The Performance of Physically Impaired Workers in Manufacturing Industries

A Report prepared by the Bureau of Labor Statistics for the Veterans Administration

Bulletin No. 923

UNITED STATES DEPARTMENT OF LABOR

Bureau of Labor Statistics

VETERANS ADMINISTRATION,
Washington, D. C., November 28, 1947.

1. This study on the Performance of Physically Impaired Workers in Manufacturing Industries has been prepared by the United States Department of Labor at the request of, and with funds provided by, the Veterans Administration.

2. Authorization for making the study is contained in Public Law No. 16, 78th Congress, Section II, Part VII, Paragraph 9, which reads in part as follows:

> 9. The Administrator shall have the power * * * to make, or, as by agreement with other agency or institution, cause to be made studies, investigations, and reports inquiring into the rehabilitation of disabled persons and the relative abilities, aptitudes, and capacities of the several groups of the variously handicapped and as to how their potentialities can best be developed and their services best utilized in gainful and suitable employment * * *.

Omar N. Bradley

OMAR N. BRADLEY,
General, U. S. Army,
Administrator of Veterans Affairs.

UNITED STATES DEPARTMENT OF LABOR
L. B. Schwellenbach, *Secretary*
BUREAU OF LABOR STATISTICS
Ewan Clague, *Commissioner*

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LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF LABOR,
BUREAU OF LABOR STATISTICS,
Washington, D. C., November 28, 1947.

THE SECRETARY OF LABOR:

I have the honor to transmit a study on the performance of seriously physically impaired workers in manufacturing industries.

The study was made possible through the financial assistance of the Veterans Administration. The report was prepared in the Industrial Hazards Division by Henry S. Hammond, assisted by Frances J. Montgomery and Norbert J. Prager. The work was under the direction of Max D. Kossoris, Chief of the Industrial Hazards Division.

This is the first comprehensive, objective survey conducted in this field in the United States.

EWAN CLAGUE, *Commissioner.*

Hon. L. B. SCHWELLENBACH,
Secretary of Labor.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. - - - Price 55 cents

Foreword

Since the original compilation of this report late in 1947 much work has been accomplished in liaison with the Veterans Administration in the final preparation of this document for public use.

The January edition of the Monthly Labor Review published a digest of some of the more pertinent findings of the study, as part of our effort to provide facts for the private and governmental groups working for greater employment possibilities for handicapped men and women.

Since General Bradley has left the Veterans Administration, the same cooperative liaison has been carried on under the administration of Carl Gray. This report is published for the information and education of the American people, employers, employees, and consumers, veterans and nonveterans, men and women, citizens all.

JUNE 30, 1948

David A. Morse,
Acting Secretary of Labor

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The Performance of Physically Impaired Workers in Manufacturing Industries

Introduction

Has industry a place for the person with a serious physical impairment? Is he a desirable employee? Can he hold his own in competition with unimpaired workers? The answers to these questions may well determine whether the man with a serious physical impairment shall take his place on the production line or in the bread line.

No reliable estimates of the number of seriously physically impaired persons, either in the population or in the labor force, are available. On the basis of fragmentary data, the number of persons of employable age who have disabilities serious enough to create difficulty in finding gainful employment is estimated at five or six millions. Each year additional thousands incur permanent disabilities as the result of illness or injury. In addition, approximately 2 million veterans who were disabled in the services are or will be a part of the labor force.

Even in the absence of exact figures on the number of physically impaired persons in the population, it is clear that the total is appallingly large. The very size of the group creates an economic problem of serious proportions. As a practical matter, it is a question of whether these persons shall be productive members of their communities or whether they shall be public charges.

The urgency of the problem is further emphasized by the fact that legislation was proposed in the seventy-ninth Congress to require that some proportion of each employer's pay roll be made up of impaired persons. This proposed legislation was similar to a British law which has been in effect for several years. Without attempting to evaluate the merits of the British practice, legal compulsion may not be a desirable solution in this country, because the impaired workers might, to cite only one reason, be stamped as an undesirable minority group incapable of satisfactory work performance.

The purpose of the study upon which this report is based was to obtain factual answers to the following basic questions: Will the impaired be able to keep up with production schedules? Will they tend toward excessive absenteeism? Will they display a proneness toward work injury and thereby increase workmen's compensation insurance costs? Will they be stable on the job or will they be short-term employees? The most reliable answers to these questions, it was believed, could be found by examining the performance of impaired workers who had been employed in industry and basing the answers on the facts revealed by industry's own records. The function performed by the Bureau of Labor Statistics was to assemble and organize into usable form the data obtained from many sources.

This report of the findings is presented in 11 parts, of which the first gives a comparison of the work performance of the whole survey group of impaired and unimpaired workers. The 10 remaining parts are arranged in order of the size of the survey group; each of these contains the complete findings on the performance of one of the specific impairment types included in the study. Although this arrangement inevitably led to some repetition, it was believed that the material would be more useful in this form to those persons whose work or interest is with a specific kind of impairment. The methods used in this study are described in the appendix (p. 120).

Acknowledgment is owed to the many persons and agencies whose published work in this field provided invaluable aid to the present study. The wholehearted interest and cooperation extended by the Veterans Administration, by the Veterans Employment Service, and by many other interested agencies — both private and governmental — played an important part in the successful completion of this work. The firms and the many plant officials who

contributed time and facilities in making the data available to the Bureau's field representatives were extremely cooperative and provided many constructive suggestions and criticisms. Special acknowledgment is due an advisory committee composed of the following members:

Dr. Ira D. Scott
Director, Advisement and Guidance Service
Veterans Administration

Dr. R. B. Teachout
Chairman, Rating Schedule Board
Veterans Administration

Dr. H. Dwight York
Special Assistant for Planning, Registration and Research Service
Veterans Administration

Mr. Ted F. Silvey
Reconversion Officer
Congress of Industrial Organizations

Mr. Martin P. Durkin
General President
United Association of Journeymen Plumbers and Steamfitters

Mr. Eugene Taylor
Assistant Veterans' Consultant
New York Times

Dr. H. P. Dutton
Chairman, Research Committee
Society for the Advancement of Management

Dr. Dean A. Clark
Medical Director
Health Insurance Plan of Greater New York

Dr. Rufus B. Crain
Assistant Medical Director
Eastman Kodak Co.

Dr. Thomas L. Shipman
Works Physician, River Works
General Electric Co.

Maj. A. R. Cullimore
President, Newark College of Engineering

The contributions made by this committee were invaluable, particularly in organizing and formulating the study.

The Impaired Worker in Industry

Summary of Statistical Findings

The objective measures of work performance in this report reflect the experience of about 11,000 impaired and 18,000 matched unimpaired workers subject to the same job incentives and exposed to the same job hazards. These measures are based on data taken from industry's own records. Analysis of the data shows conclusively that the physically impaired person was not necessarily a handicapped worker. When given reasonable job placement consideration — that is, the individual's abilities balanced against the job requirements — the physically impaired workers as a group were fully able to compete successfully with unimpaired workers similarly placed.

An examination of the work-performance data in table 1 makes it apparent at once that the outstanding features of the comparison are the similarities between the impaired and unimpaired workers. Differences in the measures of work performance between the two groups were fractional for the most part, with the balance slightly in favor of the impaired worker group: impaired workers produced at a slightly better rate and had relatively fewer disabling work injuries than did unimpaired workers on identical jobs. The two groups had identical frequency rates of nondisabling injuries, and average rates of absenteeism showed only nominal differences. Although the voluntary quit rate was higher for the impaired group, it is questionable whether the difference is large enough to be counted significant.

It was equally true of the impaired and the unimpaired workers that some made exceptionally good records and that a few made very poor records. It would be absurd to assume that the existence of a severe physical impairment automatically makes the

TABLE 1.—*Work performance of workers with serious physical impairments, and of matched unimpaired workers*

Group	Absenteeism frequency rate [1]	Nondisabling injury frequency rate [2]	Disabling injury			Output relative [6]	Quit rate [7]
			Frequency rate [3]	Time-lost rate [4]	Average days of disability [5]		
	Average performance						
Total:							
Impaired	3.8	9.9	8.9	0.10	14.5	101.0	3.6
Unimpaired	3.4	9.9	9.5	.11	14.9	100.0	2.6
Male:							
Impaired	3.6	10.1	9.3	.11	14.7	100.3	3.3
Unimpaired	3.2	10.1	10.0	.12	15.0	100.0	2.3
Female:							
Impaired	6.4	7.0	2.5	.01	6.0	103.3	6.9
Unimpaired	6.5	6.9	1.3	.01	6.3	100.0	5.3
	Number of workers						
Total:							
Impaired	11,028	10,858	10,973	10,973	----	895	5,217
Unimpaired	18,258	18,001	18,202	18,202	----	1,404	8,783
Male:							
Impaired	10,253	10,094	10,203	10,203	----	682	4,695
Unimpaired	16,926	16,692	16,875	16,875	----	1,069	7,909
Female:							
Impaired	775	764	770	770	----	213	522
Unimpaired	1,332	1,309	1,327	1,327	----	335	874

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Number of voluntary quits per 100 employees in the survey group.

individual a better worker. But the results of the study indicate that the assumption that a physical impairment makes a man a less efficient or a less dependable worker is equally unsound. Many characteristics of the individual (temperament, personality traits, etc.) influence the quality of the work performance. These characteristics are possessed in the same infinite variety and degree by impaired and by unimpaired persons and undoubtedly influenced individual performance, but these obviously are outside the scope of this study. The factor under scrutiny here is the effect of the physical impairment. Based upon the record, it seems reasonable to conclude that physical impairment did not produce an adverse effect on either the quantity of work produced or the quality of the work performance. No matter how different these physically impaired persons may have been in other respects, on the job they were just another group of workers able to meet their unimpaired fellow workers on an equal competitive footing.

Work Performance [1]

A proposal for the employment of impaired persons immediately raises questions as to how and to what extent employment of such persons may affect plant operating programs. There is uncertainty in many minds as to just what sort of work performance may reasonably be expected from these impaired persons. This doubt and uncertainty lead to the anomalous situation in which the impaired person may be rejected for employment because of what he cannot do rather than considered for employment on the basis of what he can do.

Basically, only a relatively few points require determination. These are summarized briefly in the following two paragraphs.

Mobility of Working Force

Impaired persons are somewhat more limited than unimpaired persons in their job assignments. This means that they cannot be transferred from job to job quite as easily as the unimpaired. But this limitation is one of degree and depends entirely upon the nature and extent of the impairment and the requirements of the jobs. In a given plant, there may be literally scores of jobs that a person with a specific impairment can perform, and he can be transferred among them as readily as any unimpaired worker. It was noted in many of the plants studied that at the time an impaired worker was assigned, alternative jobs were listed in the same and in other departments. The matter of mobility, then, is an operating problem peculiar to the individual plant.

Quality of Work Performance

What sort of work performance does the impaired worker bring to the job? What effect will employment of impaired persons have on production schedules, absenteeism, work-injury frequency, and labor turn-over? These are questions which lend themselves to specific and objective answers. Probably the most reliable evidence of what may be expected from impaired workers is the character of the performance of those who are employed. If the impaired worker, veteran or nonveteran, cannot hold his own on a job and cannot compete successfully with his unimpaired fellow worker, then his employment is questionable. If, however, he can compete successfully with unimpaired workers on the same jobs, his impairment ceases to be a valid basis for excluding him from employment. For the impaired and the unimpaired alike, the decision as to who gets the job then rests on skill, background, experience, education, and all the other elements of the job specification. In other words, the approach becomes a positive one based on what an applicant can do, and not a negative one based on what he cannot do. The present study was undertaken to evaluate on the basis of dependable, factual data the quality of the work performance of impaired workers in comparison with unimpaired workers on the same jobs.

The remainder of this section and table 1 show how the impaired workers compared in their work performance with matched unimpaired workers on the same jobs.[2] The measures are based entirely on objective, quantitative data taken directly from the records of cooperating firms. They contain no elements of subjective valuation or selection, or a desire to prove a preconceived thesis.

[1] Other studies which deal with one phase or another of job performance are: Physical Impairment and Job Performance, by Verne K. Harvey, M.D., and E. Parker Luongo, M.D., U.S. Civil Service Commission, *in* Journal of the American Medical Association, Apr. 7, 1945; The Physically Handicapped Worker in Industry, by Gilbert Brighouse, Bulletin No. 13, California Institute of Technology, Pasadena, 1946; An Experiment with Vocationally Handicapped Workers, by J. W. Dietz, *in* Personnel Journal, February 1932.

[2] Description of matching process will be found in the discussion of the scope and method of the study in the appendix (p. 120).

Absenteeism

For the purposes of the study, an absence was defined as absence from the job for a full day or more when the employee was scheduled to work. Lay-offs, holidays, shut-downs, and regular vacations were not counted as days absent nor were they included as days scheduled to work. The absenteeism rate was computed as days lost per 100 scheduled workdays.

The group of 11,028 impaired workers had an absenteeism rate of 3.8 as against 3.4 for the 18,258 unimpaired workers matched with them. The survey group was made up of 10,253 impaired males and 775 impaired females matched, respectively, with 16,926 unimpaired males and 1,332 unimpaired females. The female workers, both impaired and unimpaired, had a considerably higher absenteeism rate, but this did not affect the group averages materially.

Table 2 and chart 1 show a frequency distribution of the absenteeism rates for the groups of impaired and unimpaired workers. There was a very heavy concentration in the low frequencies, with a scattering from both groups in the higher frequencies. No absences at all were reported for 22.6 percent of the impaired and 23.2 percent of the unimpaired during the periods in which they were studied. About 62 percent of the impaired and 65 percent of the unimpaired had frequency rates of less than 3.0.

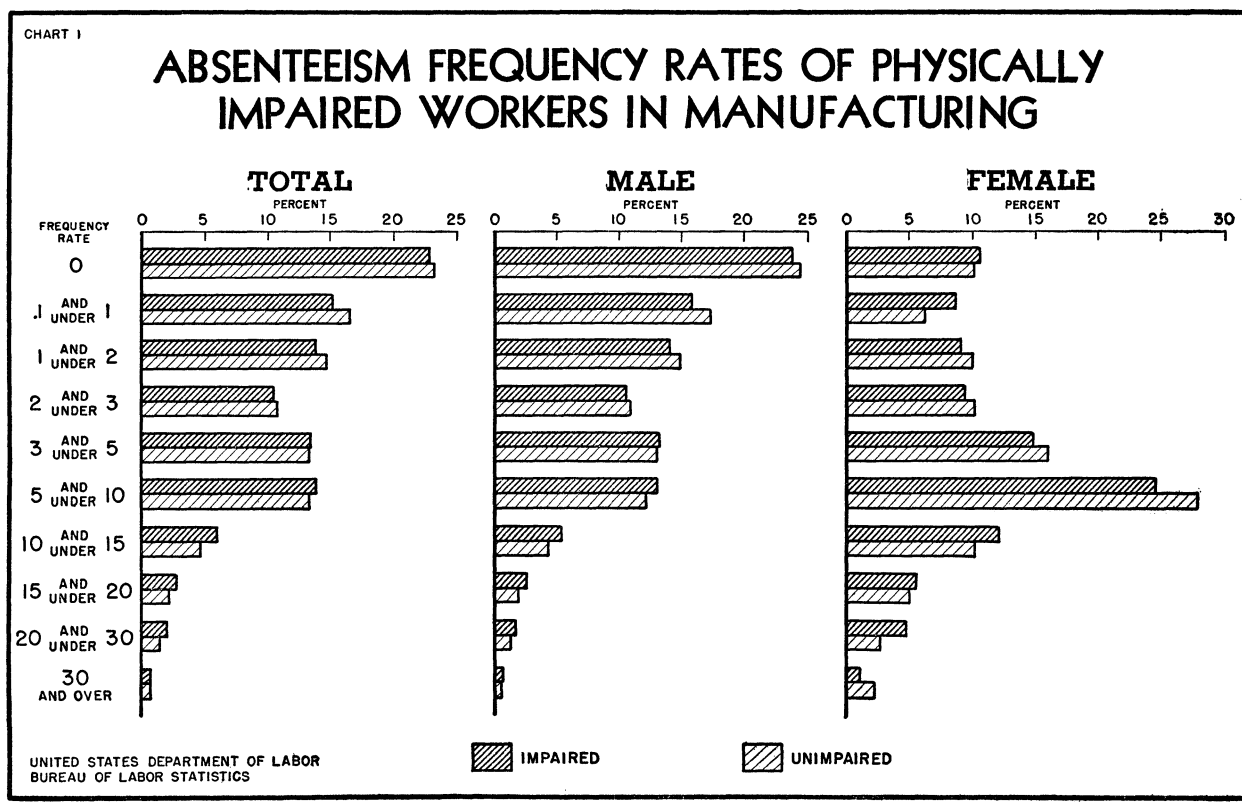
TABLE 2.—*Percentage distribution of impaired and matched unimpaired workers, by absenteeism frequency rate* [1] *and by sex*

Absenteeism frequency rate class	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
0	22.6	23.2	23.7	24.4	10.5	10.1
0.1 and under 1.0	15.1	16.4	15.7	17.2	8.6	6.2
1.0 and under 2.0	13.7	14.6	14.0	14.9	9.0	10.0
2.0 and under 3.0	10.4	10.7	10.5	10.8	9.3	10.1
3.0 and under 5.0	13.3	13.2	13.2	12.9	14.8	15.8
5.0 and under 10.0	13.8	13.2	12.9	12.1	24.6	27.9
10.0 and under 15.0	5.9	4.7	5.3	4.2	11.9	10.1
15.0 and under 20.0	2.7	2.1	2.5	1.8	5.5	5.0
20.0 and under 30.0	1.9	1.3	1.6	1.2	4.8	2.6
30.0 and over	.6	.6	.6	.5	1.0	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	11,028	18,258	10,253	16,926	775	1,332

[1] Number of days lost per 100 scheduled workdays.

Related to absenteeism as an element in work performance is the question whether a physical impairment predisposes a worker to greater absenteeism for certain specific reasons, such as illness, transportation

CHART 1



difficulties, etc. In an effort to see how significant the various reasons for absence were in actual practice, data on reason for absence were obtained wherever possible. Unfortunately, many of the plants studied did not keep such records. Hence, the reason for nearly half the absences had to be recorded as "unknown." However, table 3 indicates that for those cases in which reasons for absence could be obtained, the rates were substantially the same in the two groups.

There is some indication that a slightly greater incidence of absence because of illness may have been responsible for the fractionally higher rate recorded for the impaired group. However, only limited reliance can be placed on this inference. The sizable group of absences for which the reason was not available, if properly distributed, might have changed the pattern materially. On the information at hand, however, it seems reasonable to conclude that the physical impairment exercised at most only a very limited influence.

TABLE 3.—*Absenteeism frequency rates*[1] *for impaired and matched unimpaired workers, by reason for absence and by sex*

Reason for absence	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Total	3.8	3.4	3.6	3.2	6.4	6.5
Illness	1.5	1.2	1.3	1.1	2.4	2.4
Personal business	.3	.3	.3	.3	.9	.9
Transportation difficulties	(2)	(2)	(2)	(2)	(2)	(2)
Unknown	2.0	1.9	2.0	1.8	3.0	3.1
Number of workers	11,028	18,258	10,253	16,926	775	1,332

[1] Number of days lost per 100 scheduled workdays.
[2] Less than 0.05.

Considering the group rates, 3.8 and 3.4, and the frequency distributions of the individual rates for the impaired and unimpaired workers, there is no significant difference between them with respect to regularity of work attendance. The statistics show a fractionally higher rate for the impaired workers equivalent to about 1 day in each 250 scheduled workdays. In this connection there are three considerations which are of primary significance. First, the level of the rates was very favorable for both impaired and unimpaired workers. Second, the similarity of the rates emphasizes the fact that while many forces influenced regularity of work attendance for better or worse, physical impairment did not seem to be one of them. In the third place, the frequency distributions show that there were cases of excessive absenteeism among the unimpaired workers just as there were similar cases among the impaired workers. It is equally true for both groups, however, that these examples are the kind of individual cases of poor performance which one would expect to encounter in any large group of workers.

Work Injury Experience. Two diametrically opposed opinions are commonly encountered in discussions of the employment of impaired persons with respect to injury frequency. One is that the impaired person is more likely to be injured because his actions, movement, etc., are hampered by his impairment; the other, that the impaired person is believed to be less likely to be injured because he tends to be more safety conscious. The data obtained indicate that neither of these statements is completely accurate, although there is probably some truth in each. Possibly the force of the one tends to neutralize the effect of the other.

In this study, work injuries were divided into nondisabling and disabling and are discussed separately.

Nondisabling Injury Experience

A nondisabling injury was defined as an injury experienced in the course of the individual's work which did not result in any permanent impairment or in any loss of time beyond the day or shift on which the injury occurred. The experience for each individual was computed as a frequency rate on a base of 1,000 exposure-hours. The experience for the groups and subgroups of workers was computed on a base of 10,000 exposure-hours.

Data were available for 10,858 impaired and 18,001 unimpaired workers. The group was composed of 10,094 impaired males matched with 16,692 unimpaired males and 764 females matched with 1,309 unimpaired females. The difference between the number of workers constituting the survey groups for nondisabling injuries and absenteeism is accounted for by the fact that in some few instances nondisabling injury records had not been kept, had been lost, or for other reasons were not available. Where this was true of either the impaired or the matched unimpaired worker it was necessary to drop that matched unit so far as nondisabling injury experience was concerned.

To obtain a factual measure of the nondisabling

injury experience of the impaired workers compared with that of unimpaired workers exposed to the same hazards, reliance was placed on the dispensary records of the cooperating firms. It does not seem that the *level* of the rates should be given much consideration here because the level of the rate reflects not only the injury experience of the groups but also company policy in encouraging or requiring immediate treatment of minor injuries, employee cooperation on such a program, medical facilities maintained, etc. However, the conditions were the same for both impaired and unimpaired workers within each plant. Hence, while the level of the rate for the survey group as a whole is probably not very significant, the comparison between the rates for the impaired and unimpaired workers is valid.

The nondisabling injury frequency rates in the two groups of workers were identical, 9.9 work injuries per 10,000 exposure-hours. The female impaired workers had a fractionally higher rate than their matched unimpaired workers, 7.0 and 6.9, respectively. The male impaired and unimpaired had identical rates, 10.1.

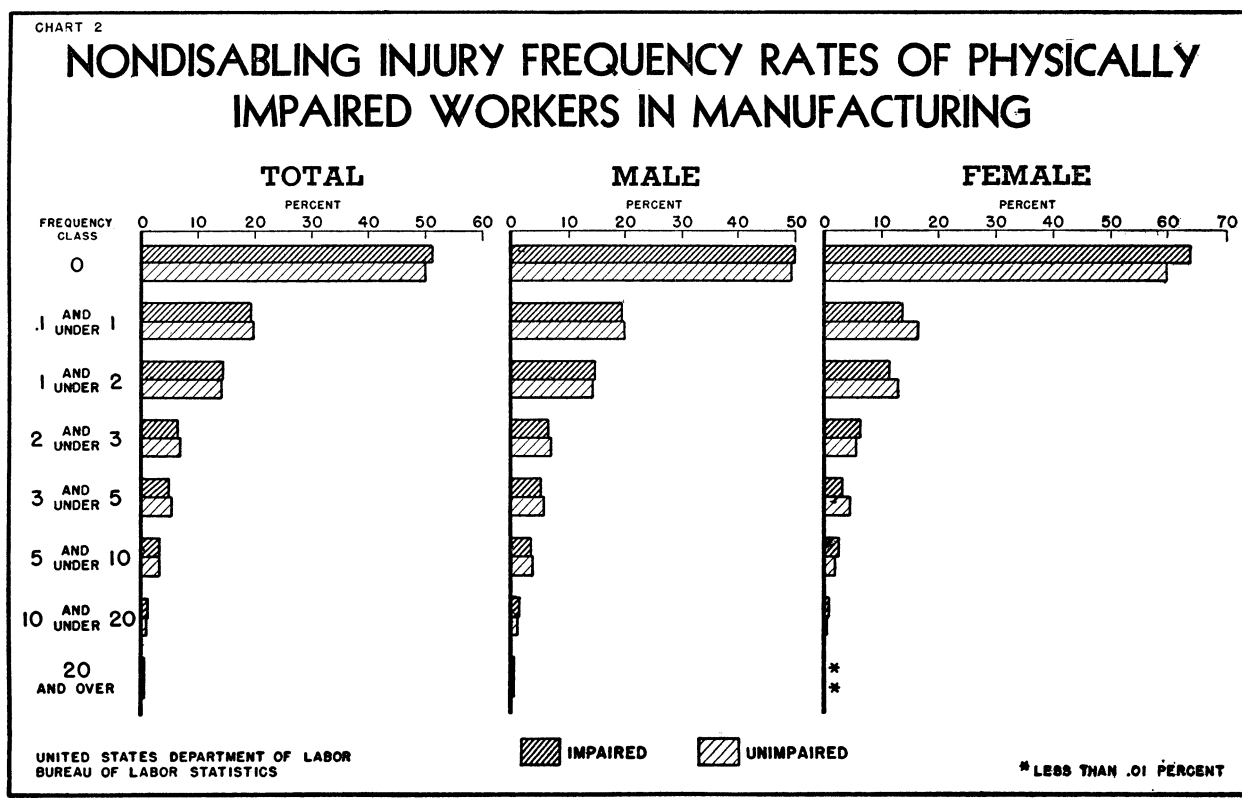
The similarity of the nondisabling injury experience of the impaired and unimpaired workers is further demonstrated by the frequency distributions shown in table 4 and chart 2. About half of each group had no injuries at all during the periods studied, about 70 percent had a rate of less than 1 per 1,000 hours, and 90 percent of each group had a rate of 2.9 or less per 1,000 hours. There was a scattering of cases, about 5 percent, with a rate of 5.0 or higher. The very marked similarity of the experience in the two groups is extremely significant.

TABLE 4.—*Percentage distribution of impaired and matched unimpaired workers, by frequency rate* [1] *of nondisabling injury and by sex*

Frequency rate class	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
0	51.0	50.0	50.0	49.2	63.9	59.7
0.1 and under 1.0	19.1	19.7	19.4	19.9	13.4	16.3
1.0 and under 2.0	14.2	14.1	14.5	14.2	11.1	12.7
2.0 and under 3.0	6.5	6.7	6.5	6.8	6.0	5.3
3.0 and under 5.0	4.9	5.3	5.1	5.5	2.9	4.1
5.0 and under 10.0	3.2	3.2	3.3	3.4	2.2	1.7
10.0 and under 20.0	1.0	.9	1.1	.9	.5	.2
20.0 and over	.1	.1	.1	.1	0	0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	10,858	18,001	10,094	16,692	764	1,309

[1] Number of injuries per 1,000 exposure-hours.

CHART 2



Clearly, there was no special proneness on the part of the impaired toward minor work injuries.

A further factor considered in connection with nondisabling injury experience was whether the presence of an impairment tended to increase the frequency of any particular kind of minor injury. Data were obtained on the nature of the injuries experienced by both impaired and unimpaired groups. The rates by type of injury are shown in table 5. Certain kinds of injuries, such as cuts and abrasions, are by their nature quite common in factory employment. The point of interest in this analysis, however, was that the kinds of injuries which had a high incidence in one group had an equally high incidence in the other. For example, cuts and abrasions had rates of 6.9 and 7.0 among the impaired and unimpaired, respectively. The pattern of the rates by kind of injury is nearly identical in the two groups. When it is considered that these data reflect the experience of 10,858 impaired and 18,001 matched unimpaired workers, the data indicate clearly that the nondisabling injury experience was related to the hazards of the job and not to the impairments which characterized one of the groups.

TABLE 5.—*Nondisabling injury frequency rates*[1] *for impaired and matched unimpaired workers, by nature of injury and by sex*

Nature of injury	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Total	9.9	9.9	10.1	10.1	7.0	6.9
Burns and scalds	.6	.5	.6	.5	.6	.5
Cuts and abrasions	6.9	7.0	7.1	7.2	4.6	4.5
Eye injuries	1.5	1.6	1.6	1.7	.8	.9
Strains and sprains	.5	.4	.4	.4	.6	.5
Fractures and dislocations	(2)	.1	(2)	.1	(2)	(2)
Dermatitis	.1	.1	.1	.1	.1	.2
Other	.3	.2	.3	.1	.3	.3
Number of workers	10,858	18,001	10,094	16,692	764	1,309

[1] Number of injuries per 10,000 exposure-hours.
[2] Less than 0.05.

An attempt was made to obtain a measure of the severity of the nondisabling injuries in terms of the number of redressings required per injury. A limitation on these data is the fact that plant practices varied widely. In some cases redressings were given only if requested by the employee, in other cases employees were encouraged to have complete treatment for the most minor scratches, and in still others the employee was required to report for redressings at intervals until given written clearance by the plant physician. These varying practices influenced the total number of redressings recorded in the study. In each plant, however, the practices affected impaired and unimpaired workers alike.

To the extent that the average number of redressings per injury reflects the severity of the injuries, there was no difference between the two groups. In both groups the average was 0.9 redressings per injury. It seems reasonable to conclude, therefore, that nondisabling injuries experienced by impaired workers did not tend to be any more or less severe than those experienced by unimpaired workers.

A final point considered in connection with the medical record was nonindustrial use of medical facilities. This was defined as dispensary visits for treatment of illness or injury not related to the worker's employment. Again, practices between plants varied widely. In some plants such visits were discouraged; in others they were encouraged and even supplemented by home visits from the nurse or physician. The study showed that the average number of such nonindustrial visits to the dispensary was the same for both groups, 1.5 visits per person during the periods studied. Clearly, the existence of the impairments did not have a measurable effect on the demands made upon the medical facilities by impaired workers because of injury or illness not related to the job.

In brief, nondisabling injuries of the same nature and severity were experienced with equal frequency by these groups of impaired and unimpaired workers matched on identical jobs and exposed to the same hazards. Also the existence of the impairment had no measurable effect on nonindustrial use of plant medical facilities.

Disabling Injury Experience

Probably one of the most difficult barriers for the impaired person to surmount in finding a place for himself in industry is the fear in the prospective employer's mind that another injury, added to the existing impairment, may result in a permanent total disability, with a consequent skyrocketing of workmen's compensation insurance costs. Realizing that the employer might well be laying himself open to serious potential hazards, various agencies, governmental and private, have advocated shifting that risk from the employer by establishment of second-injury funds under the workmen's compensation laws

of the several States.[3] Under this arrangement, the employer pays only for the specific injury. The fund pays the difference between the amount paid by the employer and the amount due the worker for the permanent total disability. As of August 1947, 36 States had second-injury funds or equivalent arrangements. In a few other States, employees with certain physical impairments are permitted to sign waivers releasing the employer from second-injury liability under the workmen's compensation law. Without going into the merits of the various second-injury provisions, the significant fact is that in most of the highly industrialized States some provision is made to protect the employer against disastrous increase in insurance costs as a result of a "second injury" to an impaired employee who becomes permanently and totally disabled through the combination of the work injury and the existing disability.

Experience under various State second-injury funds indicates that the likelihood of injuries of this type in reality is small. A very modest number of claims have been made on these funds. The experience recorded in this study constitutes further evidence that this type of injury is a comparatively rare occurrence. Of the 11,000 impaired workers comprising the survey group, 172 experienced disabling injuries of one kind or another but not one of these resulted in additional permanent disability which would place the employee in the category of the permanently and totally disabled. However, there is a qualification which should be placed on these findings. It is possible that in some instances the permanent disability may have been increased even though not to the extent of permanent total disability. In such instances the provisions of the usual type of "second injury" fund would not be operative.

The disabling injury record of the impaired workers of the survey group compared very favorably with that of the unimpaired workers matched with them and exposed to the same hazards. According to table 1 the injury frequency rate per million exposure-hours was 8.9 for the impaired and 9.5 for the unimpaired group. According to the accident statistics published by the Bureau of Labor Statistics, the rate for all manufacturing industry for the year 1946 was 19.9 per million exposure-hours. The experiences of the 11,000 impaired workers and their unimpaired co-workers, therefore, were considerably better than the experience in industry as a whole.

There is, of course, the question as to the extent to which a worker is likely to experience a disabling injury as a result of his impairment. Inquiry made at the time the data were obtained from cooperating firms disclosed only one instance in which the injury was definitely caused by the impairment. In that instance the safety director of the plant informed the Bureau's field representative that while the impairment had caused the injury, the responsibility lay with a foreman who had placed the impaired worker on a job from which he was definitely restricted. As the result of an oversight, the foreman had assigned the man to one of the few jobs in the shop he was not supposed to perform.

There were a few other instances in which it was possible that a causal relationship might have existed between impairment and injury, but the evidence was superficial and inconclusive. For example, in one instance a worker blind in his right eye struck his right hand against a projection while walking down an aisle. It happened on the blind side. It is possible that the lack of vision contributed to the accident. But this type of injury has been experienced by many people whose vision was in no way impaired. Similarly, in another plant, a worker with a crippled leg dropped a small casting on his foot. Possibly some lack of agility prevented him from jumping away from the falling piece and hence may have contributed to the injury. But in the same plant the same kind of injury was experienced by an unimpaired worker of the survey group. There were several such instances in the various plants, but always parallel accident cases were encountered among the unimpaired workers studied. In the vast majority of the work injuries there was not even a remote indication of the existence of any causal relationship between the impairment and the injury. On this point, therefore, the findings of the study lead to the conclusion that there is little reason to believe that the existence of the impairment will be a factor in work injury if the impaired worker is properly placed on the job.

Paralleling the belief that the impaired person may be a hazard to himself is the belief that he may constitute a hazard to his fellow workers. It is certainly true that both beliefs may at times be realized. Improperly placed in a job in which the abilities do not correspond to the requirements of the job, any

[3] Second Injury Funds as Employment Aids to the Handicapped, U. S. Department of Labor, Division of Labor Standards, Washington, 1947.

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worker — "impaired" or "unimpaired" — may well be a hazard to himself and to the people working in his vicinity. A man with even moderately defective depth perception operating an overhead crane may be a menace to himself and everyone working in the area. The same condition is true of any worker no matter how "normal," if he is placed in a job which he is not equipped to perform. The deficiency need not be physical — it may be mental or emotional.

Among the disabling injuries recorded among the unimpaired workers of the survey group there was no evidence that any had been caused or contributed to by a fellow worker's impairment. Information on this score was obtained from the accident records and accident-cause studies in the files of the various plants included in the survey. In order to get a broader coverage on this point, this question was raised at every plant studied, concerning impaired and unimpaired employees outside the survey group. While records were not examined in this connection, none of the plant officials questioned could recall any instances of the kind. The conclusion seems warranted that the impaired worker was no more likely to be a cause of injury to either himself or others than was his fellow worker who had no such impairment.

In summary, the impaired workers studied made a very favorable record in comparison with the unimpaired workers exposed to identical hazards. A number of factors probably contributed to this result. It is likely that the impaired person received somewhat more careful placement. Moreover, having an impairment, he may be more safety conscious. In discussing this subject, a personnel director said: "Take a walk through my plant. You won't find the impaired fellows engaging in horseplay and chasing one another with air hoses. Of course they have a better accident record!"

Time Lost. The time lost as the result of work injuries is another important consideration in this comparison. There is a fairly common belief that, because of the existing impairment, any additional injury may result in excessive loss of time; that the period of convalescence or recovery required for the impaired person may be much longer than for the person who is not burdened by an existing physical disability. What are the facts?

Of the total survey group of 11,000 impaired workers, 172 experienced 174 disabling injuries during the periods studied. The time lost as a result of these injuries amounted to 2,531 days, or a rate of 0.10 days per 100 scheduled workdays. In comparison, the 18,000 matched unimpaired workers experienced a disabling injury time-lost rate of 0.11 per 100 days scheduled to work. A further indicator of the severity of the injuries experienced in the two groups is the average time lost per injury. Among the impaired workers the time lost per injury was 14.5 days. For the unimpaired group, the time lost per injury was 14.9 days.

For the entire group of impaired workers, then, the record clearly shows that excessive time lost as a result of disabling injuries was not a factor to cause concern.

In assembling the data for each plant, it was noted too that there was a very marked similarity in the kinds of injuries experienced in the two groups. When burns or contusions were common among the impaired, they were also common among the matched unimpaired workers in the same plant. It was apparent that the injuries experienced were related to the hazards of the particular job, not to a proneness on the part of the impaired person to experience certain kinds of injury.

Because of its importance to the whole general subject of the impaired worker in industry, the disabling injury findings are summarized briefly here: If the impaired person is placed intelligently, then (1) The likelihood of an injury, which will result in permanent total disability when superimposed on an existing impairment, is very small. This is shown by this study and the experience of various State second-injury funds. (2) The impaired worker was no more likely — if anything, perhaps, a little less likely — to experience a disabling work injury than an unimpaired worker exposed to the identical hazards. (3) The impaired worker was not a source of danger to his fellow workers. (4) The average time lost as the result of disabling injuries was somewhat less among the impaired workers than among their unimpaired co-workers.

Output Relative

Data to provide a comparison of production efficiency were obtained in all instances where recorded measures of individual output were available. The number of cases for which such data were available is comparatively small, 895 impaired cases out of the total 11,028 studied. Subjective measures such

as foreman's evaluation, efficiency ratings, etc., were reviewed at the time the study was made but were not included or "weighted" into the data recorded in table 1. The measure was computed as a relative of the production efficiency of the impaired to that of the matched unimpaired workers, the output of the unimpaired in each case equaling 100.

The output relative for this group of 895 impaired workers is 101.0 against 100.0 for the 1,404 unimpaired workers with whom they were matched. Clearly, the impaired workers, as a group, were well able to hold their own with respect to volume of production.

Male and female impaired workers alike made a somewhat better production record than the unimpaired workers with whom they were matched. Data were available, however, for only a relatively few female workers, 213 impaired who had an efficiency relative of 103.3 against 100.0 for the 335 unimpaired female workers matched with them. The difference was narrower among the male workers, where 682 impaired had a relative of 100.3 against 100.0 for 1,069 matched unimpaired workers.

While the averages quoted are very favorable, they do not mean that every impaired worker produced at a better rate than did the unimpaired workers matched with him on the same job. Individual differences are as common among the impaired as among the unimpaired. As would be expected, some of the impaired showed a poor record. Many of them, on the other hand, had an excellent record. The following tabulation shows the number of impaired workers in three broad performance groups:

Output relative	*Number of impaired*
Less than 95.0	245
95.0 and under 105.0	359
105.0 and over	291

If it is assumed that an efficiency relative range of 95.0 to 105.0 represents about equal performance of the impaired and the matched unimpaired, 40.1 percent of the impaired were as good as, 27.4 percent were poorer than, and 32.5 percent were better than the matched unimpaired workers. Thus, 650 or 72.6 percent of the group produced at a rate as good as, or better than, their unimpaired fellow workers on the same jobs. It is significant that the largest group of the impaired fell in the range 95.0 to 105.0.

The figures quoted above do not take into consideration the impaired workers who were employed on assembly lines or on jobs involving group piecework. A rather large number of such cases were found. On the assembly line operations the working speed was controlled by the speed of the line and those working on it had to keep up with it. Where group incentives are in use, one member of the group who cannot keep up his end will cut down the earnings of all. No individual production records could be obtained for these people. But the fact of their employment demonstrates that they were able to match the speed of the unimpaired workers on the same assembly lines or groups.

Quit Rate

Various published works and magazine articles dealing with the subject of the impaired worker have advanced the opinion that these workers are more stable on the job and have a lower turn-over rate than unimpaired workers. In order to reduce this factor to a statistical determination, a follow-up was made in 68 of the plants included in the study to determine what the separation rates were for the survey group during a period of 6 months following the end of the survey period. Data obtained on 5,217 impaired and 8,783 unimpaired workers of the original survey group are shown in table 6 as quit, termination, and total separation rates per 100 employees in each of the two groups.

TABLE 6.—*Separation rates* [1] *for impaired workers and matched unimpaired workers, by reason for separation and by sex*

Reason for separation	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Voluntary quits	3.6	2.6	3.3	2.3	6.9	5.3
Health reasons	.6	.3	.4	.2	1.8	.9
Family reasons	.2	.2	.1	(2)	1.1	1.3
Moved from community	.4	.2	.4	.2	1.0	.2
Transportation difficulty	.1	(2)	(2)	(2)	.4	.1
Dissatisfied with job	.3	.3	.3	.2	.2	.3
Other	1.0	1.0	1.1	1.1	1.3	1.2
Unknown	1.0	.6	1.0	.6	1.1	1.3
Terminations [3]	5.2	3.1	5.2	3.1	4.4	2.9
Total separations	8.8	5.7	8.5	5.4	11.3	8.2
Number of workers	5,217	8,783	4,695	7,909	522	874

[1] Number of separations per 100 employees of the survey group.
[2] Less than 0.05.
[3] Separations initiated by the employer.

As an indicator of relative stability on the job, the rate of voluntary quits provides a comparison because the responsibility for initiating the action rests

with the employee. This rate was 3.6 for the impaired workers and 2.6 for the unimpaired workers. It is questionable whether the difference is significant. Two reasons accounted for half the difference. More of the impaired quit because of health reasons and more moved from the community. It is interesting that the quit rate attributed to dissatisfaction with the job was identical in the two groups. The rate attributable to "other" was made up of a variety of reasons. It was noticeable, however, that two reasons were fairly common in this "other" group — a sizable proportion of both impaired and unimpaired quit "to take another position" or "to set up own business."

Terminations [4] showed a rate of 5.2 for the impaired and 3.1 for the unimpaired workers. Terminations because of reduction in force were primarily responsible for this difference. It is not surprising that the impaired workers had the higher termination rate. In large part, impaired workers were the last to be hired. Consequently, when cut-backs had to be made, those workers with the lower seniority were the first to be laid off.

Composition of the Survey Group

Estimates of the number of impaired persons in the labor force vary widely, as the number depends largely upon how the term "impaired person" is defined. For the purpose of this study, the basic concept of impairment was a physical disability severe enough to constitute a serious problem for the individual in obtaining employment. With the assistance of an advisory committee, composed in part of industrial physicians, specific definitions were drawn in such a way as to exclude any doubtful, minor, or border-line cases. [5] Nine impairment types selected and defined for the study were serious orthopedic, vision, hearing, hernia, cardiac, ex-tuberculous, peptic ulcer, diabetic, and epileptic cases. A tenth group consisted of persons with a combination of two of these nine impairments, each in itself severe enough to fall within the adopted definitions.

No selection was exercised in including or excluding the various impairment types covered by the 10 categories selected for study. All of the impaired workers within the definitions and with whom unimpaired workers on the same jobs could be matched with respect to sex, age, experience, etc., were included in the survey group at each plant studied. Consequently, the composition of the survey group may reflect fairly closely the composition of the impaired worker group in industrial plants in general. Table 7 shows the distribution of the impaired workers studied, by type of impairment.

TABLE 7.—*Number of physically impaired workers of the survey group, by type of impairment*

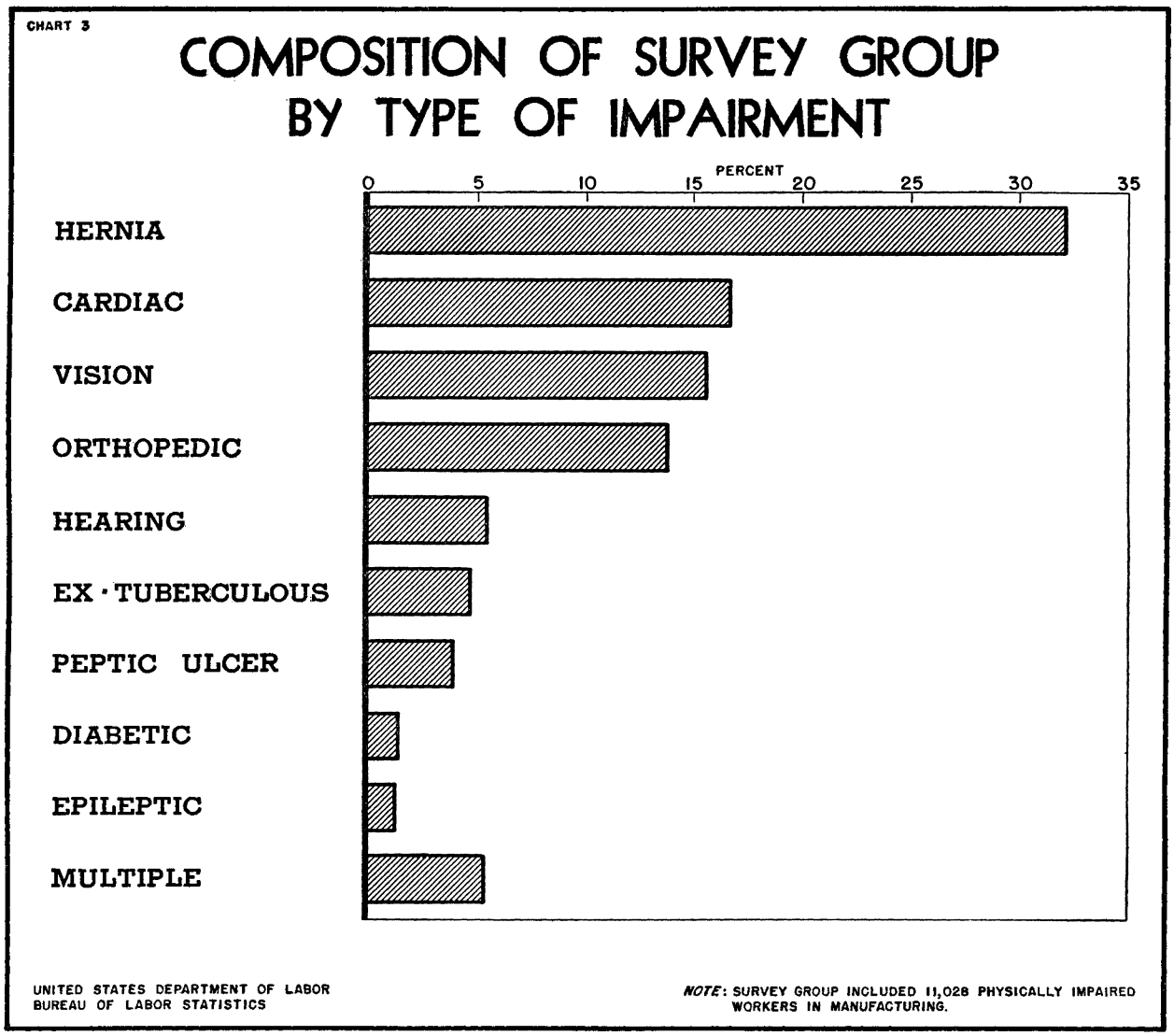
Type of impairment	Number of workers	Type of impairment	Number of workers
Total	11,028	Diabetic	144
		Epileptic	134
Orthopedic	1,522		
Amputees	484	Multiple	587
One hand	183	Orthopedic-Vision	28
Two hands	5	Orthopedic-Hearing	11
One arm	72	Orthopedic-Hernia	75
Two arms	2	Orthopedic-Cardiac	21
One foot	38	Orthopedic-Ex-tuberculous	9
Two feet	1	Orthopedic-Peptic ulcer	5
One leg	176	Orthopedic-Diabetic	3
Two legs	7	Orthopedic-Epileptic	0
Loss of use	761	Vision-Hearing	16
One hand	114	Vision-Hernia	78
Two hands	8	Vision-Cardiac	52
One arm	174	Vision-Ex-tuberculous	12
Two arms	9	Vision-Peptic ulcer	6
One foot	51	Vision-Diabetic	4
Two feet	19	Vision-Epileptic	1
One leg	335	Hearing-Hernia	23
Two legs	51	Hearing-Cardiac	17
Back deformity	214	Hearing-Ex-tuberculous	3
Multiple orthopedic	63	Hearing-Peptic ulcer	5
		Hearing-Diabetic	0
Vision	1,721	Hearing-Epileptic	0
Totally blind	34	Hernia-Cardiac	120
Blind, one eye	941	Hernia-Ex-tuberculous	29
Legally blind	25	Hernia-Peptic ulcer	18
Partially blind	721	Hernia-Diabetic	9
		Hernia-Epileptic	2
Hearing	595	Cardiac-Ex-tuberculous	22
Totally deaf	92	Cardiac-Peptic ulcer	9
Hard of hearing	313	Cardiac-Diabetic	4
Deaf mute	190	Cardiac-Epileptic	1
		Ex-tuberculous-Peptic ulcer	2
Hernia	3,543	Ex-tuberculous-Diabetic	0
		Ex-tuberculous-Epileptic	0
Cardiac	1,840	Peptic ulcer-Diabetic	2
		Peptic ulcer-Epileptic	0
Ex-tuberculous	513	Diabetic-Epileptic	0
Peptic ulcer	428		

The large number of hernia cases, 32.1 percent of the survey group, is probably the result of two factors: First, it is apparently relatively easy for the person with a hernia condition to get a job, as about the only restriction to which he is subject is that of excessive lifting; furthermore, the disability can be minimized by the use of a truss. Second, hernia is a common industrial injury and many of the workers studied probably remained with their employers after the impairment was acquired. Cardiac, vision, and orthopedic impairment cases were nearly equally common, 16.7, 15.6, and 13.8 percent, respectively. Epileptics constituted the smallest impairment

[4] Separations initiated by the employer.

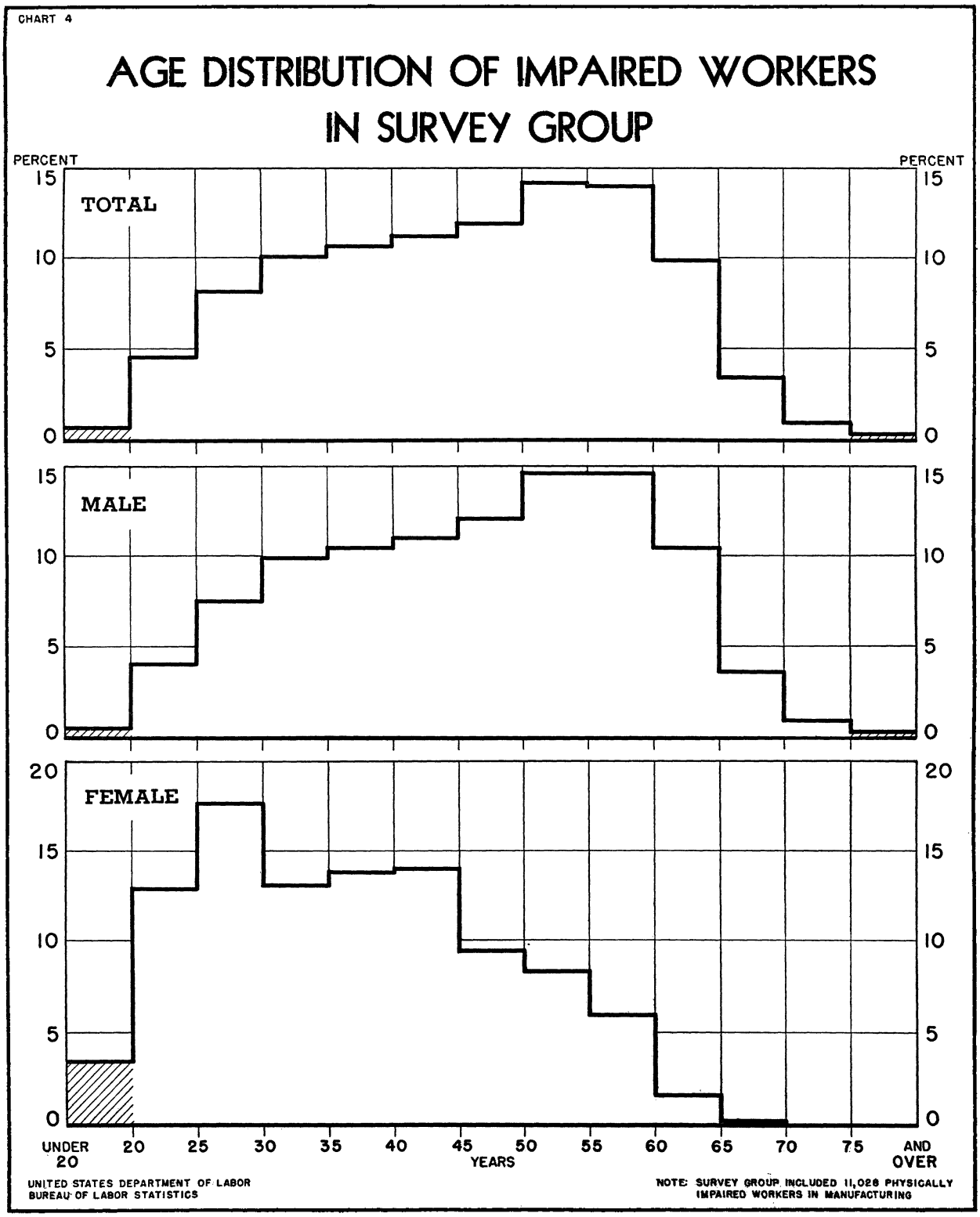
[5] The definitions of impairment as approved by the advisory committee are given in detail in the Appendix (p. 120).

group, 134 cases or 1.2 percent of the total impaired workers studied. An unexpectedly large number of multiple impairment cases were encountered, 587 or 5.3 percent of the group, making it sixth in the list of 10 impairments studied. A combination of impairments naturally complicates the placement problem, since additional qualifications and restrictions have to be considered in matching the man to the job. Nevertheless, a sizable number of these cases were encountered, although the number of cases in any given combination of impairments was small. Excluding the double orthopedics, 36 possible



combinations of the impairments were studied. The largest number recorded for any combination was 120 in the hernia-cardiac group.

