

Work experience over an 18-month period after myocardial infarction is examined among a cohort of men with a first infarction in a defined period. Age, severity of episode, and low physical activity have an adverse effect on return to work. Low physical activity is related to an excess risk for infarction. Various other findings are presented and discussed.

RETURN TO WORK AND WORK STATUS FOLLOWING FIRST MYOCARDIAL INFARCTION

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THIS report is concerned with the early impact of first myocardial infarction (MI) upon the working lives of men in a defined population who sustained this diagnosis in an 18-month period (November 1, 1961-April 30, 1963). The extent and rate of return to work over the year and a half following MI are examined in relation to a number of demographic and personal characteristics, both for the entire cohort and for those who survived the MI by three or more months. Age, clinical severity of the episode, broad occupational category, physical activity connected with job at time of diagnosis, and over-all level of customary physical activity are studied in relation both to the rate of return to work after infarction and to the work status at specified time intervals up to 18 months from the MI.

Efforts to estimate the social consequences of manifest coronary heart disease among men in the labor force are limited by the selective nature of case series reported and the frequently wide range both of age and of time over which such series have been collected. Among early papers, Master and Dack

(1940) reported on 415 patients of both sexes (aged 30-89) who had suffered one, two, or three MI's, and noted an over-all return to work of 59 per cent after the first MI.¹ In 1954 Master, et al.,² expanding this series to 500 patients who had survived the MI for at least one year, reported a return to work for 70 per cent of those on whom work histories had been obtained. Papp and Shirley Smith (1951) reported for 200 consecutive cases seen in private and hospital practice (ages 30-79) in England that 33 per cent of patients who had sustained a severe MI returned to work, compared with 65 per cent of those with MI of lesser severity.³ Of 184 selected cases (aged 25-64) from the medical records of the Eastman Kodak Company (a group characterized by the authors as "in no sense intended to be representative of the heart disease with myocardial infarction occurring among the total working force") Crain and Missal (1956) noted that 82 per cent resumed work after the MI.⁴

In 1964 Pell and D'Alonzo, in a study designed to identify all male employees of E. I. du Pont de Nemours

and Company who sustained a first MI, computed "losses to the company work force" over a five-year period by life table methods. Among 932 men who survived the MI by 30 days or more about 80 per cent of the salary-roll employees and 70 per cent of the wage-roll employees were still working for the company one year after the attack. The corresponding figures five years after MI were 50 and 43 per cent.⁵ In a recent British study D. E. Sharland has focused interest specifically on the ability of men to return to work after myocardial infarction.⁶ He has noted the problems arising from selectivity of case material, and reports on 212 male survivors of first MI collected over four years from three large district general hospitals. These men were under 60, and men with "serious complications such as congestive failure" or with diabetes or severe hypertension were excluded. Three months after the attack 55 per cent of this group were at work; this had risen to 82 per cent by six months post-MI and was 86 per cent at both one and two years after the event.

Material

The population at risk for specified manifestations of coronary heart disease (CHD) in the HIP (Health Insurance Plan of Greater New York) study, its methodology, and criteria for diagnosis have been previously described.^{7,8} The primary objective of the study is to develop prognostic data following first diagnosis of specified manifestations of CHD. Here it should be noted that enrollment in the plan is on a group basis: about 65 per cent of the members are insured through group contracts with local, state, and federal agencies; and trade union welfare funds constitute the next largest source, accounting for one in five of the persons insured. A wide range of socioeconomic, ethnic, and

religious groups exists in the covered population, although it differs from the general population of New York City in having a lower proportion of persons of very low socioeconomic status and a much lower proportion of Puerto Ricans. Almost all males (97 per cent) in the insured population are working, and they provide a diversity of occupational groups. About 32 per cent are in professional, technical or managerial jobs, and 13 per cent in clerical or sales jobs. Of the 55 per cent in "blue collar" categories, similar proportions are classified as craftsmen (15 per cent), operatives (16 per cent), and service workers (18 per cent), while laborers constitute 6 per cent of the total.

Patients in this population whose medical records suggest the possibility that a new manifestation of CHD has developed within the study period receive a base line medical evaluation. Other sources of information include hospital charts, death certificates, medical examiner's records, and interviews with next of kin. Case finding extends over a four-year period. Patients who meet the study criteria are included in the prognosis cohorts, and receive their first follow-up examination six months from the date of the base line. This is followed by two biennial examinations for a total follow-up of 4.5 years after the base line. The response rate among patients requested to appear for the initial base line examination is 94 per cent; about 95 per cent of those in the prognosis cohorts appear for their six-month follow-up examination.

At the base line examination patients are questioned by a staff interviewer about many personal characteristics. For those which are subject to change (e.g., work status, type of job, smoking, customary physical activity), questioning is directed at clarifying the status just prior to the manifestation of CHD which brought the patient into the study, as well as current status. Similar inter-

views are carried out at the follow-up examinations, and telephone interviews are obtained at the annual points between the follow-up examinations (1.5 and 3.5 years after base line). Dates of reported changes in a given characteristic are obtained which make it possible to reconstruct changes in status over a given time interval. Comparable interviews are conducted with the next of kin of patients who die before their scheduled dates of examination or telephone interview.

