Among public health workers, health educators, and sociomedical researchers, there is now consensus regarding the impact of social and environmental factors on morbidity and mortality. Individual characteristics and behaviours, as well as environmental and occupational exposures, are correlated with and may indeed cause illness, disability, and death. It is also clear that the modification of certain risk factors significantly reduces pathological outcomes. For example, weight reduction helps lower high blood pressure. Smoking cessation reduces the risk of some cardiovascular disease by as much as one-half in only one year. Older women who engage in regular weight-bearing exercises not only increase muscle strength, but also reduce the risk of osteoporosis and hip fractures. Wearing a seat belt while operating an automobile dramatically lowers road fatalities. These examples demonstrate the unquestionable influence of social factors on health and illness. Positive changes in risk factors are likely to promote health and decrease illness.

These connections between social and environmental factors and illness are well known in the public health arena. Two derivative challenges arise: (1) how, when, and where to intervene to alter risk factors; and (2) how to evaluate the effectiveness, cost-benefit, and sociocultural acceptability of public health interventions. Moreover, the planning and evaluation of interventions must take into account unexpected or unintended consequences for health which are clearly more difficult to assess.

HOW, WHERE, AND WHEN TO INTERVENE

The current approach to solving public health problems and to evaluating intervention efforts centres around change at the individual level. But there are serious problems with this approach which raise concern about the wisdom of continuing along the traditional path.

First, directing public health interventions toward producing voluntary changes in individual lifestyles serves to distract attention from other more promising areas of work (1). In his 1990 Presidential address to the
American Public Health Association, Myron Allukian pointed out that less than 3% of health expenditures in the United States are devoted to public health or prevention, despite the likelihood of considerable impact on the nation’s health.

Some have suggested that the preoccupation with change at the individual level stems from the traditional medical model in which causal biologic pathways are hypothesized and individuals at risk are managed by health care providers. For example, large intervention trials, such as MRFIT (Multiple Risk Factor Intervention Trial Research Group) (2) and the LRC study (Lipid Research Clinics Program) (3), have involved identifying high risk individuals to receive intensive counselling and/or drug treatment.

The almost exclusive focus on personal attributes in public health has brought about “the lifestyle approach to health policy” (4). Drawing on the work of California health economist Victor Fuchs (5) and former Canadian Health Minister Mark Lalonde (6), Terris argues:

To Fuchs, it is the individual decisions that are of critical importance; social decisions are “also relevant” but limited to such problems as pollution . . . A major weakness of this [Lalonde’s] approach is that it conceives of individual lifestyles as though they exist in a vacuum. Society has nothing to do with the matter. Furthermore, society takes no responsibility; as Lalonde states “Individuals’ blame must be accepted” or as Fuchs says in closing his book “The greatest potential for improving health lies in what we do and don’t do for ourselves. The choice is ours.” That is why Fuchs has much to recommend on the social organization of health care, but nothing on social measures to change lifestyles. Lalonde has a long list of recommendations to influence lifestyles, but they seem to consist largely of moderate programs of health education and a few very weak regulatory proposals. . . . This lack of a program for effective social measures is inevitable given the fundamental ideology of the lifestyle approach (4).

The prevailing approach to health promotion and disease prevention is impractical in the context of a social system that encourages and profits from the continuance of at-risk behaviours (7). According to some critics, public health interventions at the individual level are futile because they “decontextualize” at-risk behaviours and fail to take into account the ways in which such behaviours are culturally generated and maintained.

Although efforts to modify individual risk factors are clearly important, they represent only one side of the coin. On the other side lies the contribution of aspects of the broader social system—including governmental policies, organizational priorities, and professional behaviours. In seeking innovative approaches to primary and secondary prevention, particularly for vulnerable subgroups of society, these broader features of the social system may be more effective vehicles for social change (1). Investigators have already demonstrated that a “whole population strategy” is more effective and cost-efficient than an “individual high-risk management approach.”

A second reservation about the individual lifestyle approach lies in its tendency to blame the victim (8-10). This concern has been widely recognized and discussed in the literature and will not be further elaborated here.

A third concern is epistemological. Although individual characteristics and behaviours are related to measures of health status, their precise contribution is often unclear. The number of factors implicated seems to rise exponentially. A decade ago, Hopkins and Williams (71) compiled a list of 246 “risk factors” for CHD. Since then the list has continued to grow: it now includes snoring, speaking English as a native language, not having siestas, and not eating mackerel!