The distribution of the impaired workers by age group is shown in table 8 and in chart 4. Since impaired and unimpaired were matched with respect to age, no separate age tabulation was prepared for the unimpaired group. The impaired workers were concentrated in the middle age ranges with a slight tendency toward the higher ages. About 52 percent of all the impaired workers studied fell within the range between 25 and 50 years of age. Slightly less than 86 percent were under the age of 60. At the extremes of the age range were approximately 15



percent who were 60 years or over and about 5 percent who were under 25. When calls for military service withdrew large numbers of younger workers from industrial employment, their places were frequently taken by women or by older workers. To some extent this worked against inclusion of the younger impaired workers in the study because they frequently could not be matched with respect to age, sex, or experience with unimpaired workers on the same jobs. For the most part, the periods studied fell in 1945, a time during which this effect was especially pronounced. On the whole, however, the age distribution seems to show a reasonably balanced pattern.

The age distribution for the male and female impaired workers differed widely. Whereas only 55 percent of the male workers were under the age of 50, 84 percent of the female workers fell in the same range. The difference was particularly marked in the upper and lower age brackets. Nearly 20 percent of the females, as against only 5 percent of the males, were under the age of 25 while 15 percent of the males and only 2 percent of the females were 60 years of age or over.

TABLE 8.—*Number and percentage distribution of impaired workers of the survey group, by age and by sex*

Age group	Number of workers			Percent		
	Total	Male	Female	Total	Male	Female
Total	11,028	10,253	775	100.0	100.0	100.0
Under 20 years	79	53	26	.7	.5	3.4
20 and under 25 years	511	411	100	4.6	4.0	12.9
25 and under 30 years	901	764	137	8.2	7.5	17.7
30 and under 35 years	1,117	1,016	101	10.1	9.9	13.0
35 and under 40 years	1,184	1,077	107	10.7	10.5	13.8
40 and under 45 years	1,238	1,130	108	11.2	11.0	14.0
45 and under 50 years	1,312	1,239	73	11.9	12.1	9.4
50 and under 55 years	1,562	1,498	64	14.2	14.6	8.3
55 and under 60 years	1,543	1,497	46	14.0	14.6	5.9
60 and under 65 years	1,088	1,076	12	9.9	10.5	1.5
65 and under 70 years	370	369	1	3.4	3.6	.1
70 and under 75 years	96	96	0	.9	.9	0
75 years and over	27	27	0	.2	.3	0

No attempt was made to regulate the proportion of male to female workers included in the survey group in any of the plants or in the study as a whole. As finally constituted, the survey group was made up of 10,253 impaired males matched with 16,926 unimpaired males, and 775 impaired females matched with 1,332 unimpaired females. This proportion of female workers is low: according to figures published by the Employment and Occupational Outlook Branch of the Bureau of Labor Statistics, females constituted 26 percent of factory employees in manufacturing industries in December 1946. Nor can it be said that this proportion in the survey group reflects the composition of the employed impaired male and female workers in all manufacturing industries. A change in the number of plants studied in various industries could have changed the proportion of male and female workers in the survey group.

There were sizable differences in the performance rates for the two groups, and for this reason the separate tabulations by sex are shown. However, the effect of the female group on the over-all rates is nominal because of the relatively small number of cases involved.

Geographical Coverage

An effort was made to obtain some representation in the study from various sections of the country. As no information on the number of impaired persons employed or in the labor market in each area was available, no attempt was made to obtain a definite, proportionate share from each area. Furthermore, in order to obtain data on a group sufficiently large to yield statistically valid results within the limits of time and funds available for the study, it was necessary to concentrate on the large industrial centers where information could be obtained on the largest number of impaired workers in the shortest possible time. (The distribution of the survey group by geographical area is shown in table 9.) No representation at all was obtained in the West South Central and Mountain States because industries in these areas generally tend toward small and scattered units. Petroleum refining, which would have been an exception, had already been covered in other areas. About three-quarters of the study was concentrated in the highly industrialized New England, Middle Atlantic, and East North Central areas. The rest of the establishments surveyed were in the West North Central, South Atlantic, and East South Central States and on the West Coast.

On the whole, it is not likely that geographical location would exercise any pronounced effect on the factors under consideration in this study. It is true that various State workmen's compensation laws, insurance regulations, second-injury funds, etc., have an effect on the industrial employment of impaired persons. But the effect of these factors is apparent in the number of such persons employed

rather than in a comparison of the work performance of impaired and matched unimpaired persons working on the same jobs.

TABLE 9.—*Distribution of impaired workers of the survey group, by geographical division*

Geographical division	Number of plants	Number of impaired
Total	109	11,028
New England	28	1,748
Middle Atlantic	30	2,737
East North Central	33	5,359
West North Central	7	399
South Atlantic	3	105
East South Central	2	111
West South Central	0	0
Mountain	0	0
Pacific	6	569

Industry Coverage

It was not intended that comparison of work performance should be drawn between impaired workers in various industries. It was considered desirable, however, that a wide variety of industries should be represented in the impaired group studied. The Bureau of the Budget's Standard Industrial Classification was used as the guide, and as the study progressed special efforts were made to obtain representation in those major industries which were not turning up in the regular course of the field work. The number and percentage distribution of the impaired workers of the survey group, by industry classification of the plants in which they were employed, is shown in table 10.

Some representation is present for each of the industry groups in the Standard Industrial Classification except lumber and timber basic products. Although it is known that impaired workers within the definitions used in this study are employed in logging, sawmill, and similar operations, the industry is characterized by small operations which frequently are not easily accessible. It was not considered feasible to spend the time required to locate plants in the industry sufficiently large, with records adequate for survey purposes. Furthermore, this work would have been very costly.

No quota or representative sample could be set up by industrial groupings because the number of impaired workers employed in any given industry is not known. The concentration of coverage was heaviest in industries characterized by large operating units. It should not be inferred from this, however, that employment of impaired persons is proportionately greater in these industries. Large operating units were selected whenever possible in order to use the time of the field force most effectively in building up a large survey group in the shortest possible time.

The number of impaired workers studied in any industry was further influenced by various considerations, other than the number of such persons employed. For example, although the apparel industry employs impaired persons, records of pre- or post-employment physical examinations were rarely available in that industry. Without such records the study could not be made. The same difficulty was encountered in certain areas where, by custom or collective bargaining agreement, no medical examinations were used in connection with employment.

TABLE 10.—*Number and percentage distribution of impaired workers of the survey group, by industry*

Standard Industrial Classification Code	Industry group	Number of workers	Percent
20	Food and kindred products	475	4.3
21	Tobacco manufactures	127	1.2
22	Textile-mill products	266	2.4
23	Apparel and other finished products	146	1.3
24	Lumber and timber basic products	(1)	(1)
25	Furniture and finished lumber products	91	.8
26	Paper and allied products	134	1.2
27	Printing, publishing, and allied industries	32	.3
28	Chemicals and allied products	213	1.9
29	Products of petroleum and coal	652	5.9
30	Rubber products	136	1.2
31	Leather and leather products	143	1.3
32	Stone, clay, and glass products	472	4.3
33	Iron and steel and their products	1,753	16.0
34	Nonferrous metals and their products	663	6.0
35	Machinery except electrical	1,314	11.9
36	Electrical machinery	974	8.8
37	Transportation equipment, except automobiles	1,608	14.6
38	Automobiles and automobile equipment	1,656	15.0
39	Miscellaneous manufacturing industries	173	1.6
	Total	11,028	100.0

[1] The lumber and timber basic products group was omitted from the survey because of the practical consideration of expense.

The whole point of industry coverage so far as this study was concerned was that the performance data recorded should reflect a wide range of industrial activities. For this purpose the coverage and variety of manufacturing industry represented seems adequate. It demonstrates that employment of the impaired person is not limited to a relatively few industries. Impaired workers were found in all kinds of industrial activity, from the lightest to the heaviest. This wide distribution indicates clearly that impaired workers were adaptable to a great variety of occupations and that reliance need not be placed upon some few carefully selected and defined industries to provide employment opportunities for

impaired persons generally, and for disabled veterans in particular.

Occupations of Impaired Workers

The findings of the present study indicate that practically any job in any plant is potentially a job for an impaired worker of one kind or another. The jobs held by the impaired workers are listed for each type of impairment. (See under Industry and Occupational Coverage, parts A to J.) But as far as a specific job is concerned, the use of an impaired worker is an individual problem. The employment manager, personnel director, shop foreman, or whoever is responsible for assigning a man to a job has to weigh the abilities of the individual applicant, his skills, experience, temperament, personality, etc., against the requirements of the particular job. This, however, is true of any scientific placement work, regardless of whether or not a worker is impaired. The impairment is an additional element for consideration.

As significant as the variety of jobs was the range of skills reflected by the jobs performed by impaired workers of the survey group. This range included everything from unskilled manual labor to the most highly skilled of the machinist classifications. The implications here are many and varied. Some of these workers had acquired their skills before suffering their impairments; in many cases the impairments did not affect the exercise of these skills. In other instances, either because the impairment occurred before skills were acquired or because the impairment was such that it destroyed skills already acquired, the impaired person had learned new jobs and had acquired new skills, some of them of a higher degree than those lost.

In connection with the variety and range of skills reflected by the lists of jobs on which impaired workers were employed, one fact must be borne constantly in mind and cannot be overemphasized. *These jobs are merely examples.* Many of the impaired workers in each plant could not be included in the study because they could not be matched suitably with unimpaired workers doing the same work. Hence, there were many jobs other than those listed which were being performed by impaired workers and which do not appear in these listings. Further, it is readily apparent that there are many jobs which differ in only minor respects from those listed and which would be equally suitable for impaired persons. These listings are not to be interpreted as a definitive list of occupations for impaired workers.

In compiling the data for the study, the United States Employment Service publication Dictionary of Occupational Titles was used to assign a code number to the occupation of each of the impaired workers studied. In all, 971 different code numbers were used. But even this understates the case. The Dictionary of Occupational Titles frequently assigns the same code to a number of varied jobs. Actually, the 11,000 impaired workers of the survey group were employed in 1,488 separate occupations.

To determine the general classes of operations in which the impaired workers were employed, their occupations were grouped according to the occupational patterns used for wage studies by the Wage Analysis Branch of the Bureau of Labor Statistics.

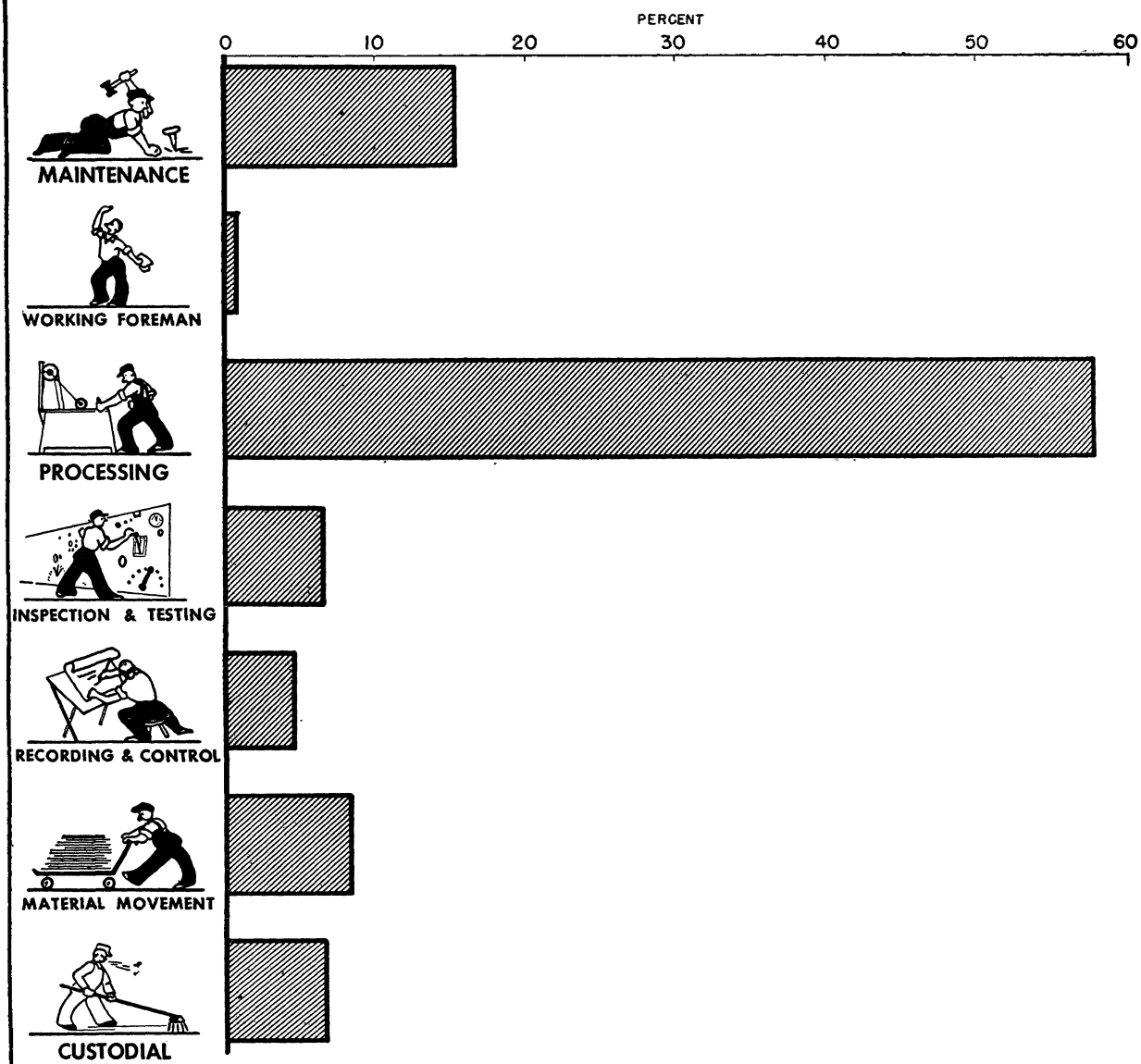
TABLE 11.—*Percentage distribution of impaired workers, by occupational pattern*

Occupational pattern	Total	Male	Female
Maintenance	15.2	16.3	1.4
Working foremen	.7	.7	.8
Processing	57.9	56.3	80.7
Inspection and testing	6.4	6.0	11.1
Recording and control	4.4	4.5	2.2
Material movement	8.5	9.0	1.2
Custodial	6.9	7.2	2.6
Total	100.0	100.0	100.0
Number of workers	11,028	10,253	775

The major proportion of the impaired workers were found in jobs in the processing or producing operations in the various plants studied. This kind of employment of impaired workers undoubtedly received a sharp stimulus during the war years. It also reflects the efforts of public and private placement agencies and personnel and medical departments of many industrial plants to assign the applicant where he fits best by matching the requirements of the job with the abilities of the man. This practice, commonly referred to as selective placement, has resulted in opening jobs throughout the plant to the impaired person. The very variety of skill requirements shown demonstrates conclusively that jobs such as watchman and janitor need no longer constitute the employment opportunities for those who have had even severe limitations placed on their physical equipment by the ravages of accident, illness, or the hazards of war.

CHART 5

OCCUPATIONAL DISTRIBUTION OF IMPAIRED WORKERS IN SURVEY GROUP



UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

NOTE: SURVEY GROUP INCLUDED 11,028 PHYSICALLY IMPAIRED WORKERS IN MANUFACTURING.

Placement Practices [6]

A proper evaluation of the performance data of impaired and unimpaired workers requires that the analysis take into account the placement practices used in the plants studied. With adequate factual knowledge of the requirements of the particular jobs and of the environmental conditions under which the work is performed, and with an inventory of the physical abilities of the applicant (results of the physical examination), it is reasonable to believe that the placement officer will be able to place the applicant intelligently. Under a hit-or-miss method, it is not unlikely that the person with a given impairment will be placed on a job which requires powers or abilities he does not possess. Through no fault of his own the impaired person might be placed at such a disadvantage that he would be a failure in the job from the start.

In the discussions preliminary to the study, the opinion was advanced that in the plants which practice selective placement the impaired automatically turn in a better record of work performance than the unimpaired workers matched with them. It was found however that, in practice, selective placement is not usually limited in its application to impaired persons. Consequently, the unimpaired benefit as well as the impaired. In the absence of intelligent placement practices, however, the impaired are likely to suffer disproportionately more. The basic fallacy underlying the opinion stated above is that the so-called "unimpaired" person does not need selective placement. Whether the practice is dignified with the name of "selective placement" or not, it has long been a basic tenet of sound personnel practice that an applicant, no matter how able-bodied, cannot be assigned to just any job. Every placement officer practices selective placement in some degree when he balances the qualities he wants in a certain job against the apparent abilities and capabilities of the applicant.

To a degree, the data compiled in this report are biased in the direction of the plants with more advanced placement practices because of the necessity of selecting for study only plants whose medical records revealed physical impairments. This requirement was necessary in order to select, first, the impaired workers within the definitions adopted for the study and, second, the unimpaired workers to be matched with them.

The scope of the medical examinations varied widely among the 109 plants surveyed. In some instances the examinations were comprehensive and included blood and urine analysis, X-ray examination, etc., for every applicant. In other cases, such tests were made only when the applicant's history indicated their advisability or when the kind of employment being offered indicated their necessity. In most of the plants, the examination was made by a plant physician. In others, forms were supplied by the plant and the examination was made by the applicant's family physician or by a physician designated by the employer.

A further factor which had to be considered when setting up the survey groups was the recency of the physical examination. Some plants which otherwise might have been selected for study had to be excluded because the physical examination data for many of the employees were too old to be dependable. On the other hand, many of the plants studied provided annual physical examinations or examinations following any illness or injury of the employee.

In general, however, the absence of adequate data of this kind handicapped the study. Because no pre- or post-employment physical examinations were given, 62 plants had to be excluded from the survey. As already indicated, these plants were the larger firms in their various communities. There were various reasons why physical examinations were not used. In some cases it was a matter of tradition. In other cases it was because of objection on the part of the employees, who feared that the physical examinations might be used to prevent the employment of workers objectionable to management for other reasons, or that workers would be laid off rather than placed in other suitable jobs.

In many plants it has been a long-standing policy to exclude certain types of physical impairment. When in the course of the pre-employment physical examination the specific type of impairment is disclosed, the applicant is automatically rejected. The

[6] For other detailed discussions of various phases of job placement see The Physically Handicapped in Industrial Establishments of the Government, by Verne K. Harvey, M.D., and E. Parker Luongo, M.D., U.S. Civil Service Commission, *in* Journal of the American Medical Association, Jan. 9, 1943; Job Placement of the Physically Handicapped, by Clark D. Bridges, New York, McGraw-Hill Book Co., Inc., 1946; Operations Manual for Placement of the Physically Handicapped, U.S. Civil Service Commission, Washington, 1947; and Matching the Physical Characteristics of Workers and Jobs, by Bert Hanman, *in* Industrial Medicine, May 1945. Selective Placement for the Handicapped, Rev. Feb. 1945. U. S. Employment Service.

type of exclusion referred to here is not selective in the sense that certain impairment types are rejected only for certain kinds of jobs. This exclusion is of a general nature and the person with the specified impairment will not be accepted for employment on any job in the plant.

During the war most plants relaxed the physical standards to be met by new employees. Since the end of the war, however, many plants were found to have reinstituted exclusions in their hiring policies affecting certain types of impairments. A sizable number of the 109 plants included in the present study stated specific exclusions as a matter of company policy, as follows:

Excluded impairments	*Number of plants*
Hernia	33
Epileptic	32
Cardiac	27
Vision	16
Orthopedic	11
Diabetic	8
Ex-tuberculous	7
Peptic ulcer	4
Hearing	3

Six plants excluded all impaired applicants as a matter of policy, and 75 plants had no definite policy as to specific exclusions. On the other hand, only 25 of the surveyed plants had definite, stated policies of no exclusions because of any impairment. In these plants, if the abilities of the applicant met the requirements of the job vacancy, physical impairment was not a cause for rejection.

The question may well be asked: How were these plants included in the study in the face of these exclusion policies, particularly the six plants which professed to exclude all types of physical impairment? The seeming contradiction is resolved by the fact that persons acquiring impairments subsequent to their employment were not discharged but were placed in jobs they were able to perform. There is a sort of unconscious distinction between the person who has acquired an impairment after entering the service of the company and the impaired applicant seeking employment. It is more than a sense of responsibility to the impaired employee, although that is a factor. The employee who has become impaired in the company's service is a good man who, perhaps, has to be put on somewhat different work. The impaired applicant, on the other hand, is an untried person who presents an immediate problem of placement. Also, some of the impaired persons hired during the war were retained in their jobs. As a result, these firms had sizable numbers of impaired persons in their employment even though no additional persons with impairment were being hired.

In a large number of plants, the exclusion of the impaired was more thorough: 76 of the large plants contacted had to be excluded from the study because not enough impaired workers were employed to justify the time and expense involved in searching the records and recording the performance data. The minimum had been set at 20 impaired workers.

The employment methods used varied considerably among the plants studied. The plants ranged from small to large operations, but in each of them a clearly defined personnel function had been established as the responsibility of some person or group. It seems reasonable to believe, therefore, that the placement practice which characterized these firms are representative of that segment in manufacturing industry in which the personnel problem had received careful consideration.

The placement techniques used in the firms studied differed with the requirements of the various types of operations and the needs of the individual plants. In 55 plants, comprehensive job analyses were in use; 19 plants used job descriptions; and 7 plants utilized job analyses only for selected departments and occupations. In 28 plants no such data were used; but in 11 of them, job analysis studies were under way at the time the survey was made. Many of the plants also supplemented their own facilities with others obtained from the United States Employment Service and other sources.

The actual placement of the impaired worker was also subject to a variety of methods. In many of the plants, the placement required the approval of the medical department, in some the approval of the safety department, and in a few the foreman made the assignment with the approval of the personnel or employment manager. Transfers from one job to another were handled in much the same way. In most of the plants studied, considerable importance was attached to the approval of transfers by either the medical, safety, or personnel departments, or some combination of the three. The reason, of course, was that if transfers were made by a foreman or other supervisor who was not acquainted with placement techniques, and for that matter might not even have known which of his men had organic impairments, serious difficulties might result. The impaired

person might be put on a job he was not at all equipped to perform, one in which he might even endanger himself or others. A few such instances actually were encountered during the study. To insure against such mischance, most of the plants required approval by higher authority before transfers and reassignments could be effected. In some places this applied to all employees, in others only to certain employees on "limited" or "restricted" lists.

In practically all of the plants some form of follow-up was maintained, but only in very few cases was it sustained over any considerable period of time. For the most part, a follow-up was made at the end of a probationary period. Beyond that point no further follow-up was made except in cases of complaint on the part of the supervisor or employee. It was probably because of this absence of systematic and periodic follow-up that some of the very high individual rates of absence and injury on the part of both impaired and unimpaired workers were found in a number of plants.

It is not the purpose of the present study to pass judgment on the placement practices as they affected impaired workers in the plants studied. Effective placement of the impaired worker is not a matter of interviews, formal job analyses, assignment controls, etc. These are merely some of the tools which can be used. The care and understanding with which they are used is the final determinant. If the impaired worker is automatically excluded by the mere existence of the impairment, the tools at hand are meaningless for him. On the other hand, if he is considered in terms of what he can do as against what the given job requires he is on an equal competitive footing with the unimpaired applicant.

Obviously, the greater the extent to which placement can be translated from a subjective to an objective plane by the use of such devices as job requirements data, etc., the better. But the study indicates clearly that it is not essential that each company contemplating the employment of impaired persons must undertake elaborate and expensive research as a prerequisite. Assistance, if it is needed, is readily available from the United States Employment Service and other governmental and private agencies. *For the most part, the techniques used for intelligent placement of so-called "normal" workers are all that need be brought into play for effective placement of the impaired. The essential addition is that the nature of the impairment and the requirements of the job be clearly understood by all concerned.*

One very significant fact brought out in the present study was the nearly complete absence of job re-engineering for the impaired. One hundred and nine plants employing 11,000 impaired persons had not found extensive re-engineering necessary. In a few instances, slight modifications had been made in the machines or in the work place when impaired workers were placed on the job. However, in large part the same modifications had subsequently been adopted for the unimpaired workers as well. Thus, the study demonstrates clearly that extensive and expensive re-engineering of jobs was not necessary for the employment of sizable numbers of physically impaired persons.

Selective placement as it applies to the impaired and to the unimpaired person differs only in degree. No matter how sympathetic the employer may be toward hiring impaired persons, the basic fact remains that in one way or another the impaired person is limited as to job assignments. He cannot be put on just any job that happens to be available. In a large number of plants the management told Bureau field representatives that impaired persons would be hired regardless of impairment *if they had special skills*. In plain terms, the person with a severe physical impairment must have a skill to sell which will make it worth while for management to undertake a solution to the problem of his placement. The industrial establishment with a competitive position to maintain can afford to hire the impaired person because of his skills, not because of his impairment. This, of course, throws the emphasis on rehabilitation and retraining. Whether an impairment destroys an existing skill or an impairment exists before skills are acquired, it is of the utmost importance that the impaired person acquire specialized skills. The present study has indicated clearly that such skills can be exercised by impaired persons and that such persons can turn in a record of work performance comparable to that of unimpaired workers on the same jobs. The study also brought out the fact that the emphasis in placement is upon finding the job in which the impaired person can exercise his special abilities to the best advantage. If impaired persons are to be employed in greater numbers, it is highly desirable that they bring to the jobs for which they apply a specialized training and ability which will induce management to hire them.

A. The Hernia Cases

Summary of Statistical Findings

The record of work performance of 3,544 workers with hernias was nearly identical with that of 5,869 unimpaired workers matched with them on the same jobs. Differences between the two groups were fractional for most of the factors studied. With respect to frequency of absenteeism, nondisabling work injuries, and disabling work injuries the rates varied by tenths of a point. The time lost as a result of disabling injuries was higher for the hernia cases by only a fractional part of a day. The quit rate, too, was slightly but not materially higher for the hernia cases. However, as a group the hernia cases on individual incentive work recorded an output slightly over 1 percent higher than the unimpaired on the same jobs.

In view of the marked similarity of the performance records, it seems reasonable to conclude that the hernia cases were not handicapped by the impairment as far as job performance was concerned.

TABLE A–1.—*Work performance of workers with hernias and of matched unimpaired workers*

Factor	Number of workers		Average performance	
	Impaired	Unimpaired	Impaired	Unimpaired
Absenteeism frequency rate [1]	3,544	5,869	3.2	3.1
Nondisabling injury:				
Frequency rate [2]	3,501	5,806	9.2	9.1
Disabling injury:				
Frequency rate [3]	3,543	5,868	9.9	9.9
Time-lost rate [4]	3,543	5,868	.12	.11
Average days of disability [5]			14.8	14.4
Output relative [6]	226	365	101.5	100.0
Quit rate [7]	1,805	3,068	2.9	1.8

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of unimpaired.
[7] Number of voluntary quits per 100 employees in the survey group.

Composition of the Survey Group

The definitions adopted for the study required that in selecting impaired workers in each plant only cases of existing hernia were to be taken. All cases of incipient or potential hernia, relaxed rings, and cases in which the worker had undergone a successful herniotomy were excluded.

Inguinal hernia was by far the most common type found, and accounted for 2,409 cases. Of those, 51 were direct, 145 were indirect, 565 were double, and 1,648 were listed merely as inguinal hernia without further designation; 220 cases were recorded as umbilical herinas. There was also a fairly large group, 915 cases, which the plant records described only as "hernia" without any further information as to type. For the purposes of the present study, no comparative performance tabulations were prepared for each of the several types of hernias, and all data shown cover the entire group.

Workers with hernias tended toward the higher age ranges. Only 6 percent of the hernia cases were under 30 years of age while 17 percent of the other impaired workers fell in this age group. On the other hand, while 38 percent of the other impaired workers were 50 years of age or over, fully 51 percent of the hernia cases fell in this group. Nearly 60 percent of the hernia cases fell in the 20-year range from 45 to 65 years, and 34 percent in the 10-year range from 50 to 60 years. This is probably owing to the fact that hernia is a fairly common work injury. Because of longer exposure to conditions that produce hernia, it is only natural for older workers to show a greater incidence of hernia than younger workers. It is possible, too, that there is less inclination on the part of the older worker to undergo a herniotomy except in emergency cases. In general, however, older men are not placed on jobs requiring heavy lifting or strenuous exertion. These conditions are also of major importance in placing workers with hernias, young or old.

Hernia cases were encountered more frequently in the survey than any other type of physical impairment. The 3,544 cases studied constituted nearly a third of all the impaired workers with whom unim-

TABLE A-2.—*Comparison of number and percentage distribution of 3,544 hernia cases and 7,484 other impaired workers studied, by age group*

Age group	Number of workers		Percent	
	Hernia cases	Other impaired	Hernia cases	Other impaired
Total	3,544	7,484	100.0	100.0
Under 20 years	8	71	.2	.9
20 and under 25 years	64	447	1.8	6.0
25 and under 30 years	146	755	4.1	10.1
30 and under 35 years	264	853	7.4	11.4
35 and under 40 years	372	812	10.5	10.8
40 and under 45 years	408	830	11.5	11.1
45 and under 50 years	460	852	13.0	11.4
50 and under 55 years	608	954	17.3	12.8
55 and under 60 years	602	941	17.0	12.6
60 and under 65 years	419	669	11.8	8.9
65 years and over	193	300	5.4	4.0

paired workers could be matched in the 109 plants studied. This large group was overwhelmingly male. Only 35 of the group, or about 1 percent, were females. Because of the small number of observations for the female group, no performance data for these cases are shown. Their influence on the group averages was negligible.

Industry and Occupational Coverage

The hernia cases were very widely distributed throughout the 19 major industry groups surveyed. In fact, hernia cases were found in all of the 109 companies studied. This is particularly interesting in light of the fact that more companies had specific exclusion policies concerning hernia cases than for any other of the impairments included in the study. To some extent the large number of hernia cases encountered can be accounted for by the retention of employees who contracted hernias after entering the employment of a company.

The jobs at which these impaired persons were employed were about as varied as the hernia cases were numerous. The following list of occupations in which these impaired persons were found employed indicates that most of them were in direct production activities. The number on maintenance, inspection, and similar types of occupations was small. Only about 3 percent of the group were on custodial jobs, such as sweepers, janitors, etc. The range and variety of skills represented is very broad. This is not surprising because the nature of the hernia impairment does not tend to destroy skills already acquired unless heavy lifting is involved. Similarly, the impairment places few limitations upon the acquisition of new or additional skills.

The evidence of the present study points clearly to the fact that employment opportunities for workers with hernias were present in a very wide variety of industries and occupations. The jobs listed are merely illustrative. Many other jobs on which workers with hernias were employed do not appear in this list because the impaired worker could not be included in the survey group.

Jobs at which 3,544 Hernia Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with hernia impairment can be employed]

1. Maintenance

Airplane mechanic
Asbestos worker, general
Automobile mechanic
Blacksmith II
Boiler operator II
Boilermaker
Bricklayer II
Bricklayer, refractory brick
Carpenter
Carpenter, flask
Cement finisher II
Chauffeur II
Coal pulverizer operator
Concrete-chipper man
Electric-truck operator
Electric-truck repairman
Electrical-instrument repairman
Electrical repairman
Electrician, locomotive
Electrician, powerhouse
Fireman, stationary boiler
Flame-cutter operator
Hod carrier
Instrument repairman
Kitchen helper II
Laborer (aircraft manufacturing)
Laborer (ammunition)
Laborer (automobile manufacturing)
Laborer (boot and shoe)
Laborer (building)
Laborer (electrical equipment)
Laborer (fabricated plastic products)
Laborer (forging)
Laborer (foundry)
Laborer (glass manufacturing)
Laborer (iron and steel)
Laborer (machine shop)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Laborer (office machines)
Laborer (paper and pulp)
Laborer (petroleum refining)
Laborer (rayon and allied products)
Laborer (wire)
Laborer, process (dental equipment)
Laborer, process (nonferrous metal and products)

Jobs at which 3,544 Hernia Cases of the survey group were found employed — Continued

1. Maintenance — Continued

Laborer, process (petroleum refining)
Lay-out man I
Lead burner
Machine apprentice
Machinist II
Maintenance man, factory or mill
Maintenance mechanic II
Millman
Millwright
Oiler II
Oiler, machinery
Painter I
Painter, sign
Pipe bender, machine
Pipe fitter
Pipe-fitter helper
Plumber
Plumber apprentice
Powerhouse engineer
Refrigerating engineer
Refrigerator mechanic
Rigger III
Sheet-metal worker II
Stationary engineer
Steam fitter
Structural-steel worker
Switchboard operator III
Tool-grinder operator
Tool maker
Truck mechanic
Tube cleaner
Turbine operator
Washer, machine II
Water filterer
Welder, arc
Welder, combination
Wire-fence erector
Welder helper, acetylene
Yardman I

2. Working Foremen

Absorption-plant operator
Brakeman, yard I
Chemical-laboratory chief
Foreman (electrical equipment)
Foreman (paper and pulp)
Foreman (petroleum refining)
Foreman (nonferrous metal alloys and products)
Glass grinder
Glass polisher
Grease maker, head
Hammersmith
Laborer, process (glass manufacturing)
Pumpman XII
Soda-room man
Stillman II

3. Processing

Absorberman
Absorption-plant operator
Acid maker I
Adjuster II
Ager
Aircraft carburetor subassembler
Aircraft mechanic
Airplane woodworker
Airplane woodworker II
Annealer
Annealer II
Annealing-bath operator
Apprentice machinist
Armature winder I
Assembler IV
Assembler II
Assemblyman helper II
Autoclave operator
Automobile mechanic, motor I
Baker I
Balancing-machine operator
Band-ripsaw operator
Band-sawing-machine operator
Barrel driller
Barrel filler II
Baster, hand
Batch-still operator II
Batteryman II
Batting-machine operator
Bead flipper, hand
Beater operator
Bench assembler V
Bench grinder
Bending roll operator
Blacksmith II
Blank horner
Bottle-machine operator II
Box maker, wood III
Box tender I
Brakeman, automobile
Brake operator, machine II
Broaching-machine operator
Bucket-conveyor operator
Buffer I
Buffer, machine
Burrer, hand
Button-hole machine operator
Calender operator I
Carton-forming-machine operator
Casting finisher
Catalytic-convertor operator
Causticiser man
Celluloid-roll man
Centering-machine operator
Centerless-grinder operator
Charging-machine operator I
Chassis assembler II
Checker
Chiller man
Chipper, foundry
Churn man II
Circular-sawing-machine operator
Coil assembler II
Coil assembler IV
Coil winder II
Cold-saw operator
Color matcher IV
Compounder helper
Control man
Control man III
Conveyor man
Cooper I
Coremaker I
Coremaker, machine I
Coremaker, machine III
Core-oven tender
Core paster
Correction man III
Crankshaft plugger
Cupola tender
Cutter, hand IV (boot and shoe)
Cutter, machine I
Cutter, machine V
Cutter-off II
Cyanide furnace operator
Cylinder-block repairman
Cylinder-machine operator
Cylindrical-grinder operator
Defective-cigarette slitter
Dehydrogenation operator
Detail assembler III
Die-casting-machine operator II
Die maker II
Die-setter I
Die sizer operator
Die weigher II
Digest operator I
Dipper II
Dissolver operator II
Dividing machine operator
Do-all-saw operator
Dockman II
Dough-mixer
Drawer builder
Drophammer operator II
Dryer operator
Drying-machine operator
Dyer VII
Dynamic balancer

Jobs at which 3,544 Hernia Cases of the survey group were found employed — Continued

3. Processing — Continued

Electric-arc furnace operator
Electric-motor assembler
Electric-motor repairman
Electrical assembler II
Electrician, airplane I
Engine-lathe operator
Experimental-body and minor assembler
Experimental mechanic
External-grinder operator I
Extruder operator II
Filler mixer I
Film-drying-machine operator
Filter cleaner
Filter man V
Filter operator V
Filter-press operator I
Final assembler VII
Fireman, still
First helper II
Flaker operator II
Floor assembler
Foil-rolling-machine operator
Folder, hand I
Forging-press operator
Form builder I
Forming-press operator I
Furnace-tender, heat treating
Furnace tender, oil-gas
Gager man VIII
Gatherer II
Gear-hobber operator
Gear-milling machine operator
General assembler II
Glass blower II
Glass blower, laboratory apparatus
Glass cutter
Glass grinder
Glass polisher
Grainer, machine II
Grid-caster, automatic
Grid-machine job setter
Grid paster
Grinder
Grinder operator IV
Hammersmith helper
Hardener II
Heat treater II
Heater III
Heater, forge
Heater tender
Honing machine operator
Hot-blaster man
Incinerator man II
Induction-furnace operator
Induction-furnace operator helper
Ingredient scaler
Instrument maker I
Instrument maker II
Instrument maker IV
Insulating-machine operator I
Internal-grinder-operator
Jig-boring machine operator
Job setter II
Kettle operator
Kettle operator, head
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (automobile parts)
Laborer (bakery products)
Laborer (boot and shoe)
Laborer (cutlery tools)
Laborer (foundry)
Laborer (furniture)
Laborer (glass manufacturing)
Laborer (glass products)
Laborer (iron and steel)
Laborer (leather products)
Laborer (machine tools and accessories)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Laborer (paper and pulp)
Laborer (petroleum refining)
Laborer (phonograph)
Laborer (photographic apparatus)
Laborer (plastic materials)
Laborer (radio manufacturing)
Laborer (rubber tire and tube manufacturing)
Laborer (wire)
Laborer, process (aircraft manufacturing)
Laborer, process (agricultural equipment)
Laborer, process (aluminum products)
Laborer, process (ammunition)
Laborer, process (asbestos products)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (bakery products)
Laborer, process (chemicals)
Laborer, process (coke production)
Laborer, process (cutlery tools)
Laborer, process (electrical equipment)
Laborer, process (electroplating)
Laborer, process (foundry)
Laborer, process (furniture)
Laborer, process (glass manufacturing)
Laborer, process (glass products)
Laborer, process (instrument and appliances)
Laborer, process (iron and steel)
Laborer, process (leather manufacturing)
Laborer, process (machinery manufacturing)
Laborer, process (machine shop)
Laborer, process (machine tools and accessories)
Laborer, process (malt liquors)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (paper and pulp)
Laborer, process (petroleum refining)
Laborer, process (phonograph)
Laborer, process (plastic materials)
Laborer, process (plexiglas)
Laborer, process (plumbing supplies)
Laborer, process (radio manufacturing)
Laborer, process (rayon and allied products)
Laborer, process (rubber goods)
Laborer, process (rubber tire and tube manufacturing)
Laborer, process (wire)
Ladle man II
Lapping-machine operator
Lathe operator, automatic I
Lay-out man (foundry)
Lay-out man (shop)
Lead burner II
Lead coater
Lehr man
Leverman, shear table
Lime slaker III
Lithographic-press man
Loader VII
Machine adjuster III
Machine molder, jarring
Machine molder, rollover
Machine operator, separator department
Machinist II
Machinist, bench
Major assembler I
Major-assembly installer
Marker
McKay stitcher
Melter IV
Metal finisher, hand filing
Milling-machine operator II
Milling-machine operator, automatic
Millman
Mixer II
Mixing-machine operator I
Mock-up assembler
Mold closer
Molder
Molder, bench
Molder, squeeze

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Jobs at which 3,544 Hernia Cases of the survey group were found employed — Continued

3. Processing — Continued

Molding-machine tender
Mold painter
Mold setter III
Motor adjuster
Multiple-spindle-drill-press operator
Outsole molder
Oven fireman
Ovenman helper
Oven tender I
Oven tender VI
Painter, aircraft
Painter, brush II
Painter, sprayer I
Panel trimmer
Paper cutter V
Paste cooker
Patternmaker XI
Patternmaker, metal
Patternmaker, wood
Photostat operator
Pilot-control operator
Pipe-threading-machine operator
Planer operator II
Platen-press feeder
Plater I
Plexiglas former
Plunger
Pointer operator
Polisher
Pot fireman
Pot-heater tender
Pourer, bull ladle
Pourer, crane ladle
Power shear operator I
Press cutter
Presser, hand I
Presser, machine I
Pressman
Pressman, paraffin plant
Profiling-machine operator
Profiling-machine operator II
Pumpman I
Pumpman VII
Pumpman XII
Pumpman helper
Punch-press operator I
Punch-press operator II
Pyrometer man II
Quenching-car man
Radial-drill-press operator
Radiator-core assembler
Radiator-core dipper
Radio-chassis aliner
Reactor operator I
Repairman V
Reverberatory-furnace operator
Rheostat assembler
Ripening-room operator
Riveter, aircraft
Riveter, pneumatic III
Roller operator V
Roller operator IX
Rougher II
Router operator III
Rubber compounder
Sandblaster, glass
Sand-cutter operator
Sand-slinger operator
Saw filer, hand
Saw filer, machine
Saw setter II
Screw-machine operator, automatic
Screw-machine operator, semiautomatic
Seaming-machine operator IV
Second helper II
Setter, hand
Sewing-machine operator, shirts and related products
Shaper operator I
Shaving machine operator
Sheet-metal-fabricating-machine operator
Sheet-metal worker II
Sheet-metal worker, aircraft
Sheet-metal worker, aircraft II
Single-spindle-drill-press operator
Slicking-lathe operator
Slitting machine VI
Slitting machine operator
Soda-room man
Solderer I
Sorter
Speed-lathe operator
Spinner VI
Spinning-bath patrolman
Splicer II
Sprayer VI
Spreader I
Spreader operator II
Sticker
Stillman II
Stillman helper
Still-operator helper
Straightener, hand
Straightening-machine operator II
Straightening-press operator
Stranding-machine operator
Stretching-machine operator II
Strip-mill operator
Subassembler
Subassembler III
Subassembly installer II
Surface-grinder operator
Sweater man
Swinging-cut-off-saw operator
Switch adjuster
Switch room man
Table splicer I
Tableman III
Tacker VII
Tankroom man III
Tankroom man IV
Teaser II
Temperer III
Template filer
Template maker IV
Thread-milling-machine operator
Thrower II
Tin plater III
Tire bagger
Tire builder, drum
Tire repairer
Tool designer
Tool grinder operator
Tool maker
Treater II
Treater helper
Treer, hand
Trimmer, hand VIII
Trimming-press operator II
Tube-bending-machine operator I
Tube cleaner
Tube drawer
Tube-machine operator III
Tumbler operator II
Turret-lathe operator
Twisting-machine I
Up-fitter II
Vertical-boring-mill operator
Vertical-lathe operator
Wafer-machine operator
Warm-in box
Watchcase-vulcanizer tender
Welder, acetylene
Welder, arc
Welder, butt
Welder, combination
Welder, flash
Welder, spot
Wire drawer III
Wire-tinning-machine tender
Wireman VI

4. Inspection and Testing

Airplane inspector
Airplane inspector I
Body-assembly inspector
Bottle inspector IV

Jobs at which 3,544 Hernia Cases of the survey group were found employed — Continued

4. Inspection and Testing — Continued

Casting inspector
Checker
Checker I
Chemist, assistant II
Chemist, organic
Chemist, physical
Cloth examiner, hand II
Core checker
Deflector operator
Electrical inspector II
Engineman II
Experimental mechanic
Final-assembly inspector
Final-assembly inspector, fuselage installation
Final tester II
Gager IV
Gear roller
Hardness inspector
Hot-forging inspector
Inspector I
Inspector II
Inspector, Chief I
Inspector, Chief III
Inspector, crude rubber
Inspector, hammers and presses
Inspector (machine shop)
Inspector, plate forming and drying
Inspector, raw materials
Inspector and tester
Installation inspector
Instrument maker I
Laborer (iron and steel)
Laborer (machine shop)
Laborer process (glass manufacturing)
Meter tester
Planer operator II
Procurement inspector
Pump tester
Radio repairmen III
Raw-material inspector II
Refrigerator inspector
Salvage inspector II
Sheet-metal inspector I
Tester I
Tester, chemical process
Tire inspector II
Tool inspector
Welding inspector I
X-ray technician II

5. Recording and Control

Checker
Clerk, general
Expediter II
Material clerk
Material planner
Mill recorder
Parcel-post packer
Production clerk II
Production planner
Receiving clerk III
Shipping checker
Shipping checker II
Shipping clerk I
Shipping clerk II
Stock chaser II
Stock-control clerk
Stock supervisor
Tallyman III
Timekeeper
Tool clerk
Weigher II

6. Material Movement

Brakeman, yard I
Bucket-conveyor operator
Diesel-dinkey operator
Dump-truck driver
Electric-bridge-crane operator
Electric-monorail-crane operator
Electric-truck operator
Elevator operator, freight
Floor boy II
Follow-up man III
Gasoline-truck operator
Hot-metal-crane operator
Industrial-locomotive operator
Laborer (aircraft manufacturing)
Laborer (aluminum products)
Laborer (automobile manufacturing)
Laborer (automobile parts)
Laborer (bakery products)
Laborer (chemical)
Laborer (cutting tools)
Laborer (electrical equipment)
Laborer (fabricated plastic products)
Laborer (firearms)
Laborer (foundry)
Laborer (glass manufacturing)
Laborer (glass products)
Laborer (hardware)
Laborer (iron and steel)
Laborer (leather products)
Laborer (machine tools and accessories)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Laborer (petroleum refining)
Laborer (photographic apparatus)
Laborer (plastic materials)
Laborer (plumbing supplies)
Laborer (rayon and allied products)
Laborer (rubber tire and tube manufacturing)
Laborer (surgical appliances)
Laborer (wire)
Laborer, process (automobile manufacturing)
Laborer, process (bakery products)
Laborer, process (iron and steel)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (paper and pulp)
Laborer, process (rayon and allied products)
Laborer, process (rubber tire and tube)
Locomotive-crane operator
Locomotive engineer, gasoline
Rigger X
Routeman I
Shipping clerk II
Tractor operator
Truck-crane operator
Truck driver, heavy
Truck driver, light

7. Custodial

Filter cleaner
Fire equipment man
Fireman III
Gateman IV
Grounds keeper I
Janitor I
Laborer (automobile manufacturing)
Laborer (automobile parts)
Laborer (felt goods)
Laborer (foundry)
Laborer (machinery manufacturing)
Laborer (petroleum refining)
Porter I
Porter II
Watchman I

Placement Practices

No special features of placement were encountered in the placement of hernia cases. For the most part, a knowledge of the existence of the condition and a knowledge of the simple physical requirements of the job were found to be sufficient for proper placement.

The pre-employment physical examination is the only means by which the nature and extent of the impairment can be determined accurately. In the absence of the examination, the applicant may or may not admit the existence of a hernia. In the event he chooses to withhold the information, he may be placed on a job which will aggravate his condition. Such a result may have serious consequences for both the impaired person and the company employing him.

The principal consideration involved when the existence of a hernia has been established is that the worker shall not be placed on a job requiring excessive lifting or other strenuous exertion which is likely to cause strain. In general, other factors such as the presence of moving equipment, high speed machinery, etc., are not particularly significant unless the applicant has other characteristics which influence the matching of abilities to the requirements of the job. Placement is thus comparatively simple, a fact which probably accounts in part for the large number of hernia cases encountered in the survey.

Because restrictions were few, the hernia group was found to be more mobile than most of the other impairment groups. Given the requisite skills, a worker with a hernia can perfom many of the jobs in a given shop. Furthermore, clearance of transfers through the personnel and medical departments was also found to be comparatively simple.

One of the most important aspects of the employment of a worker with a hernia is the possible aggravation of the existing hernia, and the likely increase in workmen's compensation costs. However, this factor can be controlled. In the entire survey group of more than 3,500 persons with existing hernias, only one instance of an abdominal strain was recorded as a disabling injury. The degree of control exercised in the various plants varied widely. In some plants an applicant with a hernia was required to have it repaired within some reasonable period after employment. In other plants, the employee had to agree to wear a truss. In some plants periodic checks were made to determine whether the employee complied with this requirement. Primarily, of course, the best control for existing cases is provided by careful placement and adequate provision for review of transfers by the personnel and medical departments. On jobs which do not involve factors that might aggravate the hernia condition, it probably is not important whether the worker has a hernia or not. Although it may be to the personal advantage of the individual to have his hernia repaired, if that can be done, the existence of the hernia did not have an adverse effect on work performance of the survey group.

Work Performance

As it was possible to obtain data on a large group of active hernia cases, findings were possible for all of the factors of work performance under consideration in the study. Table A–1 and the following paragraphs summarize the findings:

Absenteeism

All absences of 1 day or more on days on which an employee was scheduled to work were recorded for each member of the survey group. Absenteeism rates were computed for each individual as well as for the group as the number of days absent per 100 scheduled workdays. Lay-offs, regular vacations, etc., were not counted either as absences or as days scheduled for work.

Data were available on absenteeism for all of the 3,544 hernia cases and the 5,869 unimpaired workers matched with them. The rates for the two groups were practically identical, 3.2 and 3.1, for the impaired and matched unimpaired workers, respectively. The slight variation in the rates indicates that, as a group, the hernia cases had 1 day more of absence than the matched unimpaired in each 1,000 scheduled workdays — clearly not a significant difference. As a group then, it can be said that the hernia cases were as regular in their work attendance as the matched unimpaired workers on the same jobs.

Comparison of the individual rates by means of a frequency distribution bears out the similarity of performance indicated by the group averages: 26 percent of the impaired and 25 percent of the unimpaired had no absences at all during the period studied; 74 percent of the impaired and 75 percent of the unimpaired had rates of 3.9 days per hundred

or lower. A scattering of poor performance was found in both groups: 1.4 percent of the impaired and 1.5 percent of the unimpaired had excessively high individual rates of 20.0 or higher. Individual cases of this kind, however, may be expected in any sizable group of workers.

TABLE A–3.—*Percentage distribution of 3,544 hernia cases and 5,869 unimpaired workers, by absenteeism frequency rate* [1]

Absenteeism frequency rate class	Impaired	Unimpaired
0	25.7	24.7
0.1 and under 1.0	17.5	17.9
1.0 and under 2.0	14.2	15.5
2.0 and under 3.0	9.5	9.8
3.0 and under 4.0	7.4	7.0
4.0 and under 7.0	12.1	12.9
7.0 and under 10.0	5.4	4.8
10.0 and under 20.0	6.8	5.9
20.0 and over	1.4	1.5
Total	100.0	100.0

[1] Number of days lost per 100 scheduled workdays.

An effort was made to determine the cause for each absence. The results were disappointing, however, as information on the reasons for absences were available for less than half the absences reported. To the extent to which such reasons were obtainable, however, the rates attributable to various causes for absence were nearly identical for both the impaired and the unimpaired workers (see table A–4). Within the limits of the data, it appears that the persons with a hernia condition did not lose any more time than the unimpaired workers because of actual or alleged illness.

TABLE A–4.—*Absenteeism frequency rates* [1] *for 3,544 hernia cases and 5,869 unimpaired workers, by reason for absence*

Reason for absence	Impaired	Unimpaired
Total	3.2	3.1
Illness	1.1	1.1
Personal business	.3	.3
Unknown	1.8	1.7

[1] Number of days lost per 100 scheduled workdays.

Nondisabling Injury Experience

A nondisabling injury was defined as one which did not result in any permanent impairment or in loss of time beyond the day or shift on which the injury occurred. Frequency rates for the groups were computed on a base of 10,000 exposure-hours, and individual rates for frequency distributions on a base of 1,000 exposure-hours. The use of the smaller base was necessary for the individual cases because in most instances the periods studied covered approximately 2,000 hours of work per employee.

