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Death Rates among Italian Railroad Employees
Terminal Progress Report

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16. Abstract (Limit: 200 words)

A 10 year followup mortality study was conducted of 172,459 men working on the Italian Railroad system. All causes of death were evaluated, with specific attention given to myocardial infarction and sudden death as related to physical activity at work. During the 10 year period a total of 9759 deaths occurred. Cardiovascular diseases accounted for about 37 percent of the total mortality and were the major single cause of death. Findings did not differ from that expected for the overall Italian male population of the same age for this time period. A significant excess of mortality was noted among sedentary versus moderate workers and in heavy versus moderate workers when considering the middle aged group of workers. The author concludes that strenuous physical activity connected with work seems to be a protective factor against early mortality from cardiovascular heart disease. Men, after retirement, maintain approximately the same amount of physical activity in their lives as they had done when they were working. Only a moderate activity level at work does not appear to be sufficient to afford protection from early cardiovascular heart disease.

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DEATH RATES AMONG ITALIAN RAILROAD EMPLOYEES (*)
TERMINAL PROGRESS REPORT (**)

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Summary.

A cohort of 172,459 males aged 20-65 employeed in the Italian Railroad system, at work on April 1st 1963 have been classified by habitual physical activity at work and followed-up for death along a 10 year period.

Crude total mortality has been of 56.59 per 1000 in 10 years. No significant differences have been shown between sedentary, moderate and heavy workers. Age-corrected death rates for coronary heart disease, as manifested by myocardial infarction and sudden coronary death, were substancially different in the three activity groups, with moderate workers ranking first, sedentary workers lieing in between but very close to the former, and heavy workers having the lowest rate. The age corrected rates for all ages were 12.55, 14.18 and 7.63 per 1000 in 10 years respectively. All differences were statistically significant, the mortality ratio betwee sedentary-moderate workers vs heavy workers being of the order of 1.75 to 1. Such protection seems to be maintained also after retirement.

Introduction

This is the final progress report of a study started in 1963 and covering the 10 year follow-up mortality of over 172,000 employees of the Italian Railroad.

Data reported here concern the analysis of all causes mortality and of deaths due to myocardial infarction and sudden death recorded in 10 years, as related to physical activity at work. The first 5 year analysis has been reported in a previous report, whereas a separate analysis of the second 5 year data has not been attempted so far.

Background and Rationale

Coronary heart disease(CHD) is one of the major, or the major cause of death in the Western World, and is merging with the same role also in many developing countries.

There are many indications that such increasing trend and its large prevalence,incidence,fatality and mortality may have a behavioural basis, linked to the diet, the emotional stress,the smoking habits and the habitual physical activity; such patterns being related to some of the most predictive coronary risk factors like serum cholesterol and other serum lipids, blood glucose, blood uric acid, body fatness and body weight, in part blood pressure,etc.

Also physical activity, as habitualy performed at or out of work, might be reflected by some specific individual measurements,like body fatness and weight, skinfold thickness,pulse rate at rest and after exercise, vital capacity and other ventilatory measurements, muscolar mass, maximum working capacity ,etc. But for many years the tendency has been that of trying an evaluation of physical activity, as a predictor of CHD, in a rather direct way, without the help of the possible mediators and/or indicators of its level,as listed above.

Such attempts have been directed to investigate the role of physical activity,mainly at work and evaluated by questionnaires,as indipendent predictor of CHD. Some of them have indicated a higher risk of developing a CHD in sedentary people,other studies have not confirmed or have denied such findings.

