be the cost of production loss per employee divided by the average annual wage of the employee multiplied by \$100.

$$\frac{105}{2,600} \times 100 = \$4/\$100 \text{ of annual wage.}$$

V. Ratio of Indirect and Direct Costs of Absenteeism

The ratio of the indirect cost to the direct cost would be the cost of production loss per \$100 of payroll divided by the premium cost of the Disability Benefit Insurance per \$100 of payroll.

$$\frac{4}{1} = 4$$

Therefore, the indirect cost of absenteeism is 4 times greater than the direct cost.

APPENDIX N

FINANCIAL BENEFITS RESULTING FROM AN INDUSTRIAL MEDICAL
PROGRAM IN A PLANT OF 500 EMPLOYEES

A. Experience and Cost before a Medical Program
was Instituted

1. There were 25 compensation cases which cost \$6,150 in one year.
2. There was an absence disability rate of 9 days per employee annually.
3. The average daily wage was \$5.00.
4. It was estimated that the cost of the production loss from absences was one and one-half times the wage loss of the employee.
5. The annual cost of production loss from absences was $(9 \times 5 \times 1.5 \times 500)$, \$33,750.
6. Therefore, the total loss from occupational illnesses, injuries and absences was $(6,150 \text{ plus } 33,750)$, \$39,900.

B. The Cost of the Medical Program was calculated to be \$6,730 per year, or \$13.46 per employee annually.

C. The Experience with the Industrial Medical Program was a Reduction of Industrial Illness and Injury by 47 percent and a Reduction of Absenteeism by 28 percent.

1. The monetary saving from industrial illness and injury was $(6,150 \times .47)$, \$1,260 annually.
2. The monetary saving from absenteeism was $(33,750 \times .28)$, \$9,450 annually.
3. The total savings with the Industrial Medical Program were $(1,260 \text{ plus } 9,450)$, \$12,341.

D. The Net Saving to the Company was $(12,341 - 6,730)$, \$5,611 per year.

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