FOR MANY DECADES DISEASES of the circulatory system (traditionally called cardiovascular diseases) have been not only the leading cause of death, accounting for one half of all fatalities, but also responsible for the largest epidemic yet encountered in Canada and the United States (U.S.). Because of their dramatic social and economic impact, it is not surprising that changes in the trends of cerebrovascular disease (CBVD) and those of ischemic heart disease* (IHD) mortality have been received with avid interest. Mortality rate trends for diseases of the circulatory system, have been on the increase since the beginning of this century. Hypertension and cerebrovascular disease mortality began a steady decline at least since the early fifties and rheumatic heart disease declined even earlier. The decline in CBVD mortality first became apparent in Canada in the 55 to 64 age group. Subsequently, older and particularly younger age groups have also benefited and the rate of decline has become progressively steeper in all of them. The decline in CBVD was preceded by a reduction in hypertensive disease mortality and both trends show some similarities, namely the absence of a marked sex predominance and the peculiar evolution of rates for females which were initially higher than those of males and later fell below them.1

The interpretation of CBVD ("stroke") trends is compounded by the diversity of clinical outcomes to be considered (thrombosis, embolism, intracerebral, subarachnoid haemorrhage, transient ischemic attacks); by the difficulty involved in detecting and ascertaining cases and also by the impact of other competing cardiovascular risks affecting similar population groups at earlier ages.2

While CBVD is linked with most of the risk factors known to affect atherosclerosis, its preponderant association with hypertension has been established beyond reasonable doubt.3-6 It is also well known that considerable risk reduction results from anti-hypertensive treatment.7-9 It is not then surprising that the sustained mortality decline observed in the last few decades has been attributed to the use of antihypertensive agents. Presumably the acceleration in the downward trend seen in recent years is also due to increased utilization and improved efficacy of these products. The probable reduction in stroke incidence commented upon below supports this assumption.

The first suggestion that a turnaround had also taken place in IHD mortality rates was reported in the U.S. only in the mid-seventies.10 Since then, similar declines in IHD mortality have been confirmed in Australia, Belgium, Canada, Finland and Japan;11 New Zealand12 and possibly in England, Wales13 and Ireland.14 These trends remain unchanged or continue to rise in most other industrialized societies.15

The decline in IHD mortality documented recently in Canada1 reveals striking similarities with that described for the United States.16-17 Age adjusted mortality rates for IHD, which have been markedly declining in Canada at least since 1965, dropped 16.4% (for both sexes combined) between 1969 and 1977. The United States reported a 20.7% decrease between 1968 and 1976. Although both sexes and almost every age group were favoured, mortality declined most in women and young people, particularly in the upper socioeconomic strata. It is also interesting to note that in both countries the decline is becoming steeper and is extending gradually over a wider range of age groups. Although IHD mortality has declined from coast to coast, there have been differences among the various geographic regions in regard to the rate of decline and the time of initiation. At present there are marked IHD mortality differentials across the continent where the lowest rates can be found in the central plains and the highest in the eastern regions.18 In contrast, regional differences in CBVD mortality are not as marked as those of IHD but the decline also started in the central plains that now exhibit the lowest rates.

The features described above support the impression that younger adults, particularly the most educated, were the first to benefit from reduced IHD mortality. As successive birth cohorts began to experience the same benefits, these extended progressively to the entire adult population.

The most pressing concern in the mid-seventies was to determine whether there was a real decline in IHD mortality. After the "factors obscuring the downturn

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*The term Ischemic Heart Disease proposed in the International Classification of diseases has been used instead of the term Coronary Heart Disease used elsewhere.
in IHD mortality had been duly examined, it became evident that an unprecedented decline of such magnitude observed in several other countries could hardly be attributed to changing awareness or diagnostic fashions or to shifts in coding causes of deaths and that the decline was not simply a statistical artifact. The most crucial issue now is to identify the cause(s) of this decline in order to further enhance preventive and control measures.

In general, decreased IHD and CBVD mortality rates could be attributed to three possible explanations: 1. A decreased incidence of non-fatal episodes presumably occurring as a consequence of changes in lifestyle, environmental exposures or other factors. Incidence data produced by European studies and registries depict a static or a rising trend in IHD rates in most countries while those coming from the U.S. are piece-meal and as yet inconsistent. The Kaiser-Permanente Study reveals a downward trend in hospitalization for “acute myocardial infarction” and “stroke” but both the Framingham and the Mayo Clinic Studies indicate that the overall incidence rate of IHD has not changed. Nevertheless, the Mayo Clinic Study shows that the incidence of stroke has declined in both sexes and in all age groups between 1945 and 1974.

Evidence suggests that the overall prevalence of major risk factors such as smoking, hypertension and hypercholesterolemia may have declined coincidentally with the mortality decline both in Canada and the U.S. The role of weight-loss, regular participation in exercise and sports and perhaps that of other still unaccounted factors has not as yet been fully established. Attempts to explain the decline and the sizeable differences observed in IHD and CBVD mortality in terms of the risk factors involved, have been hindered by the limitations of the information available. Nationwide surveys have provided a good indication of the overall prevalence of these risk factors and other related aspects, but they are inadequate to estimate a trend or to accurately assess prevalence in localized geographic areas. Risk factor data must be generated directly for the specific populations under study.