Even when an issue appears to be settled, uncertainty and doubt rear their ugly heads. For example, the contribution of cholesterol as a risk factor has been well documented in numerous investigations. Costly national campaigns have been mounted to encourage
regular testing for all age groups and to promote methods for voluntarily reducing cholesterol levels in those at risk. By the end of this century, everyone in the U.S. is supposed to "know their number." Yet a highly respected team of Stanford University researchers recently evaluated the results of cholesterol screening in their review of over 100 published studies. Focusing solely on asymptomatic adults "whose history and physical examination show no evidence of hyper-cholesterolemia, coronary heart disease or hypertension," they concluded that evidence regarding the value of cholesterol reduction is "incomplete." "There is some connection between the presence of a high cholesterol reading and premature death for middle-aged men," the authors say, but "it's much weaker for women and it's much weaker for the elderly. As a matter of fact, in the elderly it's possible it goes the other way—the low cholesterol may be associated with higher mortality." One of the authors notes that for middle-aged men who have "marked" cholesterol elevation—"in the top 5 to 10 percent"—treatment with drugs to reduce cholesterol levels will lower the rate of heart attacks. However, the impact of this treatment on overall mortality has not been demonstrated because the men die from other causes. There is no conclusive evidence that medications to reduce cholesterol actually save lives.

This argument by no means suggests that cholesterol is unimportant (12). The point is, rather, that evidence regarding the precise contribution of many lifestyle characteristics remains uncertain, even for those so seemingly well established as cholesterol! If the contribution of such risk factors is in fact much less than originally believed, then targeting considerable efforts and resources toward modifying these factors may not be an optimal investment.

Fourthly, nonmodifiable risk factors such as gender, age, family background, and genetics have often been maligned in public health and sociomedical research. Assessments of the relative contributions of social and individual characteristics have tended to overlook genetic or family differences. In some social science circles, assessment (or even discussion) of the likely contribution of biophysiologic to behaviour is not politically correct: Sociobiology is an illegitimate sub-discipline which must be vigorously resisted, or even stamped out. As my former Aberdeen colleague Phil Strong puts it: "... in most attempts to explain the human world, only social factors are admitted; biology goes unmentioned. Economic reductionism rules supreme" (13). Sociologists are in the vanguard of those who disdain and ignore biological explanations. Strong, a sociologist himself, maintains, "The reasons are straight forward—disciplinary prejudice and imperialism. Just as biomedical scientists typically ignore social factors—such as class—however relevant they may be, so social scientists in turn generally ignore genetics" (13).

Some public health figures espouse the humanitarian view that all people are born equal. Inequalities or differences in health status are due primarily to social differences—environment, life chances, social mobility, differential access to care. In most areas of health, that view is egregiously wrong. For example, all people are not born equal with respect to CHD (the number one cause of death in most western societies). Among mid-aged males, nonmodifiable factors can account for as much as 50% of the variance in CHD. Modifying risk factors such as smoking, exercise, and diet certainly offer protection against CHD, but there is simply no dispute about the profound contribution of family background, male gender, and age (all nonmodifiable risk factors) to CHD. In this instance, the nonmodifiable attributes probably have an overriding influence. There is certainly no attempt here to argue that only one view is correct. Maintaining that underlying biophysiologic processes drive everything simply substitutes biophysiologic for economic reductionism.

The point is that both social behaviours and biophysiologic processes make important
TABLE I. Multiple Risk Factor Intervention Trials

<table>
<thead>
<tr>
<th>Trial</th>
<th>Sample Size</th>
<th>Age Group (yrs.)</th>
<th>Duration (yrs.)</th>
<th>Intervention</th>
<th>CHD Deaths</th>
<th>Total Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO</td>
<td>60,881</td>
<td>40-59</td>
<td>6</td>
<td>D,S,BP,E,W</td>
<td>428</td>
<td>1,325</td>
</tr>
<tr>
<td>Göteborg</td>
<td>30,000</td>
<td>47-55</td>
<td>12</td>
<td>D,S,BP</td>
<td>462</td>
<td>1,293</td>
</tr>
<tr>
<td>MRFIT</td>
<td>12,866</td>
<td>35-57</td>
<td>7</td>
<td>D,S,BP</td>
<td>115</td>
<td>265</td>
</tr>
<tr>
<td>Helsinki</td>
<td>1,222</td>
<td>40-55</td>
<td>5</td>
<td>D,S,BP,E,W</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Oslo</td>
<td>1,232</td>
<td>40-49</td>
<td>5</td>
<td>D,S</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>828,000</td>
<td></td>
<td></td>
<td></td>
<td>1,015</td>
<td>3,009</td>
</tr>
</tbody>
</table>