Data were available for 3,501 of the impaired workers and for 5,806 of the unimpaired workers matched with them on the same jobs. For the remaining cases the records were not available. For the group as a whole, the rates were 9.2 and 9.1 nondisabling injuries per 10,000 exposure-hours among the impaired and unimpaired, respectively. The variation in the rates indicates that hernia cases as a group had about one more nondisabling injury than unimpaired workers for each 100,000 hours of exposure, clearly not a significant difference. It may be concluded safely that the nondisabling injury experience was the same in the two groups.

The same similarity of the nondisabling injury experience was apparent on individual comparison. The individual rates computed on a 1,000-hour base are shown as a frequency distribution in table A–5. About 50 percent of the impaired and 49 percent of the unimpaired had no injuries at all during the periods studied; 85 percent of the impaired and 84 percent of the unimpaired had rates of less than 2 per 1,000 exposure-hours. As would be expected, some cases of very poor performance were found in both groups of workers: about 1 percent of the workers in each group had rates of 10.0 or higher per 1,000 exposure-hours.

TABLE A–5.—*Percentage distribution of 3,501 hernia cases and 5,806 unimpaired workers, by frequency rate* [1] *of nondisabling injuries*

Frequency rate class	Impaired	Unimpaired
0	49.5	48.7
0.1 and under 1.0	21.4	21.8
1.0 and under 2.0	14.4	13.9
2.0 and under 5.0	10.6	11.9
5.0 and under 10.0	3.0	2.8
10.0 and over	1.1	.9
Total	100.0	100.0

[1] Number of injuries per 1,000 exposure-hours.

An effort was made to determine whether the hernia cases displayed a proneness toward any particular kind of injury. The rates attributable to the various kinds of injuries are practically identical in the two groups (see table A–6). Cuts and abrasions accounted for most of the injuries in both groups, and in about equal proportions. No more proneness on the part of the hernia cases toward any particular type of nondisabling injury could be determined than was apparent among unimpaired workers on the same jobs.

TABLE A–6.—*Frequency rates* [1] *of nondisabling injuries for 3,501 hernia cases and 5,806 unimpaired workers, by nature of injury*

Nature of injury	Impaired	Unimpaired
Total	9.2	9.1
Burns and scalds	.5	.5
Cuts and abrasions	6.5	6.4
Eye injuries	1.4	1.5
Strains and sprains	.5	.4
Other	.3	.3

[1] Number of injuries per 10,000 exposure-hours.

As a possible measure of the severity of these minor injuries, the number of redressings required per injury was computed for each group. Although policies on first-aid services varied widely between companies, this comparison is valid because the conditions in each plant were the same for the impaired and the unimpaired workers. Among the hernia cases and the unimpaired workers matched with them practically no difference was found in this measure. The hernia cases had an average of 0.9 redressings per injury against an average of 1.0 for the unimpaired. Measured in this way, there was no tendency indicated on the part of the hernia cases to experience nondisabling injuries of greater severity than was the case among the unimpaired workers.

So far then as the nondisabling injury experience is concerned, frequency, severity, and nature of injury were practically identical in the two groups. From these facts it seems reasonable to infer that the nondisabling injuries were related to the hazards of the jobs and were not influenced by the existence of the hernias.

The medical records also disclosed pertinent facts on the prevalence of nonindustrial illness and injury in the two groups. "Nonindustrial visits" were defined as dispensary visits occasioned by causes not related to the worker's employment. For this factor, too, policies varied widely as to the use of medical facilities. However, the policies did not vary for impaired and unimpaired workers in the same plant. The purpose of these data was to determine how the two groups of workers compared with respect to demands made upon the medical facilities of the plant. Most plants were liberal in their policies and it is conceivable that impaired persons might make demands on such facilities for treatment or medication related to the impairment. For the hernia cases this was definitely not true. The 3,501 workers with hernias for whom data were available averaged 1.3 visits per person while the 5,806 unimpaired workers matched with them averaged 1.4 visits per person. The difference between these two groups of workers with respect to demands upon plant medical facilities for nonindustrial purposes clearly is not significant, and whatever difference there may be appears to be in favor of the hernia cases.

Disabling Injury Experience

Frequency. A disabling injury was defined as a work-connected injury which resulted in a permanent impairment or in a time loss of 1 day or more beyond the day or shift on which the injury occurred. The frequency rate was computed as the number of injuries per million exposure hours.

Data on disabling injuries were available for 3,543 of the hernia cases matched with 5,868 unimpaired workers on the same jobs. The rates were identical, 9.9 for the impaired and the unimpaired groups. The workers with hernias and the unimpaired workers exposed to the same hazards had the same disabling injury experience.

The similarity of this injury experience extended also to the kinds of injuries sustained. Contusions of the hands, arms, legs, and feet accounted for a sizable proportion of the injuries in both groups. Fractures of the extremities were also fairly common. Several lost-time cases resulted from infected cuts. Sprains and strains, particularly of the back and legs, were also fairly numerous in both groups. But no case of aggravation of an existing hernia was found among the impaired workers. On the other hand, four of the unimpaired workers incurred hernias during the periods surveyed. One reason for this difference may have been that the workers with hernias exercised somewhat greater caution when handling materials.

Time Lost. Not only were the injury frequency rates nearly identical, but the average time loss per injury was nearly the same in both groups.

The time-lost factor was computed in two ways: As a rate per 100 days of scheduled work for the impaired and unimpaired groups, and as the number of days lost per injury in each group. In either way, the differences between the two groups are not significant. The time-lost rate was 0.12 days per 100 scheduled workdays for the hernia cases and 0.11 days for the unimpaired group. On the time-lost-per-injury basis, the hernia cases averaged 14.8 days

per injury, and the unimpaired workers 14.4 days. In each group most of the injury disabilities were of short duration, with the heaviest concentrations at 10 days and under.

Plant accident reports were examined to determine whether injuries among the impaired workers were caused by or related to the worker's impairment. In none of the injuries was this found to have been the case. Similarly, no instance was found in which the hernia of an impaired worker was a causal factor in an injury to an unimpaired worker. These findings were confirmed by interview with the plant safety directors or other responsible officials.

In summary, it was found that (1) the hernia cases had the same disabling injury frequency as the unimpaired workers exposed to the same hazards; (2) the injuries were of about the same severity, as measured by the amount of time lost per injury; (3) no causal relationship between impairment and injury could be established. According to the survey findings as well as in the opinions of responsible plant officials, the existence of a hernia condition was not a causal factor in the injury experience of either the impaired workers or their unimpaired fellow workers.

Output Relative

This measure was computed as a relative of the production efficiency of the impaired to that of the matched unimpaired workers, the output of the unimpaired in each case equaling 100. The output relative could be computed only for those cases for which data on individual production were available. For all practical purposes, this meant that data for this factor could be recorded only where the impaired worker and the unimpaired workers matched with him on the same job were paid on an individual piecework or similar incentive system. In order to maintain an objective comparison, no subjective measures such as foreman's evaluation or efficiency ratings were used.

Of the present survey group, individual production records were available for 226 of the hernia cases matched with 365 unimpaired workers on the same jobs. As a group, workers with hernias were 1.5 percent more efficient, and averaged that much more output per hour worked than their unimpaired coworkers.

This does not mean, of course, that every worker with a hernia was a superior worker. Cases of very good and very poor performance were found among both the impaired and the unimpaired workers. In general, however, the individual comparisons support the group averages. About 49 percent of the workers with hernias were as efficient as workers without hernias. For these impaired workers relative efficiency ranged from 95 percent to 105 percent of the average performance of unimpaired workers. About 29 percent exceeded the performance of the unimpaired workers with whom they were matched, by 5 percent or more; and in 22 percent of the cases the performance was poorer by 5 percent or more.

Fully 78 percent of the hernia cases, then, had individual production records as good as or better than the unimpaired workers with whom they were matched on the same jobs. The percentage of impaired workers with poor performances was more than offset by the percentage of workers with superior performances:

Output relative	*Number of impaired workers*
Under 95.0	50
95.0 and under 105.0	110
105.0 and over	66

These findings deal only with those hernia cases for whom output records were available. But there were many others who were on production work for which the basis of payment was group production. Others worked on assembly lines where the production was paced by the speed of the entire line. In these instances, the impaired worker must have been able to hold his own in order to hold his job.

Quit Rate

Voluntary quits were made up of all the instances in which the employee severed his connection with the employer on his own volition. The quit rates are shown as the number of such cases per 100 employees in each group, i. e., the impaired and the unimpaired. It was possible to obtain these data for 1,805 of the hernia cases and 3,068 unimpaired workers matched with them. The data were obtained by means of follow-up and show the quits which occurred in a period of 6 months after the end of the survey period. At the same time, data on terminations were obtained to provide a total separation rate, but it is with voluntary quits that the study is primarily concerned.

The quit rate was slightly higher for the hernia

cases than for the unimpaired group, 2.9 and 1.8, respectively. Actually there were 53 quits among the impaired and 55 among the unimpaired. Six persons in each group quit for health reasons and one impaired worker quit for family reasons. A variety of reasons were lumped together under "other" and it is in this category that most of the difference between the groups is found; 26 impaired and 19 unimpaired fell into this classification. Most common reasons in this group were "to accept other employment" and "to establish own business." These reasons were equally common among the impaired and unimpaired workers. It is probable that these impaired workers had acquired industrial skills and experience which enabled them to find jobs a little more readily than they could before. The rates may be influenced too by the fact that conditions were rather unstable during the period covered by the data. Reconversion from wartime to peacetime production was under way in many plants, and there was considerable moving around among the working population in general.

B. The Cardiac Cases

Summary of Statistical Findings

The record of work performance of about 1,800 workers with cardiac impairments was very similar to that of the 3,000 unimpaired workers matched with them on the same jobs.

Differences in the measures of performance were, for the most part, fractional. The cardiac cases had slightly higher rates of absenteeism and disabling work injuries and a slightly lower rate of nondisabling work injuries. The voluntary quit rate also was higher but hardly sufficiently so to be counted significant. The greatest difference occurred in the case of work output, where the cardiac cases as a group produced at a rate a little more than 2 percent higher than the unimpaired workers on the same jobs.

The impaired male and female cases compared in much the same way with the unimpaired workers with whom they were matched. Although the level of the rates for the male and female groups was substantially different, the latter group was not large enough (except for the output relative) to exercise a very marked effect on the rates for this survey group as a whole.

Based on the record it seems reasonable to conclude that the workers with cardiac impairments, properly placed, were not handicapped workers. As a group they displayed about the same work characteristics as the unimpaired workers subject to the same incentives and exposed to the same hazards and were able to compete successfully with them.

TABLE B–1.—*Work performance of cardiac cases and of matched unimpaired workers*

Group	Absenteeism frequency rate [1]	Nondisabling injury frequency rate [2]	Disabling injury			Output relative [6]	Quit rate [7]
			Frequency rate [3]	Time-lost rate [4]	Average days of disability [5]		
	Average performance						
Total:							
Impaired	4.7	10.0	10.2	0.11	14.0	102.4	4.4
Unimpaired	3.8	10.7	9.3	.09	12.9	100.0	2.7
Male:							
Impaired	4.2	10.5	11.3	.13	14.2	101.9	3.4
Unimpaired	3.4	11.2	10.5	.11	13.1	100.0	2.1
Female:							
Impaired	7.6	6.5	2.4	.01	7.0	102.8	7.6
Unimpaired	6.7	6.7	1.2	(8)	1.0	100.0	5.2
	Number of workers						
Total:							
Impaired	1,840	1,820	1,840	1,840	----	236	836
Unimpaired	3,055	3,025	3,055	3,055	----	329	1,376
Male:							
Impaired	1,557	1,541	1,557	1,557	----	114	638
Unimpaired	2,613	2,590	2,613	2,613	----	169	1,085
Female:							
Impaired	283	279	283	283	----	122	198
Unimpaired	442	435	442	442	----	160	291

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Number of voluntary quits per 100 employees in the survey group.
[8] Less than 0.01.

Composition of the Survey Group

All workers recorded as organic cardiac cases in the medical files of the plants surveyed were included in the study. Hypertensive heart disease cases were included, but hypertension and potential heart disease cases were excluded. An attempt was made to classify the cases in accordance with the classifications of organic heart disease devised by the American Heart Association, but in only a few plants were these classifications readily available from the medical records. In a few instances cases were recorded as rheumatic heart disease, hypertensive heart disease, etc., but they were scattered and too few in number to permit conclusions as to their relative significance in the group. As a consequence, all data are shown for the entire group of cardiac impairments without any more detailed break-down by type of disease. Authorities state that the rheumatic type constitute most of the employable cardiac cases, and presumably the present survey group is made up largely of such cases.[7]

It would have been desirable also to obtain data on the duration of the impairment. Provision was made for obtaining these data, but in the overwhelming proportion of the cases the information was not given in the plant records. The further investigation which would have been required to develop the data was not deemed practicable in the present study.

The cardiac impairment is one which the layman generally associates with advanced age. But in the present study over half the impaired workers in this group were under the age of 45. This finding raises an interesting question but one which the survey cannot answer: Whether the nature of the impairment generally causes earlier withdrawal from the labor market for reasons of health than is true of workers generally or whether this kind of impairment — coupled with advancing age — raises a substantial barrier to employment.

A rather high percentage of workers with cardiac impairments were found in the lower age ranges in comparison with the rest of the impaired workers studied: 21 percent of the cardiac cases as against only 12 percent in the remainder of the survey group were under the age of 30; further, 52 percent of the cardiac cases against 44 percent of the rest of the survey group were under the age of 45. This tendency toward concentration in the lower age ranges was noted in both the male and female groups.

TABLE B–2.—*Comparison of number and percentage distribution of 1,840 cardiac cases and 9,188 other impaired workers studied, by age group and by sex*

Age group and sex	Number of workers		Percent	
	Cardiac cases	Other impaired	Cardiac cases	Other impaired
Total	1,840	9,188	100.0	100.0
Under 20 years	33	46	1.8	.5
20 and under 25 years	134	377	7.3	4.1
25 and under 30 years	210	691	11.4	7.5
30 and under 35 years	211	906	11.5	9.9
35 and under 40 years	164	1,020	8.9	11.1
40 and under 45 years	200	1,038	10.9	11.3
45 and under 50 years	186	1,126	10.0	12.3
50 and under 55 years	203	1,359	11.1	14.8
55 and under 60 years	236	1,307	12.8	14.2
60 and under 65 years	173	915	9.4	9.9
65 years and over	90	403	4.9	4.4
Males	1,557	8,696	100.0	100.0
Under 20 years	20	33	1.3	.4
20 and under 25 years	100	311	6.4	3.6
25 and under 30 years	152	612	9.8	7.0
30 and under 35 years	177	839	11.4	9.6
35 and under 40 years	125	952	8.0	11.0
40 and under 45 years	150	980	9.6	11.3
45 and under 50 years	168	1,071	10.8	12.3
50 and under 55 years	189	1,309	12.1	15.1
55 and under 60 years	217	1,280	14.0	14.7
60 and under 65 years	170	906	10.9	10.4
65 years and over	89	403	5.7	4.6
Females	283	492	100.0	100.0
Under 20 years	13	13	4.6	2.6
20 and under 25 years	34	66	12.0	13.4
25 and under 30 years	58	79	20.4	16.1
30 and under 35 years	34	67	12.0	13.6
35 and under 40 years	39	68	13.8	13.8
40 and under 45 years	50	58	17.7	11.8
45 and under 50 years	18	55	6.4	11.2
50 and under 55 years	14	50	4.9	10.2
55 and under 60 years	19	27	6.7	5.5
60 and under 65 years	3	9	1.1	1.8
65 years and over	1	0	.4	0

The survey group consisted of 1,840 workers with cardiac conditions matched with 3,055 unimpaired workers on the same jobs — the second largest of the 10 impairment groups studied. 1,557 males were matched with 2,613 unimpaired males, and 283 impaired females were matched with 442 unimpaired females. This was the largest female group included in any of the impairment types surveyed. As both groups were large enough to provide reasonably dependable results, separate performance figures have been shown for the male and female cases.

Industry and Occupational Coverage

Workers with cardiac impairments are included in the survey group from each of the 19 major industry groups and from 104 of the 109 plants covered by the study. Cardiac cases were found in 3 of the 5 plants not represented but could not be included because unimpaired workers could not be matched with

[7] Selective Placement of the Handicapped, War Manpower Commission, Washington, revised 1945.

them on the same jobs. The plant and industry coverage obtained in this group indicates that cardiac cases are adaptable to an extremely wide variety of job requirements and that the job opportunities for such workers are potentially very broad. In addition, the work record is more impressive as it reflects performance under a variety of conditions in light and heavy industries.

The jobs at which the cardiac cases studied were employed are shown in the listing below. As was true of the other impairment groups, most of the cardiac cases were on processing or production jobs. However, the proportion found in maintenance and in inspection and testing work was perhaps a little higher than was the case in the other impairment groups.

The most significant feature of this listing of jobs is the very broad range and variety of skills represented. Only a small proportion — 5 percent of the group — were found in unskilled custodial work, such as gateman, porter, and similar occupations; this probably was to be expected. Practically any skill which does not involve excessive exertion or exposure to extreme dust and temperature conditions is within the physical capacities of a person with the most common — the rheumatic — type of cardiac impairment, and the findings in this case lend factual substance to what otherwise might be no more than a reasonable inference.

It should be noted here, too, that the jobs listed are only illustrative. Many cardiac cases could not be matched with unimpaired workers; hence, many other jobs on which these impaired persons were employed could not be included in the study.

Jobs at which 1,840 Cardiac Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with cardiac impairment can be employed]

MALE

1. Maintenance

Air-compressor operator
Airplane mechanic
Automobile-mechanic helper
Boiler operator II
Bricklayer II
Bucker-up II
Cable splicer I
Carpenter, maintenance
Chauffeur II
Electrical repairman
Electrician apprentice
Electrician, powerhouse
Engine-lathe operator
Fireman, low pressure
Fireman, stationary boiler
Flame-cutter operator
Instrument repairman
Laborer (aircraft manufacturing)
Laborer (ammunition)
Laborer (automobile manufacturing)
Laborer (boot and shoe)
Laborer (chemicals)
Laborer (electrical equipment)
Laborer (forging)
Laborer (iron and steel)
Laborer (machine shop)
Laborer (machinery manufacturing)
Laborer (nonferrous metal alloys and products)
Laborer (petroleum refining)
Laborer (printing and publishing)
Laborer (railroad)
Laborer (rayon and allied products)
Laborer (wire)
Laborer, process (boilermaking)
Laborer, process (forging)
Laborer, process (machine shop)
Laborer, process (petroleum refining)
Lead-burner helper
Machinist II
Machinist apprentice
Maintenance man, building
Maintenance man, factory or mill
Maintenance mechanic II
Millman
Oiler I
Oiler II
Painter I
Painter, sign
Pipe fitter
Pipe-fitter helper
Polymerization helper
Power house engineer
Refrigerator mechanic
Rigger III
Salvage man II
Steam fitter
Structural-steel worker
Tool-grinder operator
Tool maker
Turbine operator
Water filterer
Welder, acetylene
Welder, arc

2. Working Foremen

Absorption-plant operator
Chemist assistant II
Darkroom man
Foreman (electrical equipment)
Foreman (petroleum refining)
Glass polisher
Hammersmith
Inspector, machine shop
Installation inspector
Laborer (railroad)
Pumpman XII
Stillman II

3. Processing

Aircraft carburetor subassembler
Airplane woodworker
Airplane woodworker II
Annealer
Annealer III
Anodic operator
Apprentice machinist
Armament mechanic
Assembler I
Automobile mechanic, motor I
Baker I
Ball-mill man
Banbury mixer
Band builder
Band-saw-straightener operator
Barrel filler II
Batch-still operator II

Jobs at which 1,840 Cardiac Cases of the survey group were found employed — Continued

3. Processing — Continued

Beater operator
Bed-laster
Belt sander
Bench assembler V
Bench grinder
Bending roll operator
Blacksmith II
Blank horner
Box maker, wood III
Brake operator, machine II
Buffer I
Buffer, machine
Burnisher II
Burrer, hand
Celluloid-roll man
Centerless-grinder operator
Chassis assembler II
Chipper, foundry
Churn man II
Cigarette-making-machine operator
Circular-sawing-machine operator
Coding machine operator V
Coil assembler IV
Compounder helper
Control man
Coremaker I
Coremaker, machine I
Core paster
Cupola tender helper
Cutter, machine I
Cutter, machine V
Cutter-off II
Cylindrical-grinder operator
Detail assembler II
Developer I
Die-casting-machine operator II
Die maker II
Die-setter I
Dipper II
Do-all-saw operator
Dockman II
Double-seamer, hand
Drophammer operator II
Electric-motor assembler
Electrician, airplane I
Engine-lathe operator
Etcher, hand II
Experimental-body and minor assembler
Experimental mechanic
Facing mixer
Fancy stitcher
Film spooler
Final assembler VII
Fireman, still
Floor assembler
Forging-press operator
Forging-press operator I
Form builder I
Forming-press operator I
Friction-sawing machine operator
Furnace operator II
Furnace tender, heat treating
Gager man VIII
Gear-generator operator
General assembler II
Glass cutter
Glass grinder
Glass polisher
Grinder
Heat treater
Heater III
Heater, forge
Heel-seat laster, machine
Honing machine operator
Incinerator man II
Induction-furnace operator
Induction-furnace operator helper
Jig-boring machine operator
Job setter II
Kettle operator
Laborer (aircraft manufacturing)
Laborer (ammunition)
Laborer (automobile manufacturing)
Laborer (bindery)
Laborer (foundry)
Laborer (furniture)
Laborer (glass manufacturing)
Laborer (hardware)
Laborer (iron and steel)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Laborer (paper and pulp)
Laborer (petroleum refining)
Laborer (radio manufacturing)
Laborer (rubber goods)
Laborer, process (aircraft manufacturing)
Laborer, process (aluminum products)
Laborer, process (ammunition)
Laborer, process (asbestos products)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (bakery products)
Laborer, process (chemicals)
Laborer, process (confectionery)
Laborer, process (cutlery tools)
Laborer, process (electrical equipment)
Laborer, process (foundry)
Laborer, process (glass manufacturing)
Laborer, process (iron and steel)
Laborer, process (machine shop)
Laborer, process (machine tools and accessories)
Laborer, process (machinery manufacturing)
Laborer, process (malt liquors)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (paper and pulp)
Laborer, process (phonograph)
Laborer, process (plastic materials)
Laborer, process (rayon and allied products)
Laborer, process (rubber goods)
Laborer, process (wire)
Lapping-machine operator
Lay-out man (shop)
Lens molder II
Lime slaker III
Line walker
Machine molder, jarring
Machine molder, rollover
Machinist II
Machinist, bench
Major assembler I
Major-assembly installer
Marker
McKay stitcher
Metal finisher, hand filing
Milling-machine operator II
Milling-machine operator, automatic
Millman
Mold closer
Mold painter
Molder
Molder, squeeze
Multiple-spindle-drill-press operator
Nailing-machine operator I
Nigger-hand-machine operator
Ovenman helper
Packer
Painter, aircraft
Painter, spray I
Painter, spray II
Patternmaker XI
Patternmaker apprentice, metal
Patternmaker, metal
Patternmaker, wood
Pipe straightener
Planer operator II
Platen-press man
Plater I
Pointer operator
Polisher
Pourer, crane ladle
Power-shear operator I
Precipitator operator II
Pressman
Pressman, paraffin plant
Process helper
Puller-over, hand

Jobs at which 1,840 Cardiac Cases of the survey group were found employed — Continued

3. Processing — Continued

Puller-over-machine operator
Pumpman I
Pumpman VII
Punch-press operator I
Punch-press operator II
Pusher man I
Radial-drill-press operator
Radiator-core dipper
Radio-chassis aliner
Rewinder operator
Riveter, aircraft
Riveter, pneumatic III
Roller, bar mill
Roller operator V
Roller operator IX
Rolling-mill operator
Rubber compounder
Sandblaster I
Sand mixer, hand
Saw filer, hand
Saw filer, machine
Screw-machine operator, automatic
Screw-machine operator, semiautomatic
Seaming-machine operator IV
Shaper operator I
Sheet catcher
Sheet-metal worker II
Sheet-metal worker, aircraft
Sheet-metal worker, aircraft II
Shredder operator II
Single-spindle-drill-press operator
Slitting machine operator II
Solderer I
Sole assembler
Speed-lathe operator
Spinner VI
Spinning-bath patrolman
Straightener and parts fitter
Stillman II
Stillman helper
Still-operator helper
Straightening-machine operator II
Straightening-press operator
Stranding-machine operator
Subassembler
Subassembler II
Subassembler III
Surface-grinder operator
Sweater man
Tacker VII
Tailor II
Tapper III
Tenter-frame operator
Tool dresser I
Tool grinder I
Tool grinder operator
Tool maker
Tool-maker apprentice
Treater II
Treer, hand
Trimmer, hand
Tube-bending-machine operator I
Tube drawer
Turret-lathe operator
Valve grinder II
Valve repairman
Vamper II
Vertical-boring-mill operator
Vertical-turret-lathe operator
Weigher-up
Welder, acetylene
Welder, arc
Welder, combination
Welder, spot
Wire drawer III
Wood turner

4. Inspection and Testing

Balancing-machine operator
Body-assembly inspector
Casting inspector
Checker I
Chemist, physical
Cigarette-package examiner
Core checker
Dynamometer tester, motor
Electrical inspector
Engine tester
Experimental mechanic
Final-assembly inspector
Final-assembly inspector — fuselage installation
Final tester II
Gager IV
Hot-forging inspector
Inspector
Inspector I
Inspector, chief III
Inspector, crude rubber
Inspector, hammers and presses
Inspector (machine shop)
Inspector, raw materials
Inspector and tester
Installation inspector
Instrument maker I
Laborer (fabricated plastic products)
Machinist
Paint-spray inspector
Procurement inspector
Pulp tester
Radio repairman I
Salvage inspector II
Tester
Tester I
Tool inspector

5. Recording and Control

Checker
Expediter II
Production clerk II
Receiving clerk III
Shipping clerk I
Stock chaser II
Stock supervisor
Timekeeper
Tool clerk

6. Material Movement

Brakeman, yard I
Bucket-conveyor operator
Electric-bridge-crane operator
Electric-truck operator
Elevator operator, freight
Follow-up man III
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (bakery products)
Laborer (chemical)
Laborer (cutlery tools)
Laborer (electrical equipment)
Laborer (firearms)
Laborer (foundry)
Laborer (glass manufacturing)
Laborer (hardware)
Laborer (iron and steel)
Laborer (machine tool and accessories)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Laborer (petroleum refining)
Laborer (rayon and allied products)
Laborer (wire)
Laborer, process (automobile manufacturing)
Laborer, process (iron and steel)
Laborer, process (nonferrous metal alloys and products)
Locomotive-crane operator
Truck driver, heavy

7. Custodial

Fireman III
Gateman IV
Grounds keeper I
Janitor I
Laborer (automobile manufacturing)
Laborer (automobile parts)

Jobs at which 1,840 Cardiac Cases of the survey group were found employed — Continued

7. Custodial — Continued

Laborer (machinery manufacturing)
Porter I
Porter II
Watchman I

FEMALE

1. Maintenance

Counterman, cafeteria

2. Working Foremen

Foreman (bakery products)

3. Processing

Airplane woodworker II
Assembler III
Assembler IV
Assemblyman helper II
Bander and cellophaner, machine
Baster, hand
Blank horner
Burrer, hand
Button-hole machine operator
Button-sewing machine operator
Cementer, hand II (boot and shoe)
Cigar packer
Cloth winder
Coil assembler I
Coil taper, machine
Coil winder II
Cut-out stitcher
Cutter, machine V
Cylindrical-grinder operator
Detail electrical assembler
Dipper II
Do-all-saw operator
Double-seamer, hand
Electrician, airplane I
Engine-lathe operator
Exhaust operator
Fancy stitcher
Floor assembler II
Gear-shaper operator
Hem-stitching machine operator
Instrument maker I
Labeler, machine II
Laborer (aircraft manufacturing)
Laborer (bakery products)
Laborer (boot and shoe)
Laborer (glass products)
Laborer (printing and publishing)
Laborer (surgical appliances)
Laborer, process (aircraft manufacturing)
Laborer, process (ammunition)
Laborer, process (bakery products)
Laborer, process (boot and shoe)
Laborer, process (confectionery)
Laborer, process (dental equipment)
Laborer, process (electrical equipment)
Laborer, process (garment manufacturing)
Laborer, process (instruments and appliances)
Laborer, process (machinery manufacturing)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (photographic apparatus)
Laborer, process (radio manufacturing)
Laborer, process (rayon and allied products)
Laborer, process (rubber goods)
Laborer, process (surgical appliances)
Laborer, process (tobacco)
Major assembler I
Major-assembly installer
Milling-machine operator II
Mounter VIII
Pipe-threading-machine operator
Presser, machine I
Profiling-machine operator II
Riveting machine operator IV
Rubber-press man
Sewing-machine operator (fabricated products, n. e. c.)
Sewing-machine operator (men's tailored garments)
Sewing-machine operator, shirts and related products
Sewing-machine operator (textile)
Sheet-metal worker, aircraft
Shoe cleaner I (boot and shoe)
Single-spindle-drill-press operator
Skiver, machine
Still-operator helper
Stitcher, machine II (boot and shoe)
Stripper, machine
Subassembler II
Thread grinder
Tool grinder operator
Top stitcher I
Turret-lathe operator
Vamper II
Yarn winder

4. Inspection and Testing

Airplane inspector I
Casting inspector
Checker II
Engine tester
Film inspector II
Gager I
Inspector (boot and shoe)
Inspector (hat and cap)
Inspector (machine shop)
Laborer (printing)
Laborer, process (automobile manufacturing)
Laborer, process (glass manufacturing)
Laborer, process (radio manufacturing)
Magnaflux inspector
Salvage inspector II

5. Recording and Control

Parcel-post packer
Shipping checker
Shipping clerk I
Stock clerk II
Tool clerk

6. Material Movement

Laborer (rayon and allied products)

7. Custodial

Porter I
Porter II
Rest-room attendant

Placement Practices

As with organic impairments generally, the preemployment physical examination is extremely important to both the impaired person and the employer. Full knowledge of the nature and extent of this impairment are important to the placement officer so that he may avoid work assignments which would tend to aggravate the condition. Depending upon the nature of the impairment, various factors such as exertion, dust, temperature, working position, etc., have to be taken into consideration in making

the placement. If reliance is placed only upon the statements of the applicant, some important information may not be disclosed — either intentionally or because the applicant does not have accurate knowledge of the details of his case.

Medical examinations in the plants studied, whether given by the plant physician or by an outside physician, were quite comprehensive for the cardiac cases. In many plants cardiograms were taken. In some plants, too, periodic examinations were required more frequently for the cardiac cases than for other workers.

Exclusion policies prohibiting employment of cardiac cases were found in 27 of the plants studied. Only in the case of the epileptic and hernia groups were exclusion policies more common. However, cardiac cases were found employed in all but 2 of the 27 plants which had these exclusion policies. In large part, of course, this is accounted for by the fact that persons who develop a cardiac condition after employment are usually retained. In a few plants there was a prohibition against employment of cardiac cases in certain departments, but these policies were directed at preventing employment of these persons under harmful conditions, not at general exclusion.

Work Performance

Data were available on groups of cardiac cases and matched unimpaired workers large enough to permit showing measures for each of the five factors of work performance covered by the study. The findings are summarized in table B–1 and in the following paragraphs.

Absenteeism

The absenteeism rate was computed for the individuals and for the groups as the number of days absent for personal reasons per 100 scheduled workdays. Lay-offs, shut-downs, vacations, etc., were not counted either as days absent or as days scheduled for work.

Data on absenteeism were available for 1,840 cardiac cases matched with 3,055 unimpaired workers on the same jobs. This group was composed of 1,557 impaired males matched with 2,613 unimpaired males, and 283 impaired females matched with 442 unimpaired females. The absenteeism rates for both sexes were somewhat higher for the impaired than for the unimpaired workers. For the group as a whole, the rates were 4.7 and 3.8 for the impaired and unimpaired, respectively. The impaired males had a rate of 4.2 as against 3.4 for the unimpaired males. The female cases ran a substantially higher rate, 7.6 and 6.7 for the impaired and unimpaired females, respectively. These rates indicate that the cardiac cases tended to have nearly 1 day more of absence than the unimpaired workers in each 100 scheduled workdays, or about 2½ days more per year.

Individually, the experience in the two groups was fairly similar, as is indicated by the frequency distribution of the individual rates shown in table B–3. No absences at all were reported for 19 percent of the impaired and 21 percent of the unimpaired during the periods studied. Well over half in both groups, 62 percent of the impaired and 69 percent of the unimpaired, had individual rates of 3.9 or less. As was to be expected, some individuals in both groups had very high absence rates: 3.8 percent of the impaired and 2.1 of the unimpaired had rates of 20.0 or higher. The female cases, both impaired and unimpaired, tended toward a heavier concentration in the higher frequencies. This coincides with findings in other studies of absenteeism.

TABLE B–3.—*Percentage distribution of cardiac cases and matched unimpaired workers, by absenteeism frequency rate* [1] *and by sex*

Absenteeism frequency rate class	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
0	18.9	20.7	20.9	22.3	8.8	10.9
0.1 and under 1.0	12.3	14.1	13.4	15.7	6.4	5.0
1.0 and under 2.0	13.3	13.7	14.7	14.7	5.3	7.7
2.0 and under 3.0	9.8	12.0	9.6	12.2	11.0	11.1
3.0 and under 7.0	22.2	21.9	21.6	20.6	26.1	28.8
7.0 and under 10.0	8.6	7.4	7.8	6.2	12.7	14.7
10.0 and under 20.0	11.1	8.1	9.0	6.6	21.9	17.1
20.0 and over	3.8	2.1	3.0	1.7	7.8	4.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	1,840	3,055	1,557	2,613	283	442

[1] Number of days lost per 100 scheduled workdays.

Wherever possible, the reason was recorded for each absence. Unfortunately, the reasons could be obtained only for less than half the absences, the rest being recorded merely as "unknown." Within the limits of the available data shown in table B–4, it appears that a somewhat greater incidence of absence because of illness probably accounts for the slightly higher group rate for the impaired workers.

The differences in the group rates, the frequency distributions of the individual rates, and the reasons

TABLE B–4.—*Absenteeism frequency rates [1] for cardiac cases and matched unimpaired workers, by reason for absence and by sex*

Reason for absence	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Total	4.7	3.8	4.2	3.4	7.6	6.7
Illness	1.8	1.3	1.6	1.1	3.1	2.6
Personal business	.4	.4	.3	.3	1.0	.9
Unknown	2.5	2.1	2.3	2.0	3.5	3.2
Number of workers	1,840	3,055	1,557	2,613	283	442

[1] Number of days lost per 100 scheduled workdays.

for absence are not large enough to be labeled as serious or significant. Nevertheless, the data show clearly that workers with cardiac impairments tend to be absent somewhat more frequently than unimpaired workers on the same jobs and that a substantial part of the difference is probably accounted for by illness.

The duration of the impairment may be a factor which influenced the absences because of illness. The early stages of the cardiac impairment may be characterized by considerable, perhaps protracted, absence because of illness. An effort was made to exclude cases in which the worker had acquired the impairment within 6 months of the beginning of the survey period. It was felt that to include cases which were in the very early stages and in which compensation had not yet taken place would bias the results in the direction of excessive illness absenteeism. Undoubtedly, some cases of this kind were included because duration generally was not on record. However, the differences in the two groups is so small that if a few such cases were included they apparently did not influence the results materially.

Nondisabling Injury Experience

A nondisabling work injury was defined as a work-connected injury which did not result in a permanent impairment or in any loss of time beyond the day or shift on which the injury occurred. The experience of each group is expressed as a rate reflecting the number of injuries per 10,000 exposure-hours. Individual rates were also computed in order to obtain a frequency distribution; but for these rates the base used was 1,000 exposure-hours.

Data on nondisabling injuries were available for nearly all of the survey group — 1,820 of the cardiac cases and 3,025 of the matched unimpaired workers. 1,541 impaired males were matched with 2,590 unimpaired males, and 279 impaired females were matched with 435 unimpaired females.

Analysis of the data revealed no substantial differences in the nondisabling injury experience of the two groups. The cardiac cases experienced a rate of 10.0 against 10.7 for the matched unimpaired workers. As would be expected, there was a considerable difference between the male and female groups. The impaired males had a rate of 10.5 against 11.2 for the unimpaired males, while the females had rates of 6.5 and 6.7 for the impaired and unimpaired, respectively. The group averages indicate clearly that the cardiac cases displayed no greater proneness toward nondisabling injuries than the unimpaired workers exposed to the same hazards. In fact, their experience was slightly better.

The frequency distribution of the individual rates (table B–5) shows the same similarity of performance as is indicated by the group averages. More than half, 53 percent of the impaired and 51 percent of the unimpaired, had no injuries at all during the periods studied. Fully 91 percent of the impaired and 89 percent of the unimpaired had fewer than 3 such injuries per 1,000 exposure-hours.

As would be expected, instances of very unfavorable injury experience were found in both groups: 0.9 percent of the impaired workers and 1.2 percent of the unimpaired workers had excessively high frequency rates of 10.0 or higher per 1,000 exposure-hours. It is clear, however, that these were the usual individual instances of poor performance and were uncommon in both groups.

TABLE B–5.—*Percentage distribution of cardiac cases and matched unimpaired workers, by frequency rate [1] of nondisabling injury and by sex*

Frequency rate class	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
0	53.1	50.7	50.1	48.4	70.9	64.2
0.1 and under 1.0	17.3	18.2	18.6	19.1	10.0	12.9
1.0 and under 2.0	13.9	14.3	14.7	14.6	9.3	12.6
2.0 and under 3.0	6.6	6.0	6.9	6.3	4.7	4.8
3.0 and under 5.0	5.4	5.9	5.9	6.2	2.5	4.1
5.0 and under 10.0	2.8	3.7	2.9	4.0	1.8	1.2
10.0 and over	.9	1.2	.9	1.4	.8	.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	1,820	3,025	1,541	2,590	279	435

[1] Number of injuries per 1,000 exposure-hours.

The nature of the injury was readily available from company records, and the rates attributable to the various kinds of injury are shown in table B–6. These rates were computed on the 10,000-hour base.

The pattern of the rates is very similar in the two groups of workers. There is no evidence that the cardiac cases had any proneness toward any particular kind of minor injury. It seems reasonable to conclude therefore that the injuries experienced were related to the hazards of the job and not to the impairment which characterized one of the groups.

TABLE B–6.—*Frequency rates*[1] *of nondisabling injury for cardiac cases and matched unimpaired workers, by nature of injury and by sex*

Nature of injury	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Total	10.0	10.7	10.5	11.2	6.5	6.7
Burns and scalds	.7	.5	.7	.5	.4	.4
Cuts and abrasions	6.8	7.7	7.1	8.1	4.5	4.1
Eye injuries	1.8	1.7	2.0	1.8	.8	1.1
Strains and sprains	.4	.5	.4	.5	.5	.6
Other	.3	.3	.3	.3	.3	.5
Number of workers	1,820	3,025	1,541	2,590	279	435

[1] Number of injuries per 10,000 exposure-hours.

In an effort to derive some measure of the severity of these nondisabling injuries in the two groups, the number of redressings required in each case was recorded. Although company policies with respect to requiring redressings for minor injuries varied widely among plants, they were the same for impaired and unimpaired workers in the same plant. The average number of redressings per injury was 1.0 for the impaired workers and 0.9 for the unimpaired. Measured in this way there was no significant difference in the severity of the injuries experienced in the two groups.

A final factor considered in connection with the nondisabling injury and medical record was the demand made by impaired and unimpaired workers on medical facilities for illness or injury not related to the worker's employment. Most of the plants studied had liberal policies with regard to such use of medical facilities by their employees. In some instances this service included home visits by the plant nurse or physician. Not all of the plants, however, had such elaborate facilities. Some were equipped only to handle work injuries.

Records of nonindustrial visits to the dispensary again emphasized the similarity rather than any difference between the two groups: the cardiac cases averaged 1.5 and the matched unimpaired 1.6 such visits per person.

In brief, the medical records showed no significant differences between persons with cardiac conditions and unimpaired workers exposed to the same hazards. The nondisabling injury experience was about the same with respect to frequency and nature of injury and, as indicated by redressings required, was of about the same severity. Demands upon the plant's medical facilities for treatment of nonindustrial illness or injury were about equal in the two groups.

Disabling Injury Experience

Frequency. A disabling injury was defined as a work injury which resulted in a permanent impairment or in disability of one full day or more beyond the day or shift on which the injury occurred. The frequency rates for the groups were computed on the conventional base of one million exposure-hours.

The group for which disabling injury data were available was the same as for absenteeism: 1,840 cardiac cases were matched with 3,055 unimpaired workers. The impaired group was composed of 1,557 males and 283 females.

As was true of nondisabling injuries, no significant difference was found in the performances of the two groups with respect to disabling injuries. The impaired workers had a rate of 10.2 against a rate of 9.3 for the matched unimpaired workers exposed to the same hazards. The variation in the rates reflects a difference of something less than 1 injury per million exposure-hours, or 1 injury per 500 workers per year. The female workers of the group had very much lower rates as they tended to be concentrated in lighter and less hazardous activities.

Plant accident records were examined but in no case did they indicate that the accident was caused or contributed to by the worker's impairment. Nor were any cases encountered in which the impairment was found responsible for an injury to a fellow worker. The point was confirmed by discussion with management officials.

Time Lost. Regardless of the similarity or the disabling injury frequency rate, there was the question as to whether the impairment impeded recovery and resulted in a materially greater time loss than was the case for injured unimpaired workers.

The average period of disability for an injured worker with a cardiac impairment was 14.0 days. In comparison, the matched unimpaired workers averaged 12.9 days per injury. On the average, then, the injured cardiac worker lost 1 more day than his injured unimpaired co-worker.

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The disabling injury experience of cardiac workers was not as good as that of the unimpaired workers matched with them in this survey. They were injured more frequently, and their disabilities lasted longer. The differences, however, are not marked and it is questionable whether they are significant.

Output Relative

Wherever the impaired worker was on a job for which individual production data were available, a comparison was made between the production of the impaired worker and that of his matched unimpaired co-workers on the same job. The comparison was made by means of a relative of the production efficiency of the impaired to that of the matched unimpaired workers, the output of the unimpaired in each case equaling 100. Data of this kind were available for 236 cardiac cases matched with 329 unimpaired workers. More that half of this group were female workers: 114 impaired male workers were matched with 169 unimpaired male workers, and 122 impaired female workers were matched with 160 unimpaired female workers.

The impaired group as a whole produced 2.4 percent more than the unimpaired group. The male workers averaged 1.9 percent better, and the female workers 2.8 percent better.

Not all of the impaired persons, of course, were superior workers. As was true of the unimpaired, some produced well, others produced poorly, as the following tabulation shows:

Output relative	*Number of impaired*		
	Total	*Male*	*Female*
Under 95.0	68	29	39
95.0 and under 105.0	75	42	33
105.0 and over	93	43	50

32 percent were as good, and 39 percent were definitely superior to their co-workers. Thus, about 71 percent of the workers with cardiac impairments produced as well as or better than the unimpaired workers on the same jobs. Only 29 percent were inferior.

The evidence of these cases shows conclusively that the cardiac workers competed successfully with their unimpaired fellow workers. With respect to output on the job, they not only held their own but maintained a slight advantage as well.

Quit Rate

Data for this factor were obtained by follow-up for 836 cardiac cases and 1,376 matched unimpaired workers. The group was made up of 638 impaired males matched with 1,085 unimpaired males and 198 impaired females matched with 291 unimpaired females. The rates reflect the number of voluntary quits per 100 employees in each group during the 6 months following the end of the survey period. Those plants which were scheduled late in the study of course could not be included.

For the group as a whole the cardiac cases had a quit rate of 4.4 as against 2.7 for their matched unimpaired workers. The group rates were influenced substantially by the rates for the female workers. The impaired females had a rate of 7.6 compared with a rate of 5.2 for the matched unimpaired female workers. The male workers, on the other hand, had much lower rates, with 3.4 for the impaired and 2.1 for the unimpaired.

The 1.7 difference in the quit rates is accounted for, in large part, by differences in the number of quits for which the reason was not obtainable; 11 of the impaired and 10 of the unimpaired quit for unknown reasons, yielding rates of 1.4 and 0.7, respectively. Another sizable difference occurs in the case of quits because of dissatisfaction with the job — 4 of the impaired and 2 of the unimpaired quit for this reason. These rates, 0.5 and 0.1, respectively, account for an additional 0.4 of the difference in the group rates. Quits because of health reasons accounted for 7 quits among the impaired workers and 8 among the unimpaired workers.

Terminations were much higher for the impaired than for the unimpaired workers, 6.5 and 3.6, respectively. Terminations were primarily for reduction in force and the impaired, being in general the last to be hired, consequently were among the first to be laid off because of their lower seniority.

That the impaired workers were not as stable on the job as the unimpaired workers matched with them was indicated by the quit rate, although the difference, particularly for the male workers, was not extreme. It is possible that some of these workers took industrial employment during the war emergency and when the emergency had passed withdrew from the labor force. It was noted that the reasons for about one-fifth of the quits in both groups were "to take other employment" and "to start own business." The period represented by the data was one of considerable instability. Conversion from wartime to peacetime production was under way in many places and there was considerable moving about among the working population in general.

C. The Vision Cases

Summary of Statistical Findings

As a group, the persons with impaired vision made a somewhat better production record, were equally as regular in their work attendance, and had a somewhat better work injury experience than the unimpaired workers matched with them on the same jobs. Although the impaired workers had a slightly higher quit rate, it is questionable whether the difference is large enough to be considered significant.

The male and female impaired workers both compared favorably with the unimpaired workers with whom they were matched. The level of the rates of absenteeism and voluntary quits for the female groups, impaired and unimpaired alike, were higher, while the injury rates were lower than for the male groups. On the whole, however, the female workers did not exercise any excessive influence on the rates for the vision cases as a group. Performance figures by sex have been shown as a matter of interest rather than because separate analysis of the groups is required.

In light of the favorable record of work performance made by the persons with seriously impaired vision, it seems reasonable to conclude that they were able to compete successfully with unimpaired workers on the same jobs. These impaired persons, properly placed on the job, were not handicapped in their work performance.

Composition of the Survey Group

Four classifications of visual impairment were included in the survey. "Blindness" was defined as complete loss of light perception, and this concept was applied to both the totally blind and the blind

TABLE C-1.—*Work performance of workers with seriously impaired vision, and of matched unimpaired workers*

Group	Absenteeism frequency rate [1]	Nondisabling injury frequency rate [2]	Disabling injury			Output relative [6]	Quit rate [7]
			Frequency rate [3]	Time-lost rate [4]	Average days of disability [5]		
	Average performance						
Total:							
Impaired	3.6	9.6	8.8	0.10	14.1	101.9	4.4
Unimpaired	3.7	8.8	10.6	.14	17.6	100.0	3.3
Male:							
Impaired	3.3	10.0	9.8	.11	14.1	[8]	3.2
Unimpaired	3.3	9.0	11.8	.16	17.4	[8]	2.8
Female:							
Impaired	5.7	6.1	0	0	0	[8]	9.3
Unimpaired	6.4	7.8	1.0	[9]	6.0	[8]	5.5
	Number of workers						
Total:							
Impaired	1,721	1,696	1,699	1,699	----	108	862
Unimpaired	2,847	2,809	2,825	2,825	----	198	1,444
Male:							
Impaired	1,513	1,490	1,495	1,495	----	[8]	690
Unimpaired	2,472	2,439	2,454	2,454	----	[8]	1,135
Female:							
Impaired	208	206	204	204	----	[8]	172
Unimpaired	375	370	371	371	----	[8]	309

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Number of voluntary quits per 100 employees in the survey group.
[8] Data available for too few cases to justify showing performance figures.
[9] Less than 0.01.

in one eye. For "legal blindness" the Social Security Board's definition of 20/200 Snellen or less corrected in the better eye was used. "Partial blindness" was defined as less than 20/50 but better than 20/200 Snellen corrected in the better eye.

The composition of the survey group by specific type of visual impairment is shown in table C–2. Only a comparatively few cases of total blindness were found, 34 in all; also, a very small group was the 25 cases of legal blindness encountered. The possibility that some of the legally blind might have been classified as blind in one eye was carefully examined. For the most part, however, Snellen readings were shown in the medical records and the chance that any cases were misclassified was small. It was not expected that large numbers of totally and legally blind would be encountered, but it was expected that there would be many more than these 59 cases. No explanation of this small number is available from the material at hand, beyond the obvious one that the difficulty of placement for the blind or nearly blind is so great that their employment opportunities are very limited. It is probably true, also, that the incidence of these two types of visual impairment is substantially less than that of the other types studied.

TABLE C–2.—*Distribution of 1,721 vision cases, by type of impairment and by sex*

Impairment group	Number of cases		
	Total	Male	Female
Total	1,721	1,513	208
Totally blind	34	28	6
Blind, one eye	941	876	65
Legally blind	25	22	3
Partially blind	721	587	134

Shortly after the survey got under way, a fifth category of vision impairment was added: 50 percent or greater restriction of the visual field. Although this classification was retained throughout the study, it was not possible to include any cases in the survey group. Only an extremely small number of such cases were found on the plant records, and in the few instances where they were found it was not possible to match them with unimpaired workers on the same jobs. It is not certain whether this particular type of impairment constitutes so severe a placement problem that workers having it are rarely hired, or whether there is no real placement problem unless the field of vision is so restricted as to amount to "rifle barrel" vision. As medical files rarely recorded the visual field, the second of these reasons may be the explanation for the rare incidence of this impairment in the survey.

The vision cases provided the third largest category in the survey group — 1,721 cases. Of this number, 208 cases were females — the second largest group of impaired female workers included in the study. The 1,513 male vision cases were matched with 2,472 unimpaired males, and the 208 female vision cases were matched with 375 unimpaired females.

The age characteristics of the vision cases were very similar to those of the rest of the impaired worker group: 34.6 percent of the vision cases and 34.4 percent of the rest of the impaired workers were under the age of 40. Similarly, at the upper age range 5.1 percent of the vision cases and 4.4 percent of the other impaired workers were 65 years of age or older. The largest single age group of vision cases, consisting of 255 persons, was the group in the age range from 55 to 60. For the other impaired workers, however, the largest number in any single age group was slightly lower and fell into the 50- to 55-year span.

TABLE C–3.—*Comparison of number and percentage distribution of 1,721 visually impaired and 9,307 other impaired workers, by age group and by sex*

Age group	Number of workers		Percent	
	Vision cases	Other impaired	Vision cases	Other impaired
Total	1,721	9,307	100.0	100.0
Under 20 years	18	61	1.0	0.7
20 and under 25 years	100	411	5.9	4.4
25 and under 30 years	155	746	9.0	8.0
30 and under 35 years	154	963	8.9	10.4
35 and under 40 years	168	1,016	9.8	10.9
40 and under 45 years	157	1,081	9.1	11.6
45 and under 50 years	195	1,117	11.3	12.0
50 and under 55 years	246	1,316	14.3	14.1
55 and under 60 years	255	1,288	14.8	13.8
60 and under 65 years	185	903	10.8	9.7
65 years and over	88	405	5.1	4.4
Males	1,513	8,740	100.0	100.0
Under 20 years	11	42	0.7	0.5
20 and under 25 years	70	341	4.6	3.9
25 and under 30 years	117	647	7.7	7.4
30 and under 35 years	131	885	8.7	10.1
35 and under 40 years	143	934	9.5	10.7
40 and under 45 years	138	992	9.1	11.3
45 and under 50 years	173	1,066	11.4	12.2
50 and under 55 years	222	1,276	14.7	14.6
55 and under 60 years	241	1,256	16.0	14.4
60 and under 65 years	179	897	11.8	10.3
65 years and over	88	404	5.8	4.6
Females	208	567	100.0	100.0
Under 20 years	7	19	3.4	3.4
20 and under 25 years	30	70	14.4	12.3
25 and under 30 years	38	99	18.3	17.5
30 and under 35 years	23	78	11.1	13.7
35 and under 40 years	25	82	12.0	14.5
40 and under 45 years	19	89	9.1	15.7
45 and under 50 years	22	51	10.6	9.0
50 and under 55 years	24	40	11.5	7.1
55 and under 60 years	14	32	6.7	5.6
60 and under 65 years	6	6	2.9	1.0
65 years and over	0	1	0	.2

The age patterns for the male and female vision cases varied considerably. Among the males only 31.2 percent were under the age of 40, while 59.1 percent of the females fell into this age group. At the upper extreme, while nearly 6 percent of the male group were 65 years or over, none of the females were over 65 and less than 10 percent were over the age of 55. The largest number of male vision cases fell in the age group 55 to 60. The largest female group fell within the range from 25 to 30 years.

