

Paradigmatic obstacles to improving the health of populations -Implications for health policy*

John B. McKinlay, Ph.D.⁽¹⁾

McKinlay JB.
Paradigmatic obstacles to improving the health of populations -Implications for health policy.
Salud Publica Mex 1998;40:369-379.

McKinlay JB.
Obstáculos paradigmáticos para mejorar la salud de las poblaciones: implicaciones para las políticas de salud.
Salud Publica Mex 1998;40:369-379.

Abstract

While there are promising developments in public health, most interventions (both at the individual and community levels) remain focused on "downstream" tertiary treatments or one-on-one interventions. These efforts have their origins in the biomedical paradigm and risk factor epidemiology and the behavioral science research methods that serve as their handmaidens. This paper argues for a more appropriate balance of "downstream" efforts with a more appropriate whole population public health approach to health policy –what may be termed a social policy approach to healthy lifestyles rather than the current lifestyle approach to health policy. New, more appropriate research methods must be developed and applied to match these emerging levels of whole population intervention. We must avoid any disjunction between new upstream policy level interventions and the methods used to measure their effect –appropriate unto the intervention level must be the evaluation method thereof.

Key words: health policy; public health

Resumen

Aunque existen desarrollos prometedores en el área de la salud pública, la mayoría de las intervenciones (en los ámbitos individual y comunitario) se enfocan al tratamiento terciario de tipo curativo o se trata de intervenciones individuales. Estos esfuerzos tienen sus orígenes, tanto en el paradigma biomédico y la epidemiología de factores de riesgo, como en los métodos de investigación de las ciencias de la conducta, que actúan como sus herramientas. Este documento plantea un balance entre los esfuerzos de atención curativa y los esfuerzos más apropiados de una política de salud que propone acciones integrales de salud pública para toda la población, es decir, una política social enfocada en "estilos de vida saludables" más que en las aplicaciones actuales del concepto de estilo de vida. Deben desarrollarse y aplicarse métodos de investigación nuevos y mejores para equiparar los niveles emergentes de intervenciones poblacionales. Debemos evitar cualquier separación entre la política nueva de intervención preventiva y los métodos que se usan para medir sus efectos, es decir, que el nivel de intervención debe tener un método de evaluación apropiado.

Palabras clave: política de salud; salud pública

* Based on a paper presented at VII Congreso Nacional de Investigación en Salud Pública, Cuernavaca, Morelos, México, 2-5 March, 1997. The evaluable assistance of Ms. Lisa DiGruttolo in the preparation of this paper is gratefully acknowledged.

(1) Senior Vice President and Director, New England Research Institutes.

Challenging the prevailing paradigm of health research

Thomas Kuhn in *The Structure of Scientific Revolutions*¹ described the history of science as a chronicle of the rise and fall of “paradigms” –which are overarching viewpoints or prevailing conceptions which, for some time, dominate a discipline or field of inquiry. A paradigm serves as a guide for all activity in a particular field. It determines what topics of inquiry are appropriate, what methods are most desirable, the proper way things ought to be done, and finally how support and recognition are awarded. Scientific revolutions and change result from a breakdown of the prevailing paradigm –internal inconsistencies emerge, anomalous findings persist, and alternative viewpoints promise greater explanatory utility. Kuhn traces the paradigmatic shift from Ptolemaic to Copernican astronomy and he shows how theoretical anomalies emerged that were not explicable by the Ptolemaic system. The resulting Copernican viewpoint was, in turn, characterized by its own guiding paradigm. This new paradigm then directed science, focused attention, dictated methods and asserted and reinforced its own priorities. From this viewpoint, science is essentially conservative and resistant to change, while new views and methods are ordered and institutionalized by the system supporting the prevailing paradigm.^{2,3} Some believe a new paradigm may be emerging in public health, fostered by recognized limitations of the prevailing paradigm, including misfocused interventions and outcomes and ethical quandaries.^{4,6} There is increasing disappointment with the failure of efforts which derive from the dominant paradigm, concern about inequalities in its application and frustration over the current resistance to alternative promising approaches and methods.⁷

While there are some promising new developments in public health policy, most interventions (both at the level of the individual and the community) still remain focused on “downstream” tertiary treatments or individual one-on-one interventions.⁸ With others, I argue that these well-intentioned (but questionably effective) efforts have their origins in the prevailing biomedical paradigm and the risk factor epidemiology and public health research methods that currently serve as its handmaiden. Like good servants, these epidemiologic approaches and methods are always readily available, do whatever is asked of them, but seldom question the underlying reasons. Research methods with origins in behavioral science are being narrowly and inappropriately applied to measure the effectiveness of tertiary and secondary prevention ac-

tivities to prevent disease and to improve health promoting behaviors among selected high risk groups.⁹ We must move beyond these “downstream” efforts towards a more appropriate whole population public health approach to health policy –what may be termed a social policy approach to healthy lifestyles rather than the current lifestyle approach to health policy.¹⁰ Appropriate research methods must be developed and applied to match these emerging, appropriate levels of whole population intervention.¹¹ Viewed from the history of public health this refocus on a whole population approach to health policy suggests a journey back to the future, rather than the development of a brand new public health approach.¹⁰

The current debate over the most appropriate approaches for health policy have traceable origins in divergent social philosophies and different conceptions of disease and health. Looking behind every public health and social policy debate are philosophical disagreements.¹² Attention, however, is focused not on these underlying origins, but rather on their more immediate manifestation in health interventions and the methodologies which measure their impact. Inviting colleagues to move discussion to a philosophic level, Nijhuis and Van der Maesen¹³ suggest:

[...]most theoretical debates about the pros and cons of public health approaches are confined to the methodological scientific level. Philosophical foundations such as underlying ontological notions are rarely part of public health discussions, but these are always implicit and lie behind the arguments and reasoning of different viewpoints or traditions.¹³

Wrestling with terms like “public” on the one hand and “health” on the other, they make crucial distinctions that facilitate understanding of the consequences of these different social philosophies and conceptions of health for intervention activities.