D = Diet, S = Smoking, BP = Blood Pressure, E = Exercise, W = Weight Reduction
* Adjusted for the difference in Sample Size in the Intervention (I) and the Control (C) Groups.

Source: McCormick and Skrabanek (75).

contributions (14). Rigid adherence to one at the expense or exclusion of the other is destructively parochial, leading to incomplete or even inaccurate explanations and, by extension, misdirected research and misplaced policies. Socioeconomic reductionism among social scientists is as myopic as biophysiological reductionism among natural scientists.

Fifth, the major concern is that efforts to persuade people to voluntarily change behaviour with respect to particular risk factors have unfortunately been disappointing so far. McCormick and Skrabanek (15) reviewed the best designed risk factor intervention trials for primary prevention of CVD: the MRFIT Study, the Lipid Research Clinics Study, the Physicians’ Aspirin Study, and the Helsinki Heart Study. They concluded that the interventions had no effect whatsoever on total mortality.

TABLE II. Single Risk Factor Intervention Trials

<table>
<thead>
<tr>
<th>Trial</th>
<th>Sample Size</th>
<th>Age Group (yrs.)</th>
<th>Duration (yrs.)</th>
<th>CHD Deaths</th>
<th>Total Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WHO (Clofibrate)</td>
<td>15,745</td>
<td>30-59</td>
<td>5-8</td>
<td>54</td>
<td>162</td>
</tr>
<tr>
<td>1RC-CPPT (Cholestyramine)</td>
<td>3,806</td>
<td>33-59</td>
<td>7</td>
<td>32</td>
<td>68</td>
</tr>
<tr>
<td>Helsinki</td>
<td>4,081</td>
<td>40-55</td>
<td></td>
<td>6</td>
<td>45</td>
</tr>
<tr>
<td>Gemfibrozil</td>
<td></td>
<td></td>
<td></td>
<td>92</td>
<td>275</td>
</tr>
<tr>
<td>Total</td>
<td>115,176</td>
<td></td>
<td></td>
<td>92</td>
<td>92</td>
</tr>
</tbody>
</table>

| Smoking        |             |                 |                 |            |             |
| Whitehall Civil Servants | 1,445      | 40-59           | 10              | 49         | 123         |

| Hypertension   |             |                 |                 |            |             |
| Nine Community-based Trials | 17,314    | —               | 153,757         | *          | 784         |

| MRC            |             |                 |                 |            |             |
| 9,048 M        |             |                 |                 | 85,572     | 248         |
| 8,306 F        |             |                 |                 | 106        | 253         |

* Odds Ratio 0.92 (95% CI 0.78–1.08)

Source: McCormick & Skrabanek (15).
Fries, et al. (16) maintain that these large-scale interventions were not failures because they did result in improvements in morbidity and quality of life. With respect to the MRFIT study, for example, they argue that morbid events such as angina pectoris and congestive heart failure were reduced by 16% in the intervention group, despite an excess of deaths in this group. The interventions may not have saved lives, but they were successful in improving health. However, it is not at all clear that these improvements in morbidity were due to voluntary behaviour changes which the trials were specifically designed to promote. Instead, these changes were almost certainly due to an unanticipated side effect: more aggressive drug treatment of the identified high risk men in the trial (see also Gunning-Schepers et al., [17]).

Care must be taken to avoid applying double standards. Public health researchers often chastise clinicians for becoming so invested in a procedure (e.g., CABG) that they simply will not abandon it, even when consistent evidence from several well-designed trials reveals its ineffectiveness (18). Researchers need to abide by the standards they set for others and keep an open mind.

