Medicine matters after all

ABSTRACT—The extraordinary increase in life-expectancy that occurred early in this century has been attributed largely to non-medical factors. Life-expectancy has continued to rise, and medical care can now be shown to make substantial contributions. Three of the seven years' increase in life expectancy since 1950 can be attributed to medical care. Medical care is also estimated to provide, on average, five years of partial or complete relief from the poor quality of life associated with chronic disease. The association of social factors with health is well-known, but except for occupation, it is not known how they might act or whether they are proxies for some other yet to be identified factor.

There is a widely held view that medical care contributes little to health. 'Most doctors now understand', Morrison and Smith state in a recent issue of the *British Medical Journal (BMJ)*, that 'health results from a combination of social, economic, and psychological as well as purely biological phenomena' [1]; they suggest that politicians are reluctant 'to invest heavily in health services when they have only a small effect on health', and Smith later asks 'if health care has only a limited impact on the health of the population should doctors encourage the shift of resources from health care to education, housing, and employment, which might have a greater impact?' [2]. The premise and its political consequences could hardly be more clearly stated.

My colleagues and I, challenging the premise, have assembled an inventory of the benefits of medical care. Extrapolating from the results of clinical trials and meta-analyses we estimate that medical care can be credited with five of the 30 years of increased life-expectancy during this century and with three of the seven years of increase in life expectancy since 1950 [3]. By comparison, whatever individual contribution social, economic, or psychological phenomena have made to life expectancy is purely speculative, for there are no data by which to measure their specific effects.

The contribution of medical care to improvement in the quality of life has been largely ignored in the debate; while its importance is clear enough, there has been no easy way to measure it. But it is possible, again extrapolating from clinical trials, to estimate the number of years of poor quality of life that individuals today can be spared. I estimate that medical care has the potential to provide partial or complete relief from an average of five years of the poor quality of life associated with severe chronic disease [4].

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The view that medicine contributes little to health harks back 20 years to the publication of Thomas McKeown's *The role of medicine* [5]. McKeown attributed the dramatic increase in life-expectancy of the previous 100 years primarily to nutritional, environmental, and behavioural factors, but he conceded that the evidence was no more than circumstantial. He believed that he had shown that medical care was not responsible and concluded that social and environmental factors must have been the cause.

In a second edition [6] McKeown acknowledged that 'it is not possible to estimate with any precision the contribution which therapeutic and other advances have made to the decline of the multiple non-infective causes of death which together were associated with about a quarter of the reduction of mortality in this century'. He thus acknowledged the possibility that medical care had made a larger contribution, but as late as 1993 a *BMJ* review of citations of *The role of medicine* concluded that the problem of a 'relatively small impact of clinical medicine on health outcomes [is] still with us' [7]. Recent publications addressing the determinants of health barely mention the contribution of medical care [8,9], some arguing that there is too much [10,11].

It is not that McKeown's conclusions have gone unchallenged: distinguished leaders in medicine including Walsh McDermott, Paul Beeson, and Sol Levine have argued that medicine does, indeed, do good, but that 'what the doctor does is something that is extraordinarily difficult to analyze and measure' [12]; that 'although most clinicians do not doubt that there has been substantial improvement in the treatment of disease during the past few decades, it is difficult to assess the dimensions' [13]; and that 'the use of easily available data such as mortality statistics . . . which were not collected to test the proposition at issue . . .' may not be the most appropriate way to address the question [14].

McKeown drew his conclusions from an epidemiological analysis of public health data from years prior to 1971. The quarter century that followed has seen an explosion of new medical treatments, many of which have been shown in clinical trials and meta-analyses to result in considerable improvements in health; and at the same time evidence crediting medical care with the extension of life began to appear. The American economist Jack Hadley compared expenditures by the government's Medicare program with regional death rates and calculated that for every 10% increase in expenditure there was a 1–2% fall in mortality [15]. But conflicting data also appeared, in which national age-specific death rates were found to be greater in countries with greater numbers of doctors, and presumably more medical care [16]. Efforts to separate the effects of medical care from those of other determinants using aggregate data have been fraught with similar difficulties. Examination of the effect of individual medical interventions, one at a time, has offered a more appropriate approach, and this is the approach we have taken.

For both life-expectancy and quality of life analyses we selected conditions for which strong evidence of efficacy, usually in clinical trials, was available, and whose prevalence is sufficient to create a notable impact when their effect is spread across the entire population. Many less common or rare, but important, conditions were therefore not included.

Outcomes of medical care

Life expectancy

Estimation of months or years of increased life-expectancy attributable to the treatment of a particular condition involved a two-step procedure: estimation of increases in life expectancy from the decline in diagnosis-specific death rates, and estimation of how much of an improvement could be attributed to medical care specifically. Documentation of the decline in disease-specific death rates was based on annual reports from the National Center for Health Statistics (NCHS) in Hyattsville, Maryland [17]. The proportion of improvement attributable to medical treatment was based, whenever possible, on clinical trials and meta-analyses.