On the whole, and particularly for men, it appears that age did not affect materially the chances for a person with a visual impairment to obtain employment. Serious impairment of vision is sometimes progressive and the individual has a period of years during which to adjust to it. In such cases he may acquire new skills in anticipation of increasing impairment or may so adjust that he can continue to perform the kinds of work to which he is accustomed even after very severe impairment of vision has set in.

Industry and Occupational Coverage

Persons with visual impairments were encountered in each of the 19 major industry groups covered in the study. There was, however, no marked concentration of these workers in any particular industry. The variety of industries represented in the study indicates that, for the most part, persons with visual impairments could be employed in a large variety of industrial activities and that it was not necessary for them to rely on any special types of enterprise to provide employment opportunities.

The listing on pages 46–50 shows the jobs at which the impaired persons of this survey group were employed during the period studied. It is immediately apparent from an examination of this list that the variety of jobs for which these people were equipped was extremely broad. A second point emphasized by this tabulation is the tremendous range and variety of skills represented. It seems evident that, with proper rehabilitation and training, a person who acquired or was born with a visual impairment could acquire complex mechanical skills and with them make himself a useful and self-supporting member of the community.

The jobs performed by the various members of the survey group were further classified under the occupational patterns used by the Wage Analysis Division of the Bureau of Labor Statistics in making its industry wage studies. The significant feature revealed in this job listing is the heavy concentration in the production or processing occupations. Few of the impaired employees studied were found in custodial jobs, such as janitor, watchman, etc. For the most part, the impaired workers were in direct competition with the unimpaired workers matched with them.

It is extremely important in this connection to note that the jobs listed for the members of the survey group are only illustrations of the kinds of jobs the visually impaired can do. In each plant some of the impaired had to be excluded because no unimpaired workers could be matched with them on the same jobs. Many other jobs in which such impaired persons were employed in manufacturing industries are not listed in the present study. Although the list is impressive as it stands, it understates the case substantially, and is far from exhaustive.

Jobs at which 1,721 Vision Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with vision impairment can be employed]

MALE

Totally Blind

3. Processing

Assembler
Commutator assembler
Final assembler VII
Insulating-machine operator I
Laborer, process (automobile manufacturing)
Machinist, bench
Screw-machine operator, semiautomatic
Single-spindle-drill-press operator
Subassembler I (automobile manufacturing)

4. Inspection and Testing

Inspector I
Tool inspector

6. Material Movement

Laborer (aircraft)
Laborer (automobile manufacturing)
Laborer (iron and steel)

7. Custodial

Porter I

Blind in One Eye

1. Maintenance

Automobile mechanic
Blacksmith II
Boilermaker
Bricklayer II
Bricklayer, refractory brick
Carpenter
Carpenter, flask
Concrete-chipper man
Cooper I
Electrical-instrument repairman
Electrical repairman
Electric-truck repairman
Fireman, stationary boiler
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (iron and steel)
Laborer (machinery manufacturing)
Laborer (nonferrous metal alloys and products)
Laborer (paper and pulp)
Laborer (paper products)
Laborer (petroleum refining)
Laborer (railroad)
Laborer (rayon and allied products)
Lead burner
Locomotive repairman, Diesel
Machinist II
Machinist apprentice
Mechanic II
Millwright
Painter I
Painter, spray I
Patternmaker, wood
Pipe fitter
Pipe-fitter helper
Power-house engineer
Sheet-metal worker II
Sheet-metal worker helper
Steam fitter
Structural-steel worker
Tool maker
Tube cleaner
Welder, combination

2. Working Foremen

Fireman (electrical equipment)
Stillman II
Turret-lathe operator

3. Processing

Airbag recoverer
Assembler
Assembler I
Assembler III
Assembler IV
Bag-making-machine operator
Baker I
Band-saw-straightener operator
Band-top maker
Barrel filler II
Bench grinder
Bending roll operator
Boring-machine operator, automobile
Box maker, wood III
Broaching-machine operator
Buffer I
Burrer, hand
Cabinetmaker I
Charging-machine operator I
Chipper, foundry
Conveyor man II
Coremaker I
Coremaker, machine I
Coremaker, machine III
Core-oven tender
Cupola charger II
Cupola-tender helper
Cutter, hand III
Cutter, machine V
Cutter-off II
Dental ceramist
Die maker II
Dipper II
Drawer builder
Drier operator
Electric-motor assembler
Electrician, airplane I
Engine-lathe operator
Extruder operator II
Fabric flap builder
Felting-machine operator I
Filter cleaner
Final assembler VII
Floor assembler
Form builder I
Forming-press operator I
Furnace operator II
Furnace tender, heat treating
Furnace tender, oil and gas
Gatherer II
Gear-hobber operator
General assembler II
Glass blower, laboratory apparatus
Glass cutter
Glass grinder
Hardener II
Heater, forge
Hotbed man
Induction furnace operator
Ingredient sealer
Instrument maker I
Internal-grinder-operator
Jet man
Job setter II
Kettle operator, head
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (electrical equipment)
Laborer (foundry)
Laborer (furniture)
Laborer (iron and steel)
Laborer (leather products)
Laborer (nonferrous metal alloys and products)
Laborer (paper and pulp)
Laborer (petroleum refining)
Laborer (photographic apparatus)

Jobs at which 1,721 Vision Cases of the survey group were found employed — Continued

MALE — Continued

Blind in One Eye — Continued

3. Processing — Continued

Laborer (radio manufacturing)
Laborer, process (agricultural equipment)
Laborer, process (aircraft manufacturing)
Laborer, process (aluminum products)
Laborer, process (ammunition)
Laborer, process (asbestos products)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (boot and shoe)
Laborer, process (cutlery tools)
Laborer, process (electrical equipment)
Laborer, process (foundry)
Laborer, process (glass manufacturing)
Laborer, process (iron and steel)
Laborer, process (machine shop)
Laborer, process (machine tools and accessories)
Laborer, process (machinery manufacturing)
Laborer, process (malt liquors)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (paper and pulp)
Laborer, process (petroleum refining)
Laborer, process (phonograph)
Laborer, process (radio manufacturing)
Laborer, process (surgical appliances)
Laborer, process (wire)
Ladle liner
Lapping-machine operator
Lathe operator, automatic I
Lay-out man (shop)
Lithographic-press man
Machine molder, jarring
Machine molder, rollover
Machinist II
Machinist apprentice
Machinist, bench
Major assembler I
McKay stitcher
Mechanical engineer II
Mold closer
Molder, bench
Molder, floor
Mold painter
Multiple-spindle-drill-press operator
Nailing-machine operator I
Painter, aircraft
Painter, spray I
Painter, spray II
Paper slitter
Patternmaker, metal
Planer operator II
Platen-press feeder
Plater I
Plexiglas foreman
Power-shear operator I
Pulpit man II
Pumpman VII
Punch-press operator I
Punch-press operator II
Radial-drill-press operator
Rebeamer I
Recovery operator
Riveter, pneumatic III
Rotary-furnace tender
Rubber compounder
Sammy man
Sandblaster I
Sand mixer, hand
Sand-slinger operator
Screw-machine operator, automatic
Screw-machine operator, semiautomatic
Shaper operator I
Sheet-metal lay-out man
Sheet-metal worker, aircraft
Single-spindle-drill-press operator
Skein washer
Solderer I
Spinner VI
Sticker
Stillman II
Stopper maker II
Straightener and parts fitter
Straightening-press operator
Stranding-machine operator
Subassembler I (automobile manufacturing)
Subassembler III
Surface-grinder operator
Tack puller, machine
Teaser II
Template maker IV
Thread grinder
Thrower II
Tire bagger
Tire builder, drum
Tire repairer
Tool and diemaker operator
Tool grinder operator
Tool maker
Tread-milling-machine operator
Trim steamer
Trimming-press operator II
Tube drawer
Tumbler operator II
Turret-lathe operator
Vamper II
Vertical-boring-mill operator
Vertical-turret-lathe operator
Watchcase-vulcanizer tender
Welder, spot
Wire drawer III
Wireman VI
Woodhandler, inside

4. Inspection and Testing

Balancer I
Balancing-machine operator
Body-assembly inspector
Casting inspector
Chemist assistant II
Final assembly inspector
Hardness inspector
Hot forging inspector
Inspector
Inspector I
Inspector and tester
Inspector (machine shop)
Inspector, raw materials
Laborer, process (cutlery tools)
Laborer, process (fabricated plastic products)
Laborer, process (glass manufacturing)
Tool inspector

5. Recording and Control

Clerk general
Follow-up man III
Laborer (machine tools and accessories)
Material clerk
Production clerk
Receiving clerk II
Receiving clerk III
Shipping clerk I
Stock chaser II
Stock supervisor
Timekeeper
Tool clerk
Weigher II

6. Material Movement

Dispatcher, locomotive
Electric-bridge-crane operator
Electric-truck operator
Elevator operator, freight
Laborer (aircraft manufacturing)
Laborer (ammunition)
Laborer (automobile manufacturing)
Laborer (bakery products)
Laborer (button manufacturing)
Laborer (cutlery tools)
Laborer (firearms)
Laborer (foundry)

Jobs at which 1,721 Vision Cases of the survey group were found employed — Continued

MALE — Continued

Blind in One Eye — Continued

6. Material Movement — Continued

Laborer (glass manufacturing)
Laborer (glass products)
Laborer (heating apparatus)
Laborer (iron and steel)
Laborer (machine tools and accessories)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Laborer (mattresses and bedsprings)
Laborer (nonferrous metal alloys and products)
Laborer (paper and pulp)
Laborer (rayon and allied products)
Laborer (rubber tire and tube manufacturing)
Laborer (wire)
Laborer, process (ammunition)
Laborer, process (automobile manufacturing)
Laborer, process (foundry)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (rayon and allied products)
Laborer, process (rubber tire and tube)
Spreader I
Truck driver helper
Truck driver, light
Yardman I

7. Custodial

Gateman IV
Machine cleaner
Porter I
Porter II
Rest room attendant
Watchman I
Window cleaner I

Legally Blind

1. Maintenance

Laborer (electrical equipment)
Machinist II

3. Processing

Bench grinder
Engine-lathe operator
Laborer (automobile manufacturing)
Laborer (malt liquors)
Laborer, process (automobile manufacturing)
Laborer, process (machinery manufacturing)
Laborer, process (nonferrous metal alloys and products)
Molder, bench
Polisher
Reverberatory-furnace operator
Solderer I
Subassembler

4. Inspection and Testing

Chemist assistant II

6. Material Movement

Bucket-conveyor operator
Elevator operator, freight
Laborer (malt liquors)

7. Custodial

Porter I
Porter II

Partially Blind

1. Maintenance

Asbestos worker, general
Boilermaker
Boilermaker helper II
Bricklayer II
Bricklayer, refractory brick
Carpenter, maintenance
Drophammer operator II
Electrical repairman
Electrician
Electrician apprentice
Engine-lathe operator
Fireman, stationary boiler
Instrument repairman
Laborer (aircraft manufacturing)
Laborer (bakery products)
Laborer (chemical)
Laborer (glass manufacturing)
Laborer (iron and steel)
Laborer (machinery manufacturing)
Laborer (petroleum refining)
Laborer (rayon and allied products)
Laborer, process (petroleum refining)
Machinist II
Machinist apprentice
Maintenance man, factory or mill
Maintenance mechanic II
Millwright
Oiler I
Oiler II
Painter I
Painter, sign
Pipe fitter
Pipe-fitter helper
Riveter, hydraulic
Sheet-metal worker II
Tool maker
Welder, combination

2. Working Foremen

Foreman (glass manufacturing)
Glass polisher
Laborer, process (glass manufacturing)
Stillman II

3. Processing

Assemblyman helper
Automobile mechanic, motor I
Baker I
Band-ripsaw operator
Bench grinder
Broaching-machine operator
Buffer I
Burrer, hand
Card tender
Casting-machine operator II
Chipper, foundry
Churnman II
Coremaker I
Core paster
Cripple cutter (boot and shoe manufacturing)
Cupola tender
Cupola tender helper
Cylindrical-grinder operator
Die cutter
Die maker II
Dockman II
Dough mixer
Electrical assembler II
Electrician, airplane I
Electric-motor assembler
Emulsion operator
Engine-lathe operator
Filer, machine
Filterman IV
Final assembler VII
Fireman, still
Floor assembler
Form builder I
Forming press operator I
Furnace tender, heat treating
Gager VIII
Gear-shaper operator
Glass polisher

Jobs at which 1,721 Vision Cases of the survey group were found employed — Continued

MALE — Continued

Partially Blind — Continued

3. Processing — Continued

Heat treater II
Heat treater III
Ingredient scaler
Job setter II
Kettle operator
Labeler, machine II
Laborer (alloys and products)
Laborer (automobile manufacturing)
Laborer (automobile parts)
Laborer (boot and shoe)
Laborer (furniture)
Laborer (glass manufacturing)
Laborer (glass products)
Laborer (iron and steel)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Laborer (nonferrous metal)
Laborer (petroleum refining)
Laborer (phonograph)
Laborer (plastic materials)
Laborer (radio manufacturing)
Laborer (woodworking)
Laborer, process (aircraft manufacturing)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (baking products)
Laborer, process (electrical equipment)
Laborer, process (foundry)
Laborer, process (furniture)
Laborer, process (glass manufacturing)
Laborer, process (machine shop)
Laborer, process (machine tools and accessories)
Laborer, process (machinery manufacturing)
Laborer, process (malt liquors)
Laborer, process (mattresses and bedsprings)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (petroleum refining)
Laborer, process (tinware)
Lathe operator, automatic I
Machine molder, rollover
Machine molder, squeeze
Machinist II
Machinist apprentice
Machinist, bench
Metal finisher, hand filing
Milling-machine operator II
Milling-machine operator, automatic
Mold holder
Molder, floor
Multiple-spindle-drill-press operator
Oven fireman
Ovenman helper
Painter, brush II
Painter, spray I
Plater I
Pointer operator
Power-shear operator I
Pressman
Pressman, paraffin plant
Pumpman I
Pumpman VII
Pumpman helper
Punch-press operator I
Radial-drill-press operator
Riveter, pneumatic III
Riveting-machine operator III
Screw-machine-operator, automatic
Seaming-machine operator IV
Shaper operator I
Sheet-metal-lay-out man
Sheet-metal worker II
Sheet-metal worker, aircraft
Shredder operator I
Single-spindle-drill-press operator
Slitting-machine operator II
Soda-room man
Speed-lathe operator
Spinner VI
Stillman II
Stillman, beer
Stretcher-leveler operator
Subassembler
Subassembler II
Subassembler III
Sweater man
Tankman
Tapper II
Thrower II
Tool designer
Tool grinder operator
Tool maker
Tube cleaner
Tube drawer
Tumbler operator II
Turret-lathe operator
Vertical-boring-mill operator
Welder, combination
Wire drawer III
Yarn winder

4. Inspection and Testing

Balancing-machine operator
Body-assembly inspector
Casting inspector
Deflector operator
Fluoroscope operator
Inspector, chief I
Inspector (machine shop)
Tool inspector

5. Recording and Control

Expediter II
Follow-up man III
Laborer (machine tools and accessories)
Receiving checker II
Shipping clerk I
Stock clerk II
Timekeeper

6. Material Movement

Electric-bridge-crane operator
Electric-hoist man II
Electric-truck operator
Elevator operator, freight
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (automobile parts)
Laborer (bakery products)
Laborer (electrical equipment)
Laborer (firearms)
Laborer (foundry)
Laborer (glass manufacturing)
Laborer (glass products)
Laborer (heating apparatus)
Laborer (iron and steel)
Laborer (machine tools and accessories)
Laborer (malt liquors)
Laborer (mattresses and bedsprings)
Laborer (nonferrous metal alloys and products)
Laborer (photographic apparatus)
Laborer (rayon and allied products)
Laborer (wire)
Loader VII
Routeman I
Tractor operator
Truck driver, heavy

7. Custodial

Gateman IV
Janitor I
Laborer (automobile parts)
Laborer (malt liquors)
Locker-room attendant
Porter I
Porter II
Watchman I

Jobs at which 1,721 Vision Cases of the survey group were found employed — Continued

FEMALE

Totally Blind

2. Working Foremen

Foreman (automobile parts)

3. Processing

Final assembler VII
Floor assembler
Laborer, process (electrical equipment)

Blind in One Eye

2. Working Foremen

Foreman (bakery products)

3. Processing

Assembler
Bander and cellophaner, machine
Baster, hand
Bead flipper, hand
Blank horner
Book finisher
Burrer, hand I
Chassis assembler II
Cigar packer
Coating-machine operator III
Coil assembler IV
Die maker II
Electrician, airplane I
Electric-motor assembler
Floor assembler
Folder, machine I
Instrument maker I
Laborer (boot and shoe manufacturing)
Laborer (electrical equipment)
Laborer (glass products)
Laborer (phonograph)
Laborer, process (bakery products)
Laborer, process (confectionery)
Laborer, process (cutlery tools)
Laborer, process (dental equipment)
Laborer, process (electrical equipment)
Laborer, process (garment manufacturing)
Laborer, process (glass manufacturing)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (rubber tire and tube manufacturing)
Sewing-machine operator, men's tailored garments
Sewing-machine operator, shirts and related products
Single-spindle-drill-press operator
Splicer II
Straightener and parts fitter
Stripper, machine
Subassembler II
Subassembler III
Thrower II
Tongue and quarter stitcher

4. Inspection and Testing

Casting inspector
Checker II
Core checker
Inspector (machine shop)
Laborer, process (glass manufacturing)
Laborer, process (phonograph)

5. Recording and Control

Stock clerk II

6. Material Movement

Sorter II

7. Custodial

Charwoman
Porter I

Legally Blind

3. Processing

Laborer (bakery products)
Laborer (surgical appliances)
Laborer, process (bakery products)

Partially Blind

1. Maintenance

Counter man, cafeteria
Kitchen helper II
Laborer, process (laundry)
Sewing-machine operator (laundry)

2. Working Foremen

Foreman (automobile parts)
Foreman (bakery products)
Laborer, process (glass manufacturing)

3. Processing

Assembler
Assembler III
Assemblyman helper II
Coil winder II
Commutator assembler
Cutter, machine
Field coil winder
Final assembler
Floor assembler
Folder III
Folder, machine I
Folding-machine operator III
Friction-sewing machine operator
Glazing-machine operator
Job setter II
Labeler
Laborer (electrical equipment)
Laborer (furniture)
Laborer (glass products)
Laborer (hardware)
Laborer (machinery manufacturing)
Laborer, process (automobile manufacturing)
Laborer, process (bakery products)
Laborer, process (confectionery)
Laborer, process (electrical equipment)
Laborer, process (furniture)
Laborer, process (instruments and appliances)
Laborer, process (paper products)
Laborer, process (plexiglas)
Laborer, process (plumbing supplies)
Laborer, process (surgical appliances)

4. Inspection and Testing

Checker II
Chemist (biologicals)
Inspector (machine shop)
Laborer, process (automobile parts)
Laborer, process (glass manufacturing)

7. Custodial

Charwoman
Locker room attendant II
Porter II

Placement Practices

In general, no special provisions were found in the plants surveyed for the placement of the visually impaired persons beyond the customary physical examination and job analysis. A few plants, however, had counselors and placement officers who had received some specialized training in job placement for the visually impaired. When such specialized techniques were used they seemed to yield excellent results. The need for such services, however, seemed to depend largely upon conditions peculiar to individual plants. It was equally true that where placement of the visually impaired was handled through less specialized channels, as was the case in most of the plants surveyed, the impaired persons performed well on their jobs.

The pre-employment physical examination, or at least that part of it which dealt with vision testing, was of the utmost importance in these cases. Where defective vision is present, it is essential that the medical and placement officers know the extent of the defect as well as the nature of it. It is also important to know the cause of the impairment — whether it is progressive or arrested — in order to know whether the kind of assignment contemplated for the applicant might aggravate the impairment. Careful placement has particular significance for the visually impaired. Improperly placed, the impaired person may cause injury to himself or to others, or an aggravation of his impairment may result. As a glaring example, the person with defective vision assigned to operate an overhead crane would be a constant source of danger to himself and to others.

It was the general opinion of officials in most of the plants studied that job evaluation was a very important factor in proper placement of the person with a visual impairment. Depending upon the nature of the visual impairment, it may be necessary to guard against such seemingly unrelated factors as nervous tension as well as elements of physical exertion or movement.

Formulated policies excluding visually impaired persons were not common. Of the 109 firms studied, only 16 had definite policies concerning vision cases; but even in these plants the exclusions were not rigidly enforced. A few firms felt that hiring of the totally blind called for specialized kinds of work and specialized facilities which they could not provide. The rarity with which totally blind persons were encountered in the survey, however, indicates clearly that it is extremely difficult for the totally blind individual to find a place in manufacturing industries. Of the total survey group of 1,721 visually impaired persons, there were only 34 who were totally blind and only 25 who fell in the "legally blind" category.

Follow-up practices as well as original placement as a rule were carried on in the same way for the visually impaired as for persons with other types of physical impairments. In general, and except for special cases, no systematic follow-up was used beyond the probationary period.

It was expected that job re-engineering would be found most frequently in connection with the employment of the visually impaired. This expectation was not supported by actual findings. Job re-engineering was rare and was no more common for this group than for other impairment types. Had job re-engineering on an extensive scale been encountered, it would have handicapped the study seriously as it probably would have removed the complete comparability between impaired and unimpaired workers. In a few instances modifications so changed the jobs that no unimpaired workers could be matched with the impaired working on them. But such cases were rare. For the most part, when changes had been made at all, they were either of such minor character that they did not change the essentials of the job or the changes had been found so desirable that they had been adopted for the unimpaired workers as well. The findings suggest the conclusion that while some kinds of jobs might require extensive modifications or re-engineering, there are many other jobs which the visually impaired person can perform without the imposition of special conditions.

There are, however, special problems in the employment of visually impaired workers. Admittedly, the more serious the impairment of vision, the more necessary it is to consider the accessibility of the work place. For the person who is totally blind there is the problem of getting to and from the plant as well as that of getting around in the plant. In several plants totally blind workers used their Seeing Eye dogs to guide them. In other cases, blind workers were able to get about with no more than a little assistance from the people working near them. It probably is not advisable to require such workers to pass through a crowded shop or among moving equipment.

Workers with partial blindness or otherwise im-

paired vision appeared to offer no special problems in this connection.

Work Performance

The visually impaired persons, placed on jobs for which they were equipped with the requisite skills and physical abilities, produced as well, were as regular in their work attendance, and made a somewhat better safety record than the unimpaired workers subject to the same incentives and exposed to the same hazards. The following paragraphs and table C–1 provide a summary of the performance records of the visually impaired persons and the unimpaired workers matched with them on identical jobs:

Absenteeism

An absence was defined as absence of 1 full day or more on days on which the employee was scheduled to work. Holidays, lay-offs, shut-downs, and regular vacations were not counted as either scheduled days or as absences. The rate of absenteeism was computed as days lost from work for every 100 scheduled workdays. Data were available for 1,721 visually impaired persons matched with 2,847 unimpaired workers. Of this group, 1,513 were impaired males and 208 were impaired females.

For the group as a whole the rates were 3.6 and 3.7 days per 100 scheduled workdays for the impaired and unimpaired workers, respectively. The record of the female workers tended to raise the group rates slightly. The male impaired and unimpaired had an identical rate of 3.3, while the impaired females had a rate of 5.7 against 6.4 for the unimpaired females.

Although these group averages show the visually impaired worker in a favorable light, a clearer picture emerges from an analysis of individual performances. The frequency distribution of individual absenteeism rates shown in table C–4 reveals that about 24 percent of the visually impaired and 23 percent of the matched unimpaired had no absences at all during the periods studied; 70 percent of the impaired and 71 percent of the unimpaired had absenteeism rates of 3.9 or less. Both groups contained scattered cases with very high rates; 1.9 percent of the impaired workers and 2.6 percent of the unimpaired workers had individual rates of 20.0 or higher. The similarities between the two groups are striking. A heavy concentration of cases at the lower end of the range is evident in both groups. At the other end of the distribution there was a scattering of very high rates. Clearly, these extremely high rates were cases of poor individual performance, and were not characteristic of either group.

TABLE C–4.—*Percentage distribution of visually impaired and matched unimpaired workers, by absenteeism frequency rate* [1] *and by sex*

Frequency rate class	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
0	23.7	23.4	25.4	25.1	11.1	11.2
0.1 and under 1.0	14.7	16.2	15.3	17.5	10.1	7.2
1.0 and under 2.0	13.2	13.9	13.2	13.9	12.9	14.1
2.0 and under 3.0	11.3	10.2	11.4	10.6	10.1	8.0
3.0 and under 4.0	7.4	7.7	7.3	7.5	8.6	9.0
4.0 and under 5.0	6.1	5.3	5.8	5.3	8.6	5.3
5.0 and under 10.0	12.8	13.9	12.0	12.0	18.3	26.6
10.0 and under 20.0	8.9	6.8	8.2	6.0	14.0	12.0
20.0 and under 50.0	1.9	2.5	1.4	2.1	6.3	6.1
50.0 and over	0	.1	0	0	0	.5
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	1,721	2,847	1,513	2,472	208	375

[1] Number of days lost per 100 scheduled workdays.

An important aspect of absenteeism analysis is the reasons for which workers absent themselves. For instance, do various specific reasons for absence, such as illness, transportation difficulties, etc., hold any special significance for the visually impaired person? An effort was made to determine reasons for absence in each case. Unfortunately, for more than half the cases reasons for absences were not recorded and in such cases had to be listed as unknown. For those cases in which a reason was obtainable, however, the pattern of the rates attributable to specific reasons is markedly similar in the two groups. The impaired were absent about as often and for about the same reasons as the unimpaired. However, it is possible that this similarity might have disappeared if the cases grouped in the "unknown" category could have been included in the analysis.

TABLE C–5.—*Absenteeism frequency rates* [1] *for visually impaired and matched unimpaired workers, by reason for absence and by sex*

Reason for absence	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Total	3.6	3.7	3.3	3.3	5.7	6.4
Illness	1.1	1.4	1.1	1.2	1.8	2.4
Personal business	.3	.3	.3	.3	.7	.8
Unknown	2.2	2.0	1.9	1.8	3.2	3.2
Number of workers	1,721	2,847	1,513	2,472	208	375

[1] Number of days lost per 100 scheduled workdays.

Considered as a group, then, there was no significant difference between the visually impaired and the matched unimpaired workers so far as regularity of work attendance was concerned.

Nondisabling Injury Experience

Data on nondisabling injuries, i. e., work injuries which did not result in any permanent impairment or loss of time beyond the day or shift on which the injury occurred, were available for 1,696 visually impaired persons matched with 2,809 unimpaired workers on the same jobs. This group was composed of 1,490 visually impaired males matched with 2,439 unimpaired males and 206 impaired females matched with 370 unimpaired females.

The frequency rate of nondisabling injuries was computed for the groups on a base of 10,000 exposure-hours. The rate was fractionally higher for the impaired than for the unimpaired workers, 9.6 against 8.8, respectively. There was a rather sizable difference in the frequency rates between the male and female groups, the females having the lower rate. For the male cases the rates were 10.0 and 9.0 for the impaired and unimpaired workers, and for the female cases, 6.1 and 7.8 for the impaired and unimpaired. The lower injury experience among the female cases, however, did not affect the group rates materially. For the group as a whole, the variation in the rates indicates that the visually impaired workers experienced about 1 more nondisabling injury in each 12,000 hours of work (or 1 more injury for each 6 workers per year) than unimpaired workers on the same jobs. Considering the kinds of injuries involved here — minor cuts, abrasions, bumps, scratches, etc. — the difference does not seem to be significant.

The frequency distributions of the individual rates for the two groups computed on a 1,000-hour base further emphasize the similarity of the injury experiences. About 53 percent of the visually impaired and 51 percent of the unimpaired had no minor injuries at all during the periods studied; 70 percent of the workers in each group experienced less than 1 such injury per 1,000 hours; and about 90 percent of the impaired and unimpaired had less than 3 per 1,000 exposure-hours. However, there was a scattering of cases (1.1 percent of the impaired and 1.0 percent of the unimpaired) with excessively high rates of 10 or more per 1,000 hours. While these excessive rates were present in both groups, they were infrequent and clearly were not group characteristics.

TABLE C–6.—*Percentage distribution of visually impaired and matched unimpaired workers, by frequency rate*[1] *of nondisabling injury and by sex*

Frequency rate class	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
0	52.8	51.4	51.6	50.5	60.1	56.5
0.1 and under 1.0	17.5	18.9	17.4	18.8	18.0	20.0
1.0 and under 3.0	20.3	20.9	20.6	21.7	17.9	15.9
3.0 and under 5.0	5.0	5.0	5.5	4.9	2.0	5.4
5.0 and under 10.0	3.3	2.8	3.7	3.0	1.5	1.9
10.0 and over	1.1	1.0	1.2	1.1	.5	.3
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	1,696	2,809	1,490	2,439	206	370

[1] Number of injuries per 1,000 exposure-hours.

It was realized that while over-all rates of injury might be similar, there nevertheless might be a proneness on the part of visually impaired persons toward certain specific kinds of injury. If such were the case, it would be an important consideration in the placement of these workers. At each plant studied, information on nature of injury was recorded. The rates attributable to these various kinds of injury were computed on the 10,000 exposure-hour base and the differences between the impaired and unimpaired workers were found to be only fractional in all cases. This, of course, reflects group experience and not individual experience. It was equally true of both the impaired and unimpaired workers that there were certain individuals who experienced a very high incidence of certain kinds of injury. It is possible that a greater emphasis on periodic follow-up than was found in a majority of the plants included in the study would have reduced these extreme cases, with a consequent improvement in the over-all rates for the impaired and unimpaired workers alike. As already indicated, however, the differences between impaired and unimpaired were only slight.

Cuts and abrasions accounted for fully two-thirds of all the injuries in each group. Eye injuries were next most common, and about equally so, among both impaired and unimpaired workers. The pattern is strikingly similar throughout. The evidence indicates clearly that the injuries experienced were related to the hazards of the job and not to the impairments which characterized one of the groups. (See table C–7.)

First-aid records also indicated the number of redressings required per injury. As practice varied widely between plants with respect to giving or re-

TABLE C–7.—*Frequency rates*[1] *of nondisabling injury for visually impaired and matched unimpaired workers, by nature of injury and by sex*

Nature of injury	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Total	9.6	8.8	10.0	9.0	6.1	7.8
Burns and scalds	.5	.4	.5	.4	.6	.7
Cuts and abrasions	6.6	6.0	6.9	6.3	3.5	5.0
Eye injuries	1.4	1.6	1.5	1.6	.8	1.0
Strains and sprains	.5	.5	.5	.4	.4	.6
Other	.6	.3	.6	.3	.8	.5
Number of workers	1,696	2,809	1,490	2,439	206	370

[1] Number of injuries per 10,000 exposure-hours.

quiring redressings, the averages for the two groups are valid only for comparison purposes. It cannot be said that they represent the actual severity of the nondisabling injuries in each group. However, the visually impaired group and the unimpaired group each averaged 0.9 redressings per injury. There can be little question, on this basis of measurement, that there was no significant difference in the severity of the injuries in the two groups.

The opinion has sometimes been advanced that physically impaired persons have a tendency toward excessive illness, or that such persons tend a little toward hypochondria. The absenteeism record made by the visually impaired of the survey group refutes that idea: sickness absenteeism was no more pronounced among them than among the unimpaired workers matched with them. Data were obtained on the number of visits to the dispensary because of nonindustrial illness or injury, i. e., dispensary visits for causes not related to the worker's employment. Company policies again varied widely in the extent to which such use of medical facilities was encouraged. However, while these policies varied widely among plants, they were the same for impaired and unimpaired workers within the same plant. During the periods studied, the visually impaired workers averaged 1.2 such visits per person while the matched unimpaired had an average of 1.3. The visually impaired workers clearly made no greater demands on a plant's medical facilities than did unimpaired workers.

In brief, the visually impaired workers as a group were no different from unimpaired workers of the same age, experience, etc., working on identical jobs. Nondisabling injuries were experienced in about the same frequency in the two groups and were of about the same severity. Even the kinds of injuries were the same and occurred in about the same proportion. Finally, the demands of the visually impaired persons because of nonindustrial injury or illness were no greater than the same demands made by unimpaired workers.

Disabling Injury Experience

Frequency. For the purpose of this study a disabling injury was defined as one which resulted in permanent impairment or in the loss of time of at least one full day beyond the day or shift on which the injury occurred. Frequency rates were computed on the standard base of a million exposure-hours.

The survey group for which data were available consisted of 1,699 visually impaired persons and 2,825 unimpaired workers. 1,495 impaired males were matched with 2,454 unimpaired males, and 204 impaired females were matched with 371 unimpaired females.

The impaired as a group had a somewhat better disabling injury experience than the unimpaired, with a frequency rate of 8.8 against 10.6. The impaired females experienced no disabling injuries at all during the periods studied. The unimpaired females matched with them did not have the same perfect record but their rate, 1.0, was very low. How significant the difference is between the groups of impaired and unimpaired workers is difficult to say. A difference of about two injuries per million exposure-hours is not great although it is conceivable that two injuries of sufficient severity could make a sizable difference in compensation costs. In any case, however, the impaired workers had the better safety record.

Probably as important as the frequency rate in the case of these impaired workers is the fact that none of the injuries resulted in additional permanent impairment to bring about permanent total disability. It was also confirmed in each plant that there had been no such injury among visually impaired workers outside the survey group.

The experience of this fairly large group indicates that there is no foundation in fact for the frequently held belief that the visually impaired person is an accident hazard to himself or to his fellow workers. However, there is no question that proper placement is an extremely important factor. Only one of the visually impaired workers experienced a disabling injury which was directly traceable to the impair-

ment; and then only because he had been put on a job from which he was restricted. The foreman, apparently through an oversight, assigned the man to a job he was not supposed to perform. Other instances were found in which a causal relationship might have existed, but the evidence was very superficial. For example, a visually impaired worker mounted a low scaffold which broke down. Possibly the defect in the scaffold might have been apparent to one with good sight. On the other hand, an identical injury was experienced by an unimpaired worker in the same plant.

Inquiry was also made to determine whether any injuries among the unimpaired workers, either within or outside the survey group, were attributable to the lack of vision of an impaired fellow worker. Not a single instance of this kind was found.

The nature of the injuries experienced in the two groups was also fairly similar. Eight of the impaired and 14 of the unimpaired had suffered contusions of the upper or lower extremities, accounting for about 30 percent of all injuries in each group. Fractures of legs and hands were more common among the impaired; about 15 percent as against 10 percent for the unimpaired. Strains and sprains showed the reverse situation in which such injuries accounted for about 10 percent among the impaired and 15 percent among the unimpaired. The remaining injuries consisted of a variety of burns, cuts, infections, etc. The number of injuries in the two groups combined is hardly large enough to support conclusions. On the whole, however, there seems to be sufficient similarity in the injuries to indicate that their nature was related to the job hazards and not to the visual impairments which characterized one of the groups.

Time Lost. It is conceivable that the time lost as a result of disabling injuries by visually impaired workers might have been very much greater even though the frequency rate was lower. Although the visually impaired might be more cautious, their injuries nevertheless could be more severe. As measures of injury severity the average days lost were computed as a group rate per 100 scheduled workdays as well as in terms of the average number of days lost per injury.

The time-lost rate for the impaired group was somewhat lower than for the matched unimpaired group, 0.10 and 0.14 days per 100 scheduled workdays, respectively. For the impaired workers the average period of disability per injury was 14.1 days, as against 17.3 days for the unimpaired group. Not only did the visually impaired tend to experience somewhat fewer injuries than unimpaired workers on the same jobs, but their injuries tended to be somewhat less severe.

As injury severity is largely a matter of chance, the important fact which emerges out of these comparisons is that, given proper placement, visually impaired workers as a group certainly were no worse than their unimpaired co-workers as far as injury experience was concerned.

Output Relative

Individual production data were available for only 108 visually impaired persons. These were matched with 198 unimpaired workers on the same jobs. Of this group, 73 impaired males were matched with 129 unimpaired males, and 35 impaired females were matched with 69 unimpaired females. The number of cases is small for the group as a whole and too small to warrant showing performance figures by sex.

As a group, the visually impaired persons turned in a very creditable performance. Their average output was 1.9 percent better than that of the group of matched unimpaired workers. Although there were substantial variations in the individual rates, the visually impaired also fared well in this respect as is shown by the following comparison, in which the average performance of the entire unimpaired group is used as a base of 100.

Output relative	*Number of impaired workers*
Under 95.0	28
95.0 and under 105.0	49
105.0 and over	31

25.9 percent of these workers had an efficiency relative of 95.0 or less, 45.4 percent had a relative between 95.0 and 105.0, and 28.7 percent had a relative of 105.0 or higher. If it is assumed that an efficiency relative between 95.0 and 105.0 represents about equal performance, 74.1 percent of the visually impaired produced as well as or better than the unimpaired workers with whom they were matched. Nearly 29 percent were substantially superior.

In evaluating this performance it must be borne in mind that it represents only those cases for which quantitative measures of individual production were available. Although this group is small the comparison is entirely objective, and there is no reason to

believe that it is not true for the group as a whole. Subjective evaluations — such as foreman's opinions, efficiency ratings, etc. — are not weighted into the findings.

It was somewhat disappointing that data were not available for a larger group, as a fairly sizable number of these workers were on production work on assembly lines or on group piecework. While measured production for individuals was not obtainable in these cases, the facts of their employment strengthen the findings shown above. On assembly line and group incentive work each individual must keep up with the speed of the line or the group. Therefore, the fact that a considerable number of the visually impaired were found to be so employed indicates that they were able to keep pace with their unimpaired co-workers.

Quit Rate

Data for the computation of quit rates were obtainable for 872 of the visually impaired group and for 1,444 unimpaired workers matched with them. This group was composed of 690 visually impaired males matched with 1,135 unimpaired males, and 172 impaired females matched with 309 unimpaired females. The rates are based on the number of persons per 100 in each group who had voluntarily left the employ of the company 6 months after the end of the survey period.

Among the female workers the voluntary quits were very high, particularly among the impaired, where the rate was 9.3 against 5.5 for the unimpaired. The quit rates for the impaired and unimpaired male workers were very similar, 3.2 and 2.8, respectively. The effect of the high quit rates for the female workers on the group rates was pronounced. About twice as many impaired workers as unimpaired workers quit for health reasons, and more than twice as many quit because they moved out of the community. These two reasons accounted for most of the difference in the rates for the two groups. The reasons listed as "other" were varied, the most common one being "to take other position." This was equally true of the impaired and unimpaired workers.

The higher rate for the impaired workers is probably accounted for in part by the fact that some of these people had taken jobs during the war and had withdrawn from the labor market after the war was over. This may be especially true of the female workers. Also, as is indicated by the number who took other positions, many of these impaired workers acquired industrial skills and experience which increased the range of their employment opportunities. A third factor, which affected both groups, was the fact that the data covered a period shortly after the end of the war when there was considerable moving around among the working population in general.

Terminations showed a substantially higher rate for the impaired workers, 4.3 against 2.8 for the unimpaired. These terminations were mostly for reduction in force. The impaired, generally the last to be hired, were the first to be affected by reductions in force.

In general, however, while the impaired female workers had a very high quit rate, that for the male workers was not substantially higher than for the unimpaired workers matched with them.

D. The Orthopedic Cases

Summary of Statistical Findings

The orthopedically impaired persons made a favorable record of work performance in comparison with the unimpaired workers matched with them on identical jobs.

As a group the impaired workers produced at a slightly higher rate, as indicated by the higher output relative. The work injury experience also was a little better among the impaired workers as is shown by the slightly lower frequency rates of nondisabling and disabling work injuries. The impaired workers had a fractionally but not significantly higher absence rate. It was only with respect to the quit rate that the impaired workers failed to match the performance of their unimpaired fellow workers. Unfortunately, the reasons for the quits could not be obtained in a sufficiently large number of these cases to provide a satisfactory analysis.

TABLE D–1.—*Work performance of workers with serious orthopedic impairments and of matched unimpaired workers*

Factor	Number of workers		Average performance	
	Impaired	Unimpaired	Impaired	Unimpaired
Absenteeism frequency rate [1]	1,522	2 463	3.8	3.4
Nondisabling injury:				
Frequency rate [2]	1,482	2,402	9.4	10.0
Disabling injury:				
Frequency rate [3]	1,499	2,439	5.9	8.9
Time-lost rate [4]	1,499	2,439	.07	.10
Average days of disability [5]	0	0	15.8	13.9
Output relative [6]	121	193	101.3	100.0
Quit rate [7]	632	1,019	5.7	2.9

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired workers.
[7] Number of voluntary quits per 100 employees in the survey group.

The most significant feature of these comparisons is the marked similarity of the performance of the two groups of workers. Subject to the same incentives and exposed to the same hazards, their records of work performance revealed only fractional differences. On the basis of this record, it seems reasonable to conclude that the orthopedically impaired persons constituted a group of competent workers who, properly placed, were fully capable of holding their own in competition with unimpaired workers on the same jobs.

Composition of the Survey Group

The types of orthopedic impairment included in the definitions adopted for the study fell within three major classifications: First, cases in which some member or major portion of a member of the body was lost through amputation; second, cases in which there was severe loss of use of a member even though the member itself was retained; and third, cases of back deformity which severely restricted the use of the back in such movements as walking, stooping, crouching, bending, etc. An additional classification, multiple orthopedics, included cases in which a person had two of the major orthopedic impairments mentioned above, each in itself severe enough to fall within the adopted definitions.

Amputation cases were easily defined, and information was readily obtainable from company medical records. Where an arm, leg, hand, or foot had been amputated, there was no question as to disability. In the case of loss of use, however, the impairment was one of degree. In such cases the determination to include the worker in the study was based upon whether the loss of use of an important body member amounted to 50 percent or more. For the most part, if not indicated on the medical record, the plant physician was able to specify the extent of the impairment. In doubtful cases, the employee was not included in the survey group. The same procedure was followed for back deformity, with its attendant limitations on the use of the back. In this way, it was possible to restrict the impaired group to

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cases which constituted serious impairment and posed real problems of job placement.

Although the layman tends to think of impaired workers primarily as persons with orthopedic impairments, the survey indicates that this concept probably is in error. The 1,522 orthopedic cases constituted only about 13.8 percent of the survey group. Three other types of impairments — hernia, cardiac, and vision — were encountered more frequently. Furthermore, only one third of the orthopedic cases were amputees.

With only 80 exceptions, the orthopedic workers studied were male. The instances of female orthopedic employment were so few, in fact, that no separate data are shown for them.

Indicating perhaps a greater difficulty of older workers with orthopedic impairments to find employment, the age distribution of this group tended to be somewhat lower than that for the impaired group as a whole. About 70 percent of the orthopedic group were below 50 years of age, as against 56 percent of the rest of the impaired workers.

When arranged by 5-year intervals, the age group containing the largest number of orthopedic impairment cases was the one from 30 to 35 years. By contrast, the 5-year class containing the heaviest proportion of the other impaired workers in the entire survey was from 55 to 60 years.

Interestingly, however, the oldest impaired worker included in the entire survey was a man who had lost the use of one arm many years ago but who nevertheless was actively employed at the age of 87.

TABLE D–2.—*Comparison of number and percentage distribution of 1,522 orthopedic cases and 9,506 other impaired workers studied, by age group*

Age group	Number of workers		Percent	
	Orthopedic cases	Other impaired	Orthopedic cases	Other impaired
Total	1,522	9,506	100.0	100.0
Under 20 years	10	69	.7	.7
20 and under 25 years	106	405	6.9	4.3
25 and under 30 years	166	735	10.9	7.7
30 and under 35 years	226	891	14.9	9.4
35 and under 40 years	211	973	13.8	10.2
40 and under 45 years	164	1,074	10.8	11.3
45 and under 50 years	178	1,134	11.7	11.9
50 and under 55 years	189	1,373	12.4	14.4
55 and under 60 years	139	1,404	9.2	14.8
60 and under 65 years	94	994	6.1	10.5
65 years and over	39	454	2.6	4.8

The detailed break-down of the orthopedic cases shown in table D–3 indicates the wide variety of specific impairments in this group. As already indicated, amputations accounted for only one third of the total, with 484 cases. Hand amputations were the most common and were found in 183 cases. Amputations of one leg were nearly as frequent, with 176 cases. In 7 cases both legs had been amputated and in 2 both arms had been lost. The loss of use of one or more members of the body accounted for 761 cases, exactly 50 percent of all the orthopedic cases studied. Back deformities and multiple impairment cases accounted for the rest.

Inasmuch as the various types of orthopedic impairments present different placement problems, it would have been desirable to present performance data for each specific type. An examination of the following table, however, will make it apparent that while there are significant numbers of cases comprising some of the subgroups, there are many instances in which the available number of observations is too small to support conclusions.

TABLE D–3.—*Distribution of orthopedically impaired workers, by type of impairment*

Type of impairment	Number of workers	Type of impairment	Number of workers
Total	1,522		
Amputation cases	484	Loss of use cases	761
One hand	183	One hand	114
Two hands	5	Two hands	8
One arm	72	One arm	174
Two arms	2	Two arms	9
One foot	38	One foot	51
Two feet	1	Two feet	19
One leg	176	One leg	335
Two legs	7	Two legs	51
Back deformity cases	214	Multiple cases	63

In the individual case the cause of the impairment, the length of time the individual has had to adjust to it, and the prosthetic aid he uses may exercise a considerable influence on the quality of his work performance. An attempt was made to obtain data on cause, duration of impairment, and prosthetic aid used in each case. Unfortunately, information on these points was not available in a great many cases. Information on cause of the impairment was obtained for 743 workers, on duration of impairment for 439, and on prosthetic aid for 125. While in some instances information on all 3 points was available for the same case, in others only cause and aid were given, and in some the only available reference indicated the prosthetic aid used.

Among the 743 cases for which cause was given, 119 impairments had resulted from work injuries.

On other causes, however, the records were vague or incomplete. As the records of the cooperating firms as a rule did not provide this information, the only other alternative was to interview the persons who constituted the survey group. This, however, was not considered feasible on this study. In 33 cases, the cause given was arthritis, and in 104 the cause was stated to be polio. The impairment cause in an additional 69 cases was given merely as "illness."

Duration of the impairment was recorded in only 654 cases; 439 workers were listed as having acquired the impairment in adulthood, 175 in childhood, and in 40 cases the impairment had been present since birth.

In only 125 cases was it reported that a prosthetic aid, such as artificial limb or brace, was being used by the worker.

Unfortunately, the data available with respect to the whole general subject of cause and duration of the impairment and the prosthetic aid used, if any, are too fragmentary to be of much assistance in the analysis of the work performance of these workers.

Industry and Occupational Coverage

The orthopedic cases were not concentrated in any particular industry. A fairly sizable number were encountered in every one of the 19 major industry groups represented in the survey.

The occupations in which persons with orthopedic impairments were found employed are shown in the listing on pp. 60–68. The two facts which stand out immediately are the great variety of jobs and the concentration of these jobs in the processing or production operations.

Perhaps the most significant fact brought out by an examination of various jobs in which these workers were employed is the great range and variety of skill requirements represented. There is strong evidence here that the person with an orthopedic impairment was fully capable either of exercising skills he had acquired before the impairment, or of learning new ones in keeping with the physical abilities he had retained. Further evidence of this is the fact that so few of the orthopedic cases studied were found in the unskilled custodial group. It seems almost trite to point out that the skill a worker has acquired with his hands is not affected by loss of a leg, yet where arbitrary exclusion policies are in force, it may well be that a worker is prevented from using the skill he has in his hands for the reason that he has lost a leg.

It is obvious too from the occupations listed that industry had not found it necessary to set up any particular set of conditions or to handpick certain obvious jobs for the orthopedically impaired person. The data suggest that, except for extreme cases, an orthopedic impairment left more abilities than it took away. A man who has lost an arm was not necessarily incapable of performing jobs that required the use of two hands. Nor, for that matter, did the survey indicate that the worker who had lost a leg necessarily had to be confined to sedentary occupations. Many cases were encountered in which the individual who had lost a member, or the use of a member, was able to neutralize, or at least minimize, the disability by use of a prosthetic aid. Men who had lost a hand were found engaged in machine operations or in handling materials; and workers who had lost a leg were engaged in work requiring considerable walking and moving about.

It must be borne in mind that the jobs listed are merely illustrative. Many impaired workers employed on other jobs could not be included in the study and consequently those jobs do not appear in the listing.