Of some 55,000 men under observation, aged 25-64 and enrolled in the Plan for at least two years, 301 met the study criteria for an initial episode of MI ("highly probable," "probable," or "new coronary event leading to death" in terms of the study criteria) in the first year and a half of the study period. Work status at time of MI and three-month survival status of this cohort of new MI's diagnosed in the 18-month period are shown in Table 1. Data to be presented are based on the 275 of these men who were known to be working at the time of the diagnosed episode. Table 2 gives distributions by age in relation to the variables to be considered. Of the total of 275, 81 died before four weeks had elapsed (29.5 per cent) and an additional five were dead in the next two months (three-month mortality 31.3 per cent). Base line

examinations were obtained in 92 per cent of the working men who survived three or more months. Special interviews to establish characteristics at time of MI were obtained with 15 of 18 men who refused the base line examination; all 15 of these men were working at time of MI and they are included in the data for the total cohort of 275. Interviews with next of kin provided the information on characteristics for 83 of the patients dead within three months; the remaining three patients dead within this interval had been evaluated before the fatal MI. All evaluated patients have been followed for at least 18 months from the date of MI. The first follow-up examination (six months after base line) and the first telephone interview (18 months from base line) provide the interval data on work history on which the current findings are based.

Findings

A. Rate of Return to Work

The data to be presented focus on a short period—18 months—immediately following a first MI in employed men. The chief interest is in the rate and extent of return to work in relation to a number of variables. The experience of the entire cohort is reviewed first, so that the role of the known high early mortality of the disease and of varying

Table 1—Males experiencing first myocardial infarction in the 18 months, November 1, 1961-April 30, 1963: work status at time of MI, deaths within three months of MI, refusals and evaluations

Work Status at Time of MI	Total	Died Within 3 Months	Alive 3 Months After MI	Refused Evaluation	Evaluated
Total	301	102	199	18	181
At work	275	86	189	15	174
Unemployed	4	2	2	—	2
Retired	9	4	5	—	5
Unknown	13	10	3	3	—

Table 2—Distribution by age at time of first MI, cohorts of men with specified characteristics working at time of MI*

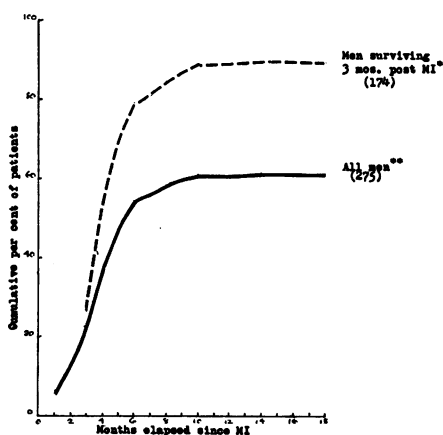
Characteristic	All Men				Men Surviving 3 Months and Evaluated			
	Total	<45	45-54	55-64	Total	<45	45-54	55-64
Total	275	13.5	38.9	47.6	174	16.1	39.7	44.3
Clinical severity								
Hospitalized, severe	57	17.5	29.8	52.6	34	20.6	29.4	50.0
Hospitalized, other	134	11.9	44.8	43.3	120	12.5	45.8	41.7
Not hospitalized	80	12.5	36.3	51.3	19	26.3	21.1	52.6
Occupational category								
White collar	135	11.9	42.2	45.9	78	15.4	43.6	41.0
Blue collar	139	15.1	36.0	48.9	96	16.7	36.5	46.9
Physical activity connected with job								
Low; medium-low	177	15.3	41.3	43.5	110	20.0	38.2	41.8
High; medium-high	94	10.6	35.1	54.3	63	9.5	42.9	47.6
Over-all level of physical activity								
Least active	75	9.3	38.7	52.0	35	8.6	34.3	57.1
Intermediate	106	11.3	42.5	46.2	68	14.7	44.1	41.2
Most active	88	20.5	34.1	45.5	68	22.1	36.8	41.2

* Men for whom the given characteristic was not classified at the time of MI are omitted from the table.

early mortality with respect to certain characteristics makes its contribution to the total picture. Attention is then concentrated on the rapidity with which the men who survive their first MI by three months return to work. It is the experience of this group which may offer insights of particular interest to those concerned with the development of programs to expand the work potential of many employed middle-aged men.

1. The Total Cohort—During the first six months after initial MI there is a rapid, steady rise in the proportion of all men sustaining this diagnosis who made a return to work (Figure 1, solid curve, and Table 3). Increments in the per cent returned to work fall sharply beyond the six-month point and are negligible after ten months have elapsed from the date of MI. One can conclude that if work has not been resumed by

Figure 1—Cumulative per cent of men returned to work after first myocardial infarction, by months elapsed since MI



* Based on evaluated patients only.

** "All men" includes patients dying within three months of MI, patients surviving three months and evaluated, and 15 men surviving three months and refusing evaluation.

the time ten months have passed, there is little likelihood of a subsequent return. The final figure, 18 months post-MI, is 62 per cent for the entire group; 55 per cent have returned by the time six months have elapsed, while only 22 per cent are back after an interval of three months.

The cumulative per cent of men returned to work over the 18-month period following infarction is inversely related to age, reaching 81 per cent for men under 45 at time of MI, 64 per cent for those aged 45-54, and 53 per cent for the oldest group (55-64). The rate of return of the oldest group in the first

Table 3—Cumulative per cent of men returned to work after first myocardial infarction, by months elapsed since MI: age and clinical severity