Comprehensive annual reports of death rates have been published by NCHS since 1950. The age-adjusted death rate for the American population fell from 840 per 100,000 in 1950 to 523 per 100,000 in 1989, with a rise in life-expectancy of 7.1 years. (Life-expectancy in England and Wales rose by almost exactly the same amount during the same period, and I assume that the break-down by diagnosis was roughly similar in our two countries.) 'Diseases of the heart' were by far the largest contributors to the improvement, their age-adjusted death rate falling from 307 to 156 per 100,000 during the 39 year period, constituting just under half of the fall in death rate from all causes (151/317 = 0.48). As a first approximation, we estimated that the fall in death rate from heart disease contributed 0.48 × 7.1, ie 3.38 years of improved life-expectancy.

Death rates for diseases of the heart, as well as for cerebrovascular diseases and one or two other diagnoses, are also reported by the National Center for Health Statistics by ten year age intervals, from which it was possible to construct an adjusted life-table and hence more precise estimates of the change in life-expectancy attributable to these diseases. The change in life-expectancy, based on the life-table adjusted for the age-specific fall in heart disease deaths, was almost identical to the approximation based on age-adjusted death rates [3], allowing us to rely on the approximate method for other diagnoses.

For an estimation of how much of the fall in death rates from heart disease and improved life expectancy to attribute to medical care, we relied heavily on Goldman and Cook's 1984 analysis [18]. They reviewed evidence of the efficacy of medical intervention in heart disease and estimated that 40% of the decline in cardiac death rates for the years between 1968 and 1976 could be attributed to coronary care units, treatment of hypertension, and medical and surgical treatment of ischaemic heart disease. Accepting their analysis, we credited medical care with 40% of the 3.38 years of increased life-expectancy associated with the fall in cardiac deaths for the entire 39 year period. Medical treatment at the beginning of the period, we assume, contributed somewhat less than 40%, but treatment at the end has clearly contributed a good deal more.

Tables 1 and 2 present our estimates of the gains in life-expectancy credited to clinical preventive and clinical curative services, respectively. We credit curative services with three and a half to four years of increased life-expectancy, with the potential of adding an additional year and a half if efficacious care were made more widely available. We credit clinical preventive services with a current gain in life-expectancy of a year and a half and the potential for an additional seven or eight months.

All told, we estimated that together, clinical preventive and curative services can be credited with about five of the 30 years increased life expectancy gained in the United States and in Great Britain during this century, ie 17 or 18%. This is certainly a good deal more than McKeown was able to identify 24 years ago, but still a relatively small contribution. To place a five year change in life-expectancy in perspective, however, it may be useful to consider that a gain of five years in life-expectancy is equivalent to a halving of death rate at every age. And for comparison, the gain of five years in life-expectancy is roughly equivalent to the loss in life-expectancy that an individual suffers by smoking a pack a day starting at age 20; and it is roughly equivalent to the difference in life expectancy between the top grade and unskilled workers in the Whitehall study of British civil servants [19].

Quality of life

Much of the debate over the contribution of medical services to health has been based on death rates and life-expectancy, since they are relatively easy to measure. The majority of medical care is, of course, devoted to improving the quality of life, or, more accurately, to relief from the poor quality of life associated with many chronic diseases. The need to measure quality of life and to assess its response to therapy has been recognised for a good many years. Sophisticated measurement instruments are now in widespread use in clinical research, but only fragmentary data are yet

Table 1. Clinical preventive services: estimated numbers at risk and gains in life expectancy for those receiving selected successful services, with gain in life expectancy for the US population and potential gain not yet achieved. (Reprinted with permission from *The Milbank Quarterly* [3])