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with this impairment can be employed]

MALE

Amputee — One Hand

1. Maintenance

Automobile mechanic
Bricklayer II
Carpenter
Electrical-instrument repairman
Electrical repairman
Fireman, stationary boiler
Laborer (pulp and paper)
Machinist II
Maintenance mechanic II
Millwright
Oiler I
Pipe-fitter helper
Roll polisher
Tube cleaner
Welder, combination

2. Working Foremen

Foreman (asbestos products)
Foreman (nonferrous metal alloys and products)
Turret-lathe operator

3. Processing

Automobile mechanic, motor I
Beater operator
Bench grinder
Box maker
Buffer III
Compound mixer II
Control man
Cutter, machine V
Cylindrical-grinder operator
Desk assembler
Die maker II
Die setter I
Drophammer operator II
Engine-lathe operator
External-grinder operator I
Final assembler VII
Floor assembler
Forming-press operator I
Hardener II
Heat treater II
Induction-furnace operator helper
Insulating-machine operator I
Job setter II
Laborer (automobile parts)
Laborer (foundry)
Laborer (iron and steel)
Laborer, process (electrical equipment)
Laborer, process (foundry)
Laborer, process (glass manufacturing)
Laborer, process (paper and pulp)
Machinist II
Machinist, bench
Mash-tub man
Milling-machine operator II
Molding-machine tender
Multiple-spindle-drill-press operator
Offset-press man
Painter, spray II
Panel trimmer
Patternmaker XI
Patternmaker, metal
Polisher
Power-shear operator I
Punch-press operator I
Radial-drill-press operator
Radiator-core assembler
Roller operator IX
Rubber compounder
Sandblaster-shotblast tumbler operator
Sand mixer, hand
Sheet-metal worker, aircraft
Still-operator helper
Straightening-press operator
Stranding-machine operator
Subassembler
Subassembler III
Surface grinder
Tankroom man IV
Tire bagger
Tool designer
Tube drawer
Turret-lathe operator
Vertical-boring-mill operator
Vertical-turret-lathe operator
Wire drawer III

4. Inspection and Testing

Inspector, crude rubber
Inspector (machine shop)
Torsion tester

5. Recording and Control

Follow-up man III
Laborer (aircraft manufacturing)
Laborer, process (iron and steel)
Production clerk II
Production planner
Receiving checker II
Stock clerk II
Tallyman III
Tool clerk

6. Material Movement

Brakeman, yard I
Electric-bridge-crane operator
Electric-truck operator
Elevator operator, freight
Hot-metal-crane operator
Laborer (automobile manufacturing)
Laborer (automobile parts)
Laborer (cutlery tools)
Laborer (electrical equipment)
Laborer (firearms)
Laborer (foundry)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Laborer (surgical appliances)

7. Custodial

Gateman IV
Laborer (automobile manufacturing)
Laborer (automobile parts)
Laborer (felt goods)
Laborer (machine parts)
Porter I
Porter II
Watchman I

Amputee — Two Hands

3. Processing

Cylinder-machine operator
Form builder I

5. Recording and Control

Shipping clerk I

7. Custodial

Porter II

Amputee — One Arm

1. Maintenance

Machinist II
Maintenance mechanic II
Oiler I
Sheet-metal worker II
Tool-grinder operator
Welder, combination

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed — Continued

MALE — Continued

Amputee — One Arm — Continued

3. Processing

Brake operator, machine II
Dipper II
Heater, forge
Laborer (foundry)
Laborer, process (automobile manufacturing)
Laborer, process (leather manufacturing)
Laborer, process (rubber goods)
Machinist, bench
Offset-press man
Riveter, pneumatic III
Shaper operator I
Subassembler
Switchroom man

4. Inspection and Testing

Casting inspector
Electrical inspector II
Final-assembly inspector
Inspector I
Inspector (fabric plastic products)
Inspector (machine shop)
Installation inspector

5. Recording and Control

Material clerk
Production clerk II
Receiving checker II
Stock-control clerk
Tool clerk

6. Material Movement

Elevator operator, freight
Follow-up man III
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (glass manufacturing)
Laborer (machine tools and accessories)

7. Custodial

Janitor I
Porter I
Porter II

Amputee — Two Arms

4. Inspection and testing

Inspector, hammers and presses

Amputee — One Foot

1. Maintenance

Carpenter
Machinist II
Maintenance mechanic II
Pipe fitter
Tool-grinder operator

3. Processing

Assembler
Burrer, hand
Final assembler
Floor assembler
Jigger-brim-pouncing-machine operator
Job setter II
Laborer, process (leather manufacturing)
Milling-machine operator II
Single-spindle-drill-press operator
Subassembler
Subassembler III
Tool-grinder operator
Tool maker
Wireman III

4. Inspection and Testing

Casting inspector
Inspector (machine shop)
Radio repairman I
Raw-material inspector II

5. Recording and Control

Production clerk II
Stock clerk II

6. Material Movement

Dispatcher, locomotive
Electric-bridge-crane operator
Fireman, industrial locomotive
Laborer (iron and steel)

7. Custodial

Watchman I

Amputee — Two Feet

6. Material Movement

Laborer (foundry)

Amputee — One Leg

1. Maintenance

Carpenter
Electrical repairman
Laborer (iron and steel)
Laborer (rayon and allied products)
Maintenance mechanic II
Oiler I
Painter I
Tool-grinder operator

3. Processing

Assembler
Battery assembler
Bench assembler V
Broaching-machine operator
Buffer I
Burrer, hand
Centerless-grinder operator
Chipper, foundry
Churn man II
Circular-sawing-machine operator
Core paster
Cutter-off II
Cylindrical-grinder operator
Die maker II
Die-maker apprentice
Electrician
Electric-motor repairman
Engine-lathe operator
Final assembler
Forming-press operator I
Gear-hobber operator
General assembler II
Germination worker
Glass polisher
Hat-brim-curler, hand
Laborer, process (agricultural equipment)
Laborer, process (automobile manufacturing)
Laborer, process (chemicals)
Laborer, process (cutlery tools)
Laborer, process (foundry)
Laborer, process (iron and steel)
Laborer, process (malt liquors)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (rubber goods)
Laborer, process (rubber tire and tube manufacturing)
Lapping-machine operator
Machinist, bench
Milling-machine operator II
Milling-machine operator, automatic

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed — Continued

MALE — Continued

Amputee — One Leg — Continued

3. Processing — Continued

Molding-machine tender
Multiple-spindle-drill-press operator
Painter, spray I
Paper slitter
Pull-over-machine operator
Punch-press operator I
Punch-press operator, automatic
Radial-drill-press operator
Repairman V
Screw-machine operator, automatic
Screw-machine operator, semiautomatic
Sheet-metal worker, aircraft
Shredder operator II
Single-spindle-drill-press operator
Straightener and parts-fitter
Straightener, hand
Straightening-press operator
Subassembler
Subassembler III
Switch adjuster
Tool-grinder operator
Tool maker
Tumbler operator II
Turret-lathe operator
Vertical-boring-mill operator
Weigher-up
Welder, acetylene
Welder, combination
Wood handler, inside

4. Inspection and Testing

Balancer I
Gager I
Hardness inspector
Inspector, chief I
Inspector, hammers and presses
Inspector (machine shop)
Inspector, material test
Laborer, process (fabric plastic products)
Salvage inspector
Tool inspector

5. Recording and Control

Chemist assistant II
Production clerk II
Production planner
Shipping clerk I
Stock clerk II
Tool clerk

6. Material Movement

Bucket-conveyor operator
Diesel-dinkey operator
Electric-bridge-crane operator
Elevator operator, freight
Laborer (automobile manufacturing)
Laborer (fabric plastic products)
Laborer (paper and pulp)
Laborer, process (automobile manufacturing)
Laborer, process (rayon and allied products)
Truck driver, heavy

7. Custodial

Gateman IV
Janitor I
Watchman I

Amputee — Two Legs

3. Processing

Burrer, hand
Engine-lathe operator
Laborer (automobile manufacturing)
Punch-press operator I
Tool-grinder operator

4. Inspection and Testing

Inspector (machine shop)

Loss of Use of One Hand

1. Maintenance

Blacksmith II
Carpenter
Electrical repairman
Instrument repairman
Laborer (aircraft manufacturing)
Laborer (machinery manufacturing)
Laborer (petroleum refining)
Laborer, process (nonferrous metal alloys and products)
Machinist II
Maintenance mechanic II
Millwright
Painter I
Pipe fitter
Tool-grinder operator
Welder, combination

2. Working Foremen

Absorption-plant foreman

3. Processing

Annealer
Bag-making-machine operator
Bench grinder
Boring-machine operator, vertical
Chipper, foundry
Churn man II
Circular-sawing-machine operator
Core paster
Cylindrical-grinder operator
Electrician apprentice
Engine-lathe operator
Forging-press operator
Glass grinder
Insulation-machine operator I
Jig-boring-machine operator
Laborer (foundry)
Laborer (malt liquors)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (malt liquors)
Laborer, process (tire and tube manufacturing)
Lehr man
Machine-molder, squeeze
Machinist II
Machinist, bench
Make-up man V
Milling-machine operator II
Molder
Pointer operator
Planter I
Plunger
Punch-press operator I
Saw filer, machine
Screw-machine operator, semiautomatic
Shaper operator I
Stillman
Subassembler
Tool-grinder operator
Tool maker
Turret-lathe operator
Welder, combination

4. Inspection and Testing

Casting inspector II
Checker
Inspector I
Inspector (machine shop)
Laborer, process (glass manufacturing)
Salvage inspector II

5. Recording and Control

Checker

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed — Continued

MALE — Continued

Loss of Use of One Hand — Continued

5. Recording and Control — Continued

Production clerk II
Timekeeper
Tool clerk
Weigher-up

6. Material Movement

Crane operator, portable
Electric-bridge-crane operator
Elevator operator, freight
Laborer (automobile manufacturing)
Laborer (iron and steel)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Loader operator III

7. Custodial

Gateman IV
Porter II
Watchman I

Loss of Use of Two Hands

1. Maintenance

Locomotive repairman, Diesel

3. Processing

Circular-sawing-machine operator
Film spooler
Laborer (malt liquors)
Subassembler II
Upholsterer II

Loss of Use of One Arm

1. Maintenance

Bricklayer, refractory brick
Carpenter
Electrical repairman
Fireman, stationary boiler
Floor assembler
Laborer (aircraft manufacturing)
Laborer (building)
Laborer (electrical equipment)
Laborer (iron and steel)
Laborer (petroleum refining)
Laborer (tobacco)
Laborer, process (machine shop)
Machinist II
Maintenance mechanic II
Milling-machine operator II
Pipe-fitter helper
Power-house engineer
Sheet-metal worker II
Tool-grinder operator
Welder, combination

2. Working Foremen

Foreman (cutlery tools)
Forming-press operator II
Tin plater III

3. Processing

Buffer I
Chipper, foundry
Coil-machine operator
Compositor I
Core-oven tender
Cutter-off I
Cylindrical-grinder operator
Developer I
Die maker II
Die-maker apprentice I
Evaporator operator I
Experimental mechanic
Floor assembler
Forming-press operator I
Furnace tender, heat treating
Gager VIII
Job setter II
Laborer (automobile manufacturing)
Laborer (foundry)
Laborer (malt liquors)
Laborer, process (agricultural equipment)
Laborer, process (automobile manufacturing)
Laborer, process (bakery products)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (photographic apparatus)
Laborer, process (radio manufacturing)
Laborer, process (rubber tire and tube manufacturing)
Laborer, process (wire)
Ladle man II
Lapping-machine operator
Machinist II
Machinist, bench
Major assembler I
Milling-machine operator II
Milling-machine operator, automatic
Mixing-machine operator I
Molder, bench
Pumpman VII
Punch-press operator I
Punch-press operator II
Rubber pressman
Saw-filer, hand
Saw-filer, machine
Screw-machine operator, automatic
Shaper operator I
Sheet-metal worker, aircraft
Single-spindle-drill-press operator
Slitting-machine operator
Slitting-machine operator II
Straightening-machine operator II
Stranding-machine operator
Subassembler I (aircraft manufacturing)
Subassembler II
Swinging-cut-off-saw operator
Tankroom man IV
Tool-grinder operator
Tool maker
Tube drawer
Turret-lathe operator
Vertical-boring-mill operator
Vertical-turret-lathe operator
Welder, arc
Welder, combination
Wireman VI

4. Inspection and Testing

Checker
Core checker
Inspector (machine shop)
Pyrometer man II
Radio repairman I

5. Recording and Control

Checker
Expediter II
Production clerk II
Shipping clerk I
Stock clerk II
Tool clerk

6. Material Movement

Brakeman, yard I
Electric-bridge-crane operator
Laborer (automobile manufacturing)
Laborer (foundry)
Laborer (glass manufacturing)
Laborer (iron and steel)
Laborer (leather products)
Laborer (malt liquors)

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed — Continued

MALE — Continued

Loss of Use of One Arm — Continued

6. Material Movement — Continued

Laborer (paper and pulp)
Laborer (wire)
Trailer-truck driver
Truck-crane operator

7. Custodial

Gateman IV
Laborer (machinery manufacturing)
Porter I
Porter II

Loss of Use of Two Arms

1. Maintenance

Laborer (machine shop)
Machinist II

2. Working Foremen

Structural steel worker

3. Processing

Final assembler VII
Job setter II
Laborer, process (machine shop)
Single-spindle-drill-press operator
Subassembler I
Turret-lathe operator

Loss of Use of One Foot

1. Maintenance

Electrical repairman
Laborer (electrical equipment)
Laborer (iron and steel)
Laborer (petroleum refining)
Power-house engineer
Sheet-metal worker helper

3. Processing

Bench grinder
Box maker, wood III
Cigarette-packing-machine operator
Cylindrical-grinder operator
Die maker II
Electrician, airplane I
Electric-motor assembler
Furnace operator II
General assembler II
Glass cutter
Hardener II
Job setter II
Laborer (automobile manufacturing)
Laborer (iron and steel)
Laborer, process (foundry)
Laborer, process (malt liquors)
Machinist II
Machinist, bench
Milling-machine operator, automatic
Painter, aircraft
Painter, spray II
Punch-press operator I
Shaper operator I
Stillman helper
Tool-grinder operator
Tool maker
Turret-lathe operator
Wire drawer III

4. Inspection and Testing

Casting inspector
Inspector, machine shop
Laborer, process (glass manufacturing)
Tool inspector

5. Recording and Control

Stock clerk II

6. Material Movement

Electric-bridge-crane operator
Elevator operator, freight
Laborer (automobile manufacturing)
Laborer (bakery products)
Laborer (foundry)
Laborer (wire)

7. Custodial

Porter I
Porter II

Loss of Use of Two Feet

1. Maintenance

Electrical repairman

3. Processing

Coil assembler IV
Die maker II
Laborer, process (nonferrous metal alloys and products)
Machinist II
Punch-press operator I
Sheet-metal worker, aircraft
Single-spindle-drill-press operator
Tool maker
Treater helper

4. Inspection and Testing

Hardness inspector
Tester helper

6. Material Movement

Electric-bridge-crane operator
Laborer (glass manufacturing)

7. Custodial

Porter I

Loss of Use of One Leg

1. Maintenance

Boilermaker
Boiler-operator helper
Carpenter
Carpenter, flask
Electrical repairman
Fireman, stationary boiler
Laborer (tobacco)
Laborer, process (machine shop)
Laborer, process (nonferrous metal alloys and products)
Machinist II
Maintenance man
Maintenance mechanic II
Millwright
Oiler I
Painter I
Painter, spray I
Pipe fitter
Plumber
Saw filer, machine
Sheet-metal worker II
Structural-steel worker
Welder, combination
Welder helper, acetylene

2. Working Foremen

Developer I
Glass polisher
Inspector (machine shop)

3. Processing

Aircraft-carburetor subassembler
Arbor-press operator
Assembler IV

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed — Continued

MALE — Continued

Loss of Use of One Leg — Continued

3. Processing — Continued

Assembler, office machines
Automobile machanic, motor I
Babbiter II
Balancer I
Body maker III
Box maker, wood III
Brazer
Broaching-machine operator
Buffer I
Burrer, hand
Churn man II
Cigarette-packing-machine operator
Circular-sawing-machine operator
Coil winder I
Core maker I
Core paster
Cutter, machine I
Cylindrical-grinder operator
Die-casting-machine operator II
Die-maker apprentice I
Drawer builder
Engine-lathe operator
Experimental mechanic
Final assembler VII
Floor assembler
Furnace tender, heat treating
Glass cutter
Glass grinder
Glass polisher
Heat treater III
Internal-grinder operator
Instrument maker I
Job setter II
Laborer (foundry)
Laborer (glass products)
Laborer (machine tools and accessories)
Laborer (nonferrous metal alloys and products)
Laborer, process (agricultural equipment)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (chemicals)
Laborer, process (firearms)
Laborer, process (foundry)
Laborer, process (furniture)
Laborer, process (glass manufacturing)
Laborer, process (malt liquors)
Laborer, process (paper and pulp)
Laborer, process (radio manufacturing)
Laborer, process (rayon and allied products)
Laborer, process (wire)
Lapping-machine operator
Lay-out man (machine shop)
Lehr man
Machinist II
Machinist apprentice
Machinist bench
Metal finisher, hand filing
Milling-machine operator II
Milling-machine operator, automatic
Molder
Molder apprentice
Molder, floor
Motorman I
Multiple-spindle-drill-press operator
Painter, spray II
Planer operator II
Plexiglas former
Plunger
Pointer operator
Polisher
Power-shear operator I
Pressman
Punch-press operator I
Punch-press operator II
Radial-drill-press operator
Reaming-machine operator I
Recovery operator
Rewinder operator
Rubber pressman
Sandblaster I
Scrap-drop craneman
Screw-machine operator, automatic
Screw-machine operator, semiautomatic
Sheet-metal worker, aircraft
Single-spindle-drill-press operator
Slitting-machine operator VI
Sorter
Spinner VI
Sticker
Still-operator helper
Straightener, hand
Stuffer, machine
Subassembler I
Subassembler II
Subassembler III
Switch adjuster
Template maker IV
Tool-grinder operator
Tool hardener
Tool maker
Tool-maker apprentice
Tube drawer
Turret-lathe operator
Vertical-turret-lathe operator
Washer
Watchcase-vulcanizer tender
Welder, arc
Welder, butt
Welder, combination
Wire drawer III

4. Inspection and Testing

Body-assembly inspector
Casting inspector
Chemist, organic
Deflector operator
Dynamometer tester, motor
Experimental mechanic
Final-assembly inspector
Inspector I
Inspector and tester
Inspector (machine shop)
Inspector (rubber goods)
Installation inspector
Instrument maker I
Laborer, process (glass manufacturing)
Tester I
Tool inspector

5. Recording and Control

Follow-up man III
Receiving checker II
Stock clerk II
Timekeeper
Tool clerk

6. Material Movement

Electric-bridge-crane operator
Electric-monorail-crane operator
Electric-truck operator
Elevator operator, freight
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (foundry)
Laborer (glass manufacturing)
Laborer (malt liquors)
Laborer (mattress and bedspring manufacturing)
Laborer (paper and pulp)
Laborer (plastic materials)
Laborer (wire)
Trailer-truck driver
Truck-driver, light

7. Custodial

Gateman IV
Porter II
Watchman I

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed — Continued

MALE — Continued

Loss of Use of Two Legs

1. Maintenance

Carpenter
Electrician helper

3. Processing

Assembler (office machines)
Bench assembler V
Burrer, hand
Chipper, foundry
Coil-machine operator
Electrical adjuster
File cutter
Fireman, still
Jigger-brim-pouncing-machine operator
Job setter II
Laborer, process (automobile manufacturing)
Laborer, process (rubber goods)
Laborer, process (tobacco products)
Pumpman VII
Punch-press operator I
Repairman V
Saw filer, machine
Shaper operator I
Single-spindle-drill-press operator
Straightener III
Subassembler I
Subassembler II
Tool-grinder operator
Tool maker
Welder, spot

4. Inspection and Testing

Body-assembly inspector
Deflector operator
Hardness inspector
Inspector I
Inspector (machine shop)
Tool inspector

5. Recording and Control

Production clerk II
Shipping checker II
Tool clerk

6. Material Movement

Diesel-dinkey operator
Laborer (cutlery tools)

7. Custodial

Porter II

Back Deformity

1. Maintenance

Fireman, stationary boiler
Instrument repairman
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (iron and steel)
Laborer (petroleum refining)
Machinist II
Maintenance man, factory or mill
Maintenance mechanic II
Millwright
Sheet-metal worker II
Water tender III
Welder, combination

2. Working Foremen

Glass grinder
Teaser II
Tinplater III

3. Processing

Aircraft mechanic
Automobile mechanic, motor I
Bench assembler V
Box maker, wood III
Brakeman, automobile
Broaching-machine operator
Buffer I
Burrer, hand
Centerless-grinder operator
Charging-machine operator I
Cigarette-making-machine operator
Cigarette-packing-machine operator
Circular-sawing-machine operator
Coremaker, machine I
Cylinder-block repairman
Cylindrical-grinder operator
Dental ceramist
Desk assembler
Die-casting machine operator
Die maker II
Electrician apprentice
Electric-motor assembler
Engine-lathe operator
Experimental-body-and-minor assembler
Filling-machine operator I
Final assembler VII
Floor assembler
Forming-press operator I
Gear-hobber operator
General assembler II
Glass cutter
Glass grinder
Glass polisher
Induction-furnace operator
Insulating-machine operator I
Job setter II
Laborer (furniture)
Laborer (glass manufacturing)
Laborer (iron and steel)
Laborer, process (automobile parts)
Laborer, process (electrical equipment)
Laborer, process (foundry)
Laborer, process (glass manufacturing)
Laborer, process (malt liquors)
Laborer, process (nonferrous metal alloys and products)
Ladle man II
Lehr man
Machinist II
Machinist, bench
Milling-machine operator II
Multiple-spindle-drill-press operator
Painter, spray II
Patternmaker-apprentice, metal
Presser, machine I
Pressman
Punch-press operator I
Radial-drill-press operator
Recovery operator
Riveter, pneumatic III
Sandblaster I
Scorer I
Screw-machine operator, semiautomatic
Sheet-metal worker, aircraft
Side-laster machine
Single-spindle-drill-press operator
Spreader I
Straightener, hand
Subassembler I
Subassembler III
Switchroom man
Tapping-machine operator I
Tool-grinder operator
Tool maker
Trimmer, hand VIII
Turret-lathe operator
Warm-in boy
Welder, combination
Welder, spot
Wire drawer III

4. Inspection and Testing

Casting inspector
Core checker
Deflector operator

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed — Continued

MALE — Continued

Back Deformity— Continued

4. Inspection and Testing — Continued

Gear matcher
Inspector (machine shop)
Installation inspector
Laborer (electrical equipment)
Laborer, process (fabricated plastic products)

5. Recording and Control

Expediter II
Laborer (machine tools and accessories)
Laborer (petroleum refining)
Production clerk II
Shipping clerk I
Stock clerk II
Tool clerk

6. Material Movement

Brakeman, yard I
Electric-bridge-crane operator
Elevator operator, freight
Industrial locomotive operator
Laborer (automobile manufacturing)
Laborer (bakery products)
Laborer (glass manufacturing)
Laborer (machine tools and accessories)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Laborer (rayon and allied products)
Laborer (wire)
Laborer, process (automobile manufacturing)

7. Custodial

Porter II
Rest-room attendant
Watchman I

Multiple Orthopedic

1. Maintenance

Floor assembler
Maintenance mechanic II
Millwright
Painter I

3. Processing

Chipper, foundry
Cutter-off II
Desk assembler
Electric-motor assembler
Filter cleaner
Glass grinder
Glass polisher
Laborer (foundry)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (electrical equipment)
Laborer, process (malt liquors)
Lathe operator, automatic I
Machinist apprentice
Milling-machine operator VI
Paper slitter
Pulpit man II
Shaper operator I
Sheet-metal-fabricating-machine operator
Sheet-metal worker, aircraft II
Single-spindle-drill-press operator
Still-operator helper
Tool designer
Tool-grinder operator
Welder, combination

4. Inspection and Testing

Airplane inspector I
Body-assembly inspector
Casting inspector
Inspector (machine shop)
Tool inspector

5. Recording and Control

Clerk, general
Production clerk II
Shipping checker

6. Material Movement

Electric-truck operator
Fireman, portable boiler
Laborer (automobile manufacturing)
Laborer (iron and steel)
Laborer (rayon and allied products)
Laborer (wire)

7. Custodial

Gateman IV
Porter II

FEMALE

Amputee — Two Hands

5. Recording and Control

Stock clerk II

Amputee — One Arm

5. Recording and Control

Stock clerk II

6. Material Movement

Laborer, process (glass manufacturing)

7. Custodial

Rest-room attendant

Amputee — One Leg

3. Processing

Profiling-machine operator II

4. Inspection and Testing

Laborer, process (cutlery tools)

Loss of Use of One Hand

3. Processing

Laborer, process (aircraft manufacturing)

4. Inspection and Testing

Laborer, process (automobile parts)
Weaver IV

5. Recording and Control

Stock clerk II

Jobs at which 1,522 Orthopedic Cases of the survey group were found employed — Continued

FEMALE — Continued

Loss of Use of Two Hands

3. Processing

Laborer, process (aircraft manufacturing)
Laborer, process (garment manufacturing)

Loss of Use of One Arm

1. Maintenance

Laborer (machinery manufacturing)

3. Processing

Instrument maker I
Laborer, process (electrical equipment)
Sewer, hand III
Sewing-machine operator (shirts and related products)
Subassembler III
Yarn winder

4. Inspection and Testing

Tester I

5. Recording and Control

Stock clerk II

Loss of Use of One Foot

3. Processing

Armature winder I

Loss of Use of Two Feet

3. Processing

Baser II

4. Inspection and Testing

Inspector (machine shops)

Loss of Use of One Leg

3. Processing

Bench grinder
Bench hand XI
Cake wrapper
Cementer, hand II
Coil assembler IV
Coil taper, machine
Final assembler VII
Instrument maker II
Laborer, process (automobile parts)
Laborer, process (confectionery)
Laborer, process (electrical equipment)
Sewer, hand III
Sewing-machine operator (shirts and related products)
Solderer I

4. Inspection and Testing

Complete-and-final-assembly inspector
Final assembly inspector, fusilage installation
Inspector (machine shop)
Laborer, process (glass manufacturing)
Tire inspector II
X-ray inspector

6. Material Movement

Laborer (rayon and allied products)
Sorter II

7. Custodial

Charwoman
Porter II

Loss of Use of Two Legs

3. Processing

Laborer, process (confectionery)
Sewing-machine operator (fabricated products, n. e. c.)
Sewing-machine operator (men's tailored garments)
Welder, filament

7. Custodial

Charwoman

Back Deformity

3. Processing

Bander and cellophaner, machine
Baser II
Floor assembler
Laborer (bindery)
Laborer, process (confectionery)
Major assembler I
Rotor-core assembler
Sewing-machine operator (men's tailored garments)
Stripper, machine
Subassembler III

4. Inspection and Testing

Inspector (machine shop)
Laborer, process (automobile parts)

6. Material Movement

Laborer (rayon and allied products)

Multiple Orthopedic

3. Processing

Baster, hand
Laborer, process (dental equipment)

4. Inspection and Testing

Inspector (machine shop)

5. Recording and Control

Stock-control clerk

Placement Practices

In general, the pre-employment physical examination was found to be relatively unimportant in the case of the person with an orthopedic impairment because the impairment usually was visible and could be evaluated readily. A placement officer is not likely to put such an applicant on a job which he obviously is incapable of performing. However, the physical examination may make a considerable contribution to proper placement by revealing the cause of the impairment, such as arthritis, varicosity, etc., which results in a limitation of the use of a body member. This information may prevent placing the applicant in working conditions which might aggravate the impairment.

In 10 of the 109 plants surveyed, it was a matter of company policy to prohibit the hiring of orthopedic cases coming within the definitions used in this study. Yet, orthopedically impaired workers were found employed in each of these 10 plants. Apparently, these were persons who had acquired the impairment after being employed by the company and either had continued on in their jobs or had moved to other jobs which their residual abilities permitted them to perform. In several other plants the policy was to exclude persons with orthopedic impairments unless they possessed some particular skill which was urgently needed at the moment. In all cases, however, the exclusion rules were relaxed to permit the hiring of disabled veterans.

The placement of a person with an orthopedic impairment tends to be simple in its essential principles. The application of these principles, however, may be quite complex. The impairment or limitation is usually visible and the matching of the abilities of the individual to the requirements of the job is not difficult. Flexibility in applying the rules, however, is the most necessary requirement. To say that an applicant who has lost a leg cannot do a job that requires standing or walking, may or may not be true. An instance encountered during the survey will illustrate the point. A man who had lost a leg in a plant accident asked to be trained for a certain job. It was believed that the man could acquire the skill but the job required constant standing and moving. However, as the employee had asked for it, the management decided to let him try. He was taught the job and had been performing it successfully for several years at the time of the survey. In another case a man who had lost a hand was found handling steel drums. He used a hook in place of the hand and had no trouble at all in keeping up with his fellow workers.

These instances are cited not to prove that a man with one leg should be put on jobs requiring standing and moving or that a man with one hand should be assigned to jobs handling heavy materials, but to emphasize the fact that placement of the orthopedically impaired person was found to be an individual matter. It is necessary to consider the job in terms of all the abilities and attributes of the individual applying for it and not exclusively in terms of the physical impairment.

The use of prosthetic aids was found to open many jobs to the man with an orthopedic impairment. For example, the worker who had lost an arm was not necessarily excluded from a job requiring the use of two arms. An artificial limb enabled many such workers to do the same work they had always done, or to learn new jobs even though these required the use of two arms or two hands. Because of the many and complicated ways in which persons with orthopedic impairments were found to adjust to different requirements, job analysis and evaluation of job requirements are extremely important placement tools in these cases.

Work Performance

The group of persons with serious orthopedic impairments compared favorably with their matched unimpaired workers on the same jobs. Table D–1 and the following paragraphs summarize the findings of the study of this group with respect to the five major factors of work performance for which data were obtained.

Absenteeism

An absence was defined as absence from the job on days on which the employee was scheduled to work. Lay-offs, vacations, etc., were not counted either as days absent or as days scheduled to work. The average rate of absenteeism, computed as days lost per 100 scheduled workdays, was 3.8 for the 1,522 orthopedic cases against 3.4 for the 2,463 unimpaired workers matched with them. These rates are the same as those for the survey group as a whole.

The slight difference in the rates indicates that,

as a group, the orthopedically impaired worker might be expected to have about 1 day more of absence than the unimpaired in each 250 scheduled workdays. If two applicants presented themselves at the employment office and it was known that one of them would be absent 1 more day than the other in each 250 days of scheduled work, it is doubtful whether this fact in itself would determine which applicant got the job. While the level of the rates as such is not a consideration in this study, the fact is that the favorable level of the rates also tends to minimize the difference between the two groups.

The frequency distribution of the individual rates for the impaired and unimpaired workers (table D–4) provides further evidence of the similarity of the performance of the two groups. There is a very high concentration in the lower range with a scattering among the very high frequencies. Nearly one quarter of each group had no absences at all during the period studied, and about 70 percent of the impaired and 73 percent of the unimpaired had absenteeism rates of 3.9 or less. Isolated instances of very poor performance occurred in both groups. Two of the orthopedic cases and four of the unimpaired workers had extremely poor rates of 50.0 or higher. Such instances, however, can be expected in any large group of workers.

TABLE D–4.—*Percentage distribution of 1,522 orthopedically impaired workers and 2,463 unimpaired workers, by absenteeism frequency rate* [1]

Absenteeism frequency rate class	Impaired	Unimpaired
0	22.2	23.7
0.1 and under 1.0	15.0	16.7
1.0 and under 2.0	12.6	12.6
2.0 and under 3.0	11.4	11.6
3.0 and under 4.0	8.0	6.9
4.0 and under 5.0	5.4	6.6
5.0 and under 10.0	14.9	13.0
10.0 and under 20.0	8.0	7.1
20.0 and under 50.0	2.4	1.6
50.0 and over	.1	.2
Total	100.0	100.0

[1] Number of days lost per 100 scheduled workdays.

Unfortunately, no reason was obtainable for well over half the total number of absences recorded. To the extent to which such reasons were obtainable, however, the rates attributable to various causes for absence as shown in table D–5 were very similar for the impaired and unimpaired workers. Personal business accounted for a rate of 0.3 in each group; and illness, the most frequent cause of absence, yielded a rate of 1.2 for the impaired against 1.0 for the unimpaired. It is, of course, impossible to say how the comparisons would have been affected had it been possible to obtain the reasons for absences in the large groups recorded as unknown. However, within the limits of the known facts, there does not seem to be any material difference between the orthopedically impaired and the unimpaired workers matched with them as to the reasons why they absented themselves on scheduled workdays.

TABLE D–5.—*Absenteeism frequency rates* [1] *for 1,522 orthopedically impaired workers and 2,463 unimpaired workers, by reason for absence*

Reason for absence	Impaired	Unimpaired
Total	3.8	3.4
Illness	1.2	1.0
Personal business	.3	.3
Unknown	2.3	2.1

[1] Number of days lost per 100 scheduled workdays.

Nondisabling Injury Experience

A nondisabling injury was defined as one which did not result in a permanent impairment or in loss of time beyond the day or shift on which the injury occurred. The group injury experience was expressed as a rate reflecting the number of injuries per 10,000 exposure-hours. The individual rates were computed on a 1,000-hour base. Data for this factor in work performance were available for 1,482 orthopedic cases matched with 2,402 unimpaired workers.

The difference between the two groups was fractional, with a small advantage on the side of the impaired workers. The rates of minor work injuries were 9.4 and 10.0 per 10,000 exposure-hours for the impaired and unimpaired, respectively. The difference indicates that the impaired, as a group, might be expected to experience about 1 less nondisabling injury than the unimpaired in each 15,000 hours of work. Considering that this represents typically the single treatment antiseptic-and-adhesive-tape type of injury with no lost time, the difference does not seem to be significant.

Because group averages might not be truly representative of the group experience, frequency distributions were developed. The patterns of the two frequency distributions shown in table D–6 are nearly identical in the two groups. 55 percent of the impaired and 53 percent of the unimpaired had no injuries at all during the periods studied. 95 percent in each group had a rate of 4.9 or less. Exactly 0.2 percent in each group were in the extremely high bracket,

with a rate of 20.0 or more. It seems reasonable to conclude on this evidence that the nondisabling injury experience was the same for the orthopedically impaired workers and for the unimpaired workers exposed to the same hazards. There was no evidence of accident proneness on the part of the worker with an orthopedic impairment.

TABLE D–6.—*Percentage distribution of 1,482 orthopedically impaired workers and 2,402 unimpaired workers, by frequency rate [1] of nondisabling injury*

Frequency rate class	Impaired	Unimpaired
0	54.9	52.5
0.1 and under 1.0	15.3	16.0
1.0 and under 2.0	13.8	14.3
2.0 and under 3.0	6.7	6.7
3.0 and under 5.0	4.4	5.4
5.0 and under 10.0	3.7	4.3
10.0 and under 20.0	1.0	.6
20.0 and over	.2	.2
Total	100.0	100.0

[1] Number of injuries per 1,000 exposure-hours.

Nor did the orthopedically impaired differ from the unimpaired as to the nature of injuries. The rates attributable to various kinds of injury, shown in table D–7, have very similar patterns for the two groups of workers. Considering the fact that the figures shown here reflect the experience of a sizable number of cases, it seems clear that the injuries experienced were related to the hazards of the jobs. There appears to have been no tendency on the part of the person with an orthopedic impairment toward some particular kind of injury.

TABLE D–7.—*Nondisabling injury frequency rates [1] for 1,482 orthopedically impaired workers and 2,402 unimpaired workers, by nature of injury*

Nature of injury	Impaired	Unimpaired
Total	9.4	10.0
Burns and scalds	.6	.6
Cuts and abrasions	6.4	6.8
Eye injuries	1.4	1.7
Strains and sprains	.5	.4
Other	.5	.5

[1] Number of injuries per 10,000 exposure-hours.

The number of redressings required per injury provides some indication of the severity of first-aid injuries. In the present study it was found that practices concerning redressings varied widely among plants. In some instances intensive follow-up was made to be sure that the employee reported for redressings on each injury until released by the company physician. In other plants redressings were obtained largely at the discretion of the employee. However, while the practices varied among plants, they were the same for the impaired and unimpaired in each plant. Thus, while the redressings per injury are some measure of the severity, they are so only on a comparative basis between the two groups.

The impaired and unimpaired groups alike averaged 0.8 redressings per injury, indicating that injuries of orthopedically impaired workers were no more severe than those of the unimpaired workers matched with them.

In brief, the nondisabling injury experience in the two matched groups of workers was practically identical with respect to frequency, severity, and nature of injury. In the light of this record, it seems reasonable to conclude that the injury experience was related to the hazards of the jobs and not to the orthopedic impairments which characterized one of the groups.

The dispensary records yielded an additional fact of considerable interest — visits for reasons other than work injuries. These were visits to the dispensary occasioned by causes not related to the workers employment, such as illness, home accidents, etc. Again, plant practices varied widely with respect to treatment of such non-work-connected injury or illness. Some plants encouraged, others discouraged, such use of plant medical facilities. However, the significant consideration here is not the actual demands made on such facilities but the comparison of the demands made by the impaired and unimpaired workers under the same conditions. In this respect again there was no difference between the two groups. The orthopedically impaired group and the matched unimpaired group each averaged 1.3 such visits per person. The opinion sometimes encountered that the orthopedically impaired worker tends to make excessive demands upon the medical facilities of the plant, clearly is not supported by the recorded experience of 1,482 such workers compared with 2,402 unimpaired co-workers.

Disabling Injury Experience

Frequency. This kind of injury was defined as one which resulted in a permanent impairment or in time loss of at least one full day beyond the day or shift on which the injury occurred.

Data on disabling work injuries were obtained for 1,499 orthopedically impaired persons matched with 2,439 unimpaired workers. The orthopedic cases had

a substantially better disabling injury record than the unimpaired workers matched with them and exposed to the same hazards. Computed on the standard base of a million exposure-hours, the rates for the impaired and unimpaired groups were 5.9 and 8.9, respectively.

As was true of nondisabling work injuries, the similarity in the nature of the disabling injuries was very pronounced. Contusions of the lower extremities were the most common and accounted for about one-third of all the injuries in both groups. Two of the impaired cases suffered fractures, as did three of the unimpaired. All five cases involved fractures of the toes. The only amputations, however, were recorded among the unimpaired workers; there were five of these, all amputations of fingers. With this exception the pattern of injuries in the two groups was practically identical. Again, the conclusion seems warranted that the injuries were attributable to the job hazards and not to any accident proneness of the impaired workers. The significance of these figures lies in the fact that the workers of the two groups were working on the same jobs and consequently were exposed to identical hazards.

Time Lost. The time lost by each group as a result of disabling injuries was computed as a rate per 100 scheduled workdays. The rates for the two groups were small, 0.07 and 0.10 days per 100 scheduled days for the impaired and unimpaired groups, respectively. On this basis of comparison, the severity of disabling injuries was about the same for impaired and unimpaired workers.

A slightly different approach to the time-lost factor is the average time lost per injury. Again, the difference between the two groups was small, 15.8 and 13.9 days per injury for the impaired and unimpaired groups, respectively. Orthopedically impaired workers experienced a total of 15 disabling injuries with a total time loss of 237 days. Included in this group was one case — a contusion of the foot — which resulted in a time loss of 96 days. This single case raised the average from 10 days to nearly 16 days. Among the unimpaired there were 36 disabling injuries, among which was also one very high case — a foot fracture with a time loss of 87 days. If, for the sake of a better comparison the extreme case is removed from each group, the averages become 10 days per injury for the impaired and 13 days per injury for the unimpaired workers. Either way, the difference does not seem to be large enough to indicate any significant difference in the severity of the injuries in the two groups.

A careful examination of accident records, supplemented by discussion with the safety director or other responsible plant official, showed that in no case was the injury of an orthopedically impaired person attributed to his impairment. None of the injuries experienced by the orthopedically impaired workers resulted in any additional permanent disability severe enough to result in total permanent disability. Nor were any of the injuries among the unimpaired recorded as caused or contributed to by a fellow worker's impairment. Furthermore, no instance of this type was discovered for any impaired workers not included in the group.

In brief, the person with an orthopedic impairment, if reasonably placed, was found to be neither a hazard to himself nor to others. On the contrary, he experienced a somewhat better accident record than did unimpaired workers exposed to the same hazards.

Output Relative

Of the 1,522 orthopedically impaired workers who comprised the survey group, individual production data were available for only 121. Matched with these impaired workers were 193 unimpaired workers on the same jobs and subject to the same incentives. As a group, the orthopedic cases were about 1 percent more efficient, with an output relative of 101.3 as against 100.0 for the unimpaired workers with whom they were matched. Although the group of 121 orthopedic cases was not as large as was desirable, it will be noted that the output relative is nearly identical with that for the 895 cases of the total survey group for whom production data were available.

Not all of the orthopedic workers studied produced at a better rate than did the unimpaired workers matched with them. It would not be reasonable to expect that they should. However, even on an individual comparison basis, the impaired workers made a favorable record, as the following tabulation indicates:

Output relative	*Number of impaired workers*
Under 95.0	31
95.0 and under 105.0	49
105.0 and over	41

If an output relative between 95.0 and 105.0 can be taken to represent satisfactory performance, 74

percent of the impaired workers produced at a rate equal to or better than the unimpaired workers with whom they were matched on the same jobs. Only 26 percent were less efficient than the unimpaired workers with whom they were compared, while, on the other hand, 34 percent were substantially better.

Incentive work was not restricted to any one or a few types of orthopedic impairment. Among the 121 cases for whom data were available, 14 of the 18 specific kinds of orthopedic impairments were represented.

The evidence here indicates that the existence of orthopedic impairments did not prevent workers from keeping up an adequate production pace, provided they were reasonably placed. For the firms represented in this study, the employment of the orthopedically impaired on incentive work did not result in any lag in production schedules. On the contrary, the records indicate that the effect was slightly in the other direction.

In evaluating the ability of these orthopedically impaired workers to keep up with production schedules, there are two additional factors which must be taken into consideration. First, the small number of cases for which data were available does not indicate that orthopedic cases were not widely used on production work. Many cases had to be excluded because they could not be matched with the unimpaired workers on the same jobs. Second, only those who were on *individual* incentive work could be used. Orthopedic cases working on group incentive systems and on assembly lines could not be included. However, on group incentive work the impaired worker had to keep up with the group in order to hold the job, and on assembly line operations the work was paced by the speed of the line. Hence, the fact of their employment on these jobs is evidence that the orthopedically impaired workers so employed were able to meet the production pace of the unimpaired workers on the same jobs.

Quit Rate

Data on job separations were obtainable for 632 orthopedically impaired workers matched with 1,019 unimpaired workers.

Data for the computation of the separation rates were obtained by means of follow-up and consisted of the number of persons of the survey group, impaired and unimpaired, who were no longer in the employ of the company 6 months after the end of the period used for the study. Thus, if the survey period covered the period January 1 through December 31, 1945, the data on separations covered the 6-month period January 1 through June 30, 1946. The rates were computed as the number of workers no longer employed per 100 workers in the survey group.

The total separation rate is made up of two factors, the terminations (lay-offs, discharges, etc.), over which an employee has no control, and the voluntary quits, where the action is initiated by the employee.

For the purpose of comparing the stability on the job of these groups of impaired and unimpaired workers, it is the quit rate which is of principal interest. In the present survey group the orthopedically impaired workers had a substantially higher quit rate, 5.7 as against 2.9 for the unimpaired workers. The difference in the quit rates amounts to 2.8 and is accounted for in part by the fact that the number of quits was higher for the impaired for health reasons and because a somewhat larger number of these employees moved out of the community. These two reasons accounted for 1.2 of the 2.8 difference. The other sizable difference occurred in the cases where the reason for quits was unknown. Unfortunately, this category accounts for more than half the difference between the two groups. It is possible that part of this group may have taken jobs during the war and then, when the emergency had passed, may have withdrawn from the labor force. Profiting from the opportunities offered by wartime employment many impaired persons acquired industrial skills and experience for which there was a ready market, and many undoubtedly quit to take other or better jobs. These factors probably influenced the rates for the impaired persons, especially during 1945 and 1946 when there was considerable shifting around among the working population in general. Miscellaneous reasons for quits classified as "other" made up a large category for both the impaired and the unimpaired, the principal reason listed for both groups being "to start own business."

Terminations primarily as a result of reduction in force ran 6.3 per hundred for the orthopedically impaired as against 4.3 for the matched unimpaired workers. This is not surprising since in general the impaired were the last to be hired and, as a result of lower seniority rating, were among the first to be laid off when reductions in force became necessary.

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E. The Hearing Cases

Summary of Statistical Findings

In most respects the performance of the workers with impaired hearing compared favorably with that of the unimpaired workers with whom they were matched. The two groups were about equally regular in their work attendance and had about the same nondisabling work injury experience. Contrary to the findings for most of the other impairment groups, the frequency of disabling injury was higher for the workers with impaired hearing than for the unimpaired workers on the same jobs. The severity of the injuries as measured by the resultant time loss, however, was substantially less. The rate of voluntary quits was also substantially lower for the hearing cases. Observations on measured individual production were not available on a group sufficiently large to permit showing comparative performance data.

Nearly 20 percent of the hearing cases were females, and the performance of this group exerted a fairly marked influence on the performance of the survey group as a whole. The female cases had a somewhat higher incidence of both disabling and nondisabling injuries than was characteristic of the female cases in other impairment groups, but the absenteeism rate was about the same.

On the whole, the workers with impaired hearing acquitted themselves creditably. Properly placed, the impairment did not seem to constitute a handicap and their work performance, except for the incidence of disabling work injuries, was about the same as that of the unimpaired workers matched with them on the same jobs.

Composition of the Survey Group

The hearing group included three specific impairments: (1) the totally deaf, defined as an 0/20 classification or 50 decibel loss; (2) the hard of hearing,

TABLE E–1.—*Work performance of workers with hearing impairments, and of matched unimpaired workers*

Group	Absenteeism frequency rate [1]	Nondisabling injury frequency rate [2]	Disabling injury			Output relative [6]	Quit rate [7]
			Frequency rate [3]	Time-lost rate [4]	Average days of disability [5]		
	Average performance						
Total:							
Impaired	3.4	11.4	8.1	0.08	13.4	(8)	2.8
Unimpaired	3.9	11.0	4.6	.06	17.0	(8)	4.7
Male:							
Impaired	3.0	11.4	8.5	.09	12.3	(8)	(8)
Unimpaired	3.4	11.4	5.1	.07	17.8	(8)	(8)
Female:							
Impaired	5.4	11.5	6.1	.04	9.0	(8)	(8)
Unimpaired	6.6	9.3	2.1	(9)	1.0	(8)	(8)
	Number of workers						
Total:							
Impaired	595	568	588	588	----	(8)	272
Unimpaired	937	892	930	930	----	(8)	430
Male:							
Impaired	494	470	487	487	----	(8)	(8)
Unimpaired	753	716	746	746	----	(8)	(8)
Female:							
Impaired	101	98	101	101	----	(8)	(8)
Unimpaired	184	176	184	184	----	(8)	(8)

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Number of voluntary quits per 100 employees in the survey group.
[8] Data available for too few cases to justify showing performance figures.
[9] Less than 0.01.

defined as 10/20 classification or a loss of 30 decibels but less than 50 decibels in the better ear; and (3) the deaf-mute. The readings used were those taken without use of hearing aid because it was found early in the study that employees usually were classified in that way on plant medical records. This impairment group yielded a total of 595 cases, making it fifth in size among the 10 impairment groups studied.

TABLE E–2.—*Distribution of 595 hearing cases, by type of impairment and by sex*

Impairment group	Total	Male	Female
Total	595	494	101
Totally deaf	92	61	31
Hard of hearing	313	275	38
Deaf-mute	190	158	32

The hard of hearing were encountered most frequently and accounted for 313 cases in this survey group. The deaf mutes provided 190 cases. Only a comparatively few totally deaf workers were found, 92 in all. Because of the comparatively small total number of cases in the group, performance data are not shown separately by specific type of impairment.

With respect to age characteristics, the group showed a fairly heavy concentration in the lower age ranges: 47 percent, or nearly one-half, were under the age of 40. Among the remainder of the impaired workers only 34 percent, or about one-third, were in this age range. 28 percent of the hearing cases and 43 percent of the rest of the impaired workers were 50 years of age or older. The largest single group, 82 cases, fell within the age range from 25 to 30 years. The concentration of the female workers in the lower age ranges was even more pronounced. Slightly over 91 percent of the females, as against 68 percent of the males, were under the age of 50. It is not apparent from the material at hand why the hearing cases should have displayed this deviation from the general pattern.

TABLE E–3.—*Comparison of number and percentage distribution of 595 hearing cases and 10,433 other impaired workers, by age group and by sex*

Age group	Number of workers		Percent	
	Hearing cases	Other impaired	Hearing cases	Other impaired
Total	595	10,433	100.0	100.0
Under 20 years	5	74	.8	.7
20 and under 25 years	50	461	8.4	4.4
25 and under 30 years	82	819	13.8	7.9
30 and under 35 years	80	1,037	13.4	9.9
35 and under 40 years	63	1,121	10.6	10.8
40 and under 45 years	79	1,159	13.3	11.1
45 and under 50 years	67	1,245	11.3	11.9
50 and under 55 years	55	1,507	9.2	14.4
55 and under 60 years	51	1,492	8.6	14.3
60 and under 65 years	38	1,050	6.4	10.1
65 years and over	25	468	4.2	4.5
Males	494	9,759	100.0	100.0
Under 20 years	3	50	.6	.5
20 and under 25 years	32	379	6.5	3.9
25 and under 30 years	65	699	13.2	7.2
30 and under 35 years	67	949	13.6	9.7
35 and under 40 years	52	1,025	10.5	10.5
40 and under 45 years	61	1,069	12.3	11.0
45 and under 50 years	54	1,185	10.9	12.1
50 and under 55 years	48	1,450	9.7	14.9
55 and under 60 years	50	1,447	10.1	14.8
60 and under 65 years	37	1,039	7.5	10.6
65 years and over	25	467	5.1	4.8
Females	101	674	100.0	100.0
Under 20 years	2	24	2.0	3.6
20 and under 25 years	18	82	17.8	12.2
25 and under 30 years	17	120	16.8	17.8
30 and under 35 years	13	88	12.9	13.1
35 and under 40 years	11	96	10.9	14.2
40 and under 45 years	18	90	17.8	13.4
45 and under 50 years	13	60	12.9	8.9
50 and under 55 years	7	57	6.9	8.5
55 and under 60 years	1	45	1.0	6.7
60 and under 65 years	1	11	1.0	1.6
65 years and over	0	1	0	(1)

[1] Less than 0.05.

Industry and Occupational Coverage

Workers with impaired hearing were found in each of the major industry groups covered by the study. The cases on which performance data were obtained are not concentrated in any one or a few of the industries, and small numbers of these cases were encountered in almost every plant. This broad plant and industry coverage indicates that the person with impaired hearing can be employed in a great variety of industrial activities. Also, the performance figures shown in the report reflect the performance of these workers under a wide variety of employment conditions. It is generally known that certain industries employ relatively large numbers of persons with impaired hearing in certain operations where noise is very objectionable to persons with good hearing. Unfortunately, however, it was impossible to obtain the performance records for these cases.

The specific jobs at which the impaired workers of this group were employed during the periods studied are shown in the listing on pp. 76–79. For the most part, the impaired persons were utilized in processing or producing operations. Maintenance work, material movement, and inspection and testing accounted for only a relatively small proportion of the group.

Not only were these workers concentrated in the processing operations, but the range and variety of skills represented in those operations were very wide.

In general, the tendency seemed to be toward the higher skilled jobs. This is not surprising, as the impaired person frequently must be able to exercise some special skill in order to gain employment. However, the low skilled jobs — the process laborers, maintenance laborers, etc. — were also represented. But very few, less than 5 percent of the group studied, were found in custodial occupations, such as janitor and porter.

The tabulation indicates clearly the wide variety of industrial occupations which the person with seriously impaired hearing is capable of performing. While it is illustrative of the point, it is by no means to be interpreted as a complete list of suitable occupations. Many jobs on which impaired persons were found to be employed were not recorded because, for one reason or another, the qualifications of the survey could not be met. A complete list of all jobs filled by workers with impaired hearing and encountered in the survey would have resulted in a much larger tabulation but still would not have been exhaustive or complete.