With respect to divergent social philosophies, Nijhuis and Van der Maesen¹³ identify two major types as follow:

- *Individualistic* (or “individualistically oriented social philosophy”). Here the emphasis is on the individual and following for example, Pareto¹⁴ and Weber,¹⁵ “the total (the Gestalt) is considered to be the outcome of the actions and motives of distinct individuals”.¹³ Accordingly, the focus is on people.
- *Collectivistic* (or “collectivistically oriented social philosophy”). Here the emphasis is on “the social constellations of which individuals are part”. From this perspective and following the views of, for example,

Marx¹⁶ and Durkheim,¹⁷ “the Gestalt[...] is primarily the social constellations of which individuals are part”.¹³ Accordingly, the focus is on categories (age, gender, social class, race/ethnicity) or places.

Regarding different conceptions of health, two general types can be identified:

- The natural science (mechanistic) view, which is the dominant orientation of allopathic medicine, focuses on disease states and factors which predispose, are associated with, or increase the chances of entering into one of those states. This pathogenic view treats people as biopsychosocial and neurophysiologic systems, while disease represents a perturber which produces disequilibrium, dysfunction and disease. Apart from its mechanistic approach, this view results in a conception of health as “non-disease”, an exclusionary state, or one that is “intrinsically residual in nature”. Accordingly, “because health is seen as non-disease it can only be viewed as a condition brought into being through causal mechanisms”.¹³
- The holistic view of health, originally associated with the Goddess Hygeia in classical Greek thought, appears to be undergoing a renaissance in the new public health and upstream health promotion strategies of today. This salutogenic view considers health “as an expression of the degree to which an individual is capable of achieving an existential equilibrium. This equilibrium is not static but constantly in motion”.¹³

Even though thinking in terms of dualities or binary opposites may, in itself, be a consequential limitation of the prevailing paradigm, we nonetheless (and only for the purpose of convenience) combine these dimensions into a conventional 2 x 2 array in order to derive a conceptual device to permit identification of general categories or classes of phenomena. This enables us to locate the origins of different levels of intervention and public health approaches in different social philosophies and conceptions of health. Accordingly, discussion can actually advance from disparaging evaluations of the advantages and disadvantages of different approaches/methods, or from futile discussion of “the best” approach, to appreciation of the underlying philosophies and views of health which manifest themselves in everyday health programs and the measurement of their effectiveness and efficiency.

This typological differentiation invites several observations (figure 1):

1. It permits us to understand some international differences in types of public health studies and

activities. In Europe, for example, where a more collectivist/holistic orientation is evident, there is great interest in upstream public health policies, or the purportedly “new” public health. In the US, with its more individualistic/natural science orientation, there is heavy investment in individual knowledge and behavior change and also in the reduction of disease in identifiable categories (high risk individuals). Some examples of this include: the National Cholesterol Education Programs whose goals are that every American ought to “know their number” by the year 2000 and the National Heart Attack Alert Program which seeks to teach people the signs and symptoms of a myocardial infarction.

2. It also permits us to understand the dominance and resilience of different methodologies in different national settings. In the US and Great Britain, two settings in which I have both lived and worked, Popperian logical positivism prevails.^{18,19} In other settings (e.g., groups in Canada, Europe, Australia and England) there is a refreshing interest in qualitative, interpretative, inductive methodologies which are more appropriate to the programs suggested by a collectivistic/holistic orientation. These alternative approaches (I prefer the term “complementary”) have their origins not in dissatisfaction with the limitations of positivistic methods, or the inherent superiority of one over the other according to some standard of science, but rather in the collectivistic/holistic philosophies of their proponents. Until these divergent origins are widely appreciated we will continue, as David Mechanic²⁰ warns, to talk past each other.
3. Most of the erudite and interesting debates among devotees within a particular orientation have little appeal to the proponents of divergent philosophical views. The utility of Popperian views and new derivative falsificationist criteria for decid-

		Conceptions of health	
		Natural science	Holistic view
Social philosophies	Individualistic	1. Downstream curative focus	3.
	Collectivistic	2.	4. Upstream health promotion policies

FIGURE 1. TYPOLOGY: SOCIAL PHILOSOPHIES AND CONCEPTIONS OF HEALTH

ing causes,²¹ while important contributions within the scientific materialist tradition,²² have very little appeal to collectivistically oriented interpreters. This is not to disparage the valuable contributions of Greenland, Rothman, Petitti, or Susser,^{21,23-27} instead, it emphasizes their irrelevance (not error) to those driven by a fundamentally different social philosophy and conception of health. These contributions are as dissimilar as two farmers with divergent views on crop production—one applies chemical sprays to kill weeds and prevent harmful insects, the other applies natural fertilizers and waters the crops. Depending on one's philosophy, either approach may be considered appropriate and will produce acceptable yields.

