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As the costs of health care increase, the ethical ramifications of the system also grow. By this I mean that as we invest larger amounts of resources in the delivery of health services (in both absolute dollars expended as well as relative to other kinds of resource development), the impact of the system on the lives of larger proportions of our population becomes more pervasive and profound. This impact occurs not only through obvious and direct ways such as delivering more health care to underserved groups or providing new services to other groups with consequent changes in health status,[1] but also there are less obvious effects.

These *indirect* effects of our enlarging and increasingly expensive system may have impacts at least as important on the lives of people. These occur through the system's impact on the very conditions under which people live. This then has ethical implications for those who, at any level in the system, have a part in determining the size and shape of health care in the nation or in any given community.

For example, we can roughly characterize our health care delivery system in economic terms as inherently inflationary; that is, it is both capital intensive (huge amounts of funds are required to develop and equip its organizational emphasis on inpatient facilities) and energy-intensive in (a) the development and maintenance of its technology as well as (b), its emphasis on specialized personnel, 80% of whom are

attached to inpatient sites.[2] The indirect impact of this kind of system on the lives of many communities and groups means at least the following:

- To the extent that a specialized system can only be supported by large and relatively affluent populations, it primarily locates in urban and affluent communities, thereby contributing to the urban-rural or central city-suburban income gaps, fostering the decline of poor communities.[3]
- Its costliness not only diminishes direct access to services by lower income groups but also, because of predominant methods of financing, places a relatively greater burden on the income of those same poorer groups through flat rate payments such as insurance premiums and social security taxes.[4]
- The specialized emphasis among health personnel, increasingly credentialed through university degrees, has the effect of favoring the entry, promotion, and income maintenance of those from privileged households and of keeping those from poorer families in the lower-income health occupations, with fewest opportunities for further training or promotion.[5]
- The 140 billion dollars used by the system each year means, in effect, that those billions are not being used in alternative ways, ways which may have potentially greater positive impacts on health.[6]

In these broad ways then, the health care system as an economic entity affects the communities, incomes, resources, the basic conditions under which large numbers of people live. To the extent that certain groups, especially the lower-income, rural or ghetto communities, or elders, become or are maintained as deprived groups, the system contributes to perpetuating their above-average burden of disease, and makes them more vulnerable to future illness. This is the basis of the ethical consequences — the impact on the chances for health and life of community populations — flowing from the decisions which determine the size and character of our health care system.

What follows is an attempt to focus these general concerns on a specific area of decision-making within the delivery system, namely, the development of screening programs. This is an area which is receiving increasing attention among community health personnel. It is a service component which appears to be expanding on the assumption that it is *not* characteristic of the system as a whole. In other words, it is relatively *not* expensive, *is* readily deployable, is often relatively simple and non-specialized, and is preventive in nature and thereby health-promoting. I am following the generally accepted definition of screening as "the presumptive identification of unrecognized disease or defect through tests, examinations, or other readily applied measures carried out on apparently *well* individuals."[8] Thus, screening is a

mode of secondary prevention in that it seeks to discover adverse conditions in order to prevent their extension or sequelae.

The ethics of screening as a service *per se* has often been discussed in its non-economic dimensions. These include such important issues as whether to screen when treatment does not exist or is unavailable, or whether to inform individuals of adverse findings when available treatment may be ineffective. Rather clear-cut criteria have been recently developed and widely discussed for guiding decisions on the use of screening.[9]

Ethical Aspects of Economics

Here our discussion will focus on the ethical aspects of the *economics* of screening programs. In order to examine this dimension some basic questions must be addressed:

1. What is the *efficacy* of screening? That is, what is the usefulness to the *individual* of the service rendered? Is the screening tool *able* to detect disease or defect?
2. What is the *effectiveness* of screening? What health-promoting impact is it actually having on a given population, and the related prior question, is it reaching the appropriate population?
3. What is the *efficiency* of screening measured in cost-effectiveness relative to other means of discovering illness, and/or measured in cost-benefits, the dollar-value of savings in treatment and time lost from consumers' daily activities?

Although the answers to these questions are only beginning to be developed, there are available several efforts to summarize findings in response to one or more of them, concerning either the efficacy, effectiveness, HEW/Congress, or efficiency of screening programs.[10]

The following discussion seeks to combine these interrelated aspects of screening services in order to draw out the ethical implications inherent in decisions to develop or expand these programs.