Jobs at which 595 Hearing Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with hearing impairments can be employed]

MALE

Totally Deaf

1. Maintenance

Electrical repairman
Machinist II
Maintenance mechanic II
Oiler I

3. Processing

Airplane woodworker II
Band-sawing-machine operator
Coil winder II
Detail assembler II
Die maker II
Drop-hammer operator II
Engine-lathe operator
Electrical assembler II
Electrician, airplane I
File cutter
Final assembler VII
Form builder I
Laborer (iron and steel)
Laborer (nonferrous metal alloys and products)
Laborer, process (agricultural equipment)
Laborer, process (cutlery tools)
Laborer, process (rayon and allied products)
Lurer
Machinist, bench
Major assembler I
Major-assembly installer
Milling-machine operator
Repairman V
Riveter, aircraft
Single-spindle-drill-press operator
Slicking-lathe operator
Straightener, hand
Subassembler III
Switch adjuster
Template maker IV
Tinner, automatic
Tool-grinder I
Tool-grinder operator
Welder, combination

5. Recording and Control

Production clerk II
Stock clerk II

6. Material Movement

Laborer (automobile manufacturing)
Laborer (bakery products)
Laborer (leather products)
Tractor operator

7. Custodial

Porter II

Hard of Hearing

1. Maintenance

Boilermaker
Carpenter
Electrical repairman
Instrument man IV
Laborer (ammunition)
Laborer (boot and shoe)
Laborer (malt liquors)
Laborer (petroleum refining)
Machinist II
Maintenance mechanic II
Millwright
Oiler I
Painter I
Pipe fitter
Plumber
Plumber apprentice
Power-shear operator I
Pumpman I
Sheet-metal worker II
Stationary engineer
Switchboard operator III
Welder, combination

2. Working Foremen

Inspector (machine shop)
Stillman II

3. Processing

Airplane woodworker II
Assembler
Automobile mechanic, motor I
Battery-charger placer
Boring-machine operator, automatic
Box maker, wood III
Box tender I
Brake operator, machine II
Buffer, machine
Burrer, hand
Calender operator I
Centerless-grinder operator
Chassis assembler II
Circular-sawing-machine operator
Coil winder II
Cylindrical-grinder operator
Dental ceramist
Detail assembler II
Die-casting-machine operator II
Die maker II
Dipper II
Electric-motor assembler
Engine-lathe operator
Final assembler VII

Jobs at which 595 Hearing Cases of the survey group were found employed — Continued

MALE — Continued

Hard of Hearing — Continued

3. Processing — Continued

Floor assembler
Form builder I
Forming-press operator
Friction-sawing-machine operator
Furnace operator II
Furnace tender, heat treating
Gear-hobber operator
Heater III
Heater, forge
Instrument maker I
Insulating-machine operator I
Job setter II
Laborer (automobile manufacturing)
Laborer (automobile parts)
Laborer (malt liquors)
Laborer, process (aircraft manufacturing)
Laborer, process (automobile manufacturing)
Laborer, process (foundry)
Laborer, process (garment manufacturing)
Laborer, process (glass manufacturing)
Laborer, process (iron and steel)
Laborer, process (machine shop)
Laborer, process (machine tools and accessories)
Laborer, process (malt liquors)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (plastic materials)
Laborer, process (rayon and allied products)
Laborer, process (wire)
Machine adjuster III
Machinist II
Major assembly installer
Milling-machine operator II
Milling-machine operator, automatic
Molder
Multiple-spindle-drill-press operator
Painter, spray I
Paper slitter
Plater I
Pointer operator
Polisher
Press cutter
Pressman
Pressman, paraffin plant
Pumpman VII
Pumpman helper
Punch-press operator I
Radial-drill-press operator
Reactor operator I
Rotor assembler
Saw setter II
Sheet-metal-fabric-machine operator
Sheet-metal worker II
Sheet-metal worker, aircraft
Sheet-metal worker, aircraft II
Single-spindle-drill-press operator
Sorter
Spinner VI
Sprayer VI
Spreader I
Stillman, beer
Stock maker
Subassembler
Subassembler II
Subassembler III
Tool-grinder operator
Tool maker
Topman V
Topping-off operator
Turret-lathe operator
Upholsterer II
Washer

4. Inspection and Testing

Air-box tester
Final-assembly inspector
Final tester II
Inspector (machine shop)

5. Recording and Control

Shipping checker
Stock chaser II
Stock clerk II
Tool clerk

6. Material Movement

Distributor I
Electric-truck operator
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (bakery products)
Laborer (button manufacturing)
Laborer (electrical equipment)
Laborer (iron and steel)
Laborer (malt liquors)
Laborer (petroleum refining)
Laborer (plastic materials)
Laborer (rayon and allied products)
Laborer (wire)
Teamster
Truck-crane operator

7. Custodial

Gateman IV
Janitor I
Laborer (machinery manufacturing)
Porter I
Porter II
Watchman I

Deaf-Mute

1. Maintenance

Carpenter
Maintenance mechanic II
Millman
Painter I
Pipe fitter

3. Processing

Assembler
Boring-machine operator, automatic
Box tender
Brake operator, machine II
Burrer, hand
Centerless-grinder operator
Chipper, foundry
Cigarette-packing-machine operator
Commutator assembler
Coremaker, machine I
Cylindrical-grinder operator
Dental ceramist
Die cutter I
Die maker II
Die-maker apprentice
Die setter I
Embosser V
Engine-lathe operator
File cutter
Final assembler
Final assembler VII
Folding-machine operator VI
Forming-press operator I
Furnace tender, heat treating
Gear-hobber operator
Gear-tooth rounder
General assembler II
Hardener II
Instrument maker I
Jet man
Job setter II
Laborer (bindery)
Laborer (photographic apparatus)
Laborer, process (automobile manufacturing)
Laborer, process (bakery products)
Laborer, process (electrical equipment)

Jobs at which 595 Hearing Cases of the survey group were found employed — Continued

MALE — Continued

Deaf Mute — Continued

3. Processing — Continued

Laborer, process (foundry)
Laborer, process (iron and steel)
Laborer, process (machine shop)
Laborer, process (nonferrous metal alloys and products)
Lapping-machine operator
Machine adjuster III
Make-up man V
Milling-machine operator II
Molder, floor
Molding-machine tender
Motor stamper
Offset-press man
Painter, aircraft
Painter, spray I
Paper slitter
Plater I
Plunger
Powderer
Punch-press operator II
Radial-drill-press operator
Saw setter II
Sheet-metal worker II
Sheet-metal worker, aircraft
Single-spindle-drill-press operator
Slicking-lathe operator
Sole-leather-cutting-machine operator
Straightener, hand
Straightening-press operator
Stranding-machine operator
Subassembler
Subassembler III
Surface grinder
Switch adjuster
Tool-maker apprentice
Turret-lathe operator
Vertical-turret-lathe operator
Welder, spot

4. Inspection and Testing

Balancer I
Inspector (machine shop)
Tester I

5. Recording and Control

Expediter II
Production clerk II
Shipping checker

6. Material Movement

Laborer (automobile manufacturing)
Laborer (electrical equipment)
Laborer (foundry)
Laborer (iron and steel)
Laborer (plumbing supplies)
Laborer (rayon and allied products)

7. Custodial

Laborer (photographic apparatus)
Porter II

FEMALE

Totally Deaf

1. Maintenance

Glass worker

3. Processing

Assembler II
Bander-and-cellophaner, machine
Battery assembler
Blank horner
Burrer, hand
Final assembler VII
Floor assembler
Laborer, process (baking products)
Laborer, process (confectionery)
Laborer, process (electrical equipment)
Laborer, process (garment manufacturing)
Laborer, process (radio manufacturing)
Riveter, aircraft
Riveting-machine operator IV
Single-spindle-drill-press operator
Solderer I
Stripper, machine
Subassembler
Switch adjuster

4. Inspection and Testing

Inspection (machine shop)
Tester I

Hard of Hearing

3. Processing

Battery assembler
Burrer, hand
Cementer, hand II
Coil assembler IV
Final assembler VII
Floor assembler
Grid operator
Laborer (rubber goods)
Laborer, process (bakery products)
Laborer, process (electrical equipment)
Laborer, process (garment manufacturing)
Laborer, process (tobacco products)
Mounter VIII
Painter, spray II
Sewer, hand III
Sewing-machine operator (shirts and related products)
Slitting-machine operator
Subassembler
Thrower II
Yarn winder

4. Inspection and Testing

Body-assembly inspector
Casting inspector
Inspector I
Inspector (printing)

5. Recording and Control

Stock clerk II
Tool clerk

6. Material Movement

Distributor I
Laborer (rayon and allied products)

Deaf-Mute

1. Maintenance

Glassblower, laboratory apparatus

3. Processing

Assembler III
Baser II
Burrer, hand
Final assembler VII
Laborer (pulp and paper)
Laborer, process (automobile manufacturing)
Laborer, process (bakery products)
Laborer, process (confectionery)
Laborer, process (dental equipment)
Laborer, process (electrical equipment)

Jobs at which 595 Hearing Cases of the survey group were found employed — Continued

FEMALE — Continued	Major-assembly installer	Subassembler
	Mounter VIII	Subassembler III
Deaf-Mute — Continued	Multiple-spindle-drill-press operator	Thrower II
	Punch-press operator I	
3. Processing — Continued	Riveter, aircraft	**4. Inspection and Testing**
	Sewing-machine operator (shirts and related products)	
Laborer, process (garment manufacturing)	Solderer I	Inspector (printing)

Placement Practices

In locating a job for the person with impaired hearing, the conditions under which the work is to be performed frequently are as important as the requirements of the job itself. In the case of the totally deaf, the problem sometimes is simplified. Obviously if the person cannot hear, he cannot be placed where sound signals are used or where his own safety or the safety of others may depend upon warning signals. On the other hand, depending upon the nature of the hearing impairment, the noisiest kind of surroundings may not affect him. In fact, the loss of hearing may be an advantage. This is equally true for the deaf-mute. A serious problem, of course, is that of communication between the person who is totally deaf or the deaf-mute and his fellow workers or supervisors. This is a problem of rehabilitation. Lip reading, sign language, written communication, etc., provide means to clear this obstacle. Placement of the hard of hearing may frequently be a more complex problem. In the case of the totally deaf, the placement officer is dealing with a definite and clearly defined condition. In the case of the hard of hearing, the loss of hearing acuity is a matter of degree. The use of a hearing aid may minimize the condition.

In many cases, too, it may be difficult to determine how important hearing is in the requirements of a job. Just how much loss of hearing acuity may the individual have before he is hampered in performing the duties of a particular job? To interpret the requirement too strictly may result in depriving an otherwise qualified person of the chance at the job; to interpret it too freely may result in placing the individual in a spot where he is almost sure to be a failure.

For the person with impaired hearing the portion of the pre-employment physical examination which tests his hearing acuity is of course the essential consideration. The remainder is in a sense negative in that it merely establishes the presence or absence of other physical impairments of sufficient significance to require consideration in the job placement. Either the examination or the case history will indicate whether the impairment of the hearing arises from causes which may be aggravated by certain conditions, such as a damp environment for a catarrhal type. It must be borne in mind that the physical examination contemplated here is directed toward the objective of job placement and differs from that directed toward rehabilitation, which the impaired person may already have undergone.

In most of the plants studied the hearing tests were the conventional ones, conducted by speaking to the patient in a whisper from certain distances or by determining at what distance the patient could no longer hear the ticking of a watch. In only a very few cases was the audiometer used and the loss of hearing acuity expressed in terms of decibels.

In general, the hearing cases were not seriously affected by exclusion policies. Only 3 of the plants studied had a definite policy refusing employment to applicants who had defective hearing. Under these conditions it would have been reasonable to expect that the hearing cases would constitute a large segment of the survey group. On the contrary, however, it was fifth in size among the 10 impairment groups included in the study. There are a number of possible explanations for this seeming contradiction. It may be more difficult for the person with impaired hearing to obtain employment than is indicated by the mere absence of exclusion policies. Furthermore, work injuries resulting in the loss of hearing are not common; and one would not expect to find many persons who had acquired the impairment as a result of work injury and were therefore kept on in the employ of the company.

No special techniques in the placement of persons with impaired hearing were encountered. The same

techniques were used with respect to these persons as were used with other impaired workers.

In none of the plants studied was any job re-engineering encountered for the workers with hearing defects. Although minor job modifications were made in some instances, it apparently had not been necessary to engage in any extensive job changes in order to utilize such workers.

Work Performance

Data were obtained on work performance of 595 persons with impaired hearing matched with 937 unimpaired workers on the same jobs. The two groups were compared with respect to absenteeism, work injuries, output, and voluntary separations, i.e., quits. The findings are detailed in the following paragraphs and in table E–1. The paucity of individual production data for this impairment group precludes any discussion of that phase of the comparison.

Absenteeism

Attendance records were available for all members of the survey group. For the purpose of the study an absence was defined as lasting at least one full day when the employee was scheduled to work. Lay-offs, shut-downs, regular vacations, etc., were not counted either as absences or as days scheduled to work. The rate of absenteeism for individuals and for the several groups was computed as the number of days absent per 100 scheduled workdays.

Considered as a group, the persons with hearing impairments were slightly more regular in their work attendance than were the unimpaired workers matched with them. The impaired and matched unimpaired workers, lost 3.4 and 3.9 days, respectively, per 100 scheduled workdays.

There was a substantial difference between the rates of male and female groups, among both the impaired and the unimpaired. The 101 impaired females had an absence rate of 5.4 as against a rate of 6.6 for the unimpaired females matched with them. On the other hand, the 494 impaired males had a rate of 3.0 as against 3.4 for the matched unimpaired males. The number of females involved and the higher level of their rates were sufficient to exercise measurable effects on the group rates.

According to these rates, the impaired lost about 1 day less than the unimpaired in each 200 scheduled workdays. Although this is not a significant difference, it does indicate that the persons with hearing impairments were at least as regular in their work attendance as the unimpaired workers.

While these group averages are informative, it is of some interest to consider comparisons of individual performances. A frequency distribution of the individual rates is shown in table E–4. About 22 percent of the impaired and 21 percent of the matched unimpaired had no absences at all during the survey period; 69 percent of the impaired and 66 percent of the unimpaired had individual rates of 3.9 or less. As was to be expected, individuals in both groups had unfavorable attendance records: 1.7 percent of the impaired and 2.2 percent of the unimpaired had rates of 20.0 or higher. These were scattered cases, however, and not characteristic of either group.

While the distributions for the male and female workers differed considerably, the patterns for the impaired and unimpaired males and for the impaired and unimpaired females were similar. For example, about 24 percent of the males, impaired and unimpaired, had no absences. Among the females, a very much smaller group, 14 percent of the impaired and 7 percent of the unimpaired, had a like experience. The higher absenteeism rates of the female workers in both groups correspond with results obtained in other absenteeism surveys.

TABLE E–4.—*Percentage distribution of hearing cases and matched unimpaired workers, by absenteeism frequency rate* [1] *and by sex*

Absenteeism frequency rate class	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
0	21.9	20.8	23.8	24.1	13.9	7.1
0.1 and under 1.0	13.3	11.7	14.8	13.3	5.9	5.4
1.0 and under 2.0	15.5	14.6	16.9	16.2	8.9	8.2
2.0 and under 3.0	10.4	10.6	10.5	11.0	9.9	8.7
3.0 and under 4.0	8.2	8.4	8.9	8.2	5.0	9.2
4.0 and under 7.0	14.5	15.6	12.3	13.0	24.7	26.1
7.0 and under 10.0	8.5	7.7	6.8	5.4	15.8	17.4
10.0 and under 20.0	6.0	8.4	4.4	6.7	13.9	15.2
20.0 and over	1.7	2.2	1.6	2.1	2.0	2.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	595	937	494	753	101	184

[1] Number of days lost per 100 scheduled workdays.

Where the necessary information was available, the cause or reason for each absence was recorded. It was hoped to determine by this means whether any specific reason or reasons for absence had particular significance for workers with impaired hearing.

Unfortunately, the reason could be obtained for only about 40 percent of the absences recorded. However, the rates attributable to the various reasons were nearly identical in the two groups, as shown in table E–5. Although these rates are based on comparatively small groups, it seems reasonable to infer that whatever factors may have caused absences, the presence of a hearing impairment did not tend to emphasize any one or any combination of them.

TABLE E–5.—*Absenteeism frequency rates* [1] *for hearing cases and matched unimpaired workers, by reason for absence and by sex*

Reason for absence	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Total	3.4	3.9	3.0	3.4	5.4	6.6
Illness	.9	1.0	.8	.9	1.5	1.4
Personal business	.4	.5	.3	.4	.9	1.3
Unknown	2.1	2.4	1.9	2.1	3.0	3.9
Number of workers	595	937	494	753	101	184

[1] Number of days lost per 100 scheduled workdays.

So far as absenteeism is concerned, then, it may be said that the workers with impaired hearing compared favorably with the unimpaired workers under the same conditions of employment. In fact, as a group, they were slightly more regular in their work attendance. Although there were individual cases of poor performance, the proportion of such cases was small and about the same in both groups.

Nondisabling Injury Experience

A nondisabling injury was defined as a work injury which did not result in any permanent impairment or in the loss of at least one full day beyond the day or shift on which the injury occurred. In computing the frequency rates two different bases were used. For the groups and subgroups the rates were computed on a base of 10,000 exposure-hours. The individual rates used for the frequency distribution were computed on a base of 1,000 exposure-hours.

Data on nondisabling injuries were obtained for 568 persons with impaired hearing and for the 892 unimpaired workers matched with them. This number differs from the number studied on absenteeism because in some instances injury records were not available. In the group analyzed were 470 impaired males matched with 716 unimpaired males, and 98 impaired females matched with 176 unimpaired females.

The differences in the rates for the various components of the survey group were fractional. The impaired had a rate of 11.4 as against 11.0 for the unimpaired. For the males alone the rates were identical, 11.4 for both groups of workers. The small group of female workers with impaired hearing, however, had a rate of 11.5 as against the substantially lower rate of 9.3 for the unimpaired females. The reason for this difference was not apparent. For the group as a whole, however, there appears to be no material difference in the nondisabling injury experience between the persons with impaired hearing and the unimpaired workers on the same jobs.

The similarity of the pattern of the frequency distribution of the individual rates shown in table E–6 supports the inference from the group rates that the nondisabling injury experience was about the same for workers with hearing defects and the unimpaired workers exposed to identical hazards. No injuries at all were reported for 45 percent of the impaired group and 46 percent of the unimpaired during the periods studied. About 80 percent of the impaired and 81 percent of the unimpaired had less than 2 minor injuries per 1,000 exposure-hours. It was inevitable, of course, that a small number of the workers in each group should have had very unfavorable experiences: 0.2 percent of the workers in both the impaired and unimpaired groups experienced excessively high rates of 20.0 or more. However, these were isolated cases of poor individual performance, not group characteristics.

TABLE E–6.—*Percentage distribution of hearing cases and matched unimpaired workers, by frequency rate* [1] *of nondisabling injury and by sex*

Frequency rate class	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
0	45.1	46.4	43.8	44.0	52.1	55.7
0.1 and under 1.0	18.7	19.4	19.4	20.1	15.3	16.5
1.0 and under 2.0	16.0	15.4	16.8	15.4	12.2	15.3
2.0 and under 5.0	15.0	14.6	15.4	15.8	13.3	9.6
5.0 and under 10.0	3.9	3.6	3.3	4.0	6.1	2.3
10.0 and under 20.0	1.1	.4	1.1	.4	1.0	.6
20.0 and over	.2	.2	.2	.3	0	0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	568	892	470	716	98	176

[1] Number of injuries per 1,000 exposure-hours.

In an attempt to determine whether the person with impaired hearing was prone to incur any kind of nondisabling injury which might be attributed specifically to the impairment, data on the kind of in-

juries experienced in the two groups were examined. It was found that the patterns for impaired and unimpaired were nearly identical, and that no particular kind of injury could be attributed to the hearing defects. As shown in table E–7, minor cuts and abrasions predominated and held about the same relative importance in both groups. The similarity is the same for the other kinds of injuries. The data seem to justify the conclusion that the injuries were related to the hazards of the job and not to the impairments which characterized one of the groups.

TABLE E–7.—*Frequency rates*[1] *of nondisabling injuries for hearing cases and matched unimpaired workers, by nature of injury and by sex*

Nature of injury	Total		Male		Female	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
Total	11.4	11.0	11.4	11.4	11.5	9.3
Burns and scalds	.4	.4	.3	.3	.8	.5
Cuts and abrasions	8.3	7.9	8.3	8.2	8.4	6.8
Eye injuries	1.5	1.8	1.7	1.9	.8	1.2
Strains and sprains	.5	.5	.4	.5	1.2	.5
Dermatitis	.1	.1	.1	.1	.2	.1
Other	.6	.3	.6	.4	.1	.2
Number of workers	568	892	470	716	98	176

[1] Number of injuries per 10,000 exposure-hours.

In order to determine whether there was any material difference in the severity of the nondisabling injuries in the two groups, data on the number of redressings required were obtained. Although policies with regard to requiring redressings varied among companies, the policies were the same for impaired and unimpaired workers in the same plant. The number of redressings for nondisabling injuries averaged 0.8 per injury for the hearing cases and 0.9 for the unimpaired workers. Measured in this way there clearly was no difference in the severity of the nondisabling injuries in the two groups.

An effort was also made to determine the comparative demand of impaired and unimpaired workers on medical facilities for illness or injury not connected with employment. Again, company policies differed with regard to the use of such facilities for disabilities not related to the work. However, a comparison is valid because the policy in any given plant was the same for both impaired and unimpaired workers. Based upon dispensary records, the hearing cases averaged 1.6 nonindustrial visits per person as against 1.5 such visits for the unimpaired workers during the periods studied. It is obvious that the employment of persons with hearing impairments did not increase demands upon existing medical facilities because of nonindustrial illness or injury.

Disabling Injury Experience

Frequency. A disabling injury was defined as a work-connected injury which resulted in permanent impairment or in the loss of at least one full day beyond the day or shift on which the injury occurred. The frequency rate is expressed as the number of such injuries per million exposure-hours.

Data on disabling injuries were available for 588 hearing cases matched with 930 unimpaired workers. The group was composed of 487 impaired males matched with 746 unimpaired males, and 101 impaired females matched with 184 unimpaired females.

Although workers with impaired hearing had as good a record of nondisabling injuries as the unimpaired workers matched with them, they had a less favorable disabling injury experience. The frequency rates were 8.1 and 4.6, respectively, for the impaired and unimpaired groups. The male and female impaired groups each had a substantially higher rate than the unimpaired workers matched with them. The total number of injuries on which these rates were based, however, was small for each group — 8 for the impaired and 9 for the unimpaired.

A very important consideration is whether the injuries experienced by the impaired workers were in any way caused or contributed to by the impairment. Accident reports were examined in each case. In no instance was the impairment recorded by the plant as the cause of the injury to an impaired worker. Furthermore, none of the injuries among the unimpaired workers in the survey were attributed to a fellow worker's impairment. At each plant discussions with responsible company officials substantiated the findings made from the records. Finally, while records were not examined for workers outside the survey group, plant management was questioned as to whether there had been any instances during the survey period in which a disabling injury was attributable to a hearing impairment. No such cases were found.

Time Lost. An indicator of the severity of disabling injuries is the time lost as the result of such injuries. This time loss was measured in two ways: (1) As the number of days lost per 100 scheduled workdays for the group and (2) as the average time lost per injury in each group.

The impaired workers had a rate of 0.08 day lost per 100 scheduled workdays as against 0.06 day for the unimpaired group. However, the impaired workers averaged only 13.4 days of lost time per injury against 17.0 days for the unimpaired. The rates and the averages were influenced by one extreme case in each group. One hearing case had an injury resulting in a time loss of 46 days while all others ranged from 1 day to 27 days. One injury among the unimpaired resulted in a time loss of 69 days, whereas the remaining injuries ranged from 1 day to 33 days.

In summary, the disabling work injuries were more frequent among the hearing cases than among the unimpaired workers matched with them; their injuries, however, tended to be less severe. Most important, company records did not indicate that any of the injuries were caused or contributed to by the hearing impairment.

Output Relative

Measured individual production data were available for only 67 of the persons with impaired hearing matched with 102 unimpaired workers on the same jobs. Of this group, 51 of the impaired were male and 16 were female. A group of this size does not provide enough observations to yield dependable results. While these observations are included in the over-all total for the impaired survey group, no comparative figures are shown for the hearing cases alone.

Quit Rate

Data on job separations were obtainable for 272 of the hearing cases and 430 matched unimpaired workers.

The data were obtained by means of follow-up contacts and consisted of the number of persons in the survey group who were no longer in the employ of the company 6 months after the end of the period used for the study. Rates are computed as the number of workers no longer employed per 100 workers included in the survey group.

The separation rate is made up of two factors — terminations (lay-offs, discharges, etc.) over which the employee has no control, and voluntary quits where the action is initiated by the employee. As an indication of stability on the job, it is the quit rate which is of principal interest.

The hearing cases had a somewhat lower quit rate than the unimpaired workers matched with them, 2.8 and 4.7, respectively. Male and female impaired workers both had lower quit rates than their matched unimpaired workers. For the male workers alone the rates were 2.7 and 5.7 for the impaired and unimpaired groups, respectively.

Termination rates were higher for the impaired than for the unimpaired workers. For the group as a whole the rates were 3.4 and 1.8, respectively. Terminations were principally for purposes of reduction in force, and the impaired, being in general the last to be hired, were among the first to be laid off.

The rates are probably influenced by the fact that the period was one during which there was considerable moving around among the working population in general. Although the group for which data were available is small, there is some indication that the workers with impaired hearing tended to be a little more stable on the job.

F. The Multiple Impairment Cases

Summary of Statistical Findings

The record of work performance of 587 workers with multiple impairments compared very favorably with that of 919 unimpaired workers matched with them on the same jobs. Differences were small but for the most part were in favor of the impaired workers.

The impaired group had a somewhat better injury experience than did the unimpaired workers, as indicated by the lower frequency rates of disabling and nondisabling injuries. The time lost as the result of disabling injuries, however, was about the same when measured as a rate based on scheduled workdays in the respective groups but was a little higher in terms of the number of days lost per injury. The impaired workers tended to be a little more stable on the job, as shown by the lower rate of voluntary quits, but were not quite as regular in their work attendance, as shown by the higher rate of absenteeism. Measured individual production was not available for a group sufficiently large to permit showing comparative output on the job for this survey group.

TABLE F–1.—*Work performance of workers with multiple impairments and of matched unimpaired workers*

Factor	Number of workers		Average performance	
	Impaired	Unimpaired	Impaired	Unimpaired
Absenteeism frequency rate [1]	587	919	4.3	3.3
Nondisabling injury:				
Frequency rate [2]	583	915	10.0	11.4
Disabling injury:				
Frequency rate [3]	586	918	7.3	9.4
Time-lost rate [4]	586	918	.14	.15
Average days of disability [5]			24.8	20.2
Output relative [6]	(7)	(7)	(7)	(7)
Quit rate [8]	320	531	1.5	2.8

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Data available for too few cases to permit showing performance data.
[8] Number of voluntary quits per 100 employees in the survey group.

In the light of the performance records, it seems reasonable to conclude that the impaired persons were not handicapped workers. Unquestionably, proper job placement made a major contribution to this result; but the record indicates clearly that when properly placed the workers with multiple impairments were able to compete successfully with unimpaired workers on the same jobs.

Composition of the Survey Group

This group was composed of those persons who had two or more physical impairments, each in itself severe enough to fall within the definitions adopted for the study and with whom unimpaired workers could be matched on the same jobs. The double orthopedic cases were not classified with this group but were included with the orthopedic group. As shown in table F–2 this multiple impairment group is made up of a small number of cases in each of a large number of impairment combinations. Some cases were found in 29 different impairment combinations. The largest single group was 120 persons who had both a hernia and a cardiac condition. The number of cases was too small to permit showing performance figures separately for the various impairment combinations. The number of cases in the group as a whole, however, was unexpectedly large. With 587 cases, it is the sixth

TABLE F–2.—*Number of impaired workers, by type of multiple impairment*

Type of impairment	Number of workers	Type of impairment	Number of workers
Total	587		
		Hearing-Hernia	27
Orthopedic-Vision	28	Hearing-Cardiac	13
Orthopedic-Hearing	11	Hearing-Ex-tuberculous	3
Orthopedic-Hernia	75	Hearing-Peptic ulcer	5
Orthopedic-Cardiac	21	Hernia-Cardiac	120
Orthopedic-Ex-tuberculous	9	Hernia-Ex-tuberculous	29
Orthopedic-Peptic ulcer	5	Hernia-Peptic ulcer	18
Orthopedic-Diabetic	3	Hernia-Diabetic	9
Vision-Hearing	16	Hernia-Epileptic	2
Vision-Hernia	78	Cardiac-Ex-tuberculous	22
Vision-Cardiac	52	Cardiac-Peptic ulcer	9
Vision-Ex-tuberculous	12	Cardiac-Diabetic	4
Vision-Peptic ulcer	6	Cardiac-Epileptic	1
Vision-Diabetic	4	Ex-tuberculous-Peptic ulcer	2
Vision-Epileptic	1	Peptic ulcer-Diabetic	2

largest among the 10 impairment groups studied. Only 12 of the multiple impairment cases were female, and consequently no break-down of the performance figures by sex has been prepared.

The multiple impairment cases tended somewhat toward the higher age brackets in comparison with the rest of the impaired workers studied. Only about 7 percent of the multiple cases as against 14 percent of the other impaired workers were under 30 years of age. In addition, nearly 45 percent of the multiple cases but only 27 percent of the other impaired were 55 years or older. This tendency toward the higher age levels perhaps is natural, as the fact of the existence of a second impairment would tend to bias the group in this direction.

TABLE F–3.—*Comparison of number and percentage distribution of 587 multiple impairment cases and 10,441 other impaired workers studied, by age group*

Age group	Number of workers		Percent	
	Multiple cases	Other impaired	Multiple cases	Other impaired
Total	587	10,441	100.0	100.0
Under 20 years	1	78	.2	.8
20 and under 25 years	10	501	1.7	4.8
25 and under 30 years	33	868	5.6	8.3
30 and under 35 years	42	1,075	7.2	10.3
35 and under 40 years	46	1,138	7.8	10.9
40 and under 45 years	45	1,193	7.7	11.4
45 and under 50 years	61	1,251	10.3	12.0
50 and under 55 years	88	1,474	15.0	14.1
55 and under 60 years	121	1,422	20.6	13.6
60 and under 65 years	99	989	16.9	9.5
65 years and over	41	452	7.0	4.3

Industry and Occupational Coverage

Multiple impairment cases were found in each of the 19 industry groups and in 92 of the 109 plants covered by the study. In most of the 17 plants not represented in the survey group, multiple impairment cases were encountered; but they could not be matched with unimpaired workers on the same jobs and consequently had to be excluded. The significance of this wide plant and industry distribution is that employment opportunities are potentially broad. These workers were not found exclusively in plants which had specialized programs for their employment.

The jobs at which the multiple impairment cases were employed are shown in the following listing. The occupational pattern is substantially the same as that found in the other impairment groups, with perhaps a little less concentration in the processing and producing operations and a slightly higher percentage in the custodial and unskilled jobs. On the whole, however, the range and variety of skill requirements represented by these jobs is very wide. These workers were found in jobs ranging from manual labor to the highly skilled machinist classifications. In analyzing this list of occupations, it must be borne in mind that many other jobs on which workers with multiple impairments were employed are not shown because the impaired worker could not be included in the study.

Jobs at which 587 Multiple Impairment Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with multiple impairments can be employed]

MALE

Loss of One Hand and Blind in One Eye

5. Recording and Control

Tool clerk

Loss of One Hand and Partially Blind

3. Processing

Laborer (petroleum refining)

6. Material Movement

Laborer (rubber tire and tube manufacturing)

Loss of One Hand and Hernia

1. Maintenance

Riveter, hydraulic

3. Processing

Milling-machine operator II

6. Material Movement

Electric-bridge-crane operator

7. Custodial

Laborer (machine shop)

Loss of One Hand and Cardiac

3. Processing

Power-shear operator I

5. Recording and Control

Checker

Loss of One Arm and Blind in One Eye

1. Maintenance

Electrical repairman

Jobs at which 587 Multiple Impairment Cases of the survey group were found employed — Continued

MALE — Continued

Loss of One Arm and Partially Blind

3. Processing

Laborer, process (wire)

Loss of One Arm and Hard of Hearing

1. Maintenance

Steam-fitter-apprentice

7. Custodial

Porter II

Loss of One Arm and Hernia

5. Recording and Control

Timekeeper

6. Material Movement

Laborer, foundry

7. Custodial

Gateman IV
Porter II

Loss of One Foot and Hernia

1. Maintenance

Laborer (rayon and allied products)

3. Processing

Centerless-grinder operator
Machinist, bench

5. Recording and Control

Stock clerk II

Loss of One Leg and Blind in One Eye

4. Inspection and Testing

Casting inspector

6. Material Movement

Elevator operator, freight

Loss of One Leg and Partially Blind

1. Maintenance

Pipe-fitter helper

5. Recording and Control

Checker

Loss of One Leg and Hard of Hearing

3. Processing

Buffer

7. Custodial

Porter I

Loss of One Leg and Hernia

1. Maintenance

Machinist II
Tool-grinder operator

3. Processing

Airplane woodworker II
Gear-shaper operator
Laborer, process (electrical equipment)
Major assembler I

4. Inspection and Testing

Body-assembly inspector
Inspector and tester
Single-spindle-drill-press operator

5. Recording and Control

Stock chaser II
Stock-control clerk

6. Material Movement

Electric-bridge-crane operator

7. Custodial

Porter II

Loss of One Leg and Ex-Tuberculous

3. Processing

Single-spindle-drill press operator

Loss of Use of One Leg and Diabetic

4. Inspection and Testing

Deflector operator

Loss of One Hand and Blind in One Eye

3. Processing

Cylindrical-grinder operator

7. Custodial

Porter II

Loss of Use of One Hand and Partially Blind

3. Processing

Barrel filler II
Single-spindle-drill-press operator

Loss of Use of One Hand and Hernia

1. Maintenance

Laborer (boot and shoe manufacturing)
Pipe fitter

Loss of Use of One Hand and Cardiac

3. Processing

Box maker, wood III

Loss of Use of One Hand and Ex-Tuberculous

3. Processing

Lapping-machine operator

Loss of Use of Two Hands and Hernia

3. Processing

Laborer, process (glass manufacturing)

6. Material Movement

Laborer (machine shop)

Loss of Use of Two Hands and Peptic Ulcer

3. Processing

Subassembler II

Jobs at which 587 Multiple Impairment Cases of the survey group were found employed — Continued

MALE — Continued

Loss of Use of One Arm and Blind in One Eye

3. Processing

Subassembler III

5. Recording and Control

Receiving clerk III
Tool clerk

Loss of Use of One Arm and Partially Blind

3. Processing

Rubber pressman

Loss of Use of One Arm and Deaf-Mute

4. Inspection and Testing

Hot forging inspector

Loss of Use of One Arm and Hernia

1. Maintenance

Electrical repairman
Oiler I

3. Processing

Do-all-saw operator
Glass polisher
Laborer, process (nonferrous metal alloys and products)
Stranding-machine operator

4. Inspection and Testing

Inspector (machine shop)
Magnetic inspector

5. Recording and Control

Laborer (malt liquors)

7. Custodial

Porter II

Loss of Use of One Arm and Cardiac

1. Maintenance

Boilermaker

3. Processing

Laborer, process (glass manufacturing)

4. Inspection and Testing

Inspector, chief III

Loss of Use of One Arm and Ex-Tuberculous

1. Maintenance

Pipe fitter

6. Material Movement

Electric-bridge-crane operator

Loss of Use of One Arm and Peptic Ulcer

3. Processing

Sheet-metal worker II (aircraft)

7. Custodial

Porter II

Loss of Use of One Arm and Diabetic

1. Maintenance

Fireman, stationary boiler

Loss of Use of Two Arms and Hernia

3. Processing

Laborer (glass manufacturing)

7. Custodial

Porter I

Loss of Use of One Foot and Hernia

3. Processing

Planer operator II
Punch-press operator I
Shaper operator I

5. Recording and Control

Laborer, process (aluminum products)

6. Material Movement

Laborer (glass manufacturing)

7. Custodial

Laborer (machinery manufacturing)

Loss of Use of One Leg and Partially Blind

7. Custodial

Porter I
Porter II

Loss of Use of One Leg and Totally Deaf

3. Processing

Multiple-spindle-drill-press operator

Loss of Use of One Leg and Hard of Hearing

1. Maintenance

Pumpman I

Loss of Use of One Leg and Hernia

1. Maintenance

Electrical repairman

2. Working Foremen

Foreman (electrical equipment)

3. Processing

Centerless-grinder operator
Final assembler VII
Floor assembler
Laborer (radio manufacturing)
Multiple-spindle-drill-press operator
Template maker IV

4. Inspection and Testing

Inspector (machine shop)

5. Recording and Control

Tool clerk

Jobs at which 587 Multiple Impairment Cases of the survey group were found employed — Continued

MALE — Continued

Loss of Use of One Leg and Hernia — Continued

7. Custodial

Elevator operator, passenger
Porter II

Loss of Use of One Leg and Cardiac

1. Maintenance

Machinist II

3. Processing

Gager VIII
Multiple-spindle-drill-press operator
Turret-lathe operator
Universal-grinder operator

5. Recording and Control

Shipping clerk I

Loss of Use of One Leg and Ex-Tuberculous

3. Processing

Subassembler III

Loss of Use of One Leg and Diabetic

6. Material Movement

Elevator operator, freight

Loss of Use of Two Legs and Hernia

1. Maintenance

Oiler I

Back Deformity and Blind in One Eye

3. Processing

Cabinet maker I
Tufting-machine operator

Back Deformity and Partially Blind

1. Maintenance

Carpenter
Laborer (automobile manufacturing)

7. Custodial

Porter II

Back Deformity and Hard of Hearing

1. Maintenance

Machinist II

4. Inspection and Testing

Laborer, process (malt liquors)

5. Recording and Control

Receiving clerk II

Back Deformity and Hernia

1. Maintenance

Electrical repairman
Machinist II

3. Processing

Dryer operator
Glass cutter
Jobsetter II
Laborer, process (glass manufacturing)

4. Inspection and Testing

Final-assembly inspector
Laborer, process (glass manufacturing)

5. Recording and Control

Shipping checker

Back Deformity and Cardiac

1. Maintenance

Machinist II
Millman

3. Processing

Do-all-saw operator
Laborer (glass manufacturing)
Punch-press operator I

5. Recording and Control

Store clerk II

6. Material Movement

Laborer (glass manufacturing)

Back Deformity and Ex-Tuberculous

3. Processing

Subassembler III

6. Material Movement

Tractor operator

Back Deformity and Peptic Ulcer

3. Processing

Floor assembler

Blind in One Eye and Totally Deaf

3. Processing

Machinist, bench

5. Recording and Control

Receiving checker

Blind in One Eye and Hard of Hearing

1. Maintenance

Mechanic II

5. Recording and Control

Production clerk II
Stock clerk

Blind in One Eye and Hernia

1. Maintenance

Laborer (nonferrous metal alloys and products)
Mechanic II
Millwright
Painter I
Water tender III

3. Processing

Burrer, hand
Centerless-grinder operator
Chipper foundry
Die maker II
Engine-lathe operator
Final assembler VII

Jobs at which 587 Multiple Impairment Cases of the survey group were found employed — Continued

MALE — Continued

Blind in One Eye and Hernia — Continued

3. Processing — Continued

Floor assembler
Glass grinder
Heater III
Laborer (automobile manufacturing)
Laborer (malt liquors)
Laborer (petroleum refining)
Laborer, process (automobile manufacturing)
Laborer, process (phonograph)
Punch-press operator I
Subassembler I (automobile manufacturing)
Turret-lathe operator

4. Inspection and Testing

Inspector I
Laborer, process (glass manufacturing)

6. Material Movement

Elevator operator, freight
Laborer (automobile manufacturing)
Laborer (electrical equipment)
Laborer (machinery manufacturing)

7. Custodial

Watchman I

Blind in One Eye and Cardiac

1. Maintenance

Friction-sawing-machine operator
Machinist II
Millwright

2. Working Foremen

Foreman (electrical equipment)

3. Processing

Balancer I
Engine-lathe operator
Floor assembler
Labeler, machine II
Laborer, process (automobile manufacturing)
Laborer, process (iron and steel)
Laborer, process (nonferrous metal alloys and products)
Sheet-metal worker II
Tool maker
Tube drawer

5. Recording and Control

Shipping checker

7. Custodial

Porter II

Blind in One Eye and Peptic Ulcer

3. Processing

Laborer, process (radio manufacturing)
Turret-lathe operator

4. Inspection and Testing

Inspector I

Blind in One Eye and Epileptic

6. Material Movement

Laborer (pulp and paper)

Legally Blind and Hernia

1. Maintenance

Fireman, stationary boiler

Legally Blind and Peptic Ulcer

1. Maintenance

Boilermaker

Legally Blind and Hard of Hearing

1. Maintenance

Boilermaker
Mechanic II
Pipe fitter

3. Processing

Blast furnace blower
Laborer, process (iron and steel)
Stillman helper
Subassembler III

5. Recording and Control

Stock clerk II

6. Material Movement

Laborer (malt liquors)

7. Custodial

Porter I

Partially Blind and Hernia

1. Maintenance

Carpenter
Laborer (petroleum refining)
Mechanic II
Millwright
Painter I
Pipe-fitter helper

2. Working Foremen

Foreman (chemical)

3. Processing

Barrel filler II
Box maker, wood III
Fireman, still
Floor assembler
Form builder I
Heater III
Laborer (malt liquors)
Laborer (petroleum refining)
Laborer, process (aircraft manufacturing)
Laborer, process (malt liquor)
Laborer, process (petroleum refining)
Machinist II
Milling-machine operator II
Molder, floor
Paper cutter I
Patternmaker, metal
Pressman, paraffin plant
Pumpman helper

4. Inspection and Testing

Magnaflux inspector

5. Recording and Control

Tool clerk

6. Material Movement

Laborer (bakery products)
Laborer (chemicals)
Laborer (malt liquors)
Laborer (rayon and allied products)

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Jobs at which 587 Multiple Impairment Cases of the survey group were found employed — Continued

MALE — Continued

Partially Blind and Hernia — Continued

7. Custodial

Porter I
Porter II
Watchman I

Partially Blind and Cardiac

1. Maintenance

Electrical repairman
Fireman, stationary
Laborer (iron and steel)
Laborer (petroleum refining)
Machinist II
Mechanic II
Oiler I
Pipe-fitter helper
Sheet-metal worker II

3. Processing

Chipper, foundry
Fireman, still
Glass polisher
Laborer, process (glass manufacturing)
Laborer, process (petroleum refining)
Molder, bench
Painter, spray I
Pressman, paraffin plant
Rubber compounder
Subassembler III
Universal-grinder operator

5. Recording and Control

Tool clerk

6. Material Movement

Laborer (iron and steel)
Laborer (machine shop)
Laborer (malt liquors)

7. Custodial

Gateman IV
Porter I
Porter II
Watchman I

Partially Blind and Ex-Tuberculous

1. Maintenance

Laborer (iron and steel)
Pipe fitter
Sheet-metal worker II

6. Material Movement

Hot-metal crane operator
Laborer (iron and steel)

Partially Blind and Peptic Ulcer

1. Maintenance

Pipe-fitter helper

3. Processing

Cylindrical-grinder operator

Partially Blind and Diabetic

1. Maintenance

Oiler I
Riveter, hydraulic

3. Processing

Machinist II

5. Recording and Control

Stock clerk II

Totally Deaf and Hernia

3. Processing

Engine-lathe operator
Punch-press operator I

7. Custodial

Watchman I

Totally Deaf and Cardiac

1. Maintenance

Machinist II

Totally Deaf and Ex-Tuberculous

4. Inspection and Testing

Inspector (machine shop)

Hard of Hearing and Hernia

1. Maintenance

Boilermaker

3. Processing

Bolt-threading-machine operator
Burrer, hand
Final assembler VII
Job setter II
Laborer, process (glass manufacturing)
Punch-press operator I
Riveter, aircraft
Single-spindle-drill-press operator
Subassembler I (automobile manufacturing)

4. Inspection and Testing

Electrical inspector II
Installation inspector

6. Material Movement

Laborer (automobile manufacturing)

7. Custodial

Porter II

Hard of Hearing and Ex-Tuberculous

3. Processing

Engine-lathe operator
Milling-machine operator II

Hard of Hearing and Peptic Ulcer

1. Maintenance

Machinist II
Painter I
Welder, combination

5. Recording and Control

Tool clerk

Deaf-Mute and Hernia

3. Processing

Broaching-machine operator
Laborer, process (nonferrous metal alloys and products)
Multiple-spindle-drill-press operator
Radial-drill-press operator

4. Inspection and Testing

Hardness inspector

Jobs at which 587 Multiple Impairment Cases of the survey group were found employed — Continued

MALE — Continued

Deaf-Mute and Hernia — Continued

7. Custodial

Laborer (foundry)

Hernia and Cardiac

1. Maintenance

Blacksmith II
Carpenter
Carpenter helper
Fireman, stationary boiler
Laborer (forging)
Laborer (railroad transportation)
Machinist II
Mechanic II
Millwright
Pipe fitter
Sheet-metal worker II
Steam fitter

2. Working Foremen

Foreman, turret-lathe operator

3. Processing

Airplane woodworker II
Assembler III
Baker I
Brush hand
Buffer I
Burrer, hand
Chemical operator III
Cylindrical-grinder operator
Dividing-machine operator
Electrician, airplane I
Engine-lathe operator
Filter operator V
Final assembler VII
Floor assembler
Foil-rolling-machine operator
Glassblower, laboratory apparatus
Internal-grinder operator
Laborer (foundry)
Laborer (iron and steel)
Laborer, process (foundry)
Laborer, process (glass manufacturing)
Laborer, process (glass products)
Laborer, process (iron and steel)
Laborer, process (machine tools and accessories)
Laborer, process (nonferrous metal alloys and products)
Loader VIII
Major assembler I
Milling-machine operator II
Milling machine operator, automatic
Power-shear operator I
Punch-press operator I
Radial-drill-press operator
Sheet-metal worker, aircraft
Single-spindle-drill press operator
Sorter
Still-operator helper
Stopper maker II
Subassembler I (automobile manufacturing)
Subassembler II
Surface-grinder operator
Tool-grinder operator
Tool maker
Turret-lathe operator

4. Inspection and Testing

Inspector (machine shop)
Sheet-metal inspector I
Tank tester I

5. Recording and Control

Checker
Stock clerk II
Tool clerk

6. Material Movement

Brakeman, yard I
Electric-bridge-crane operator
Laborer (bakery products)
Laborer (iron and steel)
Laborer (machinery manufacturing)
Laborer (machine tools and accessories)
Laborer (nonferrous metal alloys and products)
Laborer (petroleum refining)
Laborer (rayon and allied products)

7. Custodial

Elevator operator, passenger
Porter I
Porter II

Hernia and Ex-Tuberculous

1. Maintenance

Boilermaker
Boilermaker helper II
Electrical repairman
Millwright
Oiler I

3. Processing

Engine-lathe operator
Floor assembler
Gear-hobber operator
Instrument maker I
Internal-grinder operator
Jobsetter II
Laborer, process (foundry)
Laborer, process (glass manufacturing)
Laborer, process (petroleum refining)
Milling-machine operator II
Plunger
Screw-machine operator, semiautomatic
Tool-grinder operator
Welder, spot

5. Recording and Control

Laborer, process (iron and steel)
Tool clerk

6. Material Movement

Brakeman, yard I
Industrial-locomotive operator
Laborer (machinery manufacturing)

7. Custodial

Gateman IV
Watchman, crossing

Hernia and Peptic Ulcer

1. Maintenance

Instrument repairman
Machinist II
Millman
Pipe-fitter helper
Welder, combination

3. Processing

Cylindrical-grinder operator
Die-casting-machine operator II
Floor assembler
Laborer, process (automobile parts)
Laborer, process (leather manufacturing)
Major assembler I
Milling-machine operator II
Planer operator II
Plater I

Jobs at which 587 Multiple Impairment Cases of the survey group were found employed — Continued

MALE — Continued

Hernia and Peptic Ulcer — Continued

3. Processing — Continued

Presser, machine I
Tool maker
Treater II

4. Inspection and Testing

Body-assembly inspector

5. Recording and Control

Stock clerk II

7. Custodial

Gateman IV
Porter II

Hernia and Diabetic

1. Maintenance

Lead burner
Machinist II
Millman (woodworking)

3. Processing

Engine-lathe operator
Laborer, process (malt liquors)

5. Recording and Control

Tool clerk

6. Material Movement

Laborer (automobile manufacturing)

7. Custodial

Porter II

Cardiac and Ex-Tuberculous

1. Maintenance

Machinist II
Machinist apprentice
Pipe fitter

3. Processing

Brake operator, machine II
Film spooler
Floor assembler
Glass grinder
Job setter II
Milling-machine operator II
Radial-drill-press operator
Sandblaster I
Tool grinder I

4. Inspection and Testing

Inspector I
Inspector (machine shop)

7. Custodial

Gateman IV
Porter I
Porter II

Cardiac and Peptic Ulcer

1. Maintenance

Instrument repairman
Machinist II
Mechanic II
Welder, combination

3. Processing

Gear-shaper operator
Treater II

5. Recording and Control

Tool clerk

7. Custodial

Porter I
Watchman I

Cardiac and Diabetic

1. Maintenance

Carpenter

3. Processing

Die maker II
Induction-furnace operator
Straightener, hand

Cardiac and Epileptic

6. Material Movement

Laborer (paper and pulp)

Ex-Tuberculous and Peptic Ulcer

3. Processing

Vertical-boring-mill operator

6. Material Movement

Electric-bridge-crane operator

Diabetic and Epileptic

6. Material Movement

Laborer (petroleum refining)

7. Custodial

Police officer

FEMALE

Loss of Use of One Leg and Cardiac

4. Inspection and Testing

Inspector (optical goods)

Loss of Use of One Hand and Partially Blind

3. Processing

Laborer, process (electrical equipment)

Loss of Use of One Arm and Blind in One Eye

3. Processing

Sewing-machine operator (shirts and related products)

Loss of Use of One Leg and Hard of Hearing

3. Processing

Laborer, process (boot and shoe)

Loss of Use of One Leg and Ex-Tuberculous

3. Processing

Assembler
Floor assembler

Jobs at which 587 Multiple Impairment Cases of the survey group were found employed — Continued

MALE — Continued	*Blind in One Eye and Cardiac*	*Totally Deaf and Cardiac*
Loss of Use of Two Legs and Cardiac	**3. Processing**	**3. Processing**
4. Inspection and Testing	Floor assembler	Cigar packer
Inspector (machine shop)		
Blind in One Eye and Totally Deaf	*Partially and Cardiac*	*Cardiac and Ex-Tuberculous*
3. Processing	**3. Processing**	**3. Processing**
Laborer, process (electrical equipment)	Laborer, process (glass manufacturing)	Stripper, machine

Placement Practices

The medical examination was found to be very important for cases of multiple impairment. For example, in the combination of orthopedic and hernia the first impairment might be visible but the second would not. The existence of the second might not be disclosed in the absence of physical examination, with the resultant danger of work assignment which would aggravate the condition.

Placement of cases of multiple impairment naturally is complicated by the requirements of two impairments. The job which is suitable for a man with only one arm might be entirely out of the question if he happens also to have a diabetic or cardiac condition. None of the plants studied, however, seemed to have any special arrangements for placement of multiple impairment cases. The regular techniques were used, and it seemed to be merely a matter of considering a few more factors.

Work Performance

The comparison of the work performance of the workers with multiple impairments and the unimpaired workers with whom they were matched is summarized in table F–1 and the following paragraphs.

Absenteeism

An absence was defined as a full day or more away from the job on days on which the employee was scheduled to work. Lay-offs, vacations, etc., were not counted as either absences or as scheduled days. Absenteeism is expressed as a rate reflecting the number of days absent per 100 scheduled workdays.

Data for this factor of work performance were available for 587 multiple impairment cases and for 919 matched unimpaired workers. As a group the impaired workers were a little less regular in their work attendance, with an average rate of absenteeism of 4.3 as against 3.3 for the unimpaired group.

The individual rates of absenteeism are shown as a frequency distribution in table F–4. About the same proportion, 24 percent, of the workers in each group had no absences during the periods studied. Among the impaired workers, however, there was a slightly higher percentage of cases in the higher frequencies. For example, 3.8 percent of the impaired group as against only 2.1 percent of the unimpaired had excessively high rates of 20.0 or higher. It seems that while in general the two groups showed no substantial difference in regularity of attendance, the individuals with very poor records are slightly more numerous in the impaired group.

TABLE F–4.—*Percentage distribution of 587 multiple impairment cases and 919 unimpaired workers, by absenteeism frequency rate* [1]

Absenteeism frequency rate class	Impaired	Unimpaired
0	24.2	24.6
0.1 and under 1.0	12.6	17.1
1.0 and under 2.0	14.7	15.0
2.0 and under 3.0	9.2	9.2
3.0 and under 5.0	13.0	13.3
5.0 and under 10.0	12.2	12.2
10.0 and under 20.0	10.3	6.5
20.0 and over	3.8	2.1
Total	100.0	100.0

[1] Number of days lost per 100 scheduled workdays.

Wherever possible, the reason for the absence was recorded. Unfortunately, company records provided

this information for only about half the absences, and the rest had to be recorded as "unknown." The rates attributable to various reasons for absence are shown in table F–5, and it is apparent that absence because of illness accounted for most of the difference between the two groups of workers. Although the data were fragmentary, there was some indication that a greater incidence of illness absenteeism among the diabetic and the peptic ulcer cases accounted for much of the higher absenteeism rate among the multiple impairment cases.

TABLE F–5.—*Absenteeism frequency rates [1] for 587 multiple impairment cases and 919 unimpaired workers, by reason for absence*

Reason for absence	Impaired	Unimpaired
Total	4.3	3.3
Illness	2.1	1.3
Personal business	.4	.3
Unknown	1.8	1.7

[1] Number of days lost per 100 scheduled workdays.

Nondisabling Injury Experience

A nondisabling injury was defined as a work-connected injury which did not result in a permanent impairment or in any loss of time beyond the day or shift on which the injury occurred. The frequency of such injuries is expressed as a rate based on 10,000 exposure-hours for the group and on 1,000 exposure-hours for each individual.

Data were available for 583 of the multiple impairment cases and the 915 unimpaired workers matched with them. As a group the impaired workers had the lower frequency rate, 10.0 as against 11.4 for the unimpaired workers. The variation here can hardly be considered a significant difference, but it does show that the impaired workers were no more prone to this type of injury than unimpaired workers exposed to the same hazards.

TABLE F–6.—*Percentage distribution of 583 multiple impairment cases and 915 unimpaired workers, by frequency rate [1] of nondisabling injury*

Frequency rate class	Impaired	Unimpaired
0	51.0	47.8
0.1 and under 1.0	19.4	21.8
1.0 and under 2.0	13.6	13.6
2.0 and under 3.0	6.3	6.9
3.0 and under 5.0	5.5	5.7
5.0 and under 10.0	2.7	3.1
10.0 and over	1.5	1.1
Total	100.0	100.0

[1] Number of injuries per 1,000 exposure-hours.

A frequency distribution of the individual rates shows that 51 percent of the impaired and 48 percent of the unimpaired experienced no nondisabling injuries during the periods studied. In the higher frequencies there were scattered cases of poor performance in both groups; 1.5 percent of the impaired and 1.1 percent of the unimpaired had excessively high rates of 10.0 or higher.