4. This analogy prompts the question asked by Peter Rossi²⁸—can the quals and the quants ever live together in harmony? For some, like Foucault, Feyerabend and Habermas,²⁹⁻³¹ there appears to be little hope—their different methodologies are all derived from distinct philosophical perspectives, and furthermore, each includes its own ultimately irreconcilable presuppositions. While the explanations for it are perhaps necessarily divergent, the two groups nonetheless continue to suffer from the same malady—hardening of the categories.

What's wrong with the dominant approach to public health?

No one can question the remarkable contribution of public health to understanding the causes and consequences of illness, disability and death in society. From the early public health activities of 17th and 18th century Europe to the initiatives of today, the range of problems tackled, the exquisite methods developed, and the programs and policies attributable to specific findings have been remarkable. Some commentators, while acknowledging this remarkable progress, question the current direction of the field of public health research and its emergent theoretical assumptions. Let us consider one discipline within public health (epidemiology) which has much to offer health policy (other equally illustrative fields are economics, sociology, and nutrition). In marked contrast to its origins, the established epidemiology which is shaping public health policy today appears hamstrung by the assumptions that follow from its adherence to the individualist/natural science paradigm and also by the results of that paradigm.^{24,32}

This research is at least characterized by the following features:

- *Biophysiologic reductionism.* This involves a process in which phenomena, whether primarily physical or primarily behavioral, are explained by tracing their causes back to some bacteriological, genetic or molecular origins.⁷ Even sociological phenomena such as socioeconomic, racial and gender differences in heart disease are presumed to have biophysiologic explanations.^{33,34} Plausible structural explanations in social deprivation as well as biases in treatment are overlooked in preference for identifying physiological risk factors and biomedical interventions.
- *Absorption by biomedicine.* Moving from its origins in public health and its status as an independent discipline, epidemiology is simply becoming an adjunct to clinical medicine. Some reduce it to a body of expertise that is only useful for improving clinical decision making among practicing physicians (to check that they are being good Bayesians). I can well understand how my good friend John Last,^{35,36} with his background in public health at Edinburgh University, has come to regard the term “clinical epidemiology” as an oxymoron!
- *It is atheoretical.* Established epidemiology can explain very little because, unlike most disciplines, there is little interest in the field in developing theories which can be tested.^{37,38} Lamenting the absence of theory development, Alwyn Smith of Manchester likens the products of today's epidemiology to “a vast stock-pile of almost surgically clean data untouched by human thought”.³⁹
- *Limitations of dichotomous thinking.* Even though it is now widely accepted that the response curve is continuous and smooth for most risk factors and conditions, dichotomous thinking nonetheless prevails and still determines our actions. The well demonstrated fact that most illness conditions and risk behavior (for example, physical activity) are normally distributed, still appears to escape most researchers. Using hypertension as one example, Rose⁴⁰ has described the markedly different activities that logically follow from either dichotomous or continuous thinking. He observes “Paradoxically, it is epidemiologic research which has now repeatedly demonstrated that in fact disease is nearly always a quantitative rather than a categorical or qualitative phenomenon, and hence it has no natural definitions”.⁴⁰ Whole population approaches to public health which follow from acceptance of the continuous nature of risk are precluded “because it is a departure from the ordinary process of binary thought

to which they are brought up. Medicine in its present state can count up to two but not beyond".^{40,41}

- *A maze of risk factors.* Established epidemiology is analogous to a person trapped in a maze (of risk factors) in which there is no opening or exit in sight. Researchers enter this maze with great enthusiasm but are quickly diverted to the left or to the right by new, exciting and endless risk factor openings. Every new turn produces ever more promising openings but finally results in exhausting and frustrating disputes over which, among the numerous possibilities, is the "correct" direction in which to proceed. Often, after expending large amounts of time, effort and resources, researchers often return to the same place they started but without the added knowledge base that is required for action. McMichael puts risk factor epidemiology in perspective when he suggests:

Modern epidemiology is thus oriented to explaining and quantifying the bobbing of corks on the surface waters, while largely disregarding the stronger undercurrents that determine where, on average the cluster of corks ends up along the shoreline of risk.⁴²

- *Observational associations are confused with causality.* Disregarding the inferential superiority of randomized controlled trials, even when such trials are feasible, there is a preference for weaker observational studies. When elevating simple associations to causal status as occurs in most risk factor epidemiology, important qualifications for membership in the causal club are disregarded. Bradford Hill listed five conditions, all of which must be fulfilled before observed associations can even begin to qualify for consideration as cause and effect variables and hence as candidates for interventions.⁴³ These included magnitude, consistency, specificity, dose-response and biologic plausibility. Using these criteria, what proportion of observational reports qualify for membership in the causal club? Wider acceptance of Susser's discussion of levels of causality encompassing types of social organization, individuals, organ systems and molecular contributions may lead researchers beyond the obstacles of single risk factor studies to social policy and action.⁴⁴

- *Dogmatism by design.* There is a belief, often incanted by the epidemiologic faithful, that certain designs are purer than others. For example, may claim that cohort studies are inherently superior to case control studies is common dogma. Of course, each of these observational designs have their own particular strengths and weaknesses, yet both are still observational sinners! One may be more superior than the other in different circumstances, yet neither has an intrinsic advantage,

nor is one more appropriate than the other.^{45,46} Appropriateness is a contingent status. Advocating that one method is inherently superior to other methods betrays a shallow understanding of research methodology as opposed to research techniques.