The most common screening techniques are of course the physical examination and various kinds of biochemical or other tests. These may be multiphasic or disease-specific. An analysis of what is known about the efficacy of these techniques for a variety of age groups has been made.[11]

Some generalizations which may be drawn from the data are:

1. *Routine physical examinations* for children are not an efficient means for discovering significant adverse conditions which are not already known by the child's caretakers or which could not have been detected by other means; this method is somewhat more efficient for children from poor families who have no regular source of care (e.g., migrant workers' families).
2. *Multiphasic screening* produces a low yield of new findings in general populations; it is somewhat more efficient among se-

lected, high-risk groups such as lower income and black populations. The types of new diagnoses are relatively few and non-complex, such as hypercholesterolemia and iron deficiency anemia, especially among the poor. Although large proportions of the tests show "abnormal" results, these are non-diagnostic and their significance if any is not known. Such screening is cost-effective only among client populations of 15,000 children or 24,000 adults or more per year.[12] They have been shown to alter morbidity only rarely, as among middle-aged men through deferring death from cardiovascular disease and cancer.[13]

3. *Routine disease-specific screening* in infants and children, whether by physical examination or laboratory tests, has yielded low positive findings, often with a high proportion of false positives. Results are more efficient in selected high risk groups such as families already known to have had children with birth anomalies. Congenital orthopedic problems are the most treatable. For many others, such as the metabolic diseases, treatment is palliative. PKU, for which appropriate treatment is effective, is cost-beneficial because of the life-long care required for its sequela of mental retardation. However, as has been shown, the screening procedure as done in the U.S. is not optimally-timed, thus missing some children who are thereby lost to preventive treatment.[14]

4. *Screening for many growth and development variations* in children has a very high risk of false positives among large proportions of children screened, without evidence that such findings have any positive health effects. These measurements include elevated blood pressure, anemia after age one, intestinal parasites, and non-toxic blood lead levels; there is no evidence that medical treatment, e.g., iron supplements, will alter the health and disease patterns of these children. However, selective screening and intervention for dental, tubercular, and venereal diseases will alter the course of illness.

5. The methods for *mass, disease-specific screening in adults* are generally efficacious, i.e., they can detect underlying illness for serious health problems, such as chronic lung disease, hypertension, and certain cancers. However, such methods are often not effective for changing the course of illness among populations because, as in the case of chronic lung disease or lung cancer, treatment is palliative and does not apparently deter progression of the disease. Or, as with hypertension, non-symptomatic patients tend not to seek treatment or to be given treatment by their physicians.[15] Or, again, there is question whether the findings signify incipient illness at all, such as some bacterurias, anemias, and hyperglycemia.

There is also question as to what positive health effects are possible from uterine and breast cancer screening except among selected age groups; that is, at what point is screening costing more than what is saved in lives and treatment costs? One study showed that for the 23 women whose deaths from breast cancer were deferred through early detection and treatment in a five year screening program, the same effect could have been obtained through a program for smoking prevention; for it is likely that about 23 of the 31,000 screened women died of lung cancer during that period.[16]

Effectiveness of Screening Techniques

Clearly, *efficacious* screening techniques (i.e., those which *can* produce a high yield of true positives and low yield of false negatives) become *effective* (i.e., make a measurable difference in the health of populations) when they detect conditions which can be contained or cured by available treatment. This implies that these screening processes will be more efficient in relation to funds expected when the screening procedure is focused on selected, high-risk groups as compared with mass or otherwise haphazard programs in the general population.

However, the record of effectiveness for even efficacious screening techniques has been limited. They have not succeeded in reaching the appropriate groups even when the stated purpose was to focus on selected populations—those groups more likely to be vulnerable to particular illnesses or abnormalities because of familiar traits, age, sex, or socio-economic deprivation. Large proportions of such populations remain untested. Table 1 illustrates the ineffectiveness of the segmented Medicaid approach to screening as well as the greater effectiveness that concerted follow-up efforts can have for cervical screening.