Information as to the nature of the injuries was obtained in order to determine whether the impaired workers displayed any proneness to some particular kind of injury. The group rates based on 10,000 exposure-hours and attributable to various types of injury are shown in table F–7. The similarity of the pattern of the rates in the two groups is very marked. It seems reasonable to infer from this similarity of pattern that the injuries were attributable to the job hazards, not to the impairments which characterized one of the groups.

TABLE F–7.—*Frequency rates [1] of nondisabling injury for 583 multiple impairment cases and 915 unimpaired workers, by nature of injury*

Nature of injury	Impaired	Unimpaired
Total	10.0	11.4
Burns and scalds	.5	.6
Cuts and abrasions	7.6	8.6
Eye injuries	1.4	1.5
Strains and sprains	.3	.4
Other	.2	.3

[1] Number of injuries per 10,000 exposure-hours.

In an effort to obtain some measure of the relative severity of these nondisabling injuries in the two groups, data on redressings were also recorded. Practices varied between plants with respect to encouraging or requiring redressings, but the conditions were the same for both the impaired and the unimpaired in any given plant. There was no material difference in the average number of redressings required in the two groups. The impaired averaged 1.0 and the unimpaired 0.9 redressings per injury. It would seem reasonable to conclude, therefore, that there was no material difference in the severity of these injuries in the two groups.

In brief, the nondisabling injury experience was nearly identical among the impaired persons of this survey group and the unimpaired workers matched with them. There was clearly no proneness on the part of the impaired worker toward either greater frequency or greater severity of nondisabling injury.

A final consideration in connection with the medical record was nonindustrial use of medical facilities.

Such use was defined as a dispensary visit for illness or injury not connected with the worker's employment. Again, policies varied widely between companies but were the same for the impaired and unimpaired workers in the same company. The frequency of nonindustrial visits was nearly identical in the two groups. The impaired averaged 1.9 and the unimpaired 1.7 such visits per person during the periods studied.

Disabling Injury Experience

Frequency. A disabling injury was defined as one which resulted in a permanent impairment or in a time loss of at least one full day beyond the day or shift on which the injury occurred. The frequency of injury was expressed as a rate reflecting the number of such injuries per million hours worked.

The impaired workers had a somewhat better record in this respect than did the unimpaired workers exposed to the same hazards. For the impaired, the rate was 7.3 and for the unimpaired 9.4. This might or might not represent a considerable difference, depending upon the severity of the injuries and the resultant compensation claims.

Various materials such as accident reports, cause analysis studies, etc., available in the files of cooperating firms were examined in connection with the disabling injuries recorded. None of the injuries among the impaired workers of this survey group were indicated as having been caused or contributed to by the worker's impairment. Similarly, none of the injuries experienced by unimpaired workers of the survey group were related in any way to a fellow worker's impairment. This subject of causal relationship between impairment and injury was discussed with responsible officials at each plant studied. In each case the opinions of these officials and the findings of the study were in accord. These impaired persons, properly placed on the job, were not a hazard either to themselves or to their fellow workers. The record demonstrated in fact that, in general, the impaired workers as a group experienced a slightly lower incidence of disabling injury than did the unimpaired workers exposed to the same hazards.

Time Lost. An important consideration with respect to disabling injury experience is the severity of the injuries. In this survey group the severity of the injuries is indicated in two ways: as a group rate (days lost per 100 scheduled workdays) and as the number of days lost per injury.

In both the impaired and the unimpaired groups, the time lost per injury was rather high. For the impaired the average was 24.8 days and for the unimpaired 20.2 days per injury. This average, of course, is based on only a small number of observations. There were only 8 disabling injuries in the impaired group and 16 in the unimpaired group. In each group there was an extreme case which influenced the average sharply. Among the impaired, 1 injury resulted in 53 days of lost time, and in the unimpaired group 1 case resulted in a time loss of 91 days. If the averages were computed eliminating these two cases, they would be nearly identical, 20 days and 19 days per injury for the impaired and unimpaired, respectively.

Output Relative

Measured individual production data were obtainable for only 43 of the impaired workers and 64 unimpaired workers matched with them. These data have been included in computing the output relative for the total survey group, but the number of observations was considered too small to permit showing an output relative for the multiple impairment cases separately.

Although comparatively few of these workers were on individual incentive jobs, it was noted that others were working on group incentive or on assembly lines. On group incentive, the impaired worker would have to be able to contribute his share of the work or the earnings of the group would suffer accordingly. Similarly, on assembly line work the speed of work was generally paced by the line. Under both sets of conditions, the fact of their employment indicated that the multiple impairment cases were able to hold up their end of the job.

Quit Rate

The quit rate reflects the number of voluntary quits per 100 employees during the 6 months following the end of the survey period. Data were obtained by means of follow-up on 320 of the multiple impairment group and 531 unimpaired workers matched with them.

These impaired workers were somewhat more stable on the job, with a quit rate of 1.5 as against 2.8 for the unimpaired. Two impaired and two unimpaired workers quit for reasons of health. None of the im-

paired as against two of the unimpaired quit because of dissatisfaction with the job. One of the impaired and eight of the unimpaired quit for reasons listed as "other," principal of which were "to take other job" and "to start own business."

Terminations were very much higher for the impaired workers, with a rate of 7.2 as against 3.4 for the unimpaired. In these separations, however, the initiative did not lie with the employee. Reduction in force was the principal cause for terminations. It was to be expected that the impaired would have the higher rate because, being in general the last to be hired, their lesser seniority would place them among the first to be laid off.

G. The Ex-Tuberculous Cases

Summary of Statistical Findings

The work performance record of about 500 ex-tuberculous cases compared favorably with that of about 900 unimpaired workers matched with them on the same jobs.

That the impaired and unimpaired workers were about equally regular in their work attendance and had about the same nondisabling injury experience is indicated by the similar group rates for these two factors. In the case of disabling work injury, however, the ex-tuberculous cases made a substantially better record than did the unimpaired workers exposed to the same hazards. In addition, the ex-tuberculous cases were somewhat more stable on the job, as indicated by the lower voluntary quit rate. Data with which to measure relative output was not available for a sufficiently large number of cases to permit showing performance figures.

TABLE G–1.—*Work performance of ex-tuberculous cases and of matched unimpaired workers*

Factor	Number of workers		Average performance	
	Impaired	Unimpaired	Impaired	Unimpaired
Absenteeism frequency rate [1]	513	910	3.7	3.5
Nondisabling injury:				
Frequency rate [2]	507	902	15.2	14.2
Disabling injury:				
Frequency rate [3]	512	909	5.9	10.3
Time-lost rate [4]	512	909	.05	.09
Average days of disability [5]			11.7	11.4
Output [6]	(7)	(7)	(7)	(7)
Quit rate [8]	200	383	.5	2.6

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Data available for too few cases to permit showing performance figures.
[8] Number of voluntary quits per 100 employees in the survey group.

On the whole, the outstanding feature of the findings was the similarity between the two groups of impaired and unimpaired workers. Differences were present but they were minor except with respect to disabling work injuries, where the ex-tuberculous cases made a substantially better record. In light of the comparative records of the two groups, it seems reasonable to conclude that the ex-tuberculous cases were normal workers who, properly placed, were able to compete successfully with unimpaired workers on the same jobs.

Composition of the Survey Group

All workers who were specifically designated in the medical records as arrested pulmonary tuberculous cases and with whom unimpaired workers could be matched on the same jobs were included in the study. An effort was made to classify each case as minimal, moderate, or far advanced, but information on this point was available from company records in only a very few instances. It was necessary, therefore, to dispense with classification and to show performance figures for the arrested tuberculosis cases as a single group.

The 513 arrested tuberculosis cases showed a heavier concentration in the middle age brackets, in comparison with the 10,515 impaired workers comprising the rest of the survey group. About 11 percent of the ex-tuberculous cases as against 14 percent of the other impaired workers were under the age of 30,

TABLE G–2.—*Comparison of number and percentage distribution of 513 ex-tuberculous cases and 10,515 other impaired workers studied, by age group*

Age group	Number of workers		Percent	
	Ex-tuberculous	Other impaired	Ex-tuberculous	Other impaired
Total	513	10,515	100.0	100.0
Under 20 years	2	77	.4	.7
20 and under 25 years	14	497	2.7	4.7
25 and under 30 years	40	861	7.8	8.2
30 and under 35 years	65	1,052	12.7	10.0
35 and under 40 years	65	1,119	12.7	10.7
40 and under 45 years	98	1,140	19.1	10.8
45 and under 50 years	72	1,240	14.0	11.8
50 and under 55 years	76	1,486	14.8	14.1
55 and under 60 years	52	1,491	10.1	14.2
60 and under 65 years	24	1,064	4.7	10.1
65 years and over	5	488	1.0	4.7

while only 16 percent of the ex-tuberculous as against nearly 30 percent of the rest of the impaired workers were 55 years of age or older. It may be that the rather long period of time usually required to arrest tuberculosis may result in raising slightly the age at which these impaired persons enter upon active employment when the illness is contracted in early years. The group is too small to support definite conclusions, but it is possible too that the person with arrested tuberculosis may tend to withdraw from the labor market at a slightly earlier age than is characteristic of other types of physical impairment.

The number of cases of arrested tuberculosis encountered in the study was smaller than had been expected. In the 109 plants there were 513 such cases with whom unimpaired workers could be matched on the same jobs making this impairment group seventh in point of size among the 10 impairments studied. The survey group was composed of 483 impaired males matched with 858 unimpaired males and 30 impaired females matched with 52 unimpaired females. The female cases constituted too small a group to permit showing performance figures separately for them. Their presence did not affect materially the performance figures for the group as a whole.

Industry and Occupational Coverage

The ex-tuberculous cases were widely distributed among the various industry classifications. The survey group contains some representation from 17 of the 19 major industry groups and from 82 of the 109 plants covered by the study.

The fact that a large number of plants and industries are represented in the survey group is an important consideration in evaluating the findings. The performance figures do not show results attained under some special or ideal set of conditions but are a composite of performance records under widely differing conditions of employment.

The jobs at which the impaired persons of this survey group were employed are shown in the following listing. Work in the processing or production operations accounted for a majority of the workers studied, with a lesser representation in jobs in maintenance and material movement.

The range of skills represented by these jobs is very broad, extending from common labor to highly skilled machinist work. The jobs involving some skill and training were the most common, and it is significant that only about 5 percent of the cases studied were employed on the unskilled custodial jobs, such as janitor, porter, etc. This tendency toward the more-skilled jobs may have been the result of two forces: First, the person with arrested tuberculosis either was able to continue to exercise skills he had acquired before the impairment or was able to acquire new ones readily; and, second, job opportunities were probably greater for those who had a skill to sell than for those who did not. It must be borne in mind, however, that this listing of jobs is merely a token list. Because of the requirement of matching with unimpaired workers on the same jobs, many ex-tuberculous cases could not be included in the study and consequently their occupations are not recorded.

Jobs at which 513 Ex-Tuberculous Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with this impairment can be employed]

MALE

1. Maintenance

Boilermaker
Bricklayer, refractory brick
Carpenter
Electrical repairman
Fireman, stationary boiler
Floor assembler I
Hostler, inside
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (building)
Laborer (iron and steel)
Laborer (petroleum refining)
Laborer (railroad transportation)
Laborer, process (machine shop)
Lead burner
Machinist II
Machinist apprentice
Maintenance mechanic II
Millwright
Oiler I
Painter I
Pipe fitter
Pipe-fitter helper
Rigger III
Sheet-metal worker II
Steam-fitter apprentice
Truck mechanic
Water tender III
Welder, acetylene

2. Working Foremen

Foreman (nonferrous metal alloys and products)
Inspector (machine shop)

3. Processing

Aircraft mechanic
Airplane woodworker II
Bending-roll operator

Jobs at which 513 Ex-Tuberculous Cases of the survey group were found employed — Continued

MALE — Continued

3. Processing — Continued

Boring-machine operator
Boxmaker, wood III
Buffer I
Bulldozer operator
Burrer, hand
Charging-machine operator I
Chassis assembler II
Chipper, foundry
Cigarette-making-machine operator
Circular-sawing-machine operator
Circle-shear operator I
Coremaker I
Crankshaft plugger
Crusher man IV
Cupola tender
Cut-off-saw operator
Cyanide-furnace operator
Cylindrical-grinder operator
Detailer II
Die maker II
Dockman II
Dough mixer
Electrical adjuster
Electrician, airplane I
Engine-lathe operator
Experimental mechanic
Facing mixer
Final assembler VII
Flame-cutter operator
Floor assembler II
Forging-press operator
Forming-press operator I
Gatherer
Gear-generator operator
Gear-hobber operator
Heat treater II
Heater, forge
Horizontal-boring-and-milling machine operator
Internal-grinder operator
Job setter II
Laborer (foundry)
Laborer (iron and steel)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (cutlery tools)
Laborer, process (foundry)
Laborer, process (hardware)
Laborer, process (iron and steel)
Laborer, process (machine tools and accessories)
Laborer, process (machinery manufacturing)
Ladle liner
Lathe operator, automatic I
Lehr man
Leverman, table
Machine molder, jarring
Machine molder, squeeze
Machinist II
Machinist, bench
Major-assembly installer
Marker
Milling-machine operator II
Molder
Molding machine tender
Multiple-spindle-drill-press operator
Ovenman helper
Painter, spray I
Patternmaker XI
Patternmaker, wood
Planer operator II
Plunger
Power-shear operator I
Presser, machine I
Punch-press operator I
Radial-drill-press operator
Radiator-core assembler
Rewinder operator
Riveter, aircraft
Riveter, pneumatic III
Roller operator V
Sandblaster
Screw-machine operator, automatic
Second helper II
Sheet-metal worker, aircraft
Shredder operator II
Single-spindle-drill-press operator
Soaker-cleaner operator
Still-operator helper
Subassembler
Subassembler II
Subassembler III
Surface-grinder operator
Template maker IV
Tool-grinder operator
Tool maker
Tool-maker apprentice
Trimming-press operator II
Turret-lathe operator
Vertical-boring-mill operator
Vertical-turret-lathe operator
Welder, acetylene
Wireman VI
Yarn winder

4. Inspection and Testing

Assorter VI
Balancer I
Checker
Final assembly inspector, fuselage installation
Gater IV
Inspector I
Inspector, chief III
Inspector (machine)
Inspector and tester
Machinist II
Radio repairman I
Tester I
Tool inspector

5. Recording and Control

Laborer, process (iron and steel)
Material clerk
Production clerk II
Receiving clerk III
Shipping checker
Shipping clerk I
Stock clerk II
Tool clerk

6. Material Movement

Brakeman, yard I
Electric-bridge-crane operator
Electric truck operator
Fireman, industrial locomotive
Fireman, portable boiler
Follow-up man III
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (bakery products)
Laborer (foundry)
Laborer (iron and steel)
Laborer (machinery manufacturing)
Laborer (malt liquors)
Locomotive-crane operator
Truck-crane operator

7. Custodial

Gateman
Laborer (automobile parts)
Laborer, process (automobile manufacturing)
Police officer
Porter I
Porter II
Watchman I

FEMALE

3. Processing

Airplane woodworker
Assembler III
Box maker I
Burrer, hand

Jobs at which 513 Ex-Tuberculous Cases of the survey group were found employed — Continued

FEMALE — Continued

30. Processing — Continued

Cigar packer
Coil winder II
Cutter, machine I
Detail assembler II
Final assembler VII
Instrument maker I
Laborer (radio manufacturing)
Laborer (surgical appliances)
Laborer, process (electrical equipment)
Laborer, process (foundry)
Laborer, process (tobacco products manufacturing)
Painter, aircraft
Sewing-machine operator (textile)
Sewing-machine operator (men's tailored garments)
Stitcher, machine (boot and shoe)
Stripper, machine

4. Inspection and Testing

Cigarette-package examiner
Inspector (machine shop)

6. Material Movement

Distributor I

Placement Practices

For the person with arrested tuberculosis the preemployment physical examination is extremely important. So too are the periodic physical check-ups which are provided in many plants or are available to the employee from outside sources. From the standpoint of proper placement, the degree of the arrested case and the general appraisal of physical abilities are essential.

Proper placement of the person with arrested tuberculosis requires the exercise of careful analysis and good judgment on the part of the placement officer. Certain types of dust conditions, humidity, and temperature extremes are generally avoided in placing these cases. In general, too, jobs which may produce excessive general fatigue or great mental strain are also avoided. The placement officer, however, has to consider the environmental and physical requirement factors against a variety of others, such as the skills the applicant possesses, how long the case has been arrested, and the general physical capacities of the individual. The problems posed for the placement officer by the extreme variety of environmental and job requirement conditions to which the individual case may be adaptable are further indicated by the preceding job listing.

Only 7 of the 109 plants studied had exclusion policies affecting ex-tuberculous cases. In some plants persons with arrested tuberculosis were excluded from certain departments because of environmental conditions not suitable for their employment. These policies, however, were directed at protecting the impaired person against employment under conditions which might aggravate the impairment, not at excluding him from employment in the plant.

Apparently no need for job re-engineering to provide for employment of these cases had been encountered in the plants studied. For this impairment changes might have been directed toward either the environmental conditions or the work methods, but no such instances were encountered in the study.

Work Performance

The ex-tuberculous cases, as a group, turned in a record of performance which compared favorably with that of the unimpaired workers matched with them on the same jobs.

Data were available for a sufficiently large group to permit showing performance for four of the five factors under consideration in the study. The number of cases for which production data were obtainable were too few to permit showing an output relative. Table G–1 and the following paragraphs summarize the findings.

Absenteeism

For the purpose of this study, an absence was defined as absence of one full day or more on days on which the employee was scheduled to work. Vacations, lay-offs, shut-downs, etc., were not counted as either days absent or as scheduled workdays. Absenteeism was computed as a rate reflecting the number of such absences per 100 scheduled workdays.

The 513 impaired workers of the survey group had a fractionally higher rate than the 910 unimpaired workers with whom they were matched, 3.7 and 3.5, respectively. The variation in these rates indicates that the impaired workers as a group might be expected to be absent from their work about one more day than unimpaired workers in each 500 scheduled workdays. This does not seem to constitute a significant difference, and it probably should be said that as a group the impaired and unimpaired workers were about equally regular in their work attendance.

The individual rates for workers in the two groups are compared by means of a frequency distribution in table G–3. This comparison bears out the similarity of performance indicated by the group averages. About 20 percent in both groups had no absences at all during the periods studied. There were 63 percent of the impaired and 67 percent of the unimpaired who had rates of less than 3 days per 100 scheduled days. In both groups there were individual instances of very poor work attendance: 1.2 percent of the impaired and 0.8 percent of the unimpaired had excessive rates of 30.0 or higher. While these were scattered individual cases, not group characteristics, their presence accounts for the slightly higher rate among the impaired workers.

Both the group averages and the comparison of individual rates point toward the similarity of the performance of the two groups of workers. Clearly, there was no greater tendency toward excessive absenteeism on the part of the arrested tuberculosis cases than was apparent among the unimpaired workers matched with them.

TABLE G–3.—*Percentage distribution of 513 ex-tuberculous cases and 901 unimpaired workers, by absenteeism frequency rate* [1]

Absenteeism frequency rate class	Impaired	Unimpaired
0	19.7	20.5
0.1 and under 1.0	16.6	16.6
1.0 and under 2.0	15.4	18.2
2.0 and under 3.0	11.3	11.4
3.0 and under 5.0	12.5	11.5
5.0 and under 10.0	12.9	12.9
10.0 and under 20.0	8.6	7.2
20.0 and under 30.0	1.8	.9
30.0 and over	1.2	.8
Total	100.0	100.0

[1] Number of days lost per 100 scheduled workdays.

An effort was made to determine the reason for each absence. Unfortunately, in many cases company records did not provide this information and the reason for more than half the absences had to be recorded as unknown. However, for the cases in which reason for absence was given, the similarity between the two groups is marked. Table G–4 shows that the rates attributable to illness were identical and those attributable to personal business were very nearly the same in the two groups. While the number of absences for which the reason was unknown is too large to permit conclusions, there is some indication that the impaired and unimpaired not only had about the same rates of absenteeism but were absent for about the same reasons.

TABLE G–4.—*Absenteeism frequency rates* [1] *for 513 ex-tuberculous cases and 910 unimpaired workers, by reason for absence*

Reason for absence	Impaired	Unimpaired
Total	3.7	3.5
Illness	1.1	1.1
Personal business	.3	.4
Unknown	2.3	2.0

[1] Number of days lost per 100 scheduled workdays.

Nondisabling Injury Experience

A nondisabling injury was defined as a work-connected injury which did not result in a permanent impairment or in any lost time beyond the day or shift on which the injury occurred. The group injury experience is expressed as a rate reflecting the number of injuries per 10,000 exposure-hours. The individual rates were computed on a 1,000-hour base. Data for this factor were available for 507 of the arrested tuberculosis cases matched with 902 unimpaired workers on the same jobs.

Among the impaired workers the rate was 15.2 and among the unimpaired workers 14.2 injuries per 10,000 exposure-hours. This variation in the rates indicates that the impaired workers experienced one more nondisabling injury than the matched unimpaired workers in each 10,000 hours of work. Considering that these are typically the iodine-and-adhesive-tape type of injury, this difference does not seem significant.

While the averages indicate a very similar group experience, they may or may not be an accurate reflection of the individual experience. In order to compare this individual experience, the injury frequency rate for each individual was computed on a base of 1,000 exposure-hours and the rates are shown as a frequency distribution in table G–5. The nearly identical pattern of the rates in the two groups is further evidence of the similarity of the experience. Nearly half the workers in each group had no nondisabling injuries during the periods studied. The concentration was heavy in the lower frequencies, with 82 percent of the impaired and 81 percent of the unimpaired having a frequency of 1.9 or less per 1,000 exposure-hours. The experience, however, was not uniformly good. In each group there were scattered examples of poor performance. About 3 percent of the impaired and 2 percent of the unimpaired had very high rates of 10.0 or higher.

TABLE G–5.—*Percentage distribution of 507 ex-tuberculous cases and 902 unimpaired workers, by frequency rate [1] of nondisabling injury*

Frequency rate class	Impaired	Unimpaired
0	48.1	48.6
0.1 and under 1.0	20.5	21.6
1.0 and under 2.0	13.4	10.8
2.0 and under 3.0	3.9	6.1
3.0 and under 5.0	5.3	6.2
5.0 and under 10.0	5.8	4.8
10.0 and over	3.0	1.9
Total	100.0	100.0

[1] Number of injuries per 1,000 exposure-hours.

An effort was made to determine whether there was any difference in the nature of the injuries experienced by the two groups of workers. Very satisfactory data of this kind were obtainable, as the nature of the injury was a matter of record in nearly all cases. The frequency rates for the two groups, by nature of injury, are shown in table G–6, and the similarity of these rates is marked. It was the slightly higher incidence of minor cuts and abrasions which account for the slightly higher group frequency rate for the impaired workers. However, no noticeable proneness on the part of the ex-tuberculous cases toward injury of any particular nature is indicated. The similarity of the rates seems to justify a conclusion that the injuries experienced were related to the hazards of the jobs and not to the impairment which characterized one of the groups.

TABLE G–6.—*Frequency rates [1] of nondisabling injury for 507 ex-tuberculous cases and 902 unimpaired workers, by nature of injury*

Nature of injury	Impaired	Unimpaired
Total	15.2	14.2
Burns and scalds	.6	.7
Cuts and abrasions	11.9	10.3
Eye injuries	2.1	2.4
Strains and sprains	.3	.4
Other	.3	.4

[1] Number of injuries per 10,000 exposure-hours.

A rough indication of the severity of the nondisabling injuries is provided by the number of redressings required per injury. Policies varied widely among companies. In some plants employees were required to report for redressings, in others redressings were obtained at the option of the employee. However, in each plant the policies were the same for both the impaired and the unimpaired workers. The ex-tuberculous cases averaged 1.0 and the unimpaired workers 0.9 redressings per injury. Measured in this way there was clearly no difference in the severity of the nondisabling injuries in the two groups.

A final consideration in connection with the medical record was a comparison of the demands made on plant medical facilities by impaired and unimpaired workers for nonindustrial purposes. Nonindustrial visits were defined as visits to the dispensary for illness or injury not related to the workers' employment. Again policies varied among plants in the extent to which such use of medical facilities was encouraged or discouraged. But in any given plant the policy was the same for both impaired and unimpaired workers. The ex-tuberculous cases made somewhat fewer nonindustrial visits than did the unimpaired workers matched with them. The impaired averaged 1.7 and the unimpaired 2.3 such visits per person.

In summary, the medical record showed that the ex-tuberculous cases and the unimpaired workers matched with them on the same jobs had very similar nondisabling injury experience both as to frequency and nature of injury. There was no difference in the severity of such injuries as measured by the redressings required; and dispensary visits of a nonindustrial nature were somewhat less common among the impaired workers.

Disabling Injury Experience

Frequency. A disabling injury was defined as one which resulted in a permanent impairment or in a loss of one full day or more beyond the day or shift on which the injury occurred. The frequency rate was computed on the conventional base of one million exposure-hours.

Data on this factor were available for 512 of the impaired and 909 of the unimpaired workers of the survey group. The experience of the workers with arrested tuberculosis was substantially better than that of the unimpaired workers matched with them on the same jobs. The rate for the impaired group was 5.9 and for the matched unimpaired 10.3 injuries per million exposure-hours. This difference of about four injuries per million exposure-hours seems significant when considered in terms of the effect four disabling injuries might have on compensation and insurance costs.

For the entire survey group there were only 6 disabling injuries among the impaired workers and 22 among the unimpaired workers. So far as the limited number of cases will permit comparison, the injuries

were about the same. Contusions of the upper and lower extremities were fairly common, and in each group there was 1 case of amputation of a part of a hand. There were no fractures among the impaired although this type of injury accounted for 5 cases among the unimpaired. Among the unimpaired, too, there was 1 case of strain resulting in a hernia.

In each case of disabling injury, accident reports and cause studies in the company's files were consulted and the cases were discussed with responsible company officials. The purpose of this was to determine whether the impairment might have in any way caused or contributed to an injury experienced by an impaired worker. In no instance was such a causal relationship indicated in this impaired group. Similarly, none of the injuries among the unimpaired was attributed to a fellow worker's impairment.

The experience of this group indicates that these impaired workers, properly placed on the job, worked safely and did not constitute a hazard either to themselves or to their fellow workers. There is no readily apparent reason why the injury experience of the ex-tuberculous cases should have been so much better than that of the unimpaired workers exposed to the same hazards. Careful placement certainly played a major part in the fact that there were no instances of aggravation of the impairment in the survey group. Because the group is of only moderate size, there is probably some room for coincidence but it is hardly likely that coincidence could account for all of the difference.

Time Lost. The frequency of disabling injury is one important consideration; the time lost as the result of such injury is a second. In terms of a rate based on 100 scheduled days the impaired workers tended to lose slightly less time because of disabling injuries than the unimpaired workers matched with them. The rates were 0.05 and 0.09 day per hundred scheduled days for the impaired and unimpaired, respectively. Another measure, time lost per injury, is also available; among the impaired the injuries experienced resulted in an average time loss of 11.7 days and among the unimpaired a loss of 11.4 days, a difference of 0.3 day per injury.

In brief, the arrested tuberculosis cases had a very favorable disabling injury experience in every respect. The frequency rate was substantially lower than for the unimpaired exposed to the same hazards, and the time lost as the result of such injuries was about the same in both groups.

Output Relative

Measured individual production data were available for only 52 of the ex-tuberculous cases and 81 matched unimpaired workers on the same jobs. This group was not large enough to permit showing performance data. The data collected, however, has been included in computing the output relative for the total survey group.

It should be noted in this connection that there were a fairly large number of ex-tuberculous cases employed on assembly line operations and on group piecework. Although individual performance data could not be obtained for these cases, the fact of their employment is significant. On the assembly line operations the speed of the work was controlled by the speed of the line and each worker had to keep up with the line. Similarly, on group incentive each member of the group or team has to produce his share or portion of the job or the earnings of the group will suffer. Apparently these impaired workers were able to meet the production requirements in those cases or they could not have held their jobs.

Quit Rate

Data on voluntary quits among the employees of the survey group were obtained by means of follow-up, and the rates reflect the number of quits per 100 employees in the 6 months following the end of the survey period. These data were obtainable for 200 of the ex-tuberculous cases and 383 unimpaired workers matched with them.

The voluntary quit rate was very substantially lower for these impaired workers, 0.5 per hundred as against 2.6 per hundred for the unimpaired. All of the quits among the impaired were due to dissatisfaction with the job. Among the unimpaired most of the quits were classified as "other" and included a variety of reasons such as "to take other job," "starting own business," etc. Actually, the quantity of data and the number of cases are too small to support generalizations, but the 200 ex-tuberculous cases for whom data could be studied were evidently very stable on the job.

Terminations in this group were much higher for the impaired than for the unimpaired workers, 2.5 and 1.5, respectively. These terminations were for the most part the result of reductions in force and it is probable that the impaired being, in general, the last to be hired had the least seniority and consequently were among the first to be laid off.

H. The Peptic Ulcer Cases

Summary of Statistical Findings

The peptic ulcer cases did not, in general, perform quite as well as the unimpaired workers with whom they were matched on the same jobs. The nondisabling injury experience was about the same in the two groups, but disabling injuries were somewhat more common among these impaired workers than among the unimpaired workers exposed to the same hazards. The peptic ulcer cases were considerably less regular in their work attendance than the matched unimpaired workers. The difference in the absenteeism rates was due largely to a higher incidence of absence because of illness among the peptic ulcer cases. The voluntary quit rate was also much higher for the impaired workers of the group. Measured individual production data for computation of an output relative were not available for a group large enough to permit showing performance figures.

TABLE H–1.—*Work performance of peptic ulcer cases and of matched unimpaired workers*

Factor	Number of workers		Average performance	
	Impaired	Unimpaired	Impaired	Unimpaired
Absenteeism frequency rate [1]	428	806	5.4	2.9
Nondisabling injury:				
Frequency rate [2]	424	799	11.0	11.1
Disabling injury:				
Frequency rate [3]	428	806	10.7	8.7
Time-lost rate [4]	428	806	.10	.12
Average days of disability [5]			11.6	18.0
Output relative [6]	(7)	(7)	(7)	(7)
Quit rate [8]	195	357	4.6	2.0

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Data available for too few cases to permit showing performance figures.
[8] Number of voluntary quits per 100 employees in the survey group.

Composition of the Survey Group

Persons shown on the medical records of the company as peptic ulcer cases were eligible for inclusion in the survey group as impaired workers only if the diagnosis had been confirmed by X-ray or other approved laboratory test. Persons listed as peptic ulcer cases but without confirmation by test could not be included in the survey group either as impaired or as unimpaired workers. This impairment is one of the three which were added on recommendation of the advisory committee about 3 months after the study was begun.

In spite of the fact that the impairment was not included at the beginning of the study, a fairly sizable number of cases were recorded. As finally constituted, this survey group consisted of 428 peptic ulcer cases matched with 806 unimpaired workers, making it eighth in point of size among the 10 impairments studied. Only 14 of the peptic ulcer cases were female and consequently no break-down was made of performance figures by sex.

TABLE H–2.—*Comparison of number and percentage distribution of 428 peptic ulcer cases and 10,600 other impaired workers studied, by age groups*

Age group	Number of workers		Percent	
	Peptic ulcer cases	Other impaired	Peptic ulcer cases	Other impaired
Total	428	10,600	100.0	100.0
Under 20 years	0	79	0	.7
20 and under 25 years	21	490	4.9	4.6
25 and under 30 years	55	846	12.9	8.0
30 and under 35 years	54	1,063	12.6	10.0
35 and under 40 years	68	1,116	15.9	10.5
40 and under 45 years	57	1,181	13.3	11.1
45 and under 50 years	54	1,258	12.6	11.9
50 and under 55 years	59	1,503	13.8	14.2
55 and under 60 years	34	1,509	7.9	14.3
60 and under 65 years	23	1,065	5.4	10.1
65 years and over	3	490	.7	4.6

The peptic ulcer cases showed a very marked concentration in the lower and middle age ranges in comparison with the rest of the impaired workers. About 60 percent of the peptic ulcer cases were under the age of 45 years as compared with 45 percent of the remainder of the impaired group. Further, 55 percent of these cases as against only 40 percent of the rest of the impaired workers fell within the 20-

year age range from 25 to 45 years. In the upper age ranges the number of peptic ulcer cases decreased rapidly. Only 6 percent of these cases as against 15 percent of the other impaired workers were 60 years of age or older. The present study cannot explain these age groupings. It may be that the incidence of the impairment is less in the higher age ranges; also, the person with this impairment may tend to withdraw from the labor market at an earlier age.

Industry and Occupational Coverage

Peptic ulcer cases were encountered in comparatively small numbers in individual plants but were widely distributed; 18 of the 19 industry groups and 70 plants are represented in the survey group. In about half of the plants not represented some peptic ulcer cases were employed but could not be matched with unimpaired workers for inclusion in the study. The wide distribution of these impaired workers is significant for two reasons. In the first place, it indicates that employment opportunities are potentially fairly broad for persons with this impairment; and secondly, the record reflects performance under a variety of conditions and not in some one or a few plants with specialized programs for employment of peptic ulcer cases.

The following listing shows the jobs at which the impaired workers of the survey group were employed. The occupational pattern is much the same as that found in the other impairment groups — a concentration in the processing or producing operations, a secondary concentration in maintenance work, and a scattering of custodial jobs. The variety of skill requirements represented by these jobs is very broad, ranging from unskilled labor to the highly skilled machinist classifications. It should be noted in this connection that this listing of occupations is merely illustrative of some of the jobs which can be performed by peptic ulcer cases. Many impaired workers could not be included in the study, consequently their jobs are not recorded.

Jobs at which 428 Peptic Ulcer Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with peptic ulcer impairment can be employed]

1. Maintenance

Asbestos worker, general
Boilermaker
Boilermaker helper II
Boiler operator
Bucker-up II
Carpenter, maintenance
Cook V
Electrical repairman
Engine-lathe operator
Extruder operator II
Fireman, stationary boiler
Flame-cutter operator
Hod carrier
Instrument man IV
Instrument repairman
Laborer (aircraft manufacturing)
Laborer (automobile manufacturing)
Laborer (nonferrous metal alloys and products)
Laborer (paper and pulp)
Laborer (petroleum refining)
Laborer (rayon and allied products)
Laborer, process (petroleum refining)
Machinist II
Machinist apprentice
Maintenance mechanic II
Millwright
Painter I
Pipe fitter
Pipe-fitter helper
Plumber
Riveter, hydraulic
Rodman II
Welder, combination

2. Working Foremen

Batch-still operator II
Compounder II
Floor assembler

3. Processing

Acid-retort operator
Air-compressor operator
Annealer
Annealer III
Assembler III
Banbury mixer
Bookbinder
Boring-machine operator, automatic
Brush hand
Buffer I
Burrer, hand
Buttonhole-machine operator
Centerless-grinder operator
Charging-machine operator I
Cigarette-making-machine operator
Cigarette-packing-machine operator
Circular-sawing-machine operator
Cloth-shrinking-machine operator
Control man
Control man III
Coremaker I
Cutter, hand IX
Cylindrical-grinder operator
Dockman II
Electrical assembler II
Electrician, airplane I
Electric-motor assembler
Engine-lathe operator
Extruder operator II
Final assembler VII
Floor assembler
Form builder
Forming-press operator
Forming-press operator I
Friction-sawing-machine operator
Gager VIII
Gear-hobber operator
Glass grinder
Hardener II
Horizontal-boring-and-milling-machine operator
Induction-furnace operator

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Jobs at which 428 Peptic Ulcer Cases of the survey group were found employed — Continued

3. Processing — Continued

Induction-furnace operator helper
Instrument maker II
Internal-grinder operator
Job setter II
Labeler, machine II
Laborer (nonferrous metal alloys and products)
Laborer, process (ammunition)
Laborer, process (asbestos products)
Laborer, process (automobile manufacturing)
Laborer, process (automobile parts)
Laborer, process (cutlery tools)
Laborer, process (dairy products)
Laborer, process (electrical equipment)
Laborer, process (glass manufacturing)
Laborer, process (malt liquors)
Laborer, process (nonferrous metal alloys and products)
Laborer, process (phonograph manufacturing)
Laborer, process (rayon and allied products)
Laborer, process (tobacco)
Laborer, process (wire manufacturing)
Lehr man
Loader VII
Machine adjuster III
Machine molder, jarring
Machinist, bench
Marker
Milling-machine operator II
Molder, finish
Molder, floor
Multiple-spindle-drill-press operator
Ovenman helper
Planer operator II
Plater I
Pointer operator
Polisher
Presser, machine I
Profiling-machine operator II
Pumpman VII
Pumpman helper
Radial-drill-press operator
Saw filer, hand
Screw-machine operator, semiautomatic
Seaming-machine operator IV
Sewing-machine operator (men's tailored garments)
Sheeter operator
Single-spindle-drill-press operator
Spinner VI
Spreader I
Sticker
Stillman II
Stillman helper
Still-operator helper
Straightener, hand
Subassembler I
Subassembler III
Surface-grinder operator
Sweater man
Thread-mill-machine operator
Thrower II
Tire builder, drum
Tool dresser I
Tool grinder I
Tool-grinder operator
Tool maker
Treater helper
Tube cleaner
Tube drawer
Tumbler operator II
Turret-lathe operator
Turret-lathe operator, automatic
Waterproofing-machine operator
Welder, arc
Wire drawer III
Wireman VI

4. Inspection and Testing

Body-assembly inspector
Cloth examiner, hand II
Engine tester
Experimental mechanic
Inspector (machine shop)
Machinist II
Test driver II
Tester I

5. Recording and Control

Laborer (electrical equipment)
Shipping checker
Stock clerk II
Tool clerk

6. Material Movement

Electric-bridge-crane operator
Electric-truck operator
Laborer (bakery products)
Laborer (chemicals)
Laborer (glass manufacturing)
Laborer (machine tools and accessories)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Laborer (petroleum refining)
Laborer (plastic materials)
Laborer (plumbing supplies)
Laborer (tobacco)
Laborer (wire)
Laborer, process (ammunition)
Laborer, process (tobacco)
Tractor operator
Truck driver
Yardman I

7. Custodial

Fire marshal
Gateman IV
Janitor I
Laborer (aircraft manufacturing)
Porter II
Watchman I

Placement Practices

As in the other organic impairment cases, the physical examination is very important in cases of peptic ulcer. If reliance is placed upon the statements of the applicant, there is the chance that he may not have accurate knowledge of his condition or may tend to understate the case. Improper placement may result in poor performance and possible aggravation of the impairment.

Comparatively few of the plants studied had exclusion policies prohibiting the employment of peptic ulcer cases, yet this group is eighth in point of size among the 10 impairment groups studied. It may be that the incidence of this impairment among the working population is comparatively low. It may also be that employment opportunities are not as great for persons with this impairment, as indicated by the absence of specific exclusion policies.

No specialized methods or techniques for placement of peptic ulcer cases were encountered in the plants studied. In most instances special consideration was

given to environmental conditions when placing these workers. In general, the environmental conditions were considered as important in these cases as the physical requirements of the job. Among the factors considered in making the placement were working speed, odors which might cause gastric upset, eating facilities, etc., depending upon severity of the case and the general physical equipment of the applicant.

It was noted that no special follow-up practices were in effect for these peptic ulcer cases, nor were there any instances in which job re-engineering had been necessary for them.

Work Performance

Data were obtainable for a fairly large group of peptic ulcer cases although not as large as would be desirable to support definite conclusions. The findings of the study of this group are summarized in table H–1 and in the following paragraphs:

Absenteeism

This measure is based on the number of days absent for personal reasons on days on which the employee was scheduled to work. Vacations, lay-offs, etc., were not counted either as days absent or as days scheduled to work. The rate represents the number of days absent per 100 scheduled workdays.

The 428 peptic ulcer cases were not as regular in their work attendance as the 806 unimpaired workers with whom they were matched. The average rates of absenteeism for the two groups were 5.4 and 2.9 for the impaired and unimpaired, respectively. In some operations this difference in performance might well be significant.

The absenteeism rate was also computed for each individual of the survey group, and these individual rates are shown in a frequency distribution in table H–3. The comparison of the individual rates supports the comparison drawn from the group averages. Only 17 percent of the impaired as against 27 percent of the matched unimpaired had no absences at all during the periods studied. Only about 60 percent of the impaired had rates of 3.9 or less, while 78 percent of the unimpaired were in this group. It should be noted here that coincidence may be playing a part in this case. While the peptic ulcer cases had the poorest attendance record of the several impaired groups, the unimpaired workers matched with them had the best record of any of the several unimpaired groups. This tends to accentuate but does not account for the difference. There were also more instances among the peptic ulcer cases of very high absenteeism: 3.7 percent of these impaired workers as against 1.4 percent of their matched unimpaired workers had rates of 20.0 or higher.

TABLE H–3.—*Percentage distribution of 428 peptic ulcer cases and 806 unimpaired workers, by absenteeism frequency rate* [1]

Absenteeism frequency rate class	Impaired	Unimpaired
0	16.5	27.3
0.1 and under 1.0	14.7	16.7
1.0 and under 2.0	8.4	15.8
2.0 and under 3.0	12.1	11.8
3.0 and under 4.0	8.2	6.3
4.0 and under 5.0	8.0	6.1
5.0 and under 7.0	6.5	6.1
7.0 and under 10.0	9.1	3.8
10.0 and under 20.0	12.8	4.7
20.0 and over	3.7	1.4
Total	100.0	100.0

[1] Number of days lost per 100 scheduled workdays.

Information on reason for absence was obtained wherever possible. In this particular survey group fairly good coverage was obtained, a reason for absence was available for well over half of all the absences recorded. The rates attributable to various reasons for absence are shown in table H–4. It is at once apparent that absence because of illness is the factor which accounts for the higher absenteeism rate among the peptic ulcer cases.

TABLE H–4.—*Absenteeism frequency rates* [1] *for 428 peptic ulcer cases and 806 unimpaired workers, by reason for absence*

Reason for absence	Impaired	Unimpaired
Total	5.4	2.9
Illness	3.1	.9
Personal business	.4	.3
Unknown	1.9	1.7

[1] Number of days lost per 100 scheduled workdays.

In brief, the peptic ulcer cases tended toward a higher rate of absenteeism than unimpaired workers matched with them on the same jobs, and the difference is accounted for by a higher incidence of absence because of illness. It was not possible to determine how much of this illness absenteeism among the peptic ulcer cases was attributable to the impairment, but it seems reasonable to believe that a substantial part of it was.

Nondisabling Injury Experience

A nondisabling injury was defined as one which did not result in a permanent impairment or in any loss of time beyond the day or shift on which it occurred.

The experience of the group shown in table H–1 is expressed as a rate based on 10,000 exposure-hours. Individual rates used to establish the frequency distribution in table H–5 are based on 1,000 exposure-hours. Data on this factor were available for 424 of the peptic ulcer cases and their 799 matched unimpaired workers.

As a group the impaired workers had about the same nondisabling injury experience as did the unimpaired workers exposed to the same hazards. The group rates were 11.0 and 11.1 per 10,000 exposure-hours for the impaired and unimpaired groups, respectively. The difference in injury experience represented by these rates is not significant.

Comparison of the individual rates by means of a frequency distribution further emphasizes the similarity of the injury experience. 39 percent of the impaired workers and 44 percent of the unimpaired had no injuries at all during the periods studied. The overwhelming majority in both groups had a moderate injury experience, with 82 percent of the workers in each group showing a frequency rate of less than 2 per 1,000 exposure-hours. As would be expected there were some instances of poor performance in both groups: about 1 percent of the impaired and 2 percent of the unimpaired had excessively high rates of 10.0 or higher.

TABLE H–5.—*Percentage distribution of 424 peptic ulcer cases and 799 unimpaired workers, by frequency rate [1] of nondisabling injury*

Frequency rate class	Impaired	Unimpaired
0	39.2	44.2
0.1 and under 1.0	25.0	21.2
1.0 and under 2.0	17.9	16.6
2.0 and under 5.0	13.9	12.7
5.0 and under 10.0	3.1	3.5
10.0 and over	.9	1.8
Total	100.0	100.0

[1] Number of injuries per 1,000 exposure-hours.

For each of the nondisabling injuries the nature of the injury was also recorded. The rate attributable to the various kinds of injury show a practically identical pattern in the two groups. The peptic ulcer cases did not show any proneness toward injury of some particular nature. In light of the similarity of the experience it seems reasonable to conclude that the injuries were attributable to the hazards of the jobs, not to the impairments which characterized one of the groups.

TABLE H–6.—*Frequency rates [1] of nondisabling injury for 424 peptic ulcer cases and 799 unimpaired workers, by nature of injury*

Nature of injury	Impaired	Unimpaired
Total	11.0	11.1
Burns and scalds	.7	.6
Cuts and abrasions	7.4	7.4
Eye injuries	2.1	2.1
Strains and sprains	.6	.5
Other	.2	.5

[1] Number of injuries per 10,000 exposure-hours.

An effort was made to determine whether there was any difference in the severity of the nondisabling injuries in the two groups. While not entirely satisfactory, a rough indication can be found in the number of redressings required for such injuries. Practices in requiring or encouraging redressings varied widely among companies but impaired and unimpaired were affected alike in each company. The difference again is negligible and the similarity pronounced. Among the impaired group the average was 0.8 redressings per nondisabling injury and among the matched unimpaired, 1.1 redressings per injury.

So far as this type of injury is concerned, the peptic ulcer cases and the matched unimpaired workers had a practically identical experience. Injuries of the same nature were experienced with the same frequency and were of about equal severity in the two groups.

A final consideration in connection with the medical record was use of medical facilities for nonindustrial purposes, i.e., visits to the dispensary occasioned by causes not related to the workers' employment. Again, company policies varied with regard to such use of medical facilities as well as to the extent of the medical facilities maintained. However, in each plant the conditions as they affected the impaired and unimpaired were the same. The peptic ulcer cases made somewhat greater use of plant medical facilities than did their matched unimpaired workers. During the periods studied the impaired workers of this survey group averaged 3.7 nonindustrial visits per person while the matched unimpaired averaged 2.9 such visits per person. This seems to be of a pattern with the higher incidence of illness absenteeism among the peptic ulcer cases.

Disabling Injury Experience

Frequency. A disabling injury was defined as one which resulted in a permanent impairment or in a time loss of one full day or more beyond the day or shift on which the injury occurred, and the frequency rate was computed on the conventional base of one million exposure-hours. Data were available for 428 peptic ulcer cases and 806 unimpaired workers matched with them.

The frequency rate was higher for the impaired group than for the matched unimpaired workers, 10.7 and 8.7, respectively. In this instance the few female impaired workers exercised a marked influence on the group rate. For the 414 impaired males and their 778 matched unimpaired workers, the frequency rates were 9.7 and 9.0. For the larger group of male workers, then, the difference in the disabling injury rate was hardly significant.

The number of injuries experienced were too few to establish any sort of a pattern in either group. Among the peptic ulcer cases the nature of the injuries varied widely and there was no proneness indicated toward any particular kind of injury.

Materials available in company files, such as accident reports, accident cause analyses, etc., were examined for each of the injuries recorded for the survey group to determine whether the accident was caused or contributed to by the existence of the impairment. This aspect of the study was also discussed with the safety director or other responsible company officials. In none of the injuries recorded for this survey group was there a causal relationship indicated between the injury and the worker's impairment or the impairment of a fellow worker. So far as this survey group is concerned, the existence of the impairment was not considered an accident factor, and the peptic ulcer cases were not a hazard either to themselves or to their fellow workers.

Time Lost. Given the fairly close similarity in the injury frequency rates, it was possible that the time lost as a result of such injury might have been disproportionately higher among the impaired workers because of either slower recovery or greater severity. Expressed as a rate, the time lost amounted to 0.10 and 0.12 days per 100 scheduled days for the impaired and unimpaired, respectively. On a per injury basis the difference was even more pronounced. Among the peptic ulcer cases the time lost averaged 11.6 days per injury, while among the matched unimpaired the time lost averaged 18.0 days per injury. This might be a substantial difference when considered in terms of compensation and insurance costs.

Output Relative

In the present survey group such data were available for only 33 of the peptic ulcer cases and their 58 matched unimpaired workers. While these data were included in computing the output relative for the entire survey group, the number of peptic ulcer cases was considered too small to warrant showing separate performance figures.

Quit Rate

An attempt was made to measure the relative stability on the job of impaired and matched unimpaired workers by determining the number of voluntary quits in each group during the 6 months following the end of the survey period. These data were obtained by means of follow-up but unfortunately cover only a comparatively small group — 195 of the peptic ulcer cases and 357 matched unimpaired workers. The rate reflects the number of quits per 100 employees.

The quit rate was substantially higher for the peptic ulcer cases, 4.6 as against 2.0 for the matched unimpaired workers. Two of the impaired workers constituted the only quits because of health reasons. For two of the impaired and one of the unimpaired no reason was obtainable. The largest number, 3 of the impaired and 5 of the unimpaired, quit to accept other jobs or to start business of their own. Altogether there were 9 quits among the peptic ulcer cases and 7 among the matched unimpaired workers.

In addition to the fact that the group covered is small, the time period which had to be used was an unsettled one. Postwar readjustments were under way in many places with resultant reductions in force and changes in personnel requirements. Some of the workers too had taken wartime employment and after the emergency had passed either withdrew from the labor force or returned to former occupations. Even considering these factors, however, the peptic ulcer cases were indicated as being somewhat less stable on the job.

I. The Diabetic Cases

Summary of Statistical Findings

The diabetic cases as a group did not make quite as good a record of work performance as did the unimpaired workers with whom they were matched. Specifically, they were a little less regular in their work attendance and experienced a somewhat higher incidence of work injuries than the unimpaired workers on the same jobs. Data on individual production and voluntary quits were available for too few cases to permit showing separate performance figures for this group.

The findings are subject to qualification because of the small number of observations on which they are based and are presented primarily as a matter of interest.

TABLE I–1.—*Work performance of diabetic cases and of matched unimpaired workers*

Factor	Number of workers		Average performance	
	Impaired	Unimpaired	Impaired	Unimpaired
Absenteeism frequency rate [1]	144	244	4.4	3.1
Nondisabling injury:				
Frequency rate [2]	143	243	7.8	7.4
Disabling injury:				
Frequency rate [3]	144	244	15.6	12.9
Time-lost rate [4]	144	244	.11	.07
Average days of disability [5]			9.3	7.2
Output relative [6]	(7)	(7)	(7)	(7)
Quit rate [8]	(7)	(7)	(7)	(7)

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Data available for too few cases to permit showing performance figures.
[8] Number of voluntary quits per 100 employees in the survey group.

Composition of the Survey Group

Eligible for inclusion in the survey group were all workers carried on the medical records of the company as diabetic cases and for whom the diagnosis had been confirmed by glucose tolerance test. The survey group is made up of all such impaired workers with whom unimpaired workers could be matched on the same jobs. Workers listed as diabetic cases on the medical record but not confirmed by test could not be included in the study either as impaired or as unimpaired workers.

There was a marked concentration of the diabetic cases in the older age groups. Only 8 percent of the diabetic cases as against 14 percent of the other impaired workers were under the age of 30. More than 50 percent of the diabetic cases fell within the 15-year range from 45 to 60 years. Also, about 37 percent of the diabetic cases but only 28 percent of the other impaired workers were 55 years of age or older.

TABLE I–2.—*Comparison of number and percentage distribution of 144 diabetic cases and 10,884 other impaired workers studied, by age group*

Age group	Number of workers		Percent	
	Diabetic cases	Other impaired	Diabetic cases	Other impaired
Total	144	10,884	100.0	100.0
Under 20 years	1	78	.7	.7
20 and under 25 years	3	508	2.1	4.7
25 and under 30 years	7	894	4.9	8.2
30 and under 35 years	12	1,105	8.3	10.1
35 and under 40 years	11	1,173	7.6	10.8
40 and under 45 years	12	1,226	8.3	11.3
45 and under 50 years	25	1,287	17.4	11.8
50 and under 55 years	20	1,542	13.9	14.2
55 and under 60 years	30	1,513	20.8	13.9
60 and under 65 years	18	1,070	12.5	9.8
65 years and over	5	488	3.5	4.5

A total of 144 diabetic cases were encountered which could be matched with unimpaired workers, making this group ninth in size among the 10 impairments studied. Only 8 of the diabetic cases were females, consequently no performance figures by sex are shown.