Many of the studies not supporting the basic idea that physical activity is a protective factor,actually come from a country,like the USA, where differences in physical expenditure at work are rather small and the comparison between the extremes(like

heavy and sedentary workers) seems difficult to set up.
Epidemiological field studies,conducted in relatively small samples of population,have been so far inhadequate to give an answer to the question,although some recent data seems to re-evaluate the apparently neglected role of physical activity, as protecting factor against CHD.
The ideal study would be that of inducing sedentary people to change their habits and to see whether a long-term follow-up will show a lower incidence of CHD, as compared with control groups.But most pilot studies conducted along this line have proved the great difficulties in obtaining a long-term participation of middle-aged men to training programmes.
Large scale epidemiological studies,based on huge population groups, although not deeply studied, have been performed by the Minnesota Group on the US Railroad employees and more recently by the Group of Paffenbarger in California.The drawbacks of such approach are clear,since it is excluded from the start the possibility of setting up a multivariate analysis and the role of physical activity cannot be judged"everything else being equal".Still in such a difficult research field like this, where also the simple classification of the levels of habitual physical activity is a problem,if partial pieces of evidence are provided from different points of view,the likelihood of the hypothesis may become more and more acceptable,even in absence of a definitive observational study or of an experimental intervention trial.
The idea of setting up such study in Italy was inspired by the US Railroad study,and Dr Taylor, of the University of Minnesota,has been our consultant in this attempt.

Objective of the study

This study was originally designed to answer the following points:

- to establish an age-specific mortality cohort table, by cause of death of the entire employee population of the Italian Railroad system;
- to establish age specific cohort mortality tables by cause of death and by occupational groups classified according to level of physical activity, and possibly job responsability and socio-economic class;
- to contruct a table, by age and occupational groups, of mobility, due to health problems, between occupational groups within the Railroad system;
- to develope a withdrawal table by age and occupation in order to measure the stability of the cohort.

Most of the above points have been pursued and answered during the first 5 year period. But already during that time several unexpected problems of administrative and political nature have prevented from the possibility to complete the project.

The second 5 year activity has been therefore limited-also in connection with the limited funds available- to the mortality study, with particular reference to CHD deaths and their relationship with habitual physical activity at work.

Methods and Procedures

In 1963 a census was made of all the male employees at work on March 31, of the Italian Railroad System.Men were classified by age, occupation, type of work and mainly physical activity at work,plus some other socio-economic characteristics. A total of 172,459 have been found at work at that time.

Such cohort has been followed up for 10 years,that is until March 31, 1973, and the events listed below have been recorded:

1. deaths and their causes of men still at work;
2. deaths and their causes of men retired in the meanwhile;
3. retirements from the Railroad due to medical causes(for the first 5 years);
4. retirements from the Railroad due to other causes(for the first 5 years);
5. changes of job within the Railroad due to medical causes(for the first 5 years);
6. major diseases suffered while in service and determining at least 1 day absence from work, for men classified in events 1, 2, 3, and 5.

The basic information were collected through the central and peripherial files of the Medical Service of the Railroad and from the Board of Pensions. Deaths causes were obtained from the Board of Pensions and, for men dead after retirement, from the Register Office of the place where the subject lived and/or died.

Non-medical events were coded by trained clerks;while medical events and mainly death causes, were coded by an epidemiologist using the VIII Revision of the International Classification of Diseases and Causes of Death of WHO, 1967(three digit classification).

Death causes were not necessarily classified as shown on the

official certificates, but only after having searched for the "best" or most "reasonable" cause elicited from all the possible medical information of the health and disease history of each man as recorded on the personal file at the Railroad.Most of causes,when death occurred in hospital, were supported by hospital records review. Cases indicated as sudden and unexpected death(occurred within 24 hours from the onset of symptoms- detail which could always be checked for men still at work) were associated with the code of myocardial infarction when the death was typical for a cardiac mechanism and other possible causes could reasonably be excluded.

The procedure described above could be applied in a substancially complete way during the first 5 years.However already during that period a special regulation,introduced in 1967 for the duration of a few months, allowed men to retire in advance with a lot of extra retirement benefits,provided any minor disease status could be demonstrated. This led almost 20,000 men to magnify their complaints and illnesses and to produce some medical evidence for obtaining such early retirement. The data of such a massive exodus could never be completely coded and punched and this event has definitely jeopardized a careful analysis of causes of retirement.