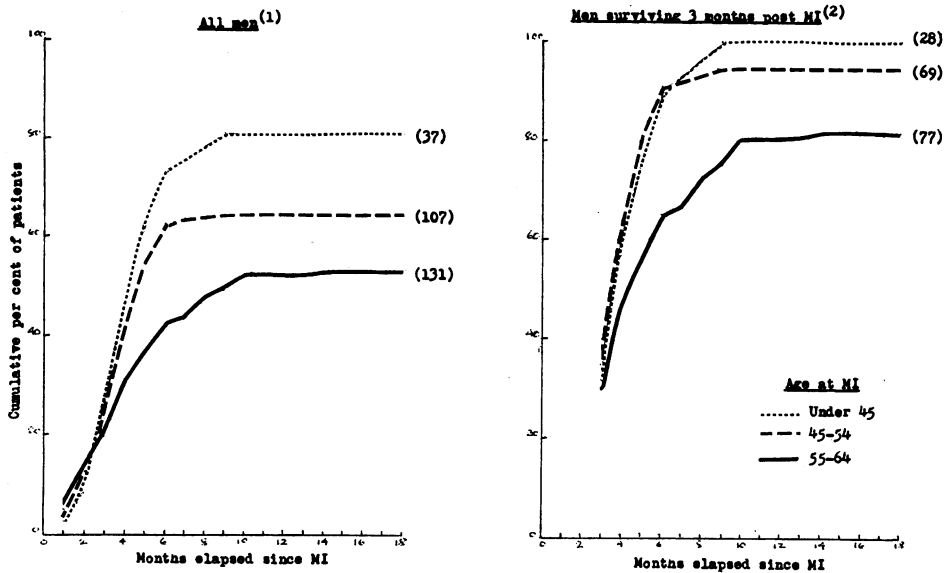
Months Elapsed Since MI	Total	Age at MI			Clinical Severity (Hospitalized Episodes Only)		
		<45	45-54	55-64	Most Severe	Moderate or Light	
All men*							
No. in cohort	275	37	107	131	57	134	
Months:	1	4.7	2.7	3.7	6.1	—	3.0
	2	12.4	8.1	12.1	13.7	1.8	15.7
	3	22.2	27.0	23.4	19.8	10.5	32.1
	4	36.7	45.9	40.2	30.5	21.1	53.0
	5	47.3	62.1	55.1	36.6	33.3	67.2
	6	54.5	73.0	62.6	42.7	45.6	76.1
	7	55.6	75.7	63.6	43.5	45.6	79.1
	8	58.2	78.4	63.6	48.1	49.1	81.3
	9	59.6	81.1	64.5	49.6	49.1	85.1
	10	61.1	.	.	52.7	52.6	85.8
	11	.	.	.	.	.	.
	12	.	.	.	.	.	.
	13	61.1	.	.	52.7	52.6	.
	14	61.5	.	.	53.4	54.4	.

	18	61.5	81.1	64.5	53.4	54.4	85.8
Men surviving 3 months†							
No. in cohort	174	28	69	77	34	120	
Months:	3	32.2	32.1	34.8	29.9	14.7	33.3
	4	53.4	57.1	59.4	46.8	32.4	55.8
	5	69.0	75.0	81.2	55.8	50.0	71.7
	6	79.3	89.3	91.3	64.9	67.6	80.8
	7	81.0	92.9	92.8	66.2	67.6	84.2
	8	84.4	96.4	92.8	72.7	73.5	86.7
	9	86.8	100.0	94.2	75.3	73.5	90.0
	10	89.1	.	.	80.5	79.4	90.8
	11	.	.	.	.	.	.
	12	.	.	.	.	.	.
	13	89.1	.	.	80.5	79.4	.
	14	89.7	.	.	81.8	82.4	.

	18	89.7	100.0	94.2	81.8	82.4	90.8

* "All men" includes patients dying within three months of MI, patients surviving three months and evaluated, and 15 men surviving three months and refusing evaluation.
 † Evaluated patients only.

Figure 2—Cumulative per cent of men returned to work after first myocardial infarction, by months elapsed since MI: age at MI



(1) "All men" includes patients dying within three months of the MI, patients surviving three months and evaluated, and 15 men (two under 45, four aged 45-54, and nine aged 55-64) surviving three months and refusing evaluation.

(2) Based on evaluated patients only.

six months is slower, while the two younger groups show a very similar rate in this period (Figure 2, Table 3).

About one in five of the working men (59 of the 275) experiencing their first MI were "sudden deaths" who did not survive long enough to be hospitalized. Of the remainder, 90 per cent (195) did enter a hospital, and the clinical severity of the episode could be classified for all but four of these men.* When the experience of these hospitalized men in returning to work is examined in relation to the severity of the episode, those with episodes classified as "most severe" show a large relative delay in resuming work. Only one in ten of

these men has returned to work three months after MI, compared with three in ten of those hospitalized with an episode of "moderate" or "slight" severity. The final figures, 18 months after MI, are 54 per cent of the most severe and 86 per cent of the remaining classified cases (Figure 3, Table 3).

Little difference is apparent in the rate and extent of return to work after first MI between white and blue collar workers† when the experience of the total cohort is examined (curves on left, Figure 4, and Table 4).

The extent to which men return to work after first MI is strongly related to their over-all level of customary phys-

* The "most severe" category consists of patients with defined evidence of shock, overt cardiac failure, ventricular tachycardia, complete heart block, or Stokes Adams attacks. All remaining patients for whom the recorded clinical data were adequate have been combined into the "moderate or slight" severity class for this presentation.

† Occupation at time of MI was coded in accordance with definition by the U. S. Bureau of the Census (1960). "White collar" includes professional and technical, managerial, clerical, and sales categories; craftsmen and foremen, operatives, service workers, and laborers are classified as "blue collar."

ical activity at the time of the episode (Figure 5, Table 4). Three broad classes of over-all physical activity have been defined on the basis of questionnaire answers pertinent to the date of the MI.* Comparing the most active with the least active group, the ratio in favor of active men is 3:1 at three months