This impairment was one of the three added on recommendation of the advisory committee after the study was already under way. Consequently, if any of these cases were present in the first 10 plants studied they were not picked up. However, this fact alone would not account for the very small number of cases encountered.

Industry and Occupational Coverage

Although the cases were few in total, they represent 15 of the 19 major industry groups and 45 of the 99 plants studied subsequent to the addition of this impairment group. In some of the plants not represented, diabetic cases were employed but could not be included in the study because they could not be matched with unimpaired workers.

The jobs at which these impaired workers were employed are listed below. As was true of the other impairment groups studied, the concentration was heaviest in the processing or producing operations. Also, the range and variety of skill requirements represented by these jobs is very broad. It was to be expected that the more-skilled jobs would be fairly common because this group tended toward the higher age brackets. It is possible, too, that the impairment developed toward middle life after skills had been acquired, although information on duration of impairment was not obtainable from company records in any significant number of cases.

Jobs at which 144 Diabetic Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with diabetic impairment can be employed]

1. Maintenance

Bricklayer II
Carpenter
Compositor I
Electrical repairman
Electrician, powerhouse
Flame-cutter operator
Glass blower, laboratory apparatus
Laborer (automobile manufacturing)
Laborer (rayon and allied products)
Machinist II
Maintenance mechanic II
Oiler I
Pipe-fitter helper
Sheet-metal worker II
Tool maker
Water filterer

3. Processing

Anodic operator
Automobile mechanic, motor I
Bench grinder
Box maker, wood III
Brakeman, automobile
Burrer, hand
Cigarette-packing-machine operator
Cylinder-press man
Desk assembler
Die-casting-machine operator II
Die maker II
Drier operator
Engine-lathe operator
Fireman, still
Final assembler VII
Floor assembler
Forming-press operator I
Furnace tender, heat treating
General assembler II
Job setter II
Laborer (furniture)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Laborer, process (aluminum products)
Laborer, process (automobile manufacturing)
Laborer, process (bakery products)
Laborer, process (electrical equipment)
Laborer, process (glass manufacturing)
Laborer, process (plastic material)
Laborer, process (plumbing supplies)
Laborer, process (wire)
Line walker
Machinist apprentice
Milling-machine operator, automatic
Power-shear operator I
Pumpman VII
Pumpman helper
Punch-press operator I
Saw filer, machine
Screw-machine operator, semiautomatic
Sewing-machine operator (shirts and related products)
Stillman II
Still-operator helper
Straightener, hand
Subassembler
Surface-grinder operator
Template maker IV
Tool-grinder operator
Tool maker
Treater II
Vertical-boring-mill operator
Welder, spot
Wire drawer III

4. Inspection and Testing

Checker I
Experimental mechanic
Gager I
Inspector (machine shop)
Inspector and tester
Laborer, process (fabricated plastic products)

5. Recording and Control

Checker
Laborer (machine tools and accessories)

6. Material Movement

Distributor I
Electric-bridge-crane operator
Laborer (ammunition)
Laborer (automobile manufacturing)
Laborer (glass manufacturing)
Laborer (machinery manufacturing)
Laborer (machine tools and accessories)
Laborer (malt liquors)
Laborer (nonferrous metal alloys and products)
Laborer (wire)
Truck driver, heavy

7. Custodial

Gateman IV
Laborer (aircraft manufacturing)
Porter I
Porter II
Watchman I

Placement Practices

The physical examination generally was considered important in these cases in order to determine whether there was any involvement of such a nature as to require reduced activity. Particularly where the case had a history of visual, cardiac, or other impairment, it was necessary for the placement officer to have an inventory of the applicant's physical abilities in order to make proper work assignment.

Special provisions for employment of diabetic cases were not encountered in the present study. Assignments were made by the same placement officers who handled other impaired workers, and the same clearance of transfers, etc., was required.

The diabetic cases were not the subject of exclusion policies in many plants. In only eight of the plants studied was there an exclusion policy prohibiting employment of diabetic cases; but, nevertheless, very few of these cases were encountered. There are a number of reasons which may serve to account for this seeming contradiction: (1) The incidence of this impairment may be relatively low in comparison with the others studied; (2) because of the nature of the treatment these cases may not ordinarily seek factory employment; or (3) they may not be as readily accepted for employment as the absence of formal exclusion policies would seem to indicate.

Work Performance

The findings relating to the comparative work performance of the diabetic cases and the unimpaired workers matched with them on the same jobs are summarized in table I–1 and the following paragraphs. It must be borne in mind that these results are based on a comparatively small number of observations and consequently are influenced by extreme cases. For that reason, only limited reliance should be placed on findings for this impairment group.

Absenteeism

An absence was defined as absence of a full day or more on days on which the employee was scheduled to work. Regular vacations, lay-offs, shut-downs, etc., were not counted either as days absent or as days scheduled to work. The absenteeism rate reflects the number of days of such absence per 100 scheduled workdays.

Data were available for 144 diabetic cases and for 244 unimpaired workers matched with them. As a group the impaired workers were not as regular in their work attendance as the unimpaired workers. Respectively, the rates were 4.4 and 3.1 per 100 scheduled workdays. This difference, while not extreme, does mark a tendency toward greater absenteeism on the part of the diabetic cases as a group.

The individual rates of absenteeism, computed in the same way as the group rates, are compared by means of a frequency distribution in table I–3. About 24 percent of the diabetic cases and 26 percent of the unimpaired workers had no absences at all during the period studied; 55 percent of the impaired and 57 percent of the unimpaired had rates of 1.9 or less. Thus, slightly more than half of each group fell within the low frequency classes. It is in the extremely high rates that the difference in the performance of the two groups is apparent: 15 percent of the impaired as against only 8 percent of the unimpaired had excessively high frequency rates of 10.0 or more. While the major portion of the workers in each group were about equally regular in their work attendance, extreme cases were more common among the impaired workers and raised the group rate of the impaired over that of the unimpaired.

TABLE I–3.—*Percentage distribution of 144 diabetic cases and 244 unimpaired workers, by absenteeism frequency rate* [1]

Absenteeism frequency rate class	Impaired	Unimpaired
0	23.5	26.3
0.1 and under 1.0	16.6	16.5
1.0 and under 2.0	14.0	14.0
2.0 and under 4.0	12.5	18.0
4.0 and under 7.0	11.2	9.3
7.0 and under 10.0	6.3	7.8
10.0 and under 20.0	11.1	6.1
20.0 and over	4.2	2.0
Total	100.0	100.0

[1] Number of days lost per 100 scheduled workdays.

Wherever the data were available, the reason was recorded for each absence. Unfortunately, reason for absence was available from the records for only a little more than half the absences reported. However, where the reason was known, the diabetic cases showed an absence rate because of illness twice as high as that of the unimpaired workers. On the other hand, absences because of personal business were much less frequent among the impaired workers. It seems reasonable to conclude that illness of the employee accounted for the higher group absenteeism rate among the impaired workers and probably for a substantial number of the extremely high individual

rates. It could not be determined from the material at hand how much of the illness absenteeism among the impaired workers was related to the impairment, although opinion expressed by several plant physicians indicated that much of it was.

TABLE I–4.—*Absenteeism frequency rates [1] for 144 diabetic cases and 244 unimpaired workers, by reason for absence*

Reason for absence	Impaired	Unimpaired
Total	4.4	3.1
Illness	2.6	1.3
Personal business	.1	.4
Unknown	1.7	1.4

[1] Number of days lost per 100 scheduled workdays.

Nondisabling Injury Experience

A nondisabling injury was defined as one which did not result in a permanent impairment or in any loss of time beyond the day or shift on which the injury occurred. The frequency rate was computed for the group as the number of injuries per 10,000 exposure-hours and for each individual as the number of injuries per 1,000 exposure-hours.

The nondisabling injury experience was about the same in the two groups. The impaired had a rate of 7.8 as against 7.4 for the unimpaired. Considering that these were minor injuries without any resultant loss of time, the difference was not considered significant.

Comparison of the individual rates supports the similarity of experience indicated by the group rates: 51 percent of the impaired and 56 percent of the unimpaired experienced no injuries at all during the period studied; 86 percent of the impaired and 87 percent of the unimpaired had rates of 1.9 or lower per 1,000 exposure-hours. Extreme cases were very few in both groups. Ouly 2.8 percent of the impaired and 1.6 percent of the unimpaired had rates of 5.0 or higher.

TABLE I–5.—*Percentage distribution of 143 diabetic cases and 243 unimpaired workers, by frequency rate [1] of nondisabling injury*

Frequency rate class	Impaired	Unimpaired
0	51.0	56.5
0.1 and under 1.0	22.4	19.3
1.0 and under 2.0	12.6	11.5
2.0 and under 5.0	11.2	11.1
5.0 and under 10.0	2.8	.8
10.0 and over	0	.8
Total	100.0	100.0

[1] Number of injuries per 1,000 exposure-hours.

The nature of the injury was recorded in each case and the rates attributable to the various kinds of injury in each group are shown in table I–6. In general, the pattern of the rates in the two groups is fairly similar. Cuts and abrasions, experienced most frequently in both groups, had a somewhat higher rate among the impaired workers. There is a possibility that, because of the ever-present and serious danger of infection which accompanies diabetes, workers with this impairment would be more conscientious in reporting even the most minor injuries for immediate treatment. This factor might bear an influence on these rates.

TABLE I–6.—*Nondisabling injury frequency rates [1] for 143 diabetic cases and 243 unimpaired workers, by nature of injury*

Nature of injury	Impaired	Unimpaired
Total	7.8	7.4
Burns and scalds	.4	.2
Cuts and abrasions	5.7	5.0
Eye injuries	1.2	1.6
Strains and sprains	.4	.4
Other	.1	.2

[1] Number of injuries per 10,000 exposure-hours.

As a measure of the severity of the nondisabling injuries, data on the number of redressings were taken in each case where available. Policies of course varied widely between plants with respect to encouraging or requiring redressings but were the same for impaired and unimpaired workers in any given plant. As indicated by this measure, the severity was slightly greater among the diabetic cases, where the redressings averaged 1.3 per injury as against 0.8 per injury among the unimpaired. This finding, too, may be conditioned by the nature of the impairment and the realization on the part of the impaired worker of the necessity for complete care of even the most minor injury.

A final consideration in connection with the medical record was nonindustrial use of plant medical facilities. A nonindustrial visit was defined as a dispensary visit for illness or injury not related to the worker's employment. Such visits were more frequent among the impaired workers, with an average of 1.7 as against an average of 0.8 per person among the unimpaired. Again, it seems reasonable to believe that some substantial part of these visits were attributable to the existence of the impairment.

In brief, the medical and nondisabling injury records for the two groups of workers were fairly similar. Nondisabling injuries had about the same frequency

and were similar in nature. The injuries among the impaired either tended to be a little more severe or, perhaps because of the impairment, required a little longer period of attention. The record indicated that the diabetic cases tended to make a somewhat greater but not excessive number of nonindustrial visits to the dispensary.

Disabling Injury Experience

Frequency. A disabling work injury was defined as one which resulted in a permanent impairment or in a time loss of at least one full day beyond the day or shift on which the injury occurred. The rate is computed on the conventional base to reflect the number of injuries per million exposure-hours. With the present small group, the million-hour base may tend to inflate the rate somewhat, as the impaired workers had a total of less than half a million exposure-hours and the unimpaired just over a million.

As a group the impaired workers had a substantially higher rate than the unimpaired, 15.6 and 12.9, respectively. Actually, there were four disabling injuries among the impaired and four among the unimpaired workers. This number is obviously too small to provide basis for analysis. It should be noted, however, that none of the injuries among the impaired involved infection, a serious possibility in diabetic cases.

Time Lost. The severity of the injuries as measured by the amount of time lost was slightly greater for the diabetic cases. As a rate, the impaired lost 0.11 and the unimpaired 0.07 days per 100 scheduled workdays. On a per injury basis, the impaired averaged 9.3 and the unimpaired 7.2 days of time loss per injury. Again, however, since the data reflect only 4 injuries in each group the findings are hardly reliable.

Output Relative

Measured individual output data were available for only five of the diabetic cases matched with seven unimpaired workers on the same jobs. While these data have been included in computing the output relative for the total survey group, no separate performance figures are shown for the diabetic cases.

It should be noted that some of the diabetic cases were employed on group piecework. Although no individual production data could be obtained for these workers, they must have been able to keep up with the pace of the group in order to hold their jobs.

Quit Rate

Data with which to compute a rate of voluntary quits were not obtainable for a sufficiently large number of the diabetic cases to permit showing separate performance figures for this group. The data, however, have been included in computing the quit rate for the total survey group.

J. The Epileptic Cases

Summary of Statistical Findings

The epileptic cases did not make quite as good a record of work performance as the unimpaired workers matched with them. Specifically, regularity of work attendance, as measured by the absenteeism frequency rate, was about the same; and the incidence of nondisabling and disabling work injuries was slightly higher among the impaired workers. However, the differences in the various performance rates are, for the most part, too small to be considered significant. Data on measured individual production and voluntary quits were not available for a sufficiently large number of the epileptic cases to permit showing performance figures.

The findings for this group are of only limited reliability because of the small number of observations available, and performance data are shown primarily as a matter of interest.

TABLE J–1.—*Work performance of epileptic cases and of matched unimpaired workers*

Factor	Number of workers		Average performance	
	Impaired	Unimpaired	Impaired	Unimpaired
Absenteeism frequency rate [1]	134	208	3.7	3.6
Nondisabling injury:				
Frequency rate [2]	134	208	5.5	4.0
Disabling injury:				
Frequency rate [3]	134	208	8.3	7.6
Time-lost rate [4]	134	208	.02	.13
Average days of disability [5]			3.0	22.8
Output relative [6]	(7)	(7)	(7)	(7)
Quit rate [8]	(7)	(7)	(7)	(7)

[1] Number of days lost per 100 scheduled workdays.
[2] Number of injuries per 10,000 exposure-hours.
[3] Number of injuries per 1,000,000 exposure-hours.
[4] Number of days lost for disabling injury per 100 scheduled workdays.
[5] Number of days of disability per disabling injury.
[6] Percentage relationship of production efficiency of impaired to that of matched unimpaired.
[7] Data available for too few cases to permit showing performance figures.
[8] Number of voluntary quits per 100 employees in the survey group.

Composition of the Survey Group

All persons who were listed in the company medical records as epileptic cases and with whom unimpaired workers could be matched on the same jobs were included in the survey group. Wherever possible, the cases were classified as petit mal or grand mal, but this information was available from the records in very few instances.

The age pattern of the epileptic cases was very similar to that of the remainder of the impaired worker group. The epileptic cases tended slightly toward the higher age groups, but the tendency was not pronounced.

Only 4 of the 134 epileptic cases studied were females, and consequently no break-down of the performance figures by sex is shown.

TABLE J–2.—*Comparison of number and percentage distribution of 134 epileptic cases and 10,894 other impaired workers studied, by age group*

Age group	Number of workers		Percent	
	Epileptic cases	Other impaired	Epileptic cases	Other impaired
Total	134	10,894	100.0	100.0
Under 20 years	1	78	.8	.7
20 and under 25 years	9	502	6.7	4.6
25 and under 30 years	7	894	5.2	8.2
30 and under 35 years	9	1,108	6.7	10.2
35 and under 40 years	16	1,168	11.9	10.7
40 and under 45 years	18	1,220	13.4	11.2
45 and under 50 years	14	1,298	10.5	11.9
50 and under 55 years	18	1,544	13.4	14.2
55 and under 60 years	23	1,520	17.2	14.0
60 and under 65 years	15	1,073	11.2	9.8
65 years and over	4	489	3.0	4.5

Industry and Occupational Coverage

The epileptic cases were less widely dispersed on an industry basis than any of the other impairment groups studied. Only 12 of the 19 major industry groups covered by the study are represented in the epileptic group.

This is one of the 3 impairment groups added on recommendation of the advisory committee after the study had begun. Consequently, any epileptic cases in the first 10 plants studied would not have been

picked up. However, only 29 of the 99 plants studied after inclusion of this impairment are represented in the survey group. In a few of the plants not represented, epileptics were employed but could not be matched with unimpaired workers. The number of such instances was not very great, however, and comparatively few epileptic cases were encountered throughout the study.

The jobs at which the epileptic cases were employed are listed below. The concentration in the processing or producing operations was fairly heavy, with a secondary concentration in maintenance work. The variety of skill requirements among the jobs listed was broad, ranging from unskilled labor to the highly skilled machinist classifications.

Jobs at which 134 Epileptic Cases of the survey group were found employed

[Titles used are those appearing in the United States Employment Service Dictionary of Occupational Titles and are grouped and numbered according to the classifications used by the Wage Analysis Branch of the Bureau of Labor Statistics. This is not to be interpreted as a complete listing of jobs at which persons with epileptic impairment can be employed]

1. Maintenance

Carpenter
Electrical repairman
Electrical instrument repairman
Electrician, powerhouse
Laborer (building)
Laborer (electrical equipment)
Laborer (foundry)
Laborer (petroleum refining)
Machinist II
Oiler I
Pipe-fitter helper
Plumber
Plumber apprentice
Tool maker
Welder, combination

3. Processing

Automobile mechanic, motor I
Buffer I
Centerless grinder operator
Chipper, foundry
Coremaker, machine I
Core-oven tender
Core paster
Cylindrical grinder operator
Die maker II
Engine lathe operator
Feller, hand
Floor assembler
Furnace tender, heat treating
Glass polisher
Heater, forge
Honing-machine operator, semiautomatic
Laborer (petroleum refining)
Laborer, process (automobile manufacturing)
Laborer, process (chemical)
Laborer, process (electrical equipment)
Laborer, process (machinery parts)
Laborer, process (nonferrous metal alloys and products)
Ladleman II
Lay-out man, machine shop
Loader VII
Machinist II
Machinist, bench
Mechanical engineer II
Molder, bench
Motor adjuster
Multiple-spindle-drill-press operator
Pourer, crane ladle
Power-press operator I
Punch-press operator I
Sand-slinger operator
Screw-machine operator, automatic
Single-spindle-drill-press operator
Swinging-cut-off-saw operator
Tool maker
Topping-off operator
Turret lathe operator
Welder, arc
Wireman VII
Yarn winder

4. Inspection and Testing

Balancer I
Casting inspector
Checker
Core checker
Inspector I
Inspector, chief I
Inspector, machine shop
Inspector, raw materials
Laborer, process (fabricated plastic products)
Tester I

5. Recording and Control

Chemist assistant II
Shipping checker
Stock clerk II
Tool clerk

6. Material Movement

Laborer (automobile manufacturing)
Laborer (foundry)
Laborer (glass manufacturing)
Laborer (machine tools and accessories)
Laborer (wire)
Laborer, process (foundry)

7. Custodial

Fireman III
Porter II

Placement Practices

In the plants in which epileptic cases were employed, the placement practices were the same for these cases as for other impaired workers. With the inventory of physical abilities supplied by the preemployment physical examination, the history of the case, and the job requirements the placement officer made the assignments; and the customary review of transfers, follow-up, etc., were practiced. With respect to the epileptic cases, the environmental conditions were given considerable emphasis. Placements had to be made with consideration for the possibility of seizure during working hours. In the

event of such seizure, certain types of machine operations, the presence of moving equipment, or work above ground level might prove to be extremely hazardous for these cases.

It is probable that the epileptic case might have the physical capacity to perform any job for which he had the requisite skill. The determination of placement in these cases revolves primarily around a contingency. What will be the results if the worker has a seizure on the job? This factor complicates the placement problem for these cases.

The nature of the seizures and the time of their occurrence are also matters to be considered in these cases. During the study a number of plant physicians expressed the opinion that recent developments and discoveries in methods of treatment and medication may make significant strides in controlling the seizures and consequently increase the employability of persons with this impairment.

Admittedly, the problem of safe placement for these cases presents serious difficulties at present. An additional obstacle to employment of epileptic cases is the reaction on the part of other employees when the impaired person has a seizure during working hours. Instances were encountered in the study in which plants had attempted to use epileptic cases but had discontinued the practice because of unfavorable reaction on the part of the other workers.

Definite exclusion policies prohibiting the employment of epileptic cases were encountered in 32 plants. Exclusion policies were encountered more frequently for only one impairment, hernia, excluded in 33 plants. However, in number of actually employed cases, hernia was highest and epilepsy lowest among the 10 impairments studied.

Work Performance

The elements of work performance for the epileptic cases and the unimpaired workers matched with them are summarized in table J–1 and the following paragraphs.

Absenteeism

An absence was defined as absence of a full day or more on days on which the employee was scheduled to work. Lay-offs, shut-downs, and regular vacations were not included as either days absent or days scheduled to work. The rates reflect the number of days absent per 100 scheduled workdays.

As a group the epileptic cases and the unimpaired workers matched with them were about equally regular in their work attendance. Rates for the two groups were 3.7 and 3.6 for the impaired and unimpaired, respectively.

Comparison of the individual rates by means of the frequency distribution in table J–3 bears out the similarity of performance indicated by the group rates. Seventeen percent of the epileptic cases and 18 percent of the unimpaired had no absences during the periods studied. More than half of each group, 55 percent of the impaired and 52 percent of the unimpaired, had nominal absence rates of 1.9 or lower. A number of the workers in each group, 3 percent of the epileptic cases and 2 percent of the unimpaired, had excessively high rates of 20.0 or higher. These isolated instances of poor performance would be expected in any sizable group of workers and duplicate the experience in the other impairment groups studied.

TABLE J–3.—*Percentage distribution of 134 epileptic cases and 208 unimpaired workers, by absenteeism frequency rate* [1]

Absenteeism frequency rate class	Impaired	Unimpaired
0	17.2	18.3
0.1 and under 1.0	17.2	21.6
1.0 and under 2.0	21.0	12.0
2.0 and under 3.0	16.4	16.3
3.0 and under 5.0	4.4	12.5
5.0 and under 7.0	9.0	6.3
7.0 and under 10.0	2.9	5.7
10.0 and under 20.0	8.9	5.3
20.0 and over	3.0	2.0
Total	100.0	100.0

[1] Number of days lost per 100 scheduled workdays.

An effort was made to determine whether epileptic cases tended toward higher rates of absenteeism for specific reasons. Unfortunately, adequate information on this point was not available from company records. No reason for absence was given for more than half the total absences recorded. In the portion for which the reason was given, however, there seems to be no material difference between the impaired and unimpaired groups.

TABLE J–4.—*Absenteeism frequency rates* [1] *for 134 epileptic cases and 208 unimpaired workers, by reason for absence*

Reason for absence	Impaired	Unimpaired
Total	3.7	3.6
Illness	1.4	1.3
Personal business	.2	.1
Unknown	2.1	2.2

[1] Number of days lost per 100 scheduled workdays.

Nondisabling Injury Experience

A nondisabling injury was defined as a work-connected injury which did not result in any loss of time beyond the day or shift on which the injury occurred. The rates for the groups reflect the number of such injuries per 10,000 exposure-hours. The rate for each individual was computed for purposes of the frequency distribution on a base of 1,000 exposure-hours.

As a group the epileptic cases experienced a slightly higher incidence of nondisabling injuries than the matched unimpaired workers. The rates for the two groups were 5.5 and 4.0, respectively. The difference is small and considering the type of injury involved is probably not significant.

Compared on an individual basis, the similarity of the experience in the two groups was even more marked: 63 percent of the impaired and 71 percent of the unimpaired had no injuries during the period studied; 92 percent of the epileptic cases and 93 percent of the unimpaired workers had very favorable rates of 1.9 or lower. It was the slightly larger number of epileptic cases with rates of 5.0 or higher—2.2 percent as against 0.5 percent of the unimpaired—which influenced the group averages.

TABLE J–5.—*Percentage distribution of 134 epileptic cases and 208 unimpaired workers, by frequency rate [1] of nondisabling injury*

Frequency rate class	Impaired	Unimpaired
0	62.7	70.6
0.1 and under 1.0	15.7	11.5
1.0 and under 2.0	13.4	11.1
2.0 and under 5.0	6.0	6.3
5.0 and under 10.0	1.5	.5
10.0 and over	.7	0
Total	100.0	100.0

[1] Number of injuries per 1,000 exposure-hours.

Data were obtained on nature of injury, and the rates attributable to the various kinds of injuries in the two groups are shown in table J–6. The pattern of the rates in the two groups is very similar, and the epileptic cases did not show any marked proneness toward injury of any particular nature. It seems reasonable to infer from this that the injuries experienced were attributable to the hazards of the jobs rather than to the impairment which characterized one of the groups.

TABLE J–6.—*Nondisabling injury frequency rates [1] for 134 epileptic cases and 208 unimpaired workers, by nature of injury*

Nature of injury	Impaired	Unimpaired
Total	5.5	4.0
Burns and scalds	.2	.4
Cuts and abrasions	3.2	2.3
Eye injuries	1.4	.9
Strains and sprains	.3	.1
Other	.4	.3

[1] Number of injuries per 10,000 exposure-hours.

An attempt was made to measure the severity of the injuries in terms of the number of redressings required. Policies with respect to encouraging or requiring redressings varied among companies but were the same for impaired and unimpaired workers in any given company. Measured in this way, the injuries were, if anything, a little less severe among the epileptic cases. In this group the nondisabling injuries averaged 1.6 redressings as against 1.9 per injury for the matched unimpaired workers.

A final consideration with respect to the medical record was the use made of plant medical facilities for nonindustrial illness or injury. This use was defined as dispensary visits for treatment of illness or injury not related to the worker's employment. Again, policies on this point varied among plants but were the same for impaired and unimpaired workers in the same plant. The epileptic cases made somewhat the greater use of plant medical facilities. Visits per person during the periods studied averaged 1.1 for the epileptic cases as against 0.7 for the matched unimpaired.

Disabling Injury Experience

Frequency. A disabling injury was defined as a work-connected injury which resulted in a permanent impairment or in a time loss of at least one full day beyond the day or shift on which the injury occurred. The frequency rate reflects the number of injuries per million exposure-hours. Use of this base may tend to inflate the rate because exposure-hours for the 134 epileptic cases totaled only about a quarter of a million.

The frequency rate was slightly higher for the epileptic cases, 8.3 as against 7.6 for the unimpaired group. This difference of less than one injury per million exposure-hours does not appear significant.

The number of injuries was not sufficient to provide a comparison between the two groups with respect to the nature of the injuries experienced. The impaired group experienced two injuries and the unimpaired group three, during the periods studied.

In connection with each disabling injury the accident reports and cause studies in the company files were examined in an effort to determine whether the injury was in any way caused or contributed to by the existing impairment. This subject was also discussed with the safety man and other responsible company officials. Neither of the injuries experienced by the epileptic cases were in any way attributable to the impairment. Similarly, none of the injuries experienced by the unimpaired workers were caused or contributed to by a fellow worker's impairment.

Time Lost. As a measure of the severity of the disabling injuries, the time lost has been computed as a rate showing the days lost per 100 scheduled workdays and also as the number of days lost per injury. The time-lost rate was 0.02 days and 0.13 days per hundred scheduled workdays for the impaired and unimpaired groups, respectively. On a per injury basis, the epileptic cases averaged a time loss of 3.0 days per injury and the unimpaired 22.8 days per injury. The number of injuries in both groups, however, is too small to support definite conclusions.

Output Relative

Measured individual production data were obtainable for only four of the epileptic cases and seven unimpaired workers matched with them. These data are included in the computation of the output relative for the total impaired and unimpaired groups, but no performance figures are shown separately for the epileptic cases.

Quit Rate

The quit rate was intended to show the number of voluntary quits per hundred employees of the survey group during the 6 months following the end of the survey period. These data were obtainable for only 23 of the epileptic cases, too few to permit showing separate performance figures for this group.

Appendix

Scope and Method of the Study

The study posed a considerable number of problems because of the complexity of the data and the number of factors which had to be measured. It was found possible, however, to provide reliable measures by means of standard statistical techniques. As will be apparent from the following description of the method used, the solutions to these problems hinged essentially upon the adaptation of these methods to the practical considerations of the nature of the information readily available in the records of cooperating plants. Basically, the objective of the study was to compare, over the same period of time, the work performance of impaired workers with that of unimpaired workers on the same jobs. The two groups were matched with respect to such elements as age, experience, and working conditions, so as to rule out as many extraneous factors as possible, and to reduce the difference between the two groups to only one important factor: The existence of a serious physical impairment. The comparisons could be expressed best in terms of averages, frequency distributions, and similar common measures of five factors in work performance: Absenteeism, minor work injuries, disabling injuries, production efficiency, and separations.

Definition of Impaired Worker

Fundamental to the undertaking of this study of the performance of impaired workers was a definition of exactly what types and degrees of disabilities should constitute the impairments to be studied. At the outset it was decided by agreement between the Bureau of Labor Statistics and the Veterans Administration that the study should be limited to physical impairments. It was not considered feasible to include mental disabilities.

The first requisite was that the concept of the "impaired worker" should be sufficiently restrictive to exclude any minor disabilities. If the study was to provide the much needed objective findings on the performance of impaired workers, it was essential that definitions be so strict as to eliminate all impairments that did not require special job placement considerations. A second requirement was that the impairments studied must be those recognized by industry. The definitions would have to fit the usages and terminology common to the medical departments of industrial plants.

Tentative definitions of a group of impairments were drawn, and were tested for data collection in several plants. With this experience as a background, an advisory committee, composed in part of practicing industrial physicians recommended by the American Medical Association, was consulted. With the assistance of this committee the scope and method of the study were reviewed carefully and in great detail. The definitions of impairment were revised. Because of their fundamental importance, these definitions are given here in detail:

Orthopedic:

(*a*) Loss of a member or members of the body (arm, hand, leg, or foot).

(*b*) Loss of a part of a hand (a thumb and one finger, or two phalanges of each of three fingers) or loss of part of a foot (all toes or any part of the front portion of the foot).

(*c*) Loss of use or severely restricted use of —

(1) An arm or leg comparable to (*a*) above, or

(2) A hand or foot comparable to (*b*) above.

(*d*) Deformities or abnormalities of the spine which severely restrict movement and use of the back in bending, stooping, lifting, crouching, etc.

Vision:

(*a*) Totally blind, meaning loss of both eyes or complete loss of light perception in both eyes.

(*b*) Blind, one eye, meaning loss of one eye or

complete loss of light perception in one eye.

(c) "Legally" blind. Legal blindness for this purpose was based on the Social Security Board's definition as 20/200 Snellen or less *corrected* in the *better* eye.

(d) "Partially" blind. This classification included persons whose vision was more than 20/200 but less than 20/50 *corrected* in the *better* eye.

(e) Restricted field. For the purpose of this study, the restriction of the visual field had to amount to 50 percent or more.

Hearing:

(a) Deaf. Complete loss of hearing in both ears without use of hearing aid. A loss of 50 decibels or 0/20 classification placed the person in this category.

(b) Hard of Hearing. Persons who had not more than 50 percent of hearing in the better ear without use of hearing aid. Fifty percent loss of hearing was defined as 10/20 hearing when 20/20 was considered normal hearing. If the medical records expressed the loss of hearing acuity in terms of decibels, a hearing loss of 30 decibels or more (but less than 50) placed the person within the definition.

(c) Deaf-Mutes.

Hernia: Those who had an existing hernia condition such as umbilical, inguinal, post-operative, etc. *The definition excluded —*

(a) Employees who had had a successful herniotomy;

(b) Employees who had only an incipient, potential, or incomplete hernia; and,

(c) Those who had only enlarged or relaxed rings.

Cardiac: Those persons who were recorded by the company doctor as definite organic cardiac cases, including cases of hypertensive heart disease. However, hypertension cases where there was no deterioration or enlargement of the heart and cases of potential heart disease were excluded.

Ex-Tuberculous: All persons recorded by the company doctors as having arrested pulmonary tuberculosis.

Peptic Ulcer: These cases were included if the record showed that the diagnosis was confirmed by X-ray or other approved laboratory methods.

Diabetic: Cases recorded in this category were taken if the diagnosis had been confirmed by a glucose tolerance test.

Epileptic: Both grand mal and petit mal were included.

Multiple Impairment: All cases in which the individual had two or more impairments each severe enough in itself to come within the adopted definitions.

In order to yield statistically valid findings in each of the impairment groups, the total number of impaired workers to be studied was set at 10,000. Upon completion of the survey, however, it was found that even this figure did not yield adequate data for some of the impairment types.

Work Performance Factors Studied

The primary purpose of the study was to establish on a factual and objective basis a comparison of the work performance of impaired workers with matched unimpaired workers on the same jobs. But, "work performance" has many phases and many aspects. It was necessary at the outset to select certain factors in work performance which would lend themselves to objective quantitative measurement, for which data could reasonably be expected to be available in company records, and which would have practical significance in the placement of impaired persons in useful jobs. Because of the likelihood that such data could be found more frequently in manufacturing plants, the survey was limited to manufacturing industries.

Interviews with plant and personnel managers, Federal, State, and local rehabilitation and placement agencies, trade associations, unions, and various associations of the impaired resulted in the selection of five major factors to be studied. These factors were discussed with the advisory committee and it was agreed that the work performance of the impaired worker should be compared with that of the matched unimpaired workers with respect to —

(a) Production efficiency, based entirely on quantitative measurements of individual output. All subjective measures such as foreman's evaluation, efficiency ratings, etc., were to be excluded.

(b) Absenteeism, defined as scheduled workdays

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lost for personal reasons. Because of the limitations of industrial records, absences of less than a full day were to be disregarded.

(*c*) Nondisabling injuries, defined as work injuries which did not result in a permanent impairment or any loss of time beyond the day or shift on which the injury occurred; in other words, first-aid cases.

(*d*) Disabling injuries, defined as work injuries which resulted in loss of time of one full day or more beyond the day or shift on which the accident occurred, or which resulted in permanent impairment even if no time was lost.

(*e*) Job separations, meaning the voluntary and involuntary terminations in the two groups within a fixed period of time. These data were to be obtained on return visits to plants which had been surveyed earlier with respect to the other four performance factors.

Supplementary information such as reasons for absence, number of redressings for nondisabling injuries, nonindustrial medical visits, medical facilities, job placement practices, job re-engineering, etc., was also provided for.

Selection of Plants

There is no central source which provides information as to which plants employ seriously impaired workers. It was necessary to resort to a number of methods to find such plants.

Early in 1944 a mail questionnaire survey on the subject of impaired workers had been made and about 450 usable returns from that many plants were tabulated.[1] This source provided some leads as to plants employing sizable numbers of impaired workers. Some assistance in this connection also was obtained from various trade associations, rehabilitation services, the United States Employment Service, and the Veterans Employment Service in the various large industrial centers. Field representatives of the Bureau of Labor Statistics were sent to various cities in all parts of the country, and the selection of plants was made after utilizing all available sources of information in the community. For the most part, the question as to whether or not a given plant could be included in the study could be determined only after interviews with the company officials.

[1] The results of this opinion survey were published in the Monthly Labor Review for October 1944.

Given willingness on the part of plant management to cooperate, the inclusion of a plant in the study depended upon three considerations:

1. Employment of a number of physically impaired workers sufficiently large to justify the expenditure of time necessary to search records and record the data for the study. The minimum limit was set at 20 such workers.
2. The existence of pre- or post-employment physical examination records adequate for a selection of impaired persons within the definitions of impairment, and for the selection of unimpaired workers to constitute the control group.
3. The existence of records of absences, injuries, and production in such form that the time required for the assembling of the data would not be prohibitive.

It was necessary that all of these requirements be fulfilled in each plant included in the study. The first and third were necessary as a practical matter of cost and the limited time available for the data collection. The second was necessary if positive accuracy in the selection of impaired and unimpaired workers was to be maintained. In order to use the limited field staff most effectively, effort was concentrated for the most part in the large industrial centers. As far as possible, however, coverage was sought in every large center throughout the country. As a result the survey was conducted in 16 States, from Massachusetts to California, and as far south as Georgia.

A conscientious effort was made to select plants in all fields of manufacturing industry so as to obtain a fair indication of the actual employment of impaired workers and the variety of occupations at which they worked. As a result, the industries surveyed include 19 of the 20 major industry groups recognized by the Standard Industrial Classification. The lumber and timber basic products group had to be omitted because of the practical consideration of expense.

Selection of the Survey Group

Through discussion with company officials, a period of relatively stable operation was selected for study in each plant. This period ranged from 6 to 18 months, depending on the particular circumstances. Data were collected for each employee of the survey group for a period of at least 6 months and wherever possible, for a full year.

By reference to medical records or other sources available at the plant, a record was made of each impaired worker who had been employed for 6 months or more during the selected period. Identifying information such as name, clock number, sex, age, shift, impairment, cause and duration of the impairment, etc., were entered on prepared work sheets for each impaired worker. The impaired workers in clerical, administrative, and supervisory jobs were eliminated at the outset. As many as possible of the remaining impaired workers were then matched with from one to three unimpaired workers to make up the survey group. It will be observed that these records gave no clues as to the performance of the workers in either group, so that it was not possible to exert any bias.

The matching operation set up a control group of unimpaired workers subject to the same incentives and exposed to the same hazards as the impaired workers with whom they were matched. Ideally, the comparison of work performance should be made between workers identical in every respect except for the existence of the impairment. In practice, however, this ideal comparison is impossible. However, as many variables as could be controlled were eliminated by matching the impaired worker with one or more unimpaired workers of the same sex, on the same shift, of closely similar age, with about the same length of experience, and working on the same job in the same department of the same plant. Thus, at least the physical facts and conditions of employment were the same in both groups. Where possible, three unimpaired workers were matched in this way with each impaired worker. Where three comparable unimpaired workers could not be obtained, two or one were used. Thus, the survey group consisted of a number of cells, each of which was composed of one impaired worker and from one to three unimpaired workers.

Collection of the Data

The data from which the measures or rates for the several performance factors were computed were taken in their entirety from original sources — the records of cooperating firms. The study was made during 1946 and 1947 and the periods studied ranged from 1945 through early 1947. The data were transcribed from company records — such as pay roll, attendance, medical visits, personnel, etc. — to prepared work sheets by trained field personnel of the Bureau. (Samples of the work sheets are attached as exhibits I through VI at the end of this section.) Supplemental information relating to placement and safety practices, job re-engineering, job requirements, etc., were obtained by interviews with company officials and first-hand observation in the plant.

The work sheets for each impaired worker and his matched unimpaired workers were assembled into cells by the field representatives and sent to the Bureau's Washington office for editing, coding, and tabulation.

Data for job separation rates (Exhibit VII) were obtained by follow-up contact with the company about 6 months after the end of the *survey period.* This method, however, made it impossible to obtain such data from plants studied within the last 4 or 5 months of the survey.

Office Processing of the Data

The data received from the field agents were first edited and reviewed to be sure that (1) impairments listed were clearly within the adopted definitions and (2) the impaired and unimpaired were properly matched as to sex, age, job, and the other prescribed limitations.

Plant schedules were given a code designation for industry from the Standard Industrial Classification. Each impaired worker's job was coded according to the U. S. Employment Service Dictionary of Occupational Titles and the jobs were classified according to the patterns used by the Wage Analysis Division of the Bureau of Labor Statistics. Thus, each schedule was related to three standard classifications in common use in the Bureau: the industry, to the Standard Industrial Classification; and the impaired worker's occupation to the Dictionary of Occupational Titles and to the Bureau of Labor Statistics wage analysis pattern. As the matched impaired and unimpaired workers had to be on the same jobs, the same job code applied for each of the impaired and unimpaired workers comprising a single cell.

The number of days scheduled to work was computed for each impaired and unimpaired worker from the operating schedule of the plant during the survey period. Deductions were made for observed holidays, shut-downs, and lay-offs so that scheduled days represented the number of days the employee was ex-

pected to be at his place of work. The scheduled days of work provided the base on which absence rates were computed.

The scheduled days less absences, multiplied by the hours worked each day, provided the exposure-hours for the computation of nondisabling and disabling injury frequency rates.

The absences for each individual were accumulated to a total for the survey period and, where available, with subtotals for the number of absences attributable to the various reasons for absence. Similarly, the data for nondisabling injuries by nature of injury, number of redressings, number of nonindustrial medical visits, and number of disabling injuries were summarized for each individual of the survey group.

All of these data were transcribed to a specially designed code sheet from which I. B. M. cards could be punched for machine tabulation. At this point a weighting factor was applied to the data for the unimpaired workers to equalize the 1 to 1, 1 to 2, and 1 to 3 matchings. A sample of this form is attached to this section as Exhibit VIII.

After the data for any one plant had been tabulated and analyzed, a confidential report of the findings was prepared and submitted to the plant management. The objective was to make the data available to the management of cooperating plants for their immediate information and administrative use. Judging from the replies, this somewhat unusual procedure was well received by management.

Weighting

As already explained, each impaired worker was matched with from 1 to 3 unimpaired workers, depending upon the number of comparable unimpaired workers available. This matching process resulted in uneven cells, some of which consisted of 1 impaired worker matched with 1 unimpaired worker, some of 1 impaired matched with 2 unimpaired, and some of 1 impaired matched with 3 unimpaired.

In combining the data of these cells for group averages and rates, it was obvious that the results for the unimpaired workers would be influenced by the performance in those cells in which the matching was on a 1 to 2 or 1 to 3 basis. It was necessary, therefore, to apply a weighting factor to the data for the unimpaired workers which would neutralize any excessive influence on the part of these units.

Since the survey group was composed of cells in which the unimpaired were variously 1, 2, or 3 persons, the least common multiple was 6. The numerical data for the unimpaired workers was therefore multiplied by 6 in the cells of 1 impaired and 1 unimpaired, by 3 in the cells of 1 impaired and 2 unimpaired, and by 2 in cells of 1 impaired and 3 unimpaired. Thus, while the *rates* for individuals and unit would not be affected, the data when combined would be relieved of any excessive influence from the units in which the number of unimpaired workers exceeded 1. Although tests made with weighted and unweighted data in the early stages of the study did not show appreciable differences, it was believed best to take the probability into account at the outset. The data as prepared for machine tabulation were weighted. Thus, it was possible to prepare final tabulations from the punch cards and eliminate the necessity for testing and weighting the data in the final stages of analysis.

Presentation of the Data

The form and organization of the final report were aimed at simplicity and greatest utility. While the broad concept of impaired and unimpaired workers is of wide interest, the practical day-to-day problems of rehabilitation and placement require findings in terms of specific impairments. Consequently, tables were prepared not only for the group as a whole, but for each of the types of impairment covered by the definitions. It was frequently found, however, that some of the detailed data represented too few cases to be valid statistically.

As various organizations concerned with the welfare of persons with specified impairments would undoubtedly wish to utilize the section of the report dealing with their individual specialties, the data for each impairment type was presented as a complete unit capable of standing by itself. This determination was further influenced by the consideration that placement officials — whether governmental or private — would want ready recourse to data organized along impairment lines in their dealing with individual impaired workers. Considerations of industry and occupation were believed to be of minor importance. As pointed out throughout the report, the problem of utilizing a seriously impaired worker is one of matching his abilities to the requirements of a job, regardless of what that job may be called or in what industry it is found.

EMPLOYEE RECORD
(Worksheet A)

1. Name_____
2. Clock No._____3. Dept._____4. Shift_____
5. Occupation_____
_____
_____
6. Age_____7. Sex_____8. Cell No._____
9. Impairment:_____
_____
_____
10. Cause of Impairment:
    (a) Congenital_____(b) Illness_____(c) Work Injury_____
    (d) Other Injury_____(e) Other Cause_____(f) Unknown_____
11. Duration of Impairment:
    (a) From Birth_____(b) Acquired in Childhood_____
    (c) Acquired in Adulthood_____
12. Rehabilitation:_____
_____
_____
_____
13. Date placed on present job:_____14. Date entered plant:_____
15. Rate of pay on present job:_____
16. Is employee a veteran of World War II? Yes_____No_____
17. What special aids, job revision, etc., are required?_____
_____
_____
_____

Exhibit I

ABSENTEEISM

(Worksheet B)

1. Cell Number_____ 2. Period: From_____Thru_____

3. Record of Absence

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan.																															
Feb.																															
Mar.																															
Apr.																															
May																															
June																															
July																															
Aug.																															
Sept.																															
Oct.																															
Nov.																															
Dec.																															

4. Code for Cause of Absence:

1. Own Illness
2. Family Illness
3. Personal Business
4. Trans. Difficulties
5.
6.
7.
8.
9. Unknown

5. Comments:

Exhibit II

MEDICAL VISITS

(Worksheet C)

1. Cell Number_____ 2. Period: From_____Thru_____

3. Record of Medical Visits

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan.																															
Feb.																															
Mar.																															
Apr.																															
May																															
June																															
July																															
Aug.																															
Sept.																															
Oct.																															
Nov.																															
Dec.																															

4. Type of Visit:
   1. Welfare
   2. Redressing for Nondisabling Injury
   3. Nondisabling Injury
   4. Disabling Injury
   a. Burns and Scalds
   b. Cuts and Abrasions
   c. Eye Injuries
   d. Strains and Sprains
   e. Dislocations and Fractures
   f. Amputations
   g. Dermatitis
   h. Infections

5. Comments:

Exhibit III

DISABLING ACCIDENT RECORD
(Worksheet D)

1. Cell No._____2. Dept._____3. Date_____
4. Occupation_____
5. Nature of Injury and Body Part Affected_____
6. Resultant Type of Disability_____
7. Cause of Accident_____
8. (a) Days Lost_____
   (b) Date of 1st Full Day Absent_____Date of Last Full Day of Disability_____
9. Was Accident Attributable to Worker's Impairment?_____

Exhibit IV

OCCUPATIONAL DATA
(Worksheet E)

1. Job Title_____2. Dept._____
3. Description of Duties_____
4. Machines Used_____
5. Hand Tools Used_____
6. Skill Demands: over 2 yr._____6 mo. to 2 yr._____under 6 mo._____
7. Physical Requirements:
   (a) standing____(b) sitting____(c) stooping____(d) moving____(e) lifting___
8. Working Conditions:
   (a) Condition of Floors:
       Wet_____Dry_____Greasy_____Rough_____Housekeeping: Good_____Bad_____
   (b) Atmosphere:
       Dusty_____Humid_____Dry_____Fumes_____Clean_____
   (c) Moving Equipment:
       Overhead_____Floor Level_____None_____
   (d) Illumination:
       Dim_____Good_____Glare_____
9. Cell Number Applicable_____
10. Comments_____

Exhibit V

U. S. BUREAU OF LABOR STATISTICS
Impaired Worker Study
(Worksheet F)

1. Name of Company_____
2. Business Affiliation_____
3. Authorizing Official (full name, title, address)_____
_____
4. Scheduled Plant (name and address)_____
5. Furnishing Officials (full names, titles, and addresses)_____
_____
_____
6. Products of Scheduled Plant_____
_____
7. Employment:
Ave. monthly for per. sched. - Total_____Unimpaired_____Impaired_____

	Male	Female
Orthopedic		
Vision		
Hearing		
Hernia		
Cardiac		
Diabetic		
Epileptic		
Gastric Ulcer		
Other		

8. Placement:
(a) Labor Recruitment_____
_____
(b) Pre-Employment Physical Examination:
(1) Scope_____
_____
(2) Exclusions_____
_____
(3) Comments_____
_____
_____
_____

Exhibit VI

(Worksheet F--Continued)

(c) Induction

(1) Interviews

(2) Tests

(3) Training Programs

(d) Job Analysis

(e) Placement and Transfer

(f) Job Follow-up

(g) Job Reengineering for Impaired

(h) Plans for Veterans

9. Work Schedule (schedule period by dept. or occupational group)
   (a) Days/wk. (b) Hrs./day (c) Holidays Observed

10. Company Policies
   (a) Safety Programs
   (b) Safety Department Organization

(Worksheet F--Continued)

(c) First Aid Program_____
Location_____
Doctor on duty_____
Registered nurses_____
Technician_____
Other attendants
Physical equipment
_____

(d) Workmen's Compensation_____
(1) Company attitude_____
_____
_____
(2) Insurance coverage_____
_____
(3) Waivers_____
_____

11. General
(a) Records used_____
_____
(b) Selection of sample_____
_____
(c) Special features to be covered in plant report_____
_____
_____
(d) Plant report to be addressed to_____
_____
(e) Comments_____
_____
_____
_____
_____
_____

Job Separations

(Form G)

Company:_____ Date checked:_____

Survey list		End of survey period	Impaired	Unimpaired	Voluntary quits							Military service	Deceased	Terminations									Remarks:
														Disc. for cause									
Page No.	Line No.				Health	Family reasons	Moved	Trans.	Dissatisfied	Other	Unknown			Break rules	Poor atten.	Other	Unsuited for work	Red. in force	Work conn. disab.	Nonwork conn. disab.	Other	Unknown	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)

Exhibit VII

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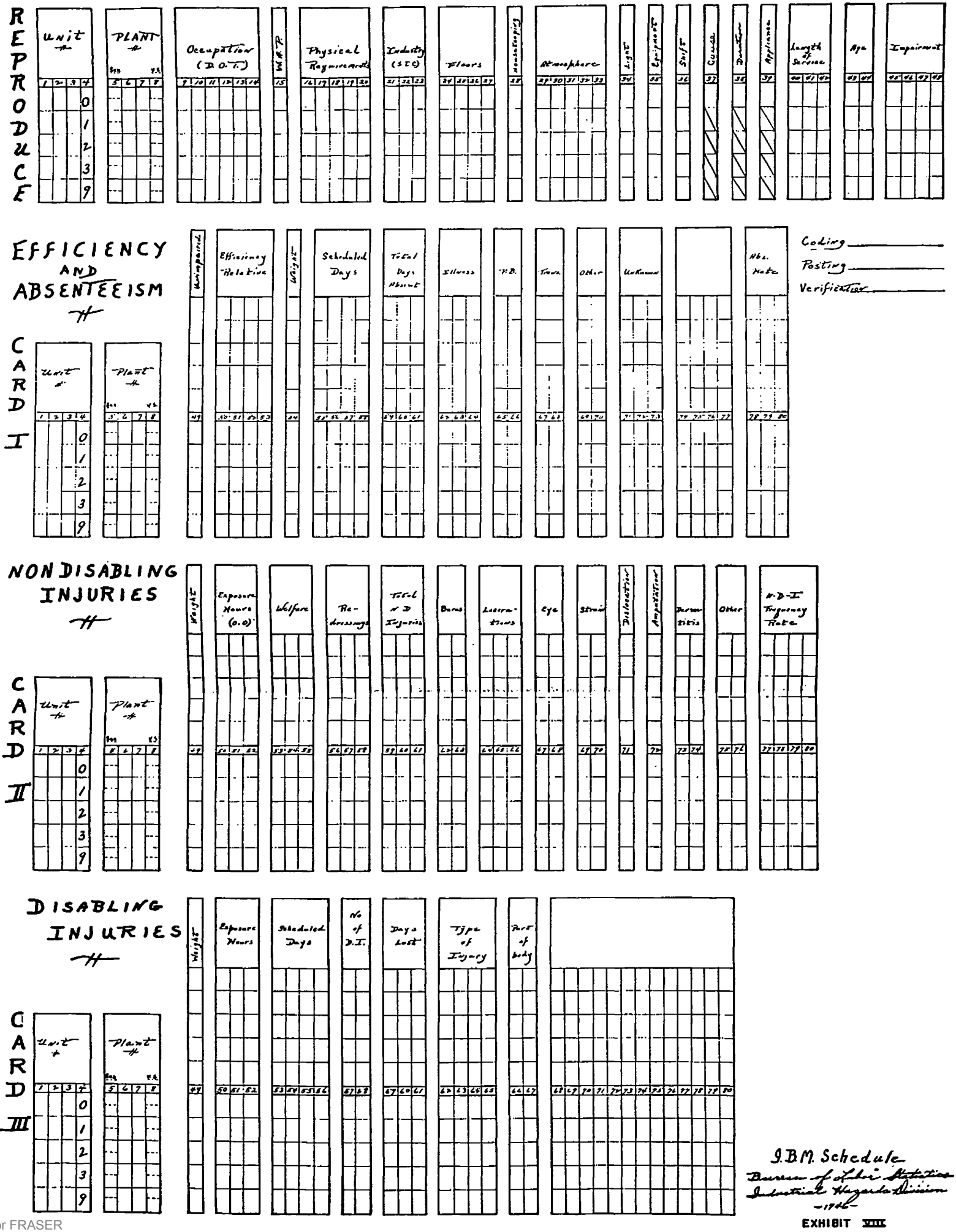

I.B.M. Schedule
Bureau of Labor Statistics
Industrial Hazards Division
-1946

EXHIBIT VIII

(Face p. 132.)