- *More of the same is the answer.* Even while recognizing some of these ontologic and epistemologic limitations, many researchers believe that the solution lies in ever more of the same –bigger observational studies, better measurement techniques and more sophisticated multivariate manipulation rather than in improving the basic structure of research design. Philips and Smith⁴⁷ recently proposed an unusual improvement to observational epidemiology –they recommended more measurements of risk factors in order to overcome the limitations of reduced sample sizes! Skrabanek responded to their idea with the old Irish saying, "you can't make a pig grow by weighing him".⁴⁸ The point is that improved measurement techniques and statistical manipulation are no cure for the wasting condition which is now afflicting established epidemiology (among other areas within the field of public health).

Yet another logical consequence of the dominant paradigm is the current individual risk factor approach to solving population based health problems. For approximately 20 years now⁴⁹⁻⁵³ I have been describing limitations associated with an individual level risk factor intervention approaches. Namely, such policies: a) divert limited resources away from upstream healthy public policies; b) blame the victim; c) produce a life style approach to health policy, instead of a social policy approach to healthy lifestyles; d) decontextualize risk behaviors and overlook the ways in which such behaviors are culturally generated and structurally maintained; e) seldom assess the relative contribution of nonmodifiable genetic factors and modifiable social and behavioral factors. (In this regard, socioeconomic reductionism among social scientists is as myopic as biophysiologic reductionism among natural scientists.), and f) can actually be harmful to the health of the targeted populations. Marshall Becker reminded us that not all health efforts are benign, an observation given added weight by recent reports that programs to lower total cholesterol in children may have actually worsened the HDL/LDL ratio.⁵⁴ Furthermore, when one wishes to publish such negative results, existing publication bias makes it difficult to do so.⁵⁵⁻⁵⁷ Successes tend to get published; failures seldom do.

Even more problematic, many downstream efforts to reduce risk and to improve quality of life at the level of the individual have unfortunately produced disappointing results. My colleagues and I have un-

dertaken a formal meta-analytic assessment of the effectiveness of community interventions, and about one-half of all published reports lack even the basic data required to calculate and effect size! Our meta-analysis reveals that some of the variations in the results of community programs are attributable to characteristics of their evaluation design and implementation.⁵⁸ Moreover, aspects of the intervention appear to play some role in the variation in results. We have furthermore all been eagerly awaiting the results of the three most sophisticated, well-designed community interventions ever conducted in the US (Stanford, Minnesota, Pawtucket).⁵⁹⁻⁶² The results are now in, and they too add to the list of disappointments.

The failure of these promising community level interventions highlights a tension and inconsistency in the field of public health and policy evaluation. Moving beyond downstream approaches in interventions also requires that we move beyond the limited quantitative methods currently employed to measure individual behavior change. In other words, more appropriate upstream interventions require appropriate research methods. Currently, more appropriate community interventions are being assessed with inappropriate methods. Interventionists are setting themselves up for failure. When programs appear to fail, as most do, there is then a defensive McCawberish search for some other positive outcome at the same level, rather than a move to more appropriate levels, methods and outcomes.

Faced with failure on the very grounds upon which these interventions were mounted, some dispute whether they are truly failures since they may have produced improvement in other areas such as morbidity and quality of life. However, it is never clear that morbidity improvements were due to the voluntary behavior changes which the trials were specifically designed to promote. Instead, resultant improvements were almost always an unanticipated side effect of more the aggressive drug treatment of those persons identified as high risk individuals.⁵² One can understand why interventionists and public health researchers select the outcomes they do—these workers have humanistic interests and want to prevent death and sickness. They also know that, without behavior change, most untoward outcomes cannot be avoided. But are the most widely accepted outcomes the most appropriate ones? Are all community interventions bound to fail? Perhaps they are successful, but their success is not immediately observable, nor easily measured.

Where to go from here

Having focused on inappropriate approaches, let the discussion now turn to appropriate approaches. Arguing for a refocusing of efforts does not imply that all resources should be invested in upstream interventions to improve the health of the whole population. That can never occur, since if it did, resource allocation would be as distorted as it is at present. A balanced distribution of effort and resources across the whole range of possible points of intervention is required to accommodate the continuous distribution of risk factors and health problems affecting the general population.

For purposes of convenience one can distinguish three levels of public health interventions that could be instituted to improve the health of the population. Downstream efforts comprise treatments, rehabilitation counseling and patient education for those already experiencing some disease and disability. This is the level which, while consuming most of the available resources, encompasses a very small segment of the general population—probably under 5% of those already occupying the sick role. Mid-stream prevention efforts to improve a population's health should involve two main areas: a) secondary prevention efforts which attempt to modify the risk levels of those individuals and groups who are very likely to experience some untoward outcome; b) primary prevention actions to encourage people not to commence risky behaviors that may unnecessarily increase their chances of experiencing a negative health event. Even further upstream are healthy public policy interventions which include governmental, institutional, and organizational actions directed at entire populations which require adequate support through tax structures, legal constraints and reimbursement mechanisms for health promotion and primary prevention.