In large part, high-yielding, efficacious screening techniques are limited in their effectiveness, even when properly focused on high-risk groups, because they are generally segregated from follow-up and treatment programs. The burden of obtaining appropriate confirmation and treatment falls on the consumer. This is particularly difficult for those most likely to require treatment and least able to seek it due to the press of day-to-day problems, as experienced by low-income people. Their access to health services, even to programs specifically intended to reach them, is made difficult because the system has not effectively reached them as Table 2 illustrates.

Ambulatory care has reached only small proportions of low income groups, those most vulnerable to illness. Thus, even accurate screening and efficacious forms of treatment cannot be effective in terms of improving the outcomes in health for those populations. Too often, of course, diagnosing and treating individuals' illnesses does little to

improve the incidence and prevalence of symptoms which result from poor living conditions (Table 2).

The problem of access is compounded by the ineffectiveness of financing programs. Medicaid covers somewhat over half of low-income families only, and pays no more than two-thirds of their health care expenditures.

To reiterate the basic ethical question inherent in the economics of screening programs: is the expenditure of resources, funds, personnel, and agency capability justified when such programs *cannot* make a measurable positive impact on the health of a given population? The reasons why screening may not be capable of health-promoting impacts include:

- the technology is not efficacious in specificity or sensitivity;
- the health problem is ill-defined, rare, self-limiting or untreatable;
- the delivery of the screening program is not directed to high-risk populations or is not effective in reaching those groups;
- confirmation of and treatment for positive findings are not assured through integration with effective services delivery and financing programs.

To purposefully develop screening programs when they cannot produce positive health impacts for one or more of these reasons has, in turn, an indirect and negative impact on the health of the consumer population in question. It means that the funds so expended, while surely paying the costs of the health agency, are not being spent for programs which *do* have potential for healthful results among the population.

In other words, given limited resources, to what alternative uses can screening funds be put when all of the criteria for a justifiable screening program cannot be met?

It is conceivable that with comparable resources, alternative programs in primary prevention might be developed or strengthened in place of the effort at secondary prevention which screening programs represent. For example, with due regard for the particular problems of a given community, monies for child health might be used to provide a truly effective immunization program, the efficacy of which is well proven, but the effectiveness of which has been limited because of inadequate outreach (Table 3). Concern over birth abnormalities might alternatively be dealt with through efficacious technologies of birth control techniques or food for poor women, both highly effective for healthful outcomes when effectively delivered (Tables 1 and 4). Again, whereas more high-lead blood levels are being found in lead screening programs, the proportion of housing found with hazardous lead paint has not changed.[17] Reducing such dangerous living conditions would be more cost-effective for the health of children in many communities.

When health care resources are used without known positive effects on the health of community populations, they are not only wasted, but also may have measurable, negative effects, directly, in absorbing consumers' time, causing concern and inconvenience, incurring out-of-pocket costs. And as importantly, the indirect impact is to deprive them of potentially more-health-promoting uses of those resources.

The heightening of our awareness of this reality should imply that program development requires thoughtful analysis before we dare rush in with the somewhat faddish nature of new or revived service activities. The total picture needs viewing, with assessment made of the relative impacts of alternative programs and strategies.

One way to do this is through working with the new health systems agencies, with their developing areawide data-gathering capability. Becoming acquainted with the growing literature on what "works" in health services is also essential. Furthermore, developing alternative and more healthful uses of community resources is further best done in concert with concerned others, including human services and environmental groups, and not least, community organizations and representative consumers.

With these inputs, the size and shape of health care in given communities would be different from what we know now, and might indeed impact more healthfully on people's lives.

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Table 1

The Effectiveness of Personal Health Services in Secondary Prevention: Delivery of Screening Programs

Screening Programs	Effectiveness: % of Target Population Reached
Early & Periodic Screening, Diagnosis & Treatment (Medicaid), 1975 [1]	14.8% screened 60.4% of ill treated
Pap smears, annual teaching hospital clinic [2]	25%
Group practice with mailed reminders [2]	48%
Follow-up for positive (cancerous) findings [3]	88%

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Table 2

The Effectiveness and Efficiency of Personal Health Services in Secondary Prevention: Delivery of Ambulatory Services