**PROMOTING HEALTH THROUGH SOCIAL POLICY**

With respect to health promotion and disease prevention strategies, how many more failures are necessary before we question the wisdom of the dominant lifestyle approach aimed at voluntary behaviour changes? Directing interventions toward modifying individual behaviours may be the wrong way to go. These failures must be recognized rather than rationalized or attributed to post hoc unintended consequences. Scientists must be able to refocus their efforts in new directions, particularly given the expense and frequently harmful effects of some preventive endeavors (19). Continuing blind support for ineffective interventions reduces public health workers to the mere appearance of doing good and serves a legitimating function for disturbing inequalities in health.

If individual level behaviours no longer constitute the most fruitful areas for intervention, then what new directions offer promise? Components of the sociopolitical system, though often neglected, represent opportunities to effectively and efficiently intervene to reduce major inequalities in health. The experimental units become components of the system rather than individuals or groups. Greater reductions in falls and hip fractures among older people are more likely to be accomplished by changing reimbursement policies for just a few psychotropic drugs that are indiscriminately prescribed than by costly and generally futile individualized approaches to improving muscle strength and bone density. Raising U.S. cigarette taxes by only US$ 0.08 apparently led 2 million adults to stop smoking and prevented 600,000 teenagers from starting. A further increase of US$ 0.20 reportedly would avert more than one-half million premature deaths among adults who currently smoke. Stringent tobacco regulations introduced by the Canadian government have produced an 11 percent per capita decline in smoking—the greatest decline ever recorded by a country. There are many other obvious examples. Health services researchers have shown time and again that experimental or deliberate manipulations of system components (especially what is and is not reimbursed by government) can have a profound effect on organizations, providers, patients, and health outcomes (4). The challenge is to move beyond personal attributes and find ways to incorporate planned and gradual changes in the sociopolitical system into primary and secondary prevention strategies.

In addressing the question “where to from here?” there are three important social system constituencies: government, organizations, and providers. First, with respect to government policies, there must be a continual push for a more rational and equitable re-
allocation of available resources in order to reduce or remove inequalities in health. However, more is not always desirable or feasible. Allocations should be made on the basis of demonstrated effectiveness, determined wherever possible by randomized trials (18, 20, 21). This is the only way for the state to get value for money spent on health care and to ensure the greatest good for the greatest number (22). While originally viewed as overly rational and politically impractical, resource allocation guidelines are now seen as an important policy priority as governments in fiscal crisis search for help in deciding what limited services they should invest in and what can be off-loaded onto the private sector (privatization). As long as ever more limited resources continue to be squandered on largely ineffective or unevaluated procedures, the state can never support a minimally adequate package to which the poor should have easy access so that inequalities in health can be diminished.

Government and public health leaders understandably espouse the humanitarian value of equality of access. According to the American Medical Association, the idea whose time has come is universal access to care rather than universal health insurance (23). But health researchers correctly ask “access to what?” Is it desirable, or even ethical to provide and promote equality of access to ineffective or unevaluated health care? Generally speaking, equality of access means that the relatively advantaged get more care (whether effective or ineffective), while the poor get less care even though they pay disproportionately more through a regressive tax structure.

Consequently, I have never advocated indiscriminate access to any and all medical care because much of it is demonstrably ineffective and wasteful of scarce resources. However, I do argue for equality of access to effective basic primary health care services, which is precisely where many of the most glaring inequalities in health can be diminished. This is not an antilibertarian position: the well-to-do can have access to anything they like—CABG, psychotherapy, elective hysterectomies, brand name medications, or whatever. However, the rest of society, particularly the disadvantaged, should not have to pay for their prodigal purchases through the tax system.

Second, at the level of health care organizations, the focus is on reorganizing and restructuring different types of health activities to address inequalities in health status. Dismantling the whole system would be nihilistic and wrong, especially since some things actually work very well. But that is not to say that many other areas do not require change. Improved management information systems and increased staff motivation can all contribute. But the most effective strategy to guarantee organizational change involves the financial incentives and disincentives that follow government reimbursement policies.

The three system contributions are interdependent: government policy can affect organizations and eventually change provider behaviours in a step-down manner. Regrettably, changes in organizational priorities and professional practices seldom follow scientific evidence or findings of health services research; rather, they tend to follow the money. An unreimbursed practice may persist for a while due to organizational and provider reluctance to change. But eventually it will be discontinued when there are no resources to support it.