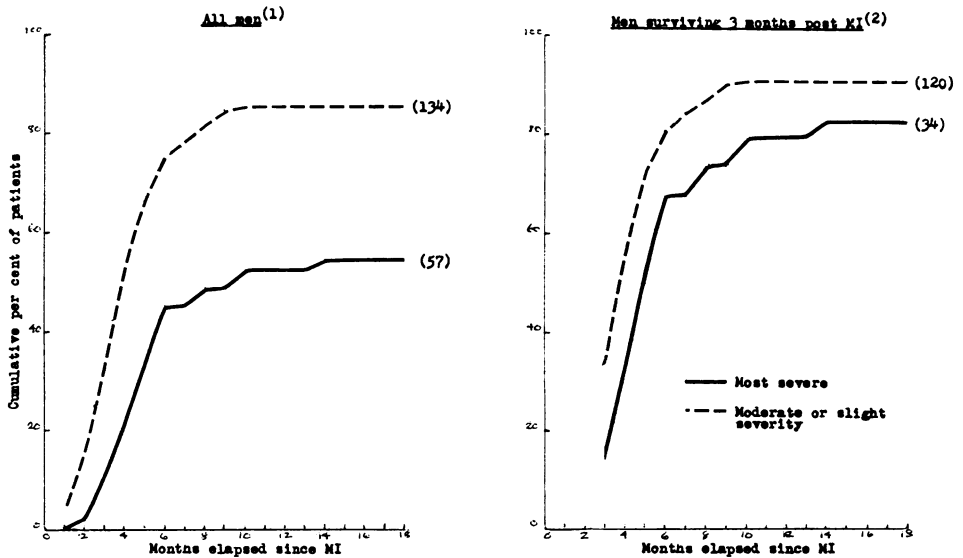
* Details of the construction of these classes have been published.¹⁰ In general, they are defined in terms of specified combinations of four classes of job-connected physical activity and four classes of physical activity off the job. Definition of the job-connected activity classes is made in terms of the range of scores assigned to answers to questions about time spent in walking and sitting on the job, the amount of walking and use of transportation in getting to and from the job, the frequency of lifting and carrying heavy things, and the total hours worked. The classes for activity off the job are similarly constituted from the answers to questions on the frequency and nature of sports engaged in and on the frequency of "taking walks in good weather," "working around the house or apartment," and "gardening in spring or summer."

after the MI and almost 2:1 at the end of the 18-month period. A similar gradient in favor of the more active men is found within both the white collar and blue collar occupational groups (Table 5).

2. Early Mortality and the Experience of Survivors—The cumulative distribution curve of per cent returned to work for men surviving their first MI by three months (Figure 1, broken line, and Table 3) rises more rapidly in the early months than the curve for the total cohort, but the turning points are the same in both curves. Because almost one-third of the total cohort die in the first three months, the proportions of survivors who have returned to work are one and a half times the corresponding proportions of the total group at each point in time thereafter. By ten months after the MI, 90 per cent of the survivors have returned to work.

Early mortality is lower in men under

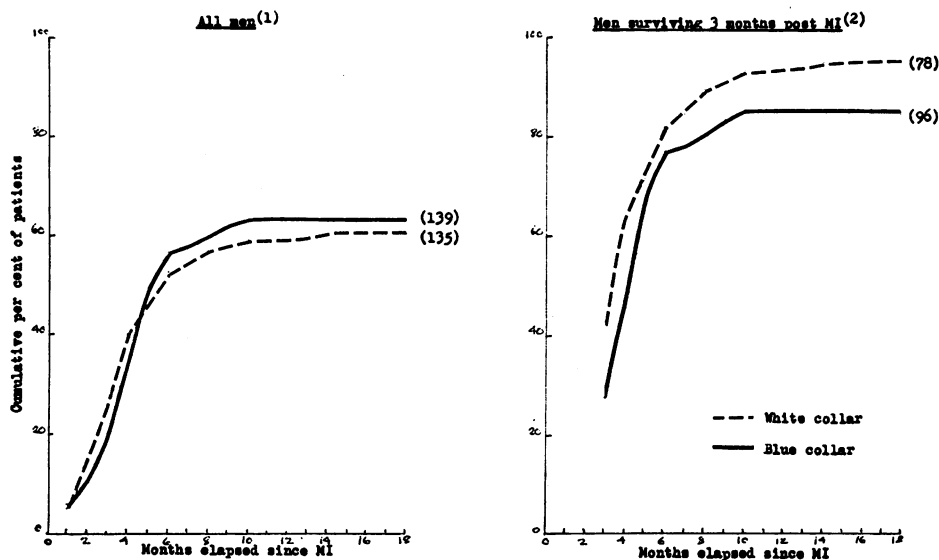
Figure 3—Cumulative per cent of men returned to work after first myocardial infarction, by months elapsed since MI: clinical severity, hospitalized patients only



(1) "All men" includes all hospitalized patients for whom data were available to classify clinical severity: those dying within three months of the MI, those surviving three months and evaluated, and ten men (four classified "most severe" and six "moderate or slight severity") surviving three months and refusing evaluation. Omitted are four hospitalized patients unclassified as to severity (one evaluated and three refusals).

(2) Based on evaluated patients only.

Figure 4—Cumulative per cent of men returned to work after first myocardial infarction, by months elapsed since MI: broad occupational category



(1) "All men" includes patients dying within three months of the MI, patients surviving three months and evaluated, and 15 men (eight white collar and seven blue collar) surviving three months and refusing evaluation.
 (2) Based on evaluated patients only.

45 at time of first MI (19 per cent) than in older men (32 per cent of men 45-54 and 34 per cent of men 55-64). When the effect of mortality is removed, the difference in final per cent returned to work between men under 45 and those 45-54 is virtually eliminated (Figure 2, curves on right, and Table 3). There is little difference by age in the proportions of survivors who have returned to work by three months after the MI. But the slower rate of return of the oldest group of men is seen for survivors as well as for the total cohort, and the per cent returned by the end of the observation period is 82 for these men, in comparison with 94 and 100 per cent for the two younger groups of survivors.

The large differentials in proportions of men returned to work in relation to clinical severity of the episode, reported above, are to a great extent the reflection of a tenfold differential in early mortality between those classified as "most severe" (32 per cent) and those

of moderate or slight severity (3.5 per cent). But the survivors in the less severe category still show a relatively earlier return to work; at three months post-MI 33 per cent of these men have gone back to work in comparison with 15 per cent of the survivors of the severe type of episode.* An advantage in favor of the survivors of relatively less severe episodes is seen over the whole observation period, although its magnitude is decreased with the passage of time (Figure 3, Table 3).