The second five year period follow-up was dicated only to the collection of mortality data which had shown interesting features during the first five years. However the collection of such data showed to become more and more difficult due to several reasons:

- recent regulations tend to increase the privacy of all medical information including causes of death;
- a re-organization of the Board of Pensions and of the peripherial office of the Railroad Medical Service has made more

and more complex to get the basic information;
- the Local Registers tended to provide with less and less care the death certificates and mainly the cause of death;
- the large number of subjects retired along 10 years(more recently other regulations made easier again some forms of early retirement) has restricted the number of men whose information were more readily available,and enlarged the proportion of those whose reach became more and more complicated.

Every effort has been made for tackling such situation in the best way,but doubt do exists about the completeness of the information. In particular a real effort into getting detailed information on the mode of death was concentrated on those cases where a cardiac cause was suspected,accepting more and more the official certificates for most of the other causes.

A relevantt number of cases belonging to men dead after retirement could be classified only as "natural death" as shown by the answer of the Local Registers; which simply means that only accidents, poisoning and violence could be excluded. This accounts for some of the results presented below and for the rather limited type of analysis performed on the 10 year data, as compared to the 5 years.

The coded data have been punched on cards and fed into a computer for main tabulations and analysis. Tests and standardization have been calculated a part by a smaller table computer.

Rates have been computed per 1000 men exposed to risk.

Usually the age break-down was limited to quinquennial classes, but for some comparisons between occupations, men aged 40-59 at entry have been considered a part, as better representative of the problem treated here. The age class 60+ is open, but most men were aged 60-62 an none was aged 65 or more at entry.

The occupational breakdown has been limited,as for previous

analysis to three large classes of sedentary, moderate and heavy workers. There are several ways for producing a classification of men at work in terms of physical activity.Also in this analysis, as done previously, we have kept the classification suggested by our consultat Dr H. Taylor, of the University of Minnesota, since 1963. It was prepared on the basis of a careful analysis of the main types of jobs directly observed on the spot, and or described by official manuals of the Railroad. The main categories of jobs included in each of the three activity classes are those indicated in Table I.

Since some pieces of analysis have been done on middle-aged men, the total for each activity class of this group are given a-part in Table IV. The corresponding quinquennial break-down can be found in Table III.

In connection with the different age distribution of the three occupational groups,the standardization of rates became necessary for comparative purposes. Direct standardization of rates has been performed using,as standard population, the overall population age distribution, for both "all ages" and "middle-aged men". (age corrected rates).

Significance of differences between rates belonging to different occupational groups have been tested employing the z' test between proportion as described by Remington and Shorck.

Terms for describing mortality

The list provided in Table II gives the terms employeed to describe mortality by causes,based on the correspondent International Codes. The main aim of the break-down of cardiovascular diseases, in particular, is clearly connected with the intention to keep in different categories those cases of degenerative heart disease where a coronary involvement is sure or anyhow typical, from those where there are many doubts about a true coronary participation to the disease process. On the other hand, cases of deaths classified in the group defined "Other degenerative heart diseases" are relatively rare before the age of 60, at least in terms of mortality.

Description of the population at risk.

The age and occupation distribution of men exposed to risk of death is reported in Table III. As indicated above the occupation is reported in terms of relative amount of physical activity at work. As compared with any free living population there is a shorthage of men in the lower and upper age groups. This is due, for the older groups to the documented tendency toward early retirement.

The age distribution within the three occupational groups seems inversely related to the level of physical activity, and also this reflect the fact that men in heavier jobs retire earlier.

The overall occupational distribution of men aged 40-59 is separately reported in Table IV.

Overall death rates and main causes of death.

These data are reported in Table V. Death occurred in 10 years were 9759, the overall rates per thousand being 56.59. This rate is somewhat lower than that of the Italian male population of the same age and sex. An explanation might be found in the selection of men when entering the job.

Main cardiovascular diseases cover, when pooled together, about 37% of total mortality and they are the main causes of death. Without such pooling, however, cancer merges as the single most important cause of death. The relative amount of cases due to myocardial infarction and sudden death of possible coronary origin, does not differ from that expected from the overall Italian population of the same age and sex. An excess, as compared to the expected proportion of cases due to violence, is only partly explained by the occupational risks.