When poor people in the U.S. are turned away from hospital admission or transferred during the course of an illness, it is not because staff are callous or the organization inhumane, but because the organization will lose money by committing resources if these patients are admitted (24). The unwillingness of hospitals to treat AIDS patients in the U.S. is a matter of survival for the patients and the hospitals. The only way to change organizational behaviour so as to reduce inequalities in health is to make treatment of the relatively deprived economically worthwhile. The effective treatment of poor people has to be rendered profitable—
probably through some form of nationalized health care. Humanitarianism, professionalism, personal sacrifice, and voluntarism are all laudable ideals. But at the level of organizational change, they are less effective than financial incentives in redirecting the flow of resources.

Third, given the trends towards corporatized medical practice, the relation of providers to the organizations employing them is similar to the relation of these organizations to the state. Just as organizations have to accommodate to available resources, so employees must always act to protect the prerogatives of their organization. And the weakening market position of doctors around the world increases the likelihood that they will ultimately tow the organizational line, despite personal and professional reservations. Admittedly, so-called “professionals” present special challenges to formal organizations. Evidence from studies in several different industries indicates that professionals in bureaucracies fairly quickly subsume their personal interests, behaviour, and even codes of ethics to the requirements of their employing organization (25). Observers in the U.S. have warned that the encroachment of the medical-industrial complex is eroding the moral basis of medicine (26, 27). This obviously has implications for professional training.

To survive in American medicine today, most providers have to keep their customers satisfied. Doctors in bureaucratic settings have to retain the organization’s clients; those in more precarious solo or partnership arrangements are under even greater pressure to comply with client demands. Even the terminology today—“clients” rather than “patients”—reflects the changes that have occurred. Providers and their employers have to compete for customers and be responsive to customer demands in order to keep them satisfied and loyal.

Data from the Pawtucket Heart Health Program illustrate the influence of patient demands. Begun in 1980 in a city of 72,000 people, this study is a community demonstration project designed to test whether a public health approach to CHD risk factor modification is effective in reducing both risk and disease events related to atherosclerosis. One component of the program has had an important effect on physician behaviour, producing a statistically significant increase in patient requests for certain types of procedures, tests, and treatments (28). Incidentally, the physicians did not identify specific elements of a continuing medical education program as an important influence. This is not intended as any criticism of physicians. In simply responding to the market, their behaviour is consistent with that evidenced among professionals in every other sphere, whether religion, education, or law. Under today’s corporatized arrangements, providers will generally do what clients/patients request, provided it is paid for.

Despite claims to the contrary, sooner or later all professional behaviour is driven by economic requirements. Rates depicting inequalities in health follow the money because providers are required to follow the money by the organizations employing them. For these organizations, the pursuit of ever more resources is a necessary condition of survival. While this may be viewed as vulgar economic determinism, it seems to simply reflect reality, and may even appear truistic. Attempts to change provider behaviour by educational interventions or by the “weight of reliable scientific data” are seldom successful. The best way (perhaps the only way) to permanently effect behaviour change in professionals is through changes that occur in organizations as they accommodate to shifts in government reimbursement policies.

Change is more effectively initiated from the top rather than from the bottom. Reducing inequalities in health produced by social system influences requires redirecting the flow of state resources: turning off the flow to ineffective and unvaluated practices and increasing the flow to essential human services that produce the greatest good for the great-
est number. Such a step-down approach—from government through organizations to providers—involving the redirection of resources (i.e., money) may be the only way to ensure behaviour change in both patients or clients and the system whose raison d'etre is to serve them.

Finally, assuming that social system influences do represent a new public health approach to health promotion, what are the implications for research methodology?

THE CONCEPT OF APPROPRIATE METHODOLOGY

Change in the focus of health promotion and disease prevention will require adaptation and refinement in traditional quantitative research methods in order for these methods, such as social surveys and experimental designs, to remain applicable to the perspective of the "new public health." Moreover, well-designed and carefully conducted qualitative studies, including ethnographic interviewing, participant observation, case studies, and focus group activities, are now required not only to complement quantitative approaches, but also to fill gaps where quantitative techniques are suboptimal or even inappropriate (29–33).