A slightly higher early mortality of white collar workers than of blue collar workers (36 and 26 per cent, respectively)† has the effect of masking the advantage of white collar survivors in making an early return to work when attention is restricted to the total cohort. At three months post-MI 40 per cent of the white collar and 26 per

* Difference significant at the 0.95 confidence level.

† Difference significant at the 0.90 confidence level.

cent of the blue collar survivors have returned to work.* This differential narrows at the six-month point, but the white collar survivors seem to retain a small advantage over most of the 18-month period, with the peak proportions

returned 95 per cent for white collar and 85 per cent for blue collar survivors.

It would seem reasonable that some of the early deficit in return to work for the blue collar survivors of a first MI might stem from a generally higher demand for physical exertion on the part of such jobs which, in turn, might

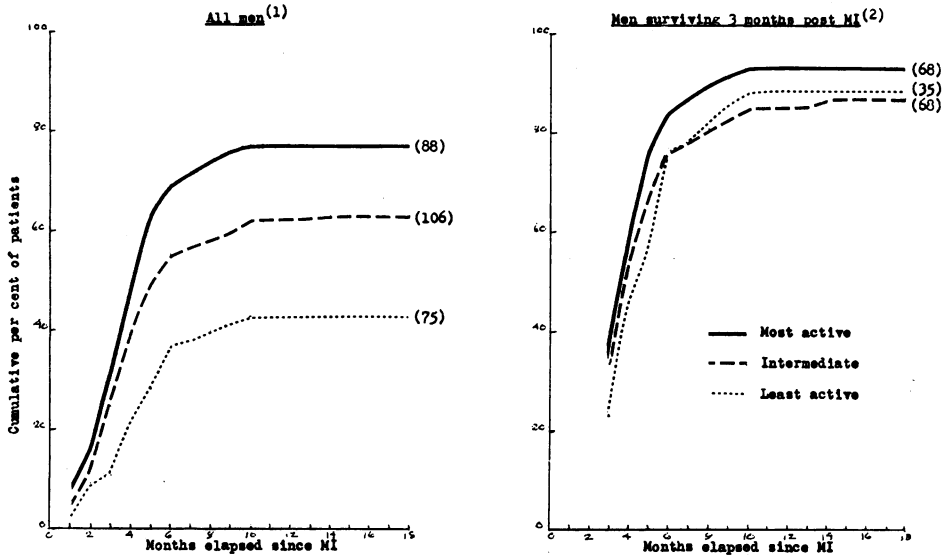
* Difference significant at the 0.90 confidence level.

Table 4—Cumulative per cent of men returned to work after first myocardial infarction, by months elapsed since MI: occupational category and over-all level of physical activity

Months Elapsed Since MI	Occupational Category		Over-all Level of Physical Activity		
	White Collar	Blue Collar	Least Active	Intermediate	Most Active
All men*					
No. in cohort	135	139	75	106	88
Months:					
1	4.4	5.8	1.3	4.7	8.0
2	14.1	10.8	9.3	11.3	15.9
3	25.2	19.4	10.7	24.5	30.7
4	40.0	33.8	21.3	39.6	48.9
5	45.9	49.6	28.0	49.1	63.6
6	52.6	56.8	37.3	55.7	69.3
7	54.1	57.6	37.3	56.6	71.6
8	57.0	59.7	40.0	58.5	73.9
9	57.8	61.9	41.3	59.4	76.1
10	59.3	63.3	42.7	62.3	77.3
11	.	.	.	.	.
12	.	.	.	.	.
13	59.3	.	.	62.3	.
14	60.7	.	.	63.2	.
.
18	60.7	63.3	42.7	63.2	77.3
Men surviving 3 months†					
No. in cohort	78	96	35	68	68
Months:					
3	39.7	26.0	22.9	33.8	36.8
4	62.8	45.8	45.7	54.4	58.8
5	71.8	66.7	57.1	67.6	76.5
6	82.1	77.1	77.1	76.5	83.8
7	84.6	78.1	77.1	77.9	86.8
8	89.7	80.2	82.9	80.9	89.7
9	91.0	83.3	85.7	82.4	91.2
10	93.6	85.4	88.6	85.3	92.6
11	.	.	.	.	.
12	.	.	.	.	.
13	93.6	.	.	85.3	.
14	94.9	.	.	86.8	.
.
18	94.9	85.4	88.6	86.8	92.6

* † See corresponding footnotes, Table 3.

Figure 5—Cumulative per cent of men returned to work after first myocardial infarction, by months elapsed since MI: over-all level of physical activity at time of episode



(1) "All men" includes all patients for whom over-all level of physical activity at time of MI could be classified: patients dying within three months of the MI, patients surviving three months and evaluated, and 15 men (one least active, nine intermediate, and five most active) surviving three months and refusing evaluation. Omitted are six patients with over-all physical activity unclassified.

(2) Based on evaluated patients only. Omitted are three patients unclassified as to physical activity.

increase the caution of physicians or employers in permitting return to work. Data from this study cannot deal with the issue directly, but no support for this speculation is found when white and blue collar jobs are divided into two subclasses by the relative level of job-connected physical activity (Table 5). There is no significant difference, among either white or blue collar workers, in rate of return to work between men with relatively inactive and those with more active jobs. But it is noted that throughout the 18 months of observation the per cent of survivors returned to work is generally higher for white collar workers both in the "high and medium-high" job-activity category and for those in the less active jobs than for the corresponding groups of blue collar workers.

