Invited Commentary: Trends in Coronary Heart Disease Mortality—Location, Location, Location

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The well-documented decline in coronary heart disease (CHD) mortality in the United States of approximately 3 percent per year over the past 30 years is one of the most remarkable developments in improving public health in the modern era. Determining the relative contribution of treatment versus primary prevention in achieving this decline is an important medical and epidemiologic issue. This endeavor is not about assigning credit but is a discovery of ways to accelerate the decline and reach those segments of the population that have not yet benefited from the reduction.

In real estate, the maxim “location, location, location” is a commentary on the preeminence that setting has in determining the value of a home. Likewise, the “location” of CHD deaths in the community—in-hospital or out-of-hospital—helps elucidate the role and the potential of medical treatment versus primary prevention in reducing CHD death. Temporal trends in in-hospital deaths often are associated with medical care, whereas trends in out-of-hospital events are best associated with primary prevention.

This is helpful thinking, especially when combined with information about prior history of heart disease. For example, the rate of sudden cardiac death (SCD) outside of hospitals among persons with no prior history of heart disease is a target of primary prevention and risk factor management more so than medical treatment. Conversely, preventing a fatal outcome for a hospitalized patient with CHD involves medical and/or surgical intervention in the context of disease severity, which is related to both medical treatment and primary prevention. As such, trends in these types of events are often considered an indication of the success of primary prevention and treatment innovation.

However, this logic is not entirely without qualifications, because the definition of out-of-hospital fatal events includes those events occurring during emergency medical transport and in emergency departments. Therefore, the distinction between in-hospital and out-of-hospital deaths does not completely equate with those cases in which medical intervention was applied versus those cases where it was not. Likewise, the widening dissemination and use of automated electronic defibrillators in the community also may blur our ability to designate out-of-hospital sudden death (with or without a history of heart disease) as being a function of primary prevention.

Dissecting the components of trends in coronary mortality has proven difficult, time-consuming, and controversial (1–7). Today, 25 years after the Bethesda conference on the decline in CHD mortality (8) challenged the research community to validate the decline in CHD mortality and identify its determinants, the answers are still not completely satisfactory. The article on the community surveillance project in Olmsted County, Minnesota, by Goraya et al. (9) in this issue of the Journal reports results from the latest study to shed light on these important medical and public health questions.

Population-based data on trends in location-specific rates of CHD mortality are important for several reasons. First, the use of various accurate measures of CHD incidence is important if the effects of primary prevention are to be distinguished from the effects of treatment. Such markers of disease incidence include rates of in-hospital CHD death, out-of-hospital CHD death, and SCD among persons without a prior history of heart disease. Use of such data, in conjunction with data on incident hospitalized myocardial infarction, provides a much-needed picture of disease incidence in the community. These data may identify and reinforce the types of efforts that are contributing significantly to the decline in mortality and refocus our attention on those that are not. Because resources are limited, best practices in treatment and prevention must be identified and supported, and those that are not effective should be reevaluated.

Second, the final measure of the effect of public health programs or treatment interventions is population-based trends in disease rates. Intermediate measures of prevention efforts such as levels of risk-factor and behavioral changes are proximal measures needed to evaluate the efficacy of programs. However, in the final analysis, the impact on reducing premature mortality in the population is the ultimate measure. These data apply directly to the questions...
posed by the Bethesda conference. The complex nature of evolving patterns in the occurrence of disease and of the methods used to measure them demands that we continue to evaluate and expand on community surveillance data as they become available.

Although the recent findings by Goraya et al. (9) largely agree with the existing literature, the article makes several important contributions to the debate on the role of primary prevention in CHD trends. As one contribution, Goraya et al. present data that are complete through the late 1990s indicating that declines in in-hospital CHD mortality were nearly three times greater than declines in out-of-hospital mortality. Not only does this replicate findings from the Atherosclerosis Risk in Communities Study, which found a 1.4-fold difference between in- and out-of-hospital CHD mortality from 1987 to 1994 (2) and a 1.5-fold difference between 1987 and 1996 (10), it also provides new evidence that this gap is widening. The prospect that the shift of CHD mortality toward the out-of-hospital setting is expanding has several implications. This suggestion underscores the need to find new ways of increasing public awareness of heart attack symptoms and signs and empowering the public to call 911 immediately to reduce delay time to treatment. The trend also suggests that without innovations in or greater emphasis on primary prevention, the reduction in CHD mortality cannot be sustained in the future.