The exceeding proportion of men who died for "all other causes" includes a number of cases without a definite cause, having being defined "natural cause" or simply not having any cause indicated.

Death rates due to all causes.

Death rates per thousand are broken down by age and occupation in Table VI. As expected, and in spite of some irregularities, there is an increasing trend of exponential type.

The linear correlation coefficient between age and death rates is 0.8138; it become 0.9399 when it is computed on the same data after double log transformation.

The regression equation on double log transformation are as follows: (y = mortality; x = age)

all men	:	$y = -5.2222 + 4.2101\ x$	$(r = 0.9399)$
sedentary men:		$y = -4.8782 + 3.9887\ x$	$(r = 0.95305)$
moderate men	:	$y = -5.2570 + 4.2309\ x$	$(r = 0.9307)$
heavy men	:	$y = -5.1927 + 4.1686\ x$	$(r = 0.9014)$

The regression coefficients, although somewhat different, in the occupational groups, do not reach statistical differences when compared each other.

The overall age corrected death rates are not substancially different for the three occupational groups and this is confirmed by the non significant p of the z' test applied to them in Table VII. On the other hand a significant excess of mortality can be found in sedentary vs moderate workers; and in heavy vs moderate workers, when the middle aged group is considered.

Death rates due to myocardial infarction and sudden death of probable coronary origin.

Death rates due to myocardial infarction (MI) and sudden death of probable coronary origin (SD) are presented in Table VIII, which provides the age and occupation break down for rates per 1000 in 10 years.

A part some irregularities, there is an evident increasing trend of exponential type in all the three occupational groups. Also for MI + SD the linear correlation improves when passing from crude data ($r = 0.8721$) to double log transformed data ($r = 0.9792$). The regression equations for the log transformed data are the following: (y = rates; x = years)

all men	:	$y = -7.5786 + 5.1834\ x$	$(r = 0.9792)$
sedentary men:		$y = -7.3022 + 5.0347\ x$	$(r = 0.9751)$
moderate men	:	$y = -8.3478 + 5.6875\ x$	$(r = 0.9861)$
heavy men	:	$y = -6.9852 + 4.7242\ x$	$(r = 0.9571)$

Also in this case the slopes do not differ significantly each other.

An analytical view of the occupational differences, related to each single quinquennial age group is reported in Table IX which considers all the possible comparisons tested with the z' statistics. Out of 9 comparisons between sedentary and moderate workers only one (age 40-44) indicates significant differences (higher level in moderate group); in 9 comparisons between sedentary and heavy workers 5 comparisons (all from the age group 40-44 on) are statistically significant, with a maximum chance explanation < 0.05 in two of them; while out of 9 comparisons between moderate and heavy workers 4 comparisons yield statistically significant results (age classes 35-39, 40-44, 50-54, 55-59).

The age corrected death rates for MI + SD are reported in a more syntetic way in Table X. It clearly appears that moderate workers rank first in both the "all ages" group and the "middle aged group", that the heavy workers rank last, while the sedentary workers lie in between but rather close to the moderate workers. The z' test on such differences indicates significant levels for all comparisons of "all ages"; whereas for "middle-aged men" the sedentary vs moderate workers comparison is not significant, being the other two (sedentary vs heavy and moderate vs heavy) highly significant ($p < 0.001$).

It is evident that when very large numerators and denominators are involved, also relatively small differences in rates may reach statistically significant levels, but, in this particular case, what is particularly important is the ratio between different occupational groups. In middle aged men the ratio S/M is 0.88; the ratio S/H is 1.67; and the ratio M/H is 1.90. The corresponding ratios for "all ages" are 0.89; 1.64; and 1.86 respectively. This means that the fact of being a non heavy worker carries with it an excess risk of dieing from a MI + SD within 10 years of about 75%. Beyond any other consideration such a differences, if true, seem to yield a definite biological significance.