Early mortality after first MI among men whose over-all level of physical

activity was considered "least active" is three times that experienced by the "most active" men.* Within three months of the MI 52 per cent of the least active men, 27 per cent of the intermediate group, and 17 per cent of the most active category are dead.† This mortality gradient affects strongly the per cent of the total cohort returned to work in relation to this variable. But the disadvantage in return to work which is associated with physical inactivity does not disappear entirely in the early months after MI when the

* Findings from the HIP study showing a strong relationship between physical inactivity and high early mortality of men with first MI are in press.⁹ These data show that among the physically inactive men there is both a higher proportion of "most severe" episodes and a greater mortality among these severe cases than found for the more active men.

† Age adjustment has no effect on the mortality rates.

focus is on survivors only. Of the least active survivors 23 per cent have returned to work by three months post-MI, compared with 34 per cent for the intermediate and 37 per cent for the most active group.* With time the differential is almost eliminated, and by the 18-month point the proportion returned to work is about 90 per cent for survivors in all three activity classes.

The prognosis cohort is not yet large enough to allow firm inferences about the influence of over-all physical activity on rate of return to work among white and blue collar survivors of a first MI (Table 5). But the current data suggest that those survivors who were least active at time of diagnosis, in both white and blue collar occupations, return to work more slowly than the others. The disadvantage appears comparatively brief among the white collar workers. Another point of interest is that within each physical activity class the white collar workers return to work more rapidly than the corresponding groups of blue collar workers.

B. Work Status at Selected Points in Time Up to 18 Months After MI

1. Per cent of Survivors at Work, Ill, Retired, Dead—The data so far presented have dealt with the per cent of men who have made a first return to work by a specific time after MI. Another measure of the effect of sustaining the infarction consists of the proportion of men in a given cohort who are at work after the elapse of a specified time from the episode. To assess the total impact of the disease from this measure it would be desirable to have some base line data for a general population of working men. Such data are not now available, but as the complete cohort of newly diagnosed MI's (from four years of case finding) enters into

* The age-adjusted proportions of survivors returned to work by three months post-MI are 20, 34, and 37 per cent for the three classes from least to most active.

analysis, it is expected that data can be developed from the general population of which these men are a part which can serve as a yardstick for the observations made in the men being followed for prognosis. At this time it is possible to examine the role of factors which might influence work status within the cohort of men who survived the MI by three or more months.

Status with respect to work for the cohort of working men surviving their first MI is given at four time points after the event in Table 6, and the factors which have been discussed above in relation to extent and rate of first return to work are again examined in Tables 6 and 7. The per cent of survivors who are at work rises sharply from 32 per cent three months after the MI to 78 per cent at six months; at both 12 and 18 months after the event the figure is 83 per cent. The proportion who are away from work because of illness falls at each observation point, from 64 per cent at three months, to 17 per cent at six months, to very low proportions at 12 and 18 months. There is a slow rise in proportion of retired men, reaching 10 per cent of the entire cohort at 18 months, and 4 per cent of the survivors of the original MI are dead by the time a year and a half has elapsed.

The difference between the per cent who have returned to work by a given time point and the per cent who are at work at that time represents movement out of the working force because of illness, retirement, or death on the part of survivors who did make an initial return to work. Of the whole cohort of survivors, over the short time period here studied, 6 per cent had returned to work at some point after the MI and had again left the working force by the time 18 months had elapsed from the original episode. The proportion of men who have returned and then left the labor force again within the year

and a half following their first MI exceeds 10 per cent only for those men who were 55 or more at time of infarction. The data suggest that the "most severe" category of MI and blue collar job status are associated not only with delays in return to work after MI but with a larger movement out of jobs subsequent to the initial return.

Many of the relationships already noted in connection with rate of return to work are again apparent when the proportion of survivors who are working at a given time point is examined (Tables 6 and 7). There is, for example, little difference with age in the proportion at work three months post-MI, but for the oldest group there is a relatively smaller per cent at work at each time point thereafter, and a corresponding increase in the per cent who have retired is noted. Survivors of the "most severe" hospitalized MI's again show a relatively lower proportion at work, and their disadvantage is reduced sharply after the six-month point. Noteworthy here is the higher proportion of deaths in this group—almost 9 per cent, compared with less than 3 per cent for the hospitalized cases of moderate or slight severity. The disadvantage of men in blue collar jobs at the time of the original MI is also underlined—over five times the proportion of blue as of white collar workers have retired by 18 months after MI, although the age composition of the two groups is quite similar (Table 2). A decreased likelihood of being at work after infarction is noted for men classified as physically inactive at the time of MI, and this holds when the observations are restricted to men under 55 at time of diagnosis (Table 7).

2. Changes in Type of Job after MI—Changes in type of job after myocardial infarction are more likely, as would be expected, among men who held jobs demanding relatively high levels of physical activity at the time of

Table 5—Cumulative per cent of men returned to work after first myocardial infarction, by months elapsed since MI: occupational category by job-connected physical activity and by over-all level of physical activity

Months Elapsed Since MI	White Collar Job-Connected Physical Activity						Blue Collar Job-Connected Physical Activity				White Collar Over-all Physical Activity			Blue Collar Over-all Physical Activity		
	Low		High		Med.-High		Low		High		Least Active		Inter-mediate		Most Active	
	Med.-Low	High	Med.-High	High	Med.-High	Med.-Low	Low	High	Med.-High	Least Active	Inter-mediate	Most Active	Least Active	Inter-mediate	Most Active	
All men*	105	30	72	64	44	54	35	31	53	31	52	53	31	52	53	
No. in cohort	3.8	3.3	4.2	6.3	—	1.9	11.4	3.2	5.7	3.2	5.8	5.7	3.2	5.8	5.7	
Months: 1	15.2	6.7	8.3	14.1	9.1	14.8	17.1	9.7	15.1	9.7	7.7	15.1	9.7	7.7	15.1	
2	26.7	20.0	16.7	21.9	11.4	27.8	40.0	9.7	24.5	9.7	21.2	24.5	9.7	21.2	24.5	
3	39.0	43.3	33.3	35.9	20.5	46.3	57.1	22.6	41.5	22.6	32.7	41.5	22.6	32.7	41.5	
4	45.7	50.0	44.4	56.3	27.3	48.1	65.7	25.8	62.3	25.8	50.0	62.3	25.8	50.0	62.3	
5	51.4	56.7	52.8	62.5	36.4	51.9	71.4	38.7	67.9	38.7	57.7	67.9	38.7	57.7	67.9	
6																

