



To: Place Directorate

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Subject: Essential Evidence on a page: No 138 The legacy of Jerry Morris' research on physical activity

Top line: The first robust studies to explore the effects of physical activity on premature death and illness, led by Jerry Morris, were conducted with transport workers involved in occupational physical activities - as bus conductors and postal workers. These showed that death rates among the active workers were half that of more sedentary colleagues.

Sixty two years ago the first investigations of what was subsequently termed the exercise hypothesis—physical activity reduces the occurrence of coronary heart disease—was undertaken by Morris et al.¹ Using data from two cohorts of British workers, they reported lower rates of coronary heart disease in bus conductors than in less occupationally active bus drivers, and in postmen relative to deskbound telephonists and other office based employees. Among bus drivers and conductors they found bus conductors on London's double-decker buses to be at lower risk than bus drivers; what disease the conductors did develop was less severe, and they were more likely to survive an attack. The conductors, who took an average of 700 steps per shift, often for decades, experienced roughly half the number of heart attacks and sudden death as the drivers. Later Morris and colleagues studied British civil servants during a follow-up with an 8-year period ending in 1977.² Subjects were classified as having engaged in vigorous activities, or not. Of the subjects 22% reported some kind of vigorous exercise. The remaining 78% reported no vigorous exercise. Their mortality rate was twice as high. This differential in death rates persisted when controlling for age, smoking, obesity and successive intervals of follow up.

In later research, data were collected on 19,019 male government employees aged from 40-69 years of age when first examined between 1967 and 1970. The men were invited to complete a questionnaire and undergo a medical examination.³ The questionnaire included enquiries about civil service employment grade (indicator of socio-economic status), smoking habits, marital status, and physical activity. Two questions were administered to 6981 of the men: (1) compared with other men of your age do you tend to walk slower, faster, or about the same pace?; and (2) do you have any hobbies or sports? The active group included men engaged in vigorous sports such as swimming, cycling, & athletics; the moderately active group comprised men who participated in active hobbies such as gardening, home maintenance, and woodwork; the inactive group was denoted by no such physical exertion. Resting heart rate was measured in a subgroup of 1240 men.

Forty years of follow-up gave rise to 5294 deaths in those with walking pace data, 5279 in those leisure time physical activity data, and 940 in employees with valid resting heart rate values. Men who reported walking more slowly than their peers, who were less active in their leisure time, and whose resting heart rate was high (i.e., lower cardiorespiratory fitness) experienced an increased risk of premature death.

¹ Morris, J., Heady J., Raffle, P., Roberts, C., Parks, J. 1953 Coronary heart-disease and physical activity of work. *Lancet*.ii:1053–1057, 1111–1120.

² Morris, J., Clayton, D., Everitt, M., Semmence, A., Burgess, E. 1990 Exercise in leisure time: coronary attack and death rates. *British Heart Journal*, 63:325-334

³ Batty, D., et al, 2010 Walking pace, leisure time physical activity, and resting heart rate in relation to disease-specific mortality in London: 40 year follow-up of the original Whitehall study. An update of our work with Professor Jerry N Morris (1910-2009), *Annals of Epidemiology*, 20: 661-669.