Clinical preventive service	Relevant population	Individuals affected by condition in the absence of preventive service	Gain per individual receiving preventive service	Proportion of those at risk receiving preventive service	Gain in life expectancy distributed across US population	
					Current	Potential
Screening for hypertension	All over age[3]	58 million[a] (10 million moderate or severe)	3 months	50%	1.5–2 months	1.5–2 months
Screening for cancer of cervix	Adult women	13,000[b]	96 days	60%–90%	2 weeks[c]	1 week[c]
Screening for colorectal cancer	All 50–80 years of age	155,000[b]	2 weeks	Unknown	Unknown	1 week
Counselling to stop smoking	Smokers	Smokers (approximately one-third of population)[a]	3 months	Unknown	Unknown	1 month
Immunisation for diphtheria	All children	40 deaths per 100,000[b]	10 months	73%–85% pre-school; 97%–98% entering school	10 months	0
Immunisation for poliomyelitis	All	2,500 deaths[b]	3 weeks	73%–85% pre-school; 97%–98% entering school	3 weeks	0
Immunisation for tetanus	All	2,500 deaths[b]				
Immunisation for smallpox	All	NA[d]	3–6 months[e]	Almost all before immunisations; almost nobody today	3–6 months	0
Immunisation for influenza	All over 65	10,000–40,000 deaths[b]	3 weeks	30%	1 week	3 weeks
Pneumococcal immunisation	All over 65	400,000 cases[b]	6 weeks	14%	1 week	6 weeks
Hepatitis-B immunisation	All	21,000 cases[b]	1.5–2 weeks	10%	1–2 days	1.5–2 weeks
Hormone replacement	Postmenopausal women	8,000 deaths[b]	3 months	50%	3 weeks[c]	3 weeks[c]
Aspirin prophylaxis for heart attack	Men over 40	Approximately 30% of men	Unknown	Unknown	Unknown	Unknown

[a] Prevalence (all cases); [b] Incidence (new cases per annum); [c] Double for single sex; [d] Not applicable following worldwide eradication; [e] Limited to this century only.

available by which to determine the impact of medical care on the quality of life at the population level.

Ideally, one would like a single index of quality of life to pair with that for life-expectancy. One candidate for this purpose that has gained some currency, particularly among medical economists, is the quality-adjusted life year, or QALY. The QALY may be useful as a semi-quantitative basis for resource allocation; it incorporates information on both life-expectancy and quality of life, and by providing a single number may give an impression of precision. The quality of life component is a subjective one, however, and may be a poor reflection of what patients actually value [20].

Whatever its merits in setting priorities for the purchase of services, the QALY is of little use to doctors or patients in making clinical decisions. It does not help to answer the patient's question, 'doctor, will the cataract operation allow me to read again?', nor will it

Table 2. Clinical curative services: for selected diagnoses, estimated numbers at risk and gains in life expectancy for those receiving successful treatment, with gain in life expectancy for the US population and potential gain not yet achieved. (Reprinted with permission from *The Milbank Quarterly* [3]).

Condition treated	Relevant population	Number at risk	Gain per individual receiving successful treatment (years)	Gain in life expectancy distributed across US population	
				Current	Potential
Cancer of cervix	Adult women	13,000[b]	21[d]	2 weeks[c]	1 week[c]
Colorectal cancer	All	155,000[b]	12[d]	2 weeks	1 week
Peptic ulcer	All	250,000[b]	10[e]	2 weeks	Unknown
Ischaemic heart disease[f]	All	6 million[a]	14[e]	1.2 year	6–8 months
Hypertension	All	58 million[a]	10[e]	3.5–4 months[g]	3.5–4 months[g]
Kidney failure	All	41,000[b]	11[e]	2–3 months	Unknown
Infant respiratory failure	Premature infants	75,000–100,000[b]	20–30[d]	3–4 months	Unknown
Appendicitis	All	273,000[b]	50[d]	4 months	0
Diabetes	All	6 million[a]	25	6 months	Unknown
Pregnancy	Women 15–44	4 million[b]	45	2 weeks[c]	0
Pneumonia and influenza	All	400,00–1 million[b]	9[e]	3 months	0
Tuberculosis	All	27,000 cases[b]	15[e]	3 months[h]	Uncertain[h]
Trauma	All	50–65 million[b]	24–38	1.5–2 months	3–4 months

[a] Prevalence (all cases).

[b] Incidence (new cases per annum).

[c] Double for women.

[d] For cancer of the cervix, colon cancer, infant respiratory distress syndrome, and appendicitis, we have made rough approximations based on mean age at death and life expectancy at that age.

[e] 'Gain in expectation of life at birth due to eliminating specified cause of death by race and sex, for those who would have died; United States, 1979–81' (National Center for Health Statistics, Curtin and Armstrong 1988, Table E) [39].

[f] Includes coronary-artery surgery, coronary-care units, and medical management of heart disease.

[g] Impact of treatment of hypertension on stroke and heart mortality.

[h] Increased likelihood of poor compliance with treatment regimens and increased frequency of infection with drug-resistant strains of tuberculosis make these estimates speculative and subject to change.

help the doctor in his efforts to instruct a patient in balancing the risks of stroke or heart attack against the unpleasant side effects of antihypertensive therapy. If we want to measure these and similar questions more precisely, there are more sophisticated 'multidimensional' measures of quality of life, such as the Nottingham Health Profile and the SF-36, a 36 question 'short-form' instrument that measures functional status, mental health, and perceived well-being.