Deaths due to other causes.

In this particular phase of the study a detailed analysis of deaths due to other causes could not be performed. Uncertainties about the validity of many certificates (not checked because not belonging to the CHD group), lack of funds due to devaluation of money, prevented such part of analysis. On the other hand details of some interest have been reported on the 5 year report which could produce valuable data on this item.

Comparison of 10 vs 5 years experience.

A comparison of 10 vs 5 years data is of limited value due to the uncertainties on the completeness of the 10 years data and mainly on the reliability of part of them.

The increase of the overall death rate from 5 to 10 years has been of about 1.8 to 1, perhaps somewhat more than expected. This would be in line with the idea of a substancial completeness of data collected but a definitive proof is not available. On the other hand it should be recalled that the level of death rates of the first five years was rather low as compared to any free-living population group and therefore it seems reasonable that there has been a kind of "catch-up" in the next quinquennium. The composition of causes of death is slighly different at 10 year follow-up from that observed after 5 years. There has been a slight decrease of the proportion of MI + SD cases, an increase of "other degenerative heart diseases" and of "strokes"; a slight decrease for "cancer" and "violence"; somewhat more of "liver cirrhosis" and "bronchitis", but a clear excess of "other causes". As said above they include a large number of cases without a specific cause or only with "natural cause".

The differences between occupational groups at the 5 year follow-up in terms of total mortality (higher mortality in the heavy group in the 40-59 age range) have remained, but now, after 10 years, significant differences do exist also between moderate and heavy workers (heavy, higher). No differences can be found for all ages corrected rates.

Looking to the MI + SD death rates, in the 5 year data, out of 27 age-occupation comparisons only 6 were statistically significant; while at the 10 year follow-up 10 comparisons yield a p

value < 0.05. The trend of differences has followed, in the 10 year data, the same line of that observed in the 5 year, with an excess mortality in the sedentary and moderate workers, as compared with the heavy ones. Some more differences merge now also between the moderate and the sedentary groups with an excess mortality in the former in several age-occupational comparisons, and also in the block of "all ages" corrected rates. The reason for such difference cannot be explained by this material.

Comments and conclusions.

The mortality data presented here seem to answer in a positive way to the main question put by the objectives of this study. I.e. strenuous physical activity connected with work seems to be a protective factor against early mortality from CHD, as manifested by the most typical clinical patterns (myocardial infarction and sudden coronary death).

The mortality ratios of non active men vs heavily active men is of the order of 1.75 to 1 or more in 10 years. It was about 1.65 to 1 in the first 5 year experience. This fact would suggest that aging, and the increasing proportion of retirements do not induce a decreasing protection of physical activity vs the occurrence of a fatal CHD in form of MI or SD.

It should be recalled that the classification of men in terms of physical activity has been done only once, and that such attribute has been assumed to be stable along time. This cannot be completely true, since physical activity at work usually decreases with aging, and it should drop quite dramatically after retirement.

If the protection predicted by a single early classification of physical activity keeps along time, there are at least two possible explanations: (a) heavy physical activity performed for most of life does protect also after eventual changes like those presumably occurring after retirement, at least for a few years; or (b) men after retirement maintain a sort of physical activity similar to that preceding retirement.

We are inclined to accept also the latter hypothesis since it is known that men in heavier jobs are mainly of rural extraction that many, if not all, of them, still own a piece of land when engaged in the Railroad, and that most of them, after retirement, go back to their original place to take direct care of their land, continuing a sort of rural activity, gardening, etc. Unfortunatel

a quantitative documentation of this fact is not available, nor easy to reach.

In any case there are good reasons for assuming that the single classification of physical activity as related to work, made in this population, might reflect for the large majority of those men, the main activity performed along most of their life.