Another contribution of the Goraya et al. article is that it expands previous work to include new data on trends among persons over age 75 years. Goraya et al. report that declines in both in-hospital and out-of-hospital CHD mortality were less pronounced among older persons (9). Although delaying CHD death towards progressively older age groups is desirable and (as Goraya et al. point out) should be considered an accomplishment, there is a paucity of data on trends in this age group. The recent work by Zheng et al. (11) using national vital statistics also indicated that death rates for SCD increased with age, although there was no difference at ages above 85 years. Zheng et al. also reported the troubling finding that although age-adjusted rates of death from SCD overall declined 11.7 percent in men from 1989 to 1998, age-specific rates for SCD increased 21 percent among women aged 35–44 years. The reasons for this increase are not clear, but both studies support the reporting of age-specific data and the inclusion of older persons in additional surveillance studies.

The article by Goraya et al. also contributes valuable data on the proportion of sudden deaths (within 24 hours of symptom onset) that are unexpected (no previous history of heart disease). The proportion of unexpected SCDs among all SCDs was 49 percent (9). This suggests that the burden of unexpected SCD is unchanged from that reported in previous studies, and this is supported by Goraya et al.’s finding that the proportion of unexpected SCDs did not change in 20 years of observation. This is an extraordinary finding. Declining case fatality from myocardial infarction over the same time period, a growing CHD prevalence pool, some progress in primary prevention and availability of screening, and considerable advances in diagnostic procedures and treatment have done little to alter the case mix of SCD. Goraya et al. conclude that this underscores the importance of primary prevention in sustaining the decline in CHD mortality. This finding is also important because specific information on history of disease among persons experiencing sudden death in the community is largely unavailable. The unique research environment of Olmsted County makes this possible.

Yet another contribution of the Goraya et al. article is that Goraya et al. were able to classify SCD according to history of CHD. The result indicated that the decline in SCD among persons with a prior history of CHD was greater than that for unexpected SCD. Conventional interpretation would suggest that this finding is consistent with a greater impact of treatment than of primary prevention. However, this may be somewhat simplistic. Although the nature of a treatment-and-prevention interaction is not well understood in the community setting, risk factor management has a likely impact on disease severity. In this sense, the reported findings by Goraya et al. support the conclusion that treatment and prevention work better in combination in reducing SCD than does prevention alone.

Although the article by Goraya et al. spans 20 years of careful and comprehensive community surveillance, there are some relevant limitations. One obvious limitation is the generalizability of findings obtained from a single community with only moderate socioeconomic and ethnic diversity. Recent reports from national vital statistics reinforce the finding of socioeconomic differences in SCD. Zheng et al. (11) found that between 1989 and 1998, the Black population had higher death rates from SCD than members of the White, American Indian/Alaska Native, or Asian/Pacific Islander populations. The Hispanic population had lower death rates for SCD than did the non-Hispanic population (11).

The Poisson regression models used to summarize trends in heart disease mortality rates and to obtain average percentage changes are widely used and generally appropriate. However, the modeling forced a straight-line fit. It is plausible that over the time span of the study, this might not have represented the best fit to the data. Visual inspection of the annual rates of CHD death presented by Goraya et al. (9) suggests that except for the two most recent years, trends for in-hospital fatal events (men) since 1988 were flat. These findings should be explored further in this and other community surveillance studies.

Although there is more to understanding trends in CHD mortality than just “location,” the data presented by Goraya et al. contribute important insights into the dynamic nature of and complexities in the decline in CHD incidence and suggest that facilitation of future declines in CHD mortality will rely heavily on realizing the promise of primary prevention.

REFERENCES

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