	EFFECTIVENESS		EFFICIENCY
	% of Target Population Reached	Health Outcomes	Cost/Effectiveness Estimates
AMBULATORY CARE TO POOR [a, 1, 2]			
Neighborhood health centers (314e & OEO)	2-25%		Some reduction in hospital admissions & emergency outpatient visits.
Maternity and infant projects	0.6-19	Est. 10% drop in infant deaths 1965-70. (20 deaths prevented per 1000 births);[6] little change in prematurity rates.	
Children and youth projects	1.8-13		
Free clinics[3]	2.0-25		$150-450/clinic session ($200/session)
Migrant health centers[4]	?	No measurable improvement.	Avg. $61,000/yr. project 81% allocated to medical services 29% of total to hospitals
FAMILY PLANNING SERVICES[5]	62 (rural: 48%)	Est. 27% drop in infant deaths, 1965-70[6]	$135,000/project $61/pt./yr. (1971)
Free-standing clinics,	32 (rural: 19%)		$69/pt./yr. (1971)
General care clinics			$55/pt./yr. (1971)
Hospital-based			$24/pt./yr. (1971)
Private MD office	30 (rural: 29%)		$96/pt./yr.
PREPAID GROUP PRACTICE[7]			
Physicians only			$131/pt./yr.
Nurse practitioner & automated screening	20x new entrants/yr.		$ 98/pt./yr.

PREPAID GROUP PRACTICES (1971)[8]			ANNUAL		
			M.D. Visits	Hospital adm. (per 1000 pop.)	Cost/pt.
Low income enrollees	0.05% (of poor)	Compared w/other delivery models:[10] Death rate of elders 11% lower; infant deaths 17-23% lower.	3.9-4.0 (low inc.)	60-101 (low inc.)	$75 (low income)
All other enrollees	6% (of U.S. population)		4.2 (other income) (U.S. avg.: 4.5 visits)	73-92 (other inc.) 145 adms. (U.S. avg.)	$47 (other income)
ADULT AMBULATORY CARE 1969-72[9]					
Low-income	60-72 (% w/ symptoms)	Symptom prevalence *unchanged*: higher for poorer, lower for non-poor			
Above-average income	62-72 (% w/ symptoms)				
CHILDHOOD AMBULATORY CARE 1969-72					
Low-income	70-74 (% w/ symptoms)	Symptom prevalence *unchanged*: roughly similar for both groups, poor about the same as non-poor.			
Above-average income	74-85 (% w/ symptoms)				

a=poverty level to 200% above designated poverty level.

TABLE 2
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Table 3

The Efficacy, Effectiveness, & Efficiency
of Personal Health Service for Primary Prevention of Disease:
Immunizations & Fluoride

Immunization*	Efficacy	Effectiveness (% Target Pop. Reached**)					Efficiency	
		Target Population (age 1–4 yrs.)	Target Pop. Subgroups				Cost — Effectiveness	Cost — Benefits
			Central City	Suburbs	Black & Other	White		
1974 Polio (3 doses+)[1]		63.1	60	68.1	47	66.2		
DTP (3 doses+)[1]		73.9	69.5	77.9	59.4	74.3		
Measles[2]	905	64.5	62.5	68.5			1 life saved/ 10,000 cases; 1 MR saved/ 3,000 cases.	Net benefits: (saved treatment, long-term care, 2400 lives saved) $1.3 billion.
Rubella[3]		59.8	61.1	62.3			$3/patient; $6 million for all 2-yr. olds.	$38.5 million ($1 in costs to 8 in benefits) savings on complications of congenital rubella in newborn, care of retarded, loss of life-long productivity, etc.
Smallpox[4]								$2.20 costs to $1 in benefits (treatments saved).

* Vaccines also exist to prevent typhoid fever, yellow fever, epidemic typhus, Rocky Mountain spotted fever, tuberculosis, meningitis, mumps, some influenza.

** For a discussion of financial and geographic access to health care, see N. Milio, *Care of Health in Communities: Access for Outcasts* (New York: Macmillan, 1975), chaps. 3-5.

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Table 4
Improving Mothers' and Children's Health Relative Benefits
From Selective Approaches, 1960-1970 Data

APPROACHES	ESTIMATE OF BENEFITS
Improving women's nutrition, quantity & quality, before & during pregnancy.	Reduction in infant deaths by 50%. Reduction in maternal deaths by 50%. Improved child nutrition & decrease in infections & deaths by 90%, age 1-4.
Lengthening and spacing birth intervals between age 20-34.	Reduction in infant deaths by 30%. Improved child nutrition.
Decreasing number of pregnancies to 3 or fewer.	Reduction in infant deaths by 10%. Improved child nutrition.
Stopping smoking before and during pregnancy.	Improved maternal health. Addition of ¼ to ½ lb. to infant, avoiding low birth weight.
Prenatal care to "high-risk" women.	Less than 10% reduction in infant deaths.