WORK STATUS AFTER FIRST MI

7	53.3	56.7	52.8	64.1	.	55.6	74.3	38.7	.	71.7
8	57.1	63.3	56.9	64.1	.	59.3	80.0	45.2	57.7	71.7
9	57.1	63.3	59.7	65.6	.	59.3	.	48.4	59.6	73.6
10	58.1	66.7	62.5	.	.	63.0	.	51.6	.	75.5
11	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.
13	58.1	.	.	.	.	63.0	.	.	.	.
14	59.0	.	.	.	.	64.8	.	.	.	.
.
18	59.0	66.7	62.5	65.6	36.4	64.8	80.0	51.6	59.6	75.5
Men surviving										
3 months†										
No. in cohort	60	18	50	45	16	33	27	19	35	41
Months:	3	43.3	27.8	24.0	28.9	31.3	39.4	48.1	15.8	29.3
	4	63.3	61.1	46.0	46.7	56.3	63.6	70.4	36.8	51.2
	5	73.3	72.2	62.0	71.1	75.0	66.7	77.8	42.1	75.6
	6	83.3	83.3	74.0	80.0	100.0	72.7	85.2	80.0	82.9
	7	86.7	83.3	74.0	82.2	.	75.8	88.9	57.9	85.4
	8	91.7	88.9	78.0	82.2	.	81.8	96.3	68.4	85.4
	9	91.7	88.9	82.0	84.4	.	81.8	.	82.9	87.8
	10	93.3	94.4	86.0	.	.	87.9	.	.	90.2
	11	.	.	.	.	.	.	.	.	.
	12	.	.	.	.	.	.	.	.	.
	13	93.3	.	.	.	87.9	.	.	.	.
	14	95.0	.	.	.	90.9	.	.	.	.
.
18	95.0	94.4	86.0	84.4	100.0	90.9	96.3	78.9	82.9	90.2

* † See corresponding footnotes, Table 3.

Table 6—Work status in the 18 months following first myocardial infarction in relation to selected characteristics*—per cent of survivors in given status (evaluated patients)

Interval Since MI; Work Status	Age at Diagnosis			Clinical Severity			Occupational Category		Job-Connected Physical Activity		
	Total	<45	45-54	55-64	Hospitalized		White Collar	Blue Collar	Low	Medium-High	
					Most Severe	Moderate or Slight					Not Hospitalized	High
No. in cohort	174	28	69	77	34	120	19	78	96	110	63
3 months											
At work	32.2	32.1	34.8	29.9	11.8	33.3	57.9	39.7	26.0	34.5	28.6
Ill	64.4	67.9	65.2	62.3	82.4	63.3	42.1	57.7	69.8	60.9	69.8
Retired	2.9	—	—	6.5	2.9	3.3	—	1.3	4.2	3.6	1.6
Unemployed	0.6	—	—	1.3	2.9	—	—	1.3	—	0.9	—
6 months											
At work	78.2	89.3	91.3	62.3	61.8	80.8	89.5	82.1	75.0	79.1	77.8
Ill	17.2	10.7	8.7	27.3	29.4	15.0	10.5	15.4	18.7	16.4	17.5
Retired	3.4	—	—	7.8	2.9	4.2	—	1.3	5.2	3.6	3.2
Unemployed	0.6	—	—	1.3	2.9	—	—	1.3	—	0.9	—
Dead	0.6	—	—	1.3	2.9	—	—	—	1.0	—	1.6
12 months											
At work	82.8	96.4	91.3	70.1	73.5	84.2	89.5	89.7	77.1	83.6	81.0
Ill	4.6	—	1.4	9.1	8.8	3.3	5.3	6.4	3.1	4.5	4.8
Retired	8.6	—	2.9	16.9	8.8	9.2	5.3	1.3	14.6	10.0	6.3
Unemployed	1.1	—	1.4	1.3	—	1.7	—	1.3	1.0	—	3.2
Work status unknown	1.1	—	2.9	—	2.9	0.8	—	1.3	1.0	0.9	1.6
Dead	1.7	3.6	—	2.6	5.9	0.8	—	—	3.1	0.9	3.2
18 months											
At work	82.8	96.4	91.3	70.1	73.5	85.8	78.9	91.0	76.0	83.6	81.0
Ill	2.3	—	1.4	3.9	5.9	1.7	—	3.8	1.0	2.7	1.6
Retired	10.3	—	4.3	19.5	11.8	9.2	15.8	2.6	16.7	10.0	11.1
Work status unknown	0.6	—	1.4	—	—	0.8	—	1.3	—	0.9	—
Dead	4.0	3.6	1.4	6.5	8.8	2.5	5.3	1.3	6.2	2.7	6.3

* Patients for whom the given characteristic was not classified are omitted from the table.

the event. Thus six months post-MI, 24 per cent of the surviving men who were in physically active jobs at the time of the episode are at work in a changed job, compared with 10 per cent of men in relatively inactive jobs (Table 8). Similarly, a higher proportion of blue collar workers (19 per cent) than of white collar workers (10 per cent) are working in a different type of job at this point in time. By the time 18 months have elapsed, however, the differential between the two job-activity levels is narrowed, and it has disappeared between the white and blue collar groups.