One problem is that quantitative and qualitative methods are viewed by their more rigid adherents as fundamentally incompatible rather than as mutually enriching partners in a common enterprise. Most quantitative researchers view qualitative approaches as inductive, subjective, unreliable, and "soft." These advocates of quantitative methods constitute the dominant force in biomedical research (and control the purse strings). Investigators employing qualitative methodologies see quantitative researchers as positivistic, mindless data dredgers who suffer from hardening of the categories. Mechanic observes that:

> As quantitative multivariate methodologies have come to dominate research work (in medical sociology), investigators have split into two cultures separating qualitative and quantitative studies. These cultures share little communication, publish in different journals and for the most part, ignore and sometimes belittle each other's research contributions (7).

How refreshing is Stange and Zyzanski's challenge to the prevailing duality:

> In contrast to this dichotomous view of the two paradigms, the actual process of understanding is more circular than linear. Observation leads to theory and hypotheses, which leads to modification of the theory, etc. Researchers may enter this circle at any point (e.g., to test an existing theory or to play a hunch based on an observation). Researchers exit the circle when they have enough confidence in their observations or theory to report the results or to take other action (34).

Frankly, the quantitative-qualitative debate is not only based on a false dichotomy which is ultimately disruptive of superior science, but it is also conducted by proponents woefully ignorant of the expertise, techniques and considerable care taken by researchers on the other side (35).

The concept of "appropriate technology" is well established in the field of international community health. Rather than supporting any hierarchy or continuum from "high" technology to "low" technology, it emphasizes instead that any intervention can be appropriate depending on the nature of the problem, the state of knowledge, the availability of resources, and the purposes served by the intervention. "Appropriate" health technology does not conform to some idealized national or international standard; nor is it necessarily optimal or even "simple." Instead, it serves as a suitable approach for that purpose at a particular point in time, taking into account the nature and magnitude of the problem and the available resources. Water boiling in a Peruvian village is not low technology (36); nor are health risk appraisals (37, 38).

In the context of developing countries, the concept of appropriate technology has been
well illustrated with respect to infantile diarrhea (39). In some countries, as many as one-third of all infant deaths are attributed to infantile diarrhea and dehydration; therefore it must be considered a major problem requiring action. Among the possible points of intervention are: maternal nutrition, environmental sanitation, child spacing, breastfeeding, weaning support, oral rehydration by the mother, oral rehydration by a health worker, rehydration centres, and individual or hospital treatment. Any one, or combination, of these points are potentially useful as the focus of intervention strategies. The nutrition of mothers could be improved by feeding programs, rural development projects, redistribution of land, or change from cash to consumable crops.

In one country, the problem of infant diarrhea was declared an emergency requiring immediate action rather than long-term planning. The strategic choice of rehydration centres was successful in reducing mortality in children. However, many families scattered in rural areas could not attend. Reaching these families required the development of a new strategy. A magic packet of electrolytes was produced which, when mixed with a bottle of boiled water, could counter dehydration if given early enough. These packets were distributed free of charge to houses, stores, schools and similar meeting places. Instructions were included to teach mothers how to make the mix and give it to their babies at the first sign of diarrhea or vomiting. The magic worked! This strategy was very popular and cheap. With the decline in acute dehydration and mortality, rehydration centres had almost no business and were closed down. Although this extreme and exotic example may appear to have limited relevance here, the principle is important and applicable even in industrial settings (40, 41).

In the more “developed” world, coronary heart disease is a pertinent example to illustrate the use of this concept in differentiating levels and types of intervention. Downstream curative interventions include heart transplantation, thrombolytic therapy, coronary artery surgery, angioplasty, prehospital resuscitation, and pharmaceuticals (42). Midstream primary and secondary prevention efforts focus on smoking prevention and cessation, cholesterol lowering medications (e.g., Lovastatin), and weight and stress reduction. As the level of intervention moves upstream, it involves organizations (e.g., schools and worksites), entire communities (e.g., Stanford, California, and Pawtucket, Rhode Island), and health and macrosocial policies (e.g., instituting “sin taxes” on smoking and alcohol, legislating no smoking, clean air, and antipollution policies, changing the corporate expensing of advertising, removing price supports for tobacco and sugar, and reimbursing for preventive health practices by providers). No one intervention approach can be viewed as intrinsically more worthwhile than another; each makes important and com-

![FIGURE 1. Appropriate Health Technology Intervention Points Example: Infantile Diarrhoea](Source: Parker AW, 1976.)
Complementary contributions toward improving the public health (1).