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APPENDIX

Summary of Recommendations for Screening*

Criteria for Evaluation of Screening Programs

1. Screening must lead to an improvement in end-results (defined in terms of mortality; physical, social and emotional function; pain; and satisfaction) among those in whom early diagnosis is achieved or in the other members of the community.
   a. The therapy for the condition must favorably alter its natural history, not simply by advancing the point in time at which diagnosis occurs, but by improving survival, function or both. The modification of "risk factors" is not sufficient evidence of effectiveness, nor is the fact that the proposed therapy is "commonly accepted." Claims for therapeutic effectiveness must withstand rigorous methodologic scrutiny, and experimental evidence, such as controlled clinical trials, is a prerequisite. The measurement of survival and other end-results must withstand epidemiologic and biostatistical scrutiny. Disease should have a recognizable, latent (asymptomatic) stage. Screening should be a continuous (not one-shot) process. Abnormality to be screened should be precisely defined.
   b. Available health services must be sufficient both to ensure diagnostic confirmation among those whose screening is positive and to provide long-term care.
   c. Compliance among asymptomatic patients in whom an early diagnosis has been achieved must be at a level to be effective in altering the natural history of the disease in question.
   d. The long-term beneficial effects, in terms of end-results, must outweigh the long-term detrimental effects of the therapeutic regimen utilized and the "labelling" of an individual as "diseased" or "high risk."
2. The effectiveness of potential components of multiphasic screening should be demonstrated individually prior to their combination.
3. If the benefits of screening accrue to the community at large rather than, or in addition to, the individual identified (e.g., disease carriers, specific occupations), the community benefit claimed must withstand scientific scrutiny.
   a. The appropriateness of the mix of screening tests to the target population must be considered, acknowledging that differences in the distribution of two diseases may render the combination of their respective screening tests inappropriate.
4. The cost-benefit and cost-effectiveness characteristics of mass screening and long-term therapy must be known. This knowledge is considered essential in developing an appropriate mix of diagnostic and therapeutic services in the face of finite manpower and financial resources. Therefore, a mechanism for the formal periodic weighing of costs against benefits or effectiveness should constitute a basic component of the initial screening activities.
5. The burden of disability for the condition in question (in terms of disease frequency, distribution, severity, and alternative approaches to its detection and control) must warrant action.
6. The cost, sensitivity, specificity, and acceptability of the screening test must be known, and it should lend itself to the utilization patterns of the target popula-

*Source: National Conference on Preventive Medicine papers, June 7-9, 1975, Washington, D.C., NIH-ACPM.

tion. Comparison should be made with previous prevention and treatment methods and other alternatives in order to determine the relative efficacy and cost-effectiveness of the proposed test.

7. Ideally, an estimate of the social benefit of preventing, arresting, or curing the condition in question should be known. Difficulties of widespread implementation should be studied. "Borderline findings should have a policy."

Validation of Screening Test Methods

1. *Simplicity.* In many screening programs more than one test is used to detect one disease, and in a multiphasic program the individual will be subjected to a number of tests within a short space of time. It is therefore essential that the tests used should be easy to administer and should be capable of use by paramedical and other personnel.
2. *Acceptability.* As screening is in most instances voluntary and a high rate of cooperation is necessary in an efficient screening program, it is important that tests should be acceptable to the subjects.
3. *Accuracy.* The test should give a true measurement of the attribute under investigation.
4. *Cost.* The expense of screening should be considered in relation to the benefits resulting from the early detection of disease, i.e., the severity of the disease, the advantages of treatment at an early stage, and the probability of cure.
5. *(Precision (sometimes called repeatability).* The test should give consistent results in repeated trials.
6. *Sensitivity.* This may be defined as the ability of the test to give a positive finding when the individual screened has the disease or abnormality under investigation.
7. *Specificity.* This may be defined as the ability of the test to give a negative finding when the individual does not have the disease or abnormality under investigation.