A fact rising questions and doubts is, by sure, the exceding mortality of moderately active men, not only as compared with heavy workers, but also - although slightly - as compared with sedentary workers. Such fact was already shown by the 5 year data, but it has been confirmed by the 10 year experience. An explanation is unknown. However it is possible that in this particular case some confounding factors, strictly correlated with and associated with the fact of being moderate workers of the Railroad, are overwelming the protective role of moderate physical activity. The amount of such adverse contribution cannot be measured but it might be substancial. Still it appears that if a lessons for preventive purposes should be elicited from these data, the depressing fact does merge that a moderate level of physical activity (at work might be not enough for a substancial protection from early CHD death, if other more powerful factors are operating.

The problem of confounding factors can of course be extended to the whole problem of the relationship between physical activity and CHD mortality risk. Lack of funds has prevented from the possibility to perform an analysis covering other aspects like those on the relationship of socio-economic status and responsability at work vs CHD mortality. However it has been shown that physical activity is highly inversely correlated with these characteristics and therefore the problem remains quite open. Still, although

through a very thine angle of view, a further evidence has been given about the possible relationship between habitual level of physical activity and CHD mortality.

On the other hand the 10 year data have confirmed that men in different activity jobs do not differ for the overall mortality risk, and from this point of view, sedentary, moderate and heavy workers can be considered equally exposed. The limited reliability of the second 5 year data, in term of causes of death other than coronary, does not allow a careful search of the causes which contribute to fill the gap existing between active and non-active men in terms of CHD mortality. From the first 5 year data practically all other single causes of death are exceding in heavy workers as compared to sedentary ones, contributing in this was to the final balance given by all causes mortality. Whether physical activity is responsible for the excess mortality due to causes other than coronary, cannot be indicated by these data.

In conclusion, from the CHD point of view, our data seem to be in line with the relatively old study of Taylor et al. (Am. J. Pub.Hlth, 52, 1697, 1962) which inspired this work, and also with the rather recent paper of Paffenbarger and Hale (New Engl.J.Med., 1975, 292, 545) which is one of the most recent large contribution to this problem. In this latter paper the ratio of light-moderate worker vs heavy workers mortality rates for CHD is about of 1.77, that is the same amount observed by our less sophisticated but somewhat larger study. Also here the difference between moderately active men and the light workers are neglegible in terms of CHD mortality.

The consistency of the hypothesis indicating in habitual physical activity a protecting factor of CHD tends to be therefore reinforced provided we accept the fact that a kind of thresold should exists and that only heavy muscular activity is a valid action against early CHD death.

TABLE I - LIST OF THE MAIN TYPES OF JOBS REQUIRING DIFFERENT LEVELS OF PHYSICAL ACTIVITY IN THE STUDIED POPULATION

Sedentary: higher degree of station master, directors of factories and hangars, higher degree of technicians, secretaries, clerks, telegraphers, interpreters, train conductors, file clerks, doormen, etc.

Moderate : lower degree of station masters, some types of switchman, train driver, engine and wagons supervisors, factory workers, brakemen, skilled technicians, some types of station general helpers.

Heavy : switchman, section man, maintenance of rail men, unskilled manual workers, some types of driver' helpers.

TABLE II - MEANINGS, IN TERMS OF INTERNATIONAL CODING, OF THE CAUSES OF DEATH AS INDICATED IN THE TABLES. (VIII REVISION ICD, WHO, 1967)

- Myocardial infarction and sudden death of probable coronary origin: 410, 411, 413, cases of 412 indicated as healed myocardial infarction, and sudden death as defined in the text.

- Other degenerative heart diseases: cases of 412 (when not included in the previous point), 414, 400-404, 427, 428.

- Strokes: 430-438.

- Cancer all sites: 140-239.

- Violence: E800-E999.

- Liver cirrhosis: 571.

- Chronic bronchitis and similar conditions: 490-493.