Summary and Discussion

Post-MI work experience over an 18-month period has been examined for a cohort of men with a first MI in a defined time period. All first episodes of myocardial infarction among working men in a population of wide occupational diversity are included. Among the total cohort, three months after the event one in five men has returned to work; by 18 months three out of five have returned. Of men surviving the MI by three months, three out of ten have returned to work by three months and nine out of ten by 18 months after

Table 7—Work status in the 18 months following first myocardial infarction in relation to over-all level of physical activity at time of diagnosis—per cent of survivors in given status (evaluated patients)

Interval Since MI; Work Status	All Men			Men Under 55 at Time of MI		
	Least Active	Intermediate	Most Active	Least Active	Intermediate	Most Active
Number in cohort	35	68	68	15	40	40
3 months						
At work	22.9	33.8	36.8	13.3	35.0	42.5
Ill	71.4	61.8	61.8	86.7	65.0	57.5
Retired	5.7	2.9	1.5	—	—	—
Unemployed	—	1.5	—	—	—	—
6 months						
At work	77.1	76.5	80.9	86.7	90.0	92.5
Ill	17.1	19.1	14.7	13.3	10.0	7.5
Retired	5.7	2.9	2.9	—	—	—
Unemployed	—	1.5	—	—	—	—
Dead	—	—	1.5	—	—	—
12 months						
At work	82.9	76.5	88.2	93.3	87.5	97.5
Ill	2.9	8.8	1.5	—	2.5	—
Retired	14.3	8.8	5.9	6.7	2.5	—
Unemployed	—	1.5	1.5	—	2.5	—
Work status unknown	—	1.5	1.5	—	2.5	2.5
Dead	—	2.9	1.5	—	2.5	—
18 months						
At work	82.9	79.4	85.3	93.3	90.0	95.0
Ill	—	2.9	2.9	—	2.5	—
Retired	14.3	11.8	7.4	6.7	2.5	2.5
Work status unknown	—	1.5	—	—	2.5	—
Dead	2.9	4.4	4.4	—	2.5	2.5

Table 8—Per cent of men at work in the same and changed jobs in the 18 months following first myocardial infarction in relation to selected characteristics at time of MI (men working at time of MI, surviving three months and evaluated)

Characteristic	No. of Patients	Number of Months After MI							
		3		6		12		18	
		Same Job	Changed Job	Same Job	Changed Job	Same Job	Changed Job	Same Job	Changed Job
Total cohort	174	28.7	3.4	63.2	14.9	65.5	17.2	64.9	17.8
Age at MI									
Under 45	28	32.1	—	71.4	17.9	71.4	25.0	71.4	25.0
45-54	69	27.5	7.2	68.1	23.2	72.5	18.8	69.6	21.7
55-64	77	28.6	1.3	55.8	6.5	57.1	13.0	58.4	11.7
Clinical severity									
Hospitalized									
Most severe	34	11.8	—	55.9	5.9	55.9	17.6	55.9	17.6
Other classified	120	28.3	5.0	62.5	18.3	65.8	18.3	65.8	20.0
Not hospitalized	19	57.9	—	78.9	10.5	78.9	10.5	73.7	5.3
Occupational category									
White collar	78	35.9	3.8	71.8	10.3	75.6	14.1	73.1	17.9
Blue collar	96	22.9	3.1	56.2	18.7	57.3	19.8	58.3	17.7
Physical activity connected with job									
Low; medium-low	110	31.8	2.7	69.1	10.0	70.0	13.6	69.1	14.5
High; medium-high	63	23.8	4.8	54.0	23.8	58.7	22.2	58.7	22.2

NOTE: "Same" job reflects patient's statement that he is doing the same work or the same type of work as at time of MI; "changed" job reflects patient's statement that there has been a change in the type of work.

the MI. By the end of the 18-month observation period 6 per cent of the survivors had again left the labor force after their initial return.

The per cent of the total cohort returned to work after elapse of 18 months from the MI is relatively low for the oldest group of men, for those with a clinically severe episode, and for men with the lowest level of over-all physical activity at the time of MI. A relatively high mortality associated with these characteristics is found in the early period following MI and accounts for much of the deficit in per cent of men returned to work. But delays in return to work have also been shown for men who survive three months from MI who are 55 or more, who experience the "most severe" type of episode, and who are customarily inactive physically, as well as for those in blue collar jobs.

The adverse influence of age and of having experienced an acute illness of relatively high severity on a man's chances of returning to work after infarction are not unexpected. But the disadvantage imposed on survivors by severity of the illness becomes very small by the time a year and a half has passed. A finding of special interest is the relatively slow rate of return to work in the early months after MI among men considered to have had a very low over-all level of physical activity at the time of infarction. Early incidence findings from this study¹⁰ have already reported an excess risk for MI among the physically least active men. The greater likelihood of experiencing the "most severe" type of episode and the much higher mortality with first MI shown by these men in comparison with more active men suggest that an inactive

mode of life is in some way related to medical and physiological aspects of the disease. The persistence of a disadvantage in return to work for a number of months following MI among survivors classified as "least active" emphasizes the importance, from a public health standpoint, of more specific studies of physical activity in relation to CHD in different populations.

The observation made in this report on the apparent disadvantage in returning to work suffered by blue collar workers compared with white collar workers seems to suggest a mechanism influenced by social features or conditions of employment rather than a medical or physiological one. Within each of these broad occupational categories there are similar distributions of men by age and by severity of the first episode of MI. For both blue and white collar workers delays in returning to work are demonstrated for the men whose over-all activity is low, but the proportion returned among blue collar workers is practically always less than that for the white collar group within a given class of over-all physical activity. The influence of the practice of physicians and employers in allowing blue collar workers to resume their jobs or to change their jobs, the possible role

of workmen's compensation rulings, disability pensions, and the relative inflexibility of some blue collar jobs in offering less strenuous employment could contribute to some of the differences observed.

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