Geoffrey Rose in the *Strategy of preventive medicine* provides eloquent arguments for an upstream or whole population public policy approach to disease prevention and health promotion in the general population.⁴⁰ He moves beyond the traditional paradigm discussed above and shifts thinking from the level of statistical association as in relative risks, odds or rates to the absolute levels of risk in populations. Of this new emphasis Marmot says:

By shifting attention away from relative risk (how many times more likely is this exposed person to succumb than someone not exposed?) to absolute risk (what is

this exposed person's increase in absolute level of risk?), and even further to some measure of population attributable risk (how much of the disease in the population can be attributed to this level of exposure?) the notion of what constitutes an important risk can change dramatically.⁶³

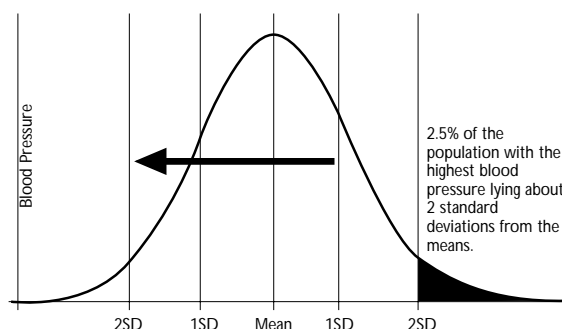
Such distinctions lead to what may be called the Rose Theorem, one of the most important insights in modern public health. A large number of people exposed to a small risk may generate many more cases than a small number exposed to a high risk.⁴⁰ This theorem has dramatic implications for public policies and resource allocation to improve the health of an entire population. With necessarily limited resources, large investments in questionably effective attempts to sustain a few high risk individuals leave little to promote the health of the majority. If utilitarian principles guide resource allocation then small improvements in the level of health among the majority are a better bet than dramatic attempts to mobilize the sick and to prevent illness in a high-risk minority. Appreciation of the continuum of risk (the dose-response curve) suggests that small and perhaps even imperceptible improvements in everyone's health (including those at low risk) will yield greater overall gains for a society than very perceptible improvements in the level of health among a minority of high risk individuals. This harsh reality must be coupled with an equally harsh certainty –society has necessarily finite resources. Therefore, what is invested in attempts to improve the sickness levels of the minority diverts resources away from promoting the health of the majority. We are confronted with what Rose terms the prevention paradox: “a preventive measure that brings large benefits to the community affords little to each participating individuals”.⁴⁰ Alternatively, downstream measures that yield possibly large benefits to sick or at risk individuals affords little to the overall health or our community which is where the real benefit lies.

Our continuing misfocus on downstream individual risk factors and the greater promise of upstream approaches is well illustrated by the dominant approach to hypertension, a prevalent condition which may affect up to 25% of the adult population. Hypertension is the most pervasive cardiovascular disease, the most critical stroke risk factor, and the leading cause of heart attack, kidney failure, eye diseases and congestive heart failure. It strikes about 35% of people without their knowledge and disproportionately afflicts minorities and the poor. Therefore, controlling this condition may produce improved outcomes in many different areas. Hypertension is especially chal-

lenging for public health workers because it is subject to the rule of halves –only half of hypertensives are known, only half of those known are under treatment, and only half of those being treated are managed effectively. As a result, a balanced whole population public health approach to hypertension must involve all three levels simultaneously –upstream public policy, mid-stream secondary prevention and downstream tertiary treatments.

Figure 2 depicts the normal distribution of blood pressure in the population, dividing it into segments based on standard deviations from the overall mean. The area within two standard deviations above and below the mean includes 95% of the entire population. Many physiological phenomena can be modeled using such a Gaussian curve. With respect to hypertension, for example, those with a diastolic BP greater than 100 mmHg, constitute about 2.5% of the total population at the greatest risk for heart disease and stroke. Most resources are devoted to the identification, treatment and modification of risk factors in this 2.5% of the population, mostly by pharmacologic measures. While these individuals are at great risk, they represent only a very small proportion of all deaths from heart disease and stroke. Ashton and Seymour argue:

[...] a public health approach to the problem of hypertension involves achieving a shift to the left of the complete population distribution through general measures to reduce risk factors among the entire population, none of whom individually may ever know whether they would have developed problems had they not adopted the proposed changes.⁶⁴



The public health approach involves a shift in the entire distribution to the left.

From: reference 64

FIGURE 2. THE NORMAL DISTRIBUTION OF BLOOD PRESSURE IN A HUMAN POPULATION

The measures envisioned, many deriving from the work of established epidemiology, are not totally dependent on voluntary individual behavior change. Rather, they are largely determined by social policies, macroeconomic structures and the prevailing cultural milieu (that is, upstream healthy public policy). A similar approach to the one advocated here for hypertension offers considerable promise in regards to the promotion of increased physical activity among older persons in society. Jette has recently described the importance of physical activity for older adults.⁶⁵ He reports that approximately 70% of people in the US over the age of 45 years do no regular exercise. This lack of exercise ranks with tobacco use as one of the leading preventable contributors to US mortality. Regular physical activity reduces the risks of mortality and morbidity. Finally, the level of activity required to beneficially affect health is actually quite modest.

Building on an appreciation of the continuous distribution of physical activity levels in the general population, figure 3 summarizes some points of intervention than can be used to improve physical activity levels in older adults. To my knowledge this is the first attempt to apply the principles of whole population public health to the challenge presented by physical inactivity among elders.

Towards more appropriate research methods and measures in public health

I have argued that the prevailing paradigm, with its inherent assumptions and orientation, results in a disproportionate emphasis on downstream, individually-oriented interventions which have limited effectiveness for whole population public health. I extend my concern to the research methods currently employed to quantitatively measure either the success of the failure of these downstream, one-on-one, secondary prevention and tertiary treatment efforts.