TABLE III - POPULATION AT RISK CLASSIFIED BY AGE AND PHYSICAL ACTIVITY AT WORK.
S = sedentary workers
M = moderate workers
H = heavy workers

Age	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+	Tot
S	1728	3528	3150	9013	9454	7683	8287	2707	1866	47
M	656	2660	4346	14821	12984	10866	13242	4228	1090	64
H	1590	7563	8482	12306	10684	7369	8603	2922	630	601
Total	3974	13751	15979	36140	33122	25918	30132	9857	3586	172

TABLE IV - DISTRIBUTION BY PHYSICAL ACTIVITY LEVELS OF MEN AGED 40-59

Sedentary:		28131
Moderate	:	41320
Heavy	:	29578
TOTAL	:	99029

TABLE V - MAIN CAUSES OF DEATH IN 10 YEARS

Causes	n	%	
Myocardial infarction and sudden death of probable coronary origin	2038	20.88	37.09
Other degenerative heart disease	820	8.40	
Strokes	762	7.81	
Cancer all sites	2741	28.09	
Violence	987	10.11	
Liver cirrhosis	564	5.78	
Chronic bronchitis and similar conditions	196	2.01	
All other causes	1651	16.92	
ALL CAUSES	9759	100.00	

TABLE VI - DEATHS RATES (PER 1000 IN 10 YEARS) FOR ALL CAUSES.
S = sedentary
M = moderate
H = heavy

	AGE GROUPS									
	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-54	60+	Al
S	5.79	8.22	11.11	13.09	28.77	46.86	101.48	170.30	328.51	57
M	6.10	7.52	8.05	15.18	33.81	48.13	61.92	231.08	499.08	55
H	7.55	6.21	9.08	6.01	33.23	52.24	95.32	186.52	393.65	57
All	6.54	6.98	9.20	11.54	32.18	48.92	111.21	201.18	391.80	56

TABLE VII - DEATH RATES DUE TO "ALL CAUSES". COMPARISONS BETWEEN OCCUPATIONS. AGE CORRECTED, RATES PER THOUSAND.

	Age 40-59	All ages
Sedentary	69.72	51.42
Moderate	65.75	52.80
Heavy	72.36	52.50
p of test z' (between proportions)		
S vs M	< 0.05	n.s.
S vs H	n.s.	n.s.
M vs H	< 0.001	n.s.

TABLE VIII - DEATHS RATE (PER 1000 IN 10 YEARS) FOR MYOCARDIAL INFARCTION AND SUDDEN DEATH OF PROBABLE CORONARY ORIGIN.
S = sedentary
M = moderate
H = heavy

	AGE GROUPS									
	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+	Al
S	0.58	0.85	1.59	2.11	6.77	10.67	26.06	55.41	60.56	13
M	-	0.75	1.84	3.10	11.78	10.03	26.88	63.62	57.80	15
H	0.62	0.53	0.83	1.62	3.74	7.33	15.11	33.54	39.68	6
All	0.50	0.65	1.25	2.35	7.76	9.45	23.30	52.45	56.05	11

TABLE IX - COMPARISON BETWEEN AGE-OCCUPATION GROUPS FOR DEATH RATES DUE TO "MYOCARDIAL INFARCTION AND SUDDEN DEATH OF PROBABLE CORONARY ORIGIN. p of test z' (between proportion).
S = sedentary
M = moderate
H = heavy

	AGE GROUPS								
	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
S vs M	n.s.	n.s.	n.s.	n.s.	< 0.001	n.s.	n.s.	n.s.	n.s.
S vs H	n.s.	n.s.	n.s.	n.s.	< 0.01	< 0.05	< 0.001	< 0.001	< 0.05
M vs H	n.s.	n.s.	n.s.	< 0.001	< 0.001	n.s.	< 0.001	< 0.001	n.s.

TABLE X - DEATH RATES DUE TO "MYOCARDIAL INFARCTION AND SUDDEN DEATH OF PROBABLE CORONARY ORIGIN". COMPARISONS BETWEEN OCCUPATIONS. AGE CORRECTED RATES PER THOUSAND.

	Age 40-59	All ages
Sedentary (S)	18.50	12.55
Moderate (M)	21.08	14.18
Heavy (H)	11.10	7.63
p of test z' (between proportions)		
S vs M	n.s.	< 0.01
S vs H	< 0.001	< 0.001
M vs H	< 0.001	< 0.001

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