Generally speaking, quantitative methods, such as randomized controlled trials, case control studies, and epidemiologic surveys, tend to be employed to measure outcomes of downstream interventions, where individuals are the unit of analysis (43). As one moves upstream, the utility of these methods becomes problematic, not because they are intrinsically defective or flawed, but because the phenomena to which they are applied (the units of investigation) are of a different type. Rigorous experimental control and manipulation are not always possible at the level of sociopolitical intervention, especially when change is unexpected or unplanned. Thus, different measurements and data collection techniques must be employed. Quite often, egregious methodologic errors result from confusing an upstream unit of random assignment (such as a school) with a downstream unit of analysis (such as an individual student). When an intervention program is applied to an aggregate unit (community, school, worksite) and the analysis is based on individual observations, the residual error is deflated by intracluster correlation and leads to overstatement of the statistical significance. This analytic problem is exacerbated by the lack of sufficient aggregate units and by political constraints on random assignment. A recent issue of the Health Education Quarterly provides an excellent illustration of the problems of applying traditional experimental design concepts to the evaluation of school-based health promotion interventions (44).

The concept of “appropriate methodology” refers to the most suitable research approach associated with different points across the broad spectrum of methodologic strategies. Just as it is inappropriate to distinguish high from low technologies, so is it also inappropriate to falsely dichotomize quantitative vs. qualitative, hard vs. soft, deductive vs. inductive, or objective vs. subjective. The appropriateness of any research methodology depends on the phenomenon under study: its magnitude, the setting, the current state of theory and knowledge, the availability of valid measurement tools, and the proposed uses of the information to be gathered. The utility of a particular methodologic approach is, in large part, a function of the load you’re asking it to carry and to whom it’s being delivered.

Diverse methods can complement and enrich each other, leading to better understanding and appreciation of the phenomena under investigation. The application of qualitative methods can provide further insight into the meaning of quantitative findings. While quantitative techniques can elucidate statistical significance, qualitative methods can reveal substantive significance. My colleagues employ the most sophisticated multivariate modelling techniques on longitudinal data sets concerning frail elders and their informal

FIGURE 2. Some Points of Intervention for Coronary Heart Disease
caregivers. We (and I include myself) crank out numbers and produce important findings for future policy and action, but do we really understand the everyday burden, usually for a woman, of having to care for a frail elderly parent or spouse? The repeated recommendation that a couple of illustrative cases should be followed intensively from dawn to dusk is persistently dismissed. You can drag a quantitative horse to water, but you can't make it drink qualitative techniques.

Similarly, quantitative methods can be used to improve the generalizability and inferential strength of findings from qualitative approaches. An ethnographic study was recently conducted at NERI as an essential component of a larger AIDS community intervention experiment. This study employed purposive sampling schemes, stratified in various ways to ensure the development of a picture of the whole community and to guard against the danger that the ethnographer would end up with informants who, while conveniently available, did not represent all groups of interest. Incidentally, this ethnography was not an afterthought, but actually served as the source of specific components of the subsequent intervention. In other words, it was the very foundation for the entire two-community experiment and informed the content of the pre- and post-intervention surveys.

The concept of process evaluation is relatively recent and still has not been widely applied in health promotion research (44–47). Increasingly, researchers are recognizing that this type of evaluation may be as important as outcome measurement, because outcomes of health or other social programs become uninterpretable without it. Process evaluation permits the systematic exclusion of competing explanations for an observed experimental result (48). When no effect is observed for an intervention, process evaluation can answer the following questions:

- Is there no effect because the program could not be fully implemented for some subjects (compliance was variable)?
- Is there no effect because of barriers to program access?

If a beneficial effect is observed from the outcome measures, then process evaluation can answer the following questions:

- Is the effect actually due to the program or is it due to the receptivity of selected subjects or target groups?
- Is the effect actually due to the program or is it due to other competing interventions?