As defined by the Oxford Dictionary, the term "appropriate" denotes something that is "specifically fitting or suitable", or phenomenon that are "proper". The term "appropriate technology" supersedes the high-low continuum. Depending on the problem of concern, so-called "low technology" may be appropriate or inappropriate –likewise with so-called "high technology". "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

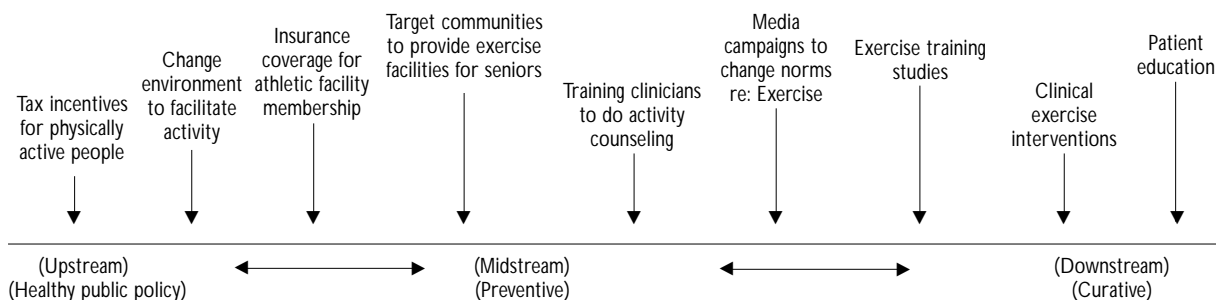
* Jette A. Designing and evaluating psychosocial interventions for promoting self-care behaviors among older adults. National Invitation Conference on Research Issues Related to Self-Care Aging. NIA, 1994. Unpublished paper.

some purpose at a particular point in time, taking into account the nature and magnitude of the problem as well as the available resources.

Obviously, what is appropriate in one setting may be quite inappropriate in another setting. Moreover, even within a particular setting there are often differences over time in what is deemed appropriate. As a result, appropriateness is a Heraclitan notion: it connotes fluidity. Appropriateness is not a state that is achieved, nor is progress easily measured against some gold standard.

It is useful to view different methodologies in the same manner as different types of interventional technologies. The concept of "appropriate methodology" refers to the most suitable research approach associated with different points across a broad spectrum of methodologic strategies. Just as it is now inappropriate to distinguish high from low interventions, so it is also inappropriate to falsely dichotomize research methods as 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 as well as its magnitude, the setting, the current state of theory and knowledge, the availability of valid measurements 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 it is carrying and also the population to whom it is being delivered. Therefore, the appropriateness of a research method is determined, not by an abstract norm or idealized Popperian conception of science, but rather by the nature of the problem under consideration, the community resources or skills available, and the prevailing norms and values at the national, regional or local levels. Acceptance of the notion of "appropriate methodologies" requires adaptation and refinement of traditional quantitative research methods such as social surveys and conventional experimental designs in order for these methods to remain useful for 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.⁶⁶⁻⁷³ 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



From: Jette, 1994

FIGURE 3. POINTS OF INTERVENTION FOR PHYSICAL INACTIVITY

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.

Generally speaking, quantitative methods developed by statisticians and epidemiologists (including randomized controlled trials or case control studies) tend to be employed exclusively to measure the outcomes of downstream interventions in which individuals are the unit of analysis.⁷⁴ These individual level experiments could almost certainly benefit from a judicious integration of appropriate qualitative methods. As one moves upstream, the utility of quantitative 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 qualitatively different type.¹¹ Rigorous experimental control and manipulation are not always possible at the level of sociopolitical intervention, especially when change is unexpected or unplanned. Thus, different design approaches, 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 community or school) with a downstream unit of analysis (such as an individual student). When an intervention program is applied to an aggregate unit such as a community, school or worksite, and the analysis is based on individual level observations, the residual error is deflated by intracluster correlation which leads to overstatement of the statistical significance, and also includes the problem of measuring the wrong outcomes.

Diverse disciplines and methods can complement and enrich each other, leading to a better understanding and appreciation of the phenomena under investigation.⁷⁵ The application of qualitative methods can

provide further insight into the meaning of quantitative findings at both the individual and system level. While quantitative techniques can elucidate statistical significance, qualitative methods can reveal substantive significance.⁷⁶⁻⁷⁷ 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 New England Research Institute as an essential component of a large 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; it was the very foundation for the entire two-community experiment and informed the content of the pre- and post-intervention surveys.

Conclusion

In summary, the central argument of this paper is quite simple. For a variety of reasons, health policy efforts to reduce disease and improve health within society need to move from the level of at risk individuals to the level of the social system (healthy public policy). 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, and others are inherently inappropriate. The notion of "appropriate methodology" emphasizes the

match between the level of intervention and the most suitable research approach in which the choice of approach is contingent on the problem, the state of knowledge, the availability of resources, the audience, and so forth. There is no right or wrong methodological approach, rather appropriateness given the purpose of the intervention must be the central concern.

Because of their underlying paradigm public health and policy studies in general (and established epidemiology in particular) are limited by three types of inappropriateness. These are, in logical order, an inappropriate, atheoretical approach which is producing the misfocus on individual behavior change which, in turn, is producing inappropriate methodologies. If we are to move beyond individual behaviors or attributes (the lifestyle approach to health policy), it is necessary to move beyond the currently limiting paradigm (to a health policy approach to life styles). The public health challenge of improving everyone's health presents an exciting opportunity to go back to the future through whole population epidemiology and healthy public policy. In pursuing these new directions, however, we must avoid any disjunction between more upstream interventions and the methods used to measure their effect –appropriate *unto* the intervention level must also be the research method *thereof*.