2. A decreased case-fatality that could be due to a change in the natural history of the disease to less severe clinical forms, or to improved efficacy and/or acceptability of modern health care technology resulting in improved survival.

The successful development of programs aimed at treating hypertension, coping with coronary emergencies outside the hospital (cardiopulmonary resuscitation), the increased use of intensive care units, arterial bypass surgery, the advent of new drugs and non-invasive diagnostic methods support the hypothesis of improved treatment efficacy. However, the increased acceptability and actual implementation of these new technologies, at least in Canada, is relatively recent and their impact still awaits objective evaluation. New diagnostic techniques may lead to earlier detection, but not necessarily to longer survival. In any event, it is difficult to reconcile a reduction in mortality that started in the early fifties or mid-sixties with technologies more recently brought into use.

The question of case-fatality can only be resolved with data regarding both incidence and severity of episodes. Indirect Canadian evidence based on the percent of the population (45 to 64 years) admitted to, and subsequently dying in hospital with the diagnosis of acute myocardial infarction, between 1969 and 1977, is consistent with improved survival after diagnosis. Nevertheless, morbidity rates based on hospital admissions are affected by serious limitations and must be interpreted with caution. This is due in part to the fact that a proportion of patients with coronary occlusion die before admission, but also because a given admission may reflect a new or recurrent episode. In addition, rates of admission and the validity of diagnosis vary from place to place.

3. A combination of the above is also possible, and perhaps the most plausible explanation. Even modest improvements in several factors could possibly account for a significant decline in mortality.

Despite the impressive research effort currently underway by a number of disciplines it is apparent that an explanation for the cause(s) of the CVD mortality decline requires the development of additional data bases and appropriate epidemiological studies.

Data is required in at least three stages involving: continuous monitoring of risk factors, related behavioural characteristics and environmental exposures; incidence and severity of non-fatal episodes; and ascertainment of deaths attributable to these events.

It is then necessary to establish the appropriate chronological and spatial relationship between these stages, and diverse approaches have been suggested to achieve this goal.

A monitoring system to ascertain the incidence of fatal and nonfatal CVD events (IHD and CBVD) along with periodic surveys to measure changes in the levels of risk factors, behavioural, social and environmental conditions of the population has been proposed by WHO. It is anticipated that by replicating the same core of observations in contrasting communities (rather than in a cohort of individuals) it would be possible to relate changes in mortality to changes in incidence, case-fatality or both. The ultimate aim is to determine whether the modification of a certain risk factor(s) or given health care technology, for example, provides the optimal effectiveness in the prevention and control of CVD.

Studies focusing on morbidity and/or mortality rate differences among diverse sub-populations and geographic areas and correlating these with various other factors have proved useful in generating new hypotheses but they are not adequate to establish a cause-effect relationship between the stages being considered. However, the use of this approach combined with case control studies to identify areas where more detailed investigations might be carried out could prove fruitful.
The approaches suggested above constitute research proposals that may achieve results in the longer term. Meanwhile attention should be given to what can be done to accelerate and extend the benefits of the mortality decline to the entire population before all the answers are known.

Most clinicians already seem to be persuaded that the mortality reductions observed are attributable to improved curative management and they are directing their efforts towards improved methods of diagnosis and treatment. Yet the cost-effectiveness of these approaches needs to be evaluated. On the other hand, the association between cigarette smoking, high blood pressure, hypercholesterolemia and ischemic heart disease has been well documented. There is also evidence of a reduction in risk of IHD associated with cessation of cigarette smoking and control of hypertension is of benefit. The role of cholesterol and diet, which has been somewhat controversial, is being reaffirmed.

In regard to CBVD, the Framingham study indicates a 2 to 17 fold greater contribution to stroke by hypertension than by other risk factors, and the Veteran’s Administration study leaves little doubt that treatment of at least moderate and severe hypertension can prevent stroke.

Modification of these major risk factors constitutes at present the cornerstone of CVD primary prevention. For example, estimates of population “attributable risks” obtained by the use of a multiple logistic model from Evans County, ten-year-mortality follow-up study suggests that elimination of hypertension, diabetic status, hypercholesterolemia and smoking would result in a predicted 10-year mortality reduction of 19.7%, 4.5%, 4.4% and 9.1%, respectively. The potential for reduction of overall ten-year mortality based on the simultaneous elimination of all four of these exposures from the population would be 35.6%.

The actual feasibility and usefulness of single or multiple risk factor modification is being evaluated by community intervention studies, where modification has been attempted either through screening for high risk segments of the population (medical model), through community organization and health education (public health model) or by modifying the social and physical environment (ecological model). A recent review of community intervention studies concludes that it is possible to reach large segments of the population and effectively modify risk factors. It is therefore suggested that risk modification should be routinely incorporated into the primary care system. This has been proposed elsewhere for hypertension control and should be encouraged without delay.

A strong appeal is made also for promoting a public health approach to deal with smoking modification.

The door should not be shut to possible intervention trials aimed at testing the effects of modifying new risk factors, a prime candidate being magnesium supplementation of the diet to prevent IHD.

Thus, there is a wide spectrum of opportunity for research and for action which provides a challenge for continuing progress in this area during the eighties.

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