In order to answer these questions adequately, it is necessary to monitor potentially competing programs, measure exposure to the experimental (and other) programs, and observe implementation of the experimental programs. With the use of case studies or video- or audio-taped interactions, qualitative methodologies are particularly appropriate for adequate monitoring of program implementation. Traditional quantitative approaches cannot measure aspects of group interaction that determine successful implementation. This situation provides a clear example of the appropriateness of qualitative over quantitative methods. In this instance, qualitative techniques serve as a necessary complement to traditional quantitative evaluation methods.

Quantitative and qualitative researchers can learn a great deal from each other and thereby enrich their own work. Take interviewing as an example; it is surely the Achilles heel of quantitative research. Although the quality of interviewing is crucial to any study's success, this aspect of survey research is typically ignored (49). Interviewers can affect quality in two principal ways. First, when interviewers are not consistently standardized, survey-based estimates are less precise, thereby increasing the amount of random error around the survey estimates and de-
creasing the extent to which the differences among respondents are detectable in the results. Second, interviewers can systematically bias data and render it invalid. In one recent study, 30 percent of the variation in some key outcome variables (social support networks and symptom reporting) was explained by interviewer differences! After fastidiously drawing representative samples and constructing neutral research instruments, survey researchers must be alarmed to learn that so much variance in key variables can be contributed by interviewer variability (50). One internationally respected researcher stated, “I’d hate to have my data reanalyzed controlling for interviewer variability—it could be devastating.”

Conducting exquisitely designed quantitative research with improperly or undertrained interviewers is like handing a new Rolls Royce over to an unlicensed teenager: the result may be a disaster. More likely, one will simply never know what the engine was subjected to while in their hands. Some people prefer to remain ignorant; what you don’t know can’t hurt you.

Many qualitative researchers undertake intensive, unstructured interviewing with great sophistication and care. Complicated in-depth interviews are tape-recorded and videotaped and played back repeatedly as part of quality control to reduce bias and get the “true picture.” Far from being “soft,” qualitative research in this area is unbelievably rigorous and reflexively self-critical of its own methodology (51). If only quantitative researchers would draw on qualitative experience and devote as much care to data gathering as they invest in research design and statistical analysis.

Assessing the effectiveness, cost-efficiency, and sociocultural acceptability of public health interventions must be carried out in the best possible way, according to well-established canons of science. Rigorous methods should be employed by all researchers, whether quantitative or qualitative. Surveyors of a thousand individuals should want to capture, and understand, the everyday world of their anonymous respondents. Ethnographers working with an n of one should want some assurance that another of their number would derive essentially the same conclusions when viewing essentially the same phenomena. In other words, rigor, method, and research integrity are not paradigm-specific.

Last year, at a conference in Australia concerned with improving health research methods, it was surprising to witness the harsh treatment of David Silverman and Robert Dingwell, both well-known British qualitative researchers, for insisting on higher research standards. Even more surprising was the source of attack: their own fellow qualitative researchers. But quantitative researchers are not exempt from similar dogmatism and narrow focus. For example, many epidemiologists consider the cohort study to be intrinsically superior to any case-control design, irrespective of the situation (52). These observational approaches have different strengths and weaknesses (53). One may be more appropriate than the other, depending on the situation: neither has an intrinsic advantage.

In conclusion, the central thesis can be summarized quite simply. For a variety of reasons, health promotion efforts need to move from the level of the individual to the level of the social system. Although tried and true quantitative methods generally work when the focus is limited to voluntary lifestyle changes at the individual level, they are not always useful or adaptable when the emphasis shifts to the social system level. Some techniques are misapplied, while others are inherently inappropriate. The notion of “appropriate methodology” emphasizes the match between the level of intervention and the most suitable research approach, with the choice of approach contingent on the problem, state of knowledge, availability of resources, audience, and so forth. There is no right or wrong methodologic approach: appropriateness to the purpose must be the central concern.

All bring different tools to the job, and every trade has its own tricks. Imagine the patent
absurdity of comparing the intrinsic contribution of a plumber or an electrician, or enquiring as to whether a wrench is more useful and reliable than a paint brush! Of course, some workers perform better than others and enjoy a reputation for superior work. But comparing ethnographies to surveys, or case studies to randomized controlled trials, is like comparing wrenches with brushes. It may temporarily reduce the insecurities of members of each guild (statisticians, sociologists, psychologists, anthropologists), but it nevertheless remains a specious comparison.

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