Acknowledgements

The valuable assistance of Ms. Lisa Digrottolo in the preparation of this paper is gratefully acknowledged.

References

1. Kuhn TS. The structure of scientific revolutions. Chicago: University of Chicago Press, 1962.
2. Watson RI. Psychology: A prescriptive science. In: Henle M, Jaynes J, Sullivan J, eds. Historical conceptions of psychology. New York: Springer, 1973.
3. Gholsen B, Barker P. Applications in the history of physics and psychology. *Am Psychol* 1985;40:755-769.
4. Evans RG. Introduction. In: Evans RG, Barer ML, Marmor TR, eds. Why are some people healthy and others not? The determinants of health of populations. New York: Aldine de Gruyter, 1994:3-26.
5. Krieger N. Epidemiology and the web of causation: Has anyone seen the spider? *Soc Sci Med* 1994;39:887-903.
6. Long AF. Understanding health and disease: Towards a knowledge base for public health action. Leeds: Nuffield Institute for Health, University of Leeds, 1993.
7. Shy CM. The failure of academic epidemiology: Witness for the prosecution. *Am J Epidemiol* 1997;145:479-484.
8. Editorial. Population health looking upstream. *Lancet* 1994;343(8895):429.
9. Rose G. Sick individuals and sick populations. *Int J Epidemiol* 1985;14:32-38.
10. Terris M. The changing relationships of epidemiology and society: The Robert Cruikshank Lecture. *J Public Health Pol* 1985;6:15-36.
11. McKinlay JB. More appropriate evaluation methods for community level health interventions: Introduction to the special issue. *Eval Rev* 1996;20(3):237-243.
12. Tesh SN. Hidden arguments: Political ideology and disease prevention policy. New Brunswick, NJ: Rutgers University Press, 1988.
13. Nijhuis HGJ, Van der Maesen LJG. The philosophical foundations of public health: An invitation to debate. *J Epidemiol Community Health* 1994;48:1-3.
14. Pareto V. The mind and society. New York: Dover, 1963.
15. Weber M. The theory of social and economic organization. New York: Oxford University Press, 1947.
16. Marx K. Selected writings in sociology and social philosophy. New York: McGraw-Hill, 1964.
17. Durkheim E. Rules of sociological method. Illinois: University of Chicago Press, 1938.
18. Popper KR. The logic of scientific discovery. New York: Harper and Rose, 1968:276-281.
19. Popper K. Conjectures and refutations. London: Routledge and Kegan Paul, 1974:339.
20. Mechanic D. Medical sociology: Some tensions among theory, method, and substance. *Health Soc Behav* 1989;30(2):147-160.
21. Weed DL. Causal criteria and Popperian refutation. In: Rothman KJ, ed. Causal inference. Chestnut Hill (MA): Epidemiology Resources, 1988:15-32.
22. Whitehead AN. Science and the modern world. London: Free Association Books, 1985:22.
23. Greenland S. Probability versus Popper: An elaboration of the insufficiency of current Popperian approaches for epidemiologic analysis. In: Rothman KJ, ed. Causal inference. Chestnut Hill (MA): Epidemiology Resources, 1988:95-104.
24. Rothman KJ. Modern epidemiology. Boston: Little Brown and Company, 1986:11.
25. Petitti DB. Associations are not effects. *Am J Epidemiol* 1991;133:101-102.
26. Susser M. Falsification, verification and causal inference in epidemiology: Reconsideration in the light of the philosophy of Sir Karl Popper. In: Rothman KJ, ed. Causal Inference. Chestnut Hill (MA): Epidemiology Resources, 1988:33-58.
27. Susser M. What is a cause and how do we know one? A grammar for pragmatic epidemiology. *Am J Epidemiol* 1991;7:635-648.
28. Rossi PH. The war between the quals and the quants: Is a lasting peace possible? *New Directions Program Evaluation* 1994;61:23-36.
29. Foucault M. The birth of the clinic: An archeology of medical perception. London: Tavistock, 1973.
30. Feyerabend P. Farewell to reason. New York: Verso, 1987:162-191.
31. Habermas J. Theorie des kommunikativen Handelns, Band 1 und 2. Frankfurt am Main: Surhkamp Verlag, 1981.
32. Miettinen OS. Theoretical epidemiology: Principles of occurrence research. New York: Wiley, 1985.
33. McKinlay J, McKinlay S, Crawford S. Does variability in physician behavior explain any of the gender difference in cardiovascular disease? In: Czajkowski NS, Robin-Hill D, Clarkson TP, eds. Women, behavior and cardiovascular disease. Washington, D.C.: US DHHS, Public Health Service, NIH Pub. No. 94-3309, 1994.
34. McKinlay JB. Some contributions from the social system to gender inequalities in heart disease. *J Health Soc Behav* 1996;37:1-26.
35. Last J. What's clinical epidemiology? *Public Health Pol* 1988a: Summer(2):159-163.
36. Last J. A dictionary of epidemiology. New York: Oxford University Press, 1988b.
37. Savitz D. The alternative to epidemiologic theory: Whatever works. *Epidemiology* 1997;8:210-212.

