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► **To cite this version:**

Annette Leclerc. Shift-work and cardiovascular disease.. European Journal of Epidemiology, 2010, 25 (5), pp.285-6. 10.1007/s10654-010-9456-2 . inserm-00488825

**HAL Id: inserm-00488825**

**<https://inserm.hal.science/inserm-00488825>**

Submitted on 3 Jun 2010

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# **Shift-work and cardiovascular disease**

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The relations between shiftwork and cardiovascular disease (CVD) or coronary heart disease (CHD) have been studied for a long time. However, many questions remain, especially about pathways from shiftwork to risk factors for CVD. In this issue of "European Journal of Epidemiology", two papers, both issued from large cohorts, bring interesting contributions to this complex question (1 , 2 ).

The first one, based on the 1958 British birth cohort, examined associations between shift-work and risk factors for CVD, such as BMI (Body mass Index), blood pressure and specific biomarkers, with a specific interest in the role of socioeconomic circumstances, occupational factors and health behaviours (1 ).

In the second one, results from a cohort followed from 1982 to 2003, the Finnish Twin Cohort, are presented and discussed (2 ). Three endpoints are considered: CHD mortality, disability retirement due to CVD, and incident hypertension.

The authors of both papers had to cope with similar difficulties. Globally speaking, daytime, nighttime and shift-work are different categories. However, shift-work is not an homogeneous entity. It can be more or less intensive, in terms of number of days per week; in addition, shift-work can imply working nights, evenings, or early mornings, and can extend to weekends or not. For that reason, it is difficult to disentangle various effects, especially shift-work itself versus work schedule.

A second problem is related to selection effects, which obscure the interpretation of observed associations. Workers are not assigned at random to shift-work or not, and to a specific shift-work schedule. The reality is that workers tend to adapt, as far as they can, their working conditions to the health and social difficulties they meet in some types of work schedules. Older workers who still are shift-workers are expected to be a selected population. On the opposite, subjects with severe health problems probably do not remain on shift-work. Having been a shift-worker for a long part of the working life could also imply specific access to some benefits, both medical and administrative, such as work disability.

One result from the Swedish cohort - a high risk of CVD disability retirement and CHD mortality among women starting shiftwork, even if they do not remain in this category later - suggest that selection effects might also occur as early as entry in the career (2 ).

Questions about confounding and mediating factors are met by all epidemiologists. Adjusting for a long list of confounding factors is often considered as "normal" or "cautious", irrespective of the implicit hypotheses behind this decision. In the search for explanations behind associations between shift-work and CVD these questions are also present. Ideally, mediating factors should be both consequences of shift-work and risk factors for CVD. However, it is difficult to be sure that a factor is a consequence of shift-work. Another problem is adjustment on a large list of variables, considered as confounding factors, whereas some of them – such as "being a manual worker" – are so closely related with shift-work that it can obscure the conclusions. Socio-economic position is expected to be associated both with most risk factors for CVD, and with shift-work, especially for men. In a sense, it "explains", at least partly, the associations between shift-work and risk factors for CVD; however, it is not a mediating factor, since it cannot be considered as a consequence of shift-work. In order to explore the role of physical activity, diet, smoking and alcohol, the best strategy might be to focus on subgroups of workers who share the same characteristics in terms of socio-economic position.

An interesting point here is that shift-workers could have a low level of education (on average) and a relatively high income level. This can have important consequences, since cardiovascular diseases are associated both with socio-economic position in adulthood, and with socioeconomic position at birth and in childhood (3 ).

Gender differences must be considered. Clearly, men and women in shift-work do not perform similar activities. Women are generally less often employed in shift-work, but are more often so in specific jobs in hospitals and the health care sector. Dealing with gender differences is a rather general question for epidemiologists. A first strategy is to perform completely separate analyses, which might lead to different models for men and women, whereas differences between men and women are in fact limited. The alternative (grouping men and women in the analyses) implies that the main risk factors are similar for men and women. Concerning shift-work, it is not sure that the main health effects (and pathways) are the same for both genders.

The results from the twin cohort raise interesting questions about "genetic influence": if similarity of permanent shiftwork is stronger among monozygotic than among dizygotic twins, can it be considered as a genetic influence on the predisposition to shiftwork? Among twins, as in the general population, some effects might be social or psychological, rather than genetic.

At first sight, the two papers lead to different conclusions: results from the Finnish Twin Cohort “do not support an association between shift-work and cardiovascular morbidity”, a rather negative result which is not due to the fact that the subjects of the cohort are twins. On the opposite, results from the British birth cohort highlight negative effects of night and early morning work schedules. It might be that shift-work in itself has no specific effect, and that the “effects of shift-work” must be considered through its components rather than globally. In this respect, the two papers published in this issue provide interesting contributions to the debate. Questions remain on the pathways from “circadian stress” to cardiovascular morbidity, with several plausible mechanisms, psychosocial, behavioural and physiological (4).

Another way to know more about causal associations, and disentangle the various health consequences of shift-work, would be preventive intervention at the workplace, an approach widely used in occupational epidemiology. However, difficulties are met here, since shift-work is not an occupational risk factor such as other ones; most often, it is more or less intrinsic to the job. That could explain the paucity of preventive interventions focusing on shift-work or components of shift-work, even though improving shift schedules can have positive effects on cardiovascular risk factors (5).

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