38. Krieger N, Zierler S. What explains the public's health –A call for epidemiologic theory. *Epidemiology* 1996;7:107-109.
39. Smith A. The epidemiological basis of community medicine. In: Smith A, ed. Recent advances in community medicine 3. Edinburgh: Churchill Livingstone, 1985:1-10.
40. Rose G. The strategy of preventive medicine. Oxford: Oxford University Press, 1992.
41. Pickering GW. High blood pressure. 2nd edition. London: Churchill, 1968.
42. McMichael AJ. The health of persons, populations, and planes: Epidemiology comes full circle. *Epidemiology* 1995;6:633-635.
43. Hill AB. Environment and disease: Association or causation? *Proc R Soc Med* 1965;58:295-300.
44. Susser M. Causal thinking in the health science. New York: Oxford University Press, 1973.
45. Schlesselman JJ. Case control studies: Design, conduct, analysis. New York: Oxford University Press, 1982.
46. Kersey JL, Thompson WD, Evans AS. Methods in observational epidemiology. Monographs in epidemiology and biostatistics. Vol. 10. New York: Oxford University Press, 1986.
47. Phillips AN, Smith GD. The design of prospective epidemiological studies more subjects or better measurements? *J Clin Epidemiol* 1993;46:1203-1211.
48. Skrabanek P. The epidemiology of errors. *Lancet* 1993;342:1502.
49. McKinlay JB. A case for refocusing upstream –The political economy of sickness. In: Evelow et al., ed. Behavioral aspects of prevention. American Heart Association, 1975.
50. McKinlay JB. Epidemiological and political determinants of social policies regarding the public health. *Soc Sci Med* 1979;13A:541-558.
51. McKinlay JB. Evaluating medical technology in the context of a fiscal crisis: The case of New Zealand. *Milbank Memorial Fund Quarterly* 1980;58(2):394-443.
52. McKinlay JB. The promotion of health through planned sociopolitical change: Challenges for research and policy. *Soc Sci Med* 1993;36(2):109-117.
53. McKinlay J. Health promotion through healthy public policy: The contribution of complementary research methods. *Can J Public Health* 1992;83:11-19.
54. Becker MH. The tyranny of health promotion. *Public Health Rev* 1986;14:15-25.
55. Rosenthal R. The "file drawer problem" and tolerance for null results. *Psychol Bull* 1979;86:638-641.
56. Begg CB, Berlin JA. Publication bias: A problem in interpreting medical data. *J Roy Statist Soc A* 1988;151:419-445.
57. Easterbrook PJ, Berlin JA, Gopalan R, Matthews DR. Publication bias in clinical research. *Lancet* 1991;337:867-872.
58. Sellers DE, Crawford S, Bullock K, McKinlay JB. A meta-analysis of community heart health programs. *Soc Sci Med* 1997;44:9:1325-1339.
59. Blackburn H, Luepker R, Kline FG. The Minnesota Heart Health Program: A research and demonstration project in cardiovascular disease prevention. In: Matarazzo JD, Weiss SM, Herd JA, Miller NE, Weiss SM, ed. Behavioral health: A handbook of health enhancement and disease prevention. New York: John Wiley and Sons, 1984.
60. Elder J, McGraw S, Abrams D. Organizational and community approaches to community-wide prevention of heart disease: The first two years of the Pawtucket heart health program. *Prev Med* 1986;15:107-117.
61. Carleton RA, Lasater TM, Assaf A, Lefevbre RC, McKinlay SM. The Pawtucket Heart Health Program. An experiment in population-based disease prevention. *RI Medical Journal* 1987;70(12):533-538.
62. Farquhar JW, Fortmann SP, Flora JA, Taylor CB, Haskell WL, Williams PT. Effects of community wide education of cardiovascular risk factors: The Stanford five-city project. *JAMA* 1990;264(3):359-365.
63. Marmot M. Cardiovascular disease. *J Epidemiol Community Health* 1994;48:2-4.
64. Ashton J, Seymour H. The new public health. Buckingham, England: Open University Press, 1988.
65. Parker A, Newell KW, Torfs M, Israel E. Appropriate tools for health care: Developing a technology for primary health care and rural development. *WHO Chronicle* 1997;31(4):131-137.
66. Spradley JP. Participant Observation. New York: Holt, Rinehart and Winston, 1980.
67. Sanday P. The ethnographic paradigm(s). In: Van Maanen J, ed. Qualitative methodology. Beverly Hills (CA): Sage Publications, 1983.
68. Yin RK. Case study research: Design and methods. Beverly Hills (CA): Sage Publications, 1984.
69. Basch C. Focus group interview: An underutilized research technique for improving theory and practice in health education. *Health Educ Q* 1987;14:411-448.
70. Bernard HR. Research methods in cultural anthropology. Newbury Park (CA): Sage Publications, 1988.
71. Morgan D. Focus groups as qualitative research. London: Sage, 1988.
72. Grunig L. Using focus group research in public relations. *Public Relations Rev* 1990;1:36-49.
73. Kitzinger J. The methodology of focus groups: The importance of interaction between research participants. *Soc Health Illn* 1994;16(1):103-121.
74. Kleinbaum DG, Kupper LL, Morgenstern H. Epidemiologic research: Principles and quantitative methods. New York: Van Nostrand Reinhold Company, 1982.
75. Strange KC, Zyzanski SJ. Integrating qualitative and quantitative research methods. *Fam Med* 1989;21(6):449-451.
76. Reichardt CS, Cook TD. Beyond qualitative versus quantitative methods. In: Cook TD, Reichardt CS, ed. Qualitative and quantitative methods in evaluation research. Beverly Hills (CA): Sage Publications, 1979.
77. McGraw SA, McKinlay SM, McClements L, Lasater TM, Assaf A, Carleton RA. Methods in program evaluation: The formative and process evaluation system of the Pawtucket Heart Health Program. *Evaluation Rev* 1989;13:459-483.