But what of the need for a global index of quality of life that could be used to estimate this important component of medicine's contribution to the public's health? It would be of some interest to see this expressed in QALYs, and perhaps such a summary statistic will be forthcoming. There are also global measures, such as disability-free years and health-adjusted life years. Global indices of disability such as these have the same problem as do 'vital statistics', including population life-expectancy: unless disaggregated, there is no way of identifying the individual determinants, let alone how much each contributes. If disaggregation allowed us to make sense of life-expectancy, perhaps the same route would be successful in estimating the impact of medical care on quality of life at the population level.

When medical care is successful in improving the quality of life, or in relief from poor quality of life, it does so in many ways: by relieving pain, dyspnoea, or depression; by restoring function, by improving vision; by preventing stroke, by preventing osteoporosis. If we want to summarise such disparate conditions, we are immediately faced with the well-known apples and oranges problem. There is, however, a common denominator: severe chronic disease manifests itself in ways that profoundly depress quality of life; these manifestations can be readily measured and, added up, present an impressive inventory of the burden of chronic disease. Their prevention or response to treatment can also be measured and provide an equally impressive index of medicine's contribution to health.

As a first approximation I have developed such an inventory, again from secondary sources, of the

Table 3. Effects of treatments for selected conditions, estimated numbers at risk, and symptomatic and functional relief for those receiving treatment. (Adapted with permission from *The Milbank Quarterly* [3]).

Condition/ symptoms	Number at risk	Lifetime risk	Treatment	Relief of symptoms in treated patients	Proportion treated	Potential years of relief per 100 population
Unipolar depression	10.5 million[a]	8–12% men 20–26% women	Drugs, ECT psycho-therapy	70–80%	50%	11
Ischaemic heart disease and angina	150,000–200,000[b]	10–15% men 3–5% women	Coronary artery revascularisation; drugs	50–66% for 5 yrs.	?	20
Osteo-arthritis pain, joint dysfunction	86,000[b] hip 41,000[b] knee 16 million[a]	3–4% hip 1.5–2% knee	Joint replacement	85–90% pain relief 70–80% functional improvement	?	20
Rheumatoid arthritis	2.1 million[a]	0.7% men 1.6% women	Drugs, physio-therapy	Partial symptomatic & functional improvement	Nearly all	20
Cancer, terminal; severe pain	450,000–475,000[a]	30%	Analgesic drugs	Nearly complete relief	40–50%	15–30
Peptic ulcer severe pain	250,000[b]	10–15% men 4–15% women	H2 receptor blocking drugs	80–90% healed in 4–8 wks	?	65–70
Gallstones with biliary colic	0.5–1 million[b]	27% women 9% men	Chole-cystectomy	2/3 pain relief at 2 years	?	
Migraine, severe	18 million women, 5.6 million men[a]	10–15%	Medication	50–75% relief	?	12–13
Post-operative pain	22 million operations[b]	90%	Epidural anesthesia; self-medication	Nearly complete relief	25%	15

Table 3 continued overleaf

months and years that an individual, or cohort of individuals, has been spared the lessened quality of life associated with common severe illnesses, mostly chronic, a few acute [4]. Based on the inventory presented in Table 3, I estimate that, on average, an individual has been relieved as a result of medical care from about five years of poor quality. Estimates of increases in the quality of life that I attributed to the treatment of hypertension illustrate how the estimates were made.

The treatment of hypertension contributes to the quality of life by lessening the probability of non-fatal myocardial infarction and non-fatal stroke. Goldman and Cook [18] attributed 8.7% of the fall in fatal ischaemic heart disease that occurred between 1968 and 1976 to the treatment of hypertension. Deaths attributed to diseases of the heart fell, as discussed in the foregoing sections on life-expectancy, from 307 to 156 per 100,000 between 1950 and 1989, about two-thirds of which were attributed to ischaemic heart disease [17]. If it is assumed that for every 100 ischaemic heart deaths there were 200 non-fatal ischaemic heart attacks, and if we assume that patients survive on average ten years after a non-fatal ischaemic heart attack, we estimate that there have been approximately 150 fewer years of post-myocardial disability per 100 population in the lifetime of individuals today than there would have been had deaths from ischaemic heart disease remained unchanged from those of 1950. We credited 8.7% of this improvement, 13 years, to the treatment of hypertension. An increase in the medical control of hypertension above the 50%

Table 3. *Continued from page 109*

Condition/ symptoms	Number at risk	Lifetime risk	Treatment	Relief of symptoms in treated patients	Proportion treated	Potential years of relief per 100 population
Benign prostatic hypertrophy	125,000[b]	20–45%	Prostatic resection	79–93% relief of symptoms	?	25
Osteoporosis & fracture	1 million[b] (women)	10–12% by age 65, over 20% aged 80	Hormone replacement therapy; calcium	20% reduction in fractures in 1st 2 years, then 60% reduction	50%	17.5
Poliomyelitis with paralysis	All	0.5 to 1% prior to 1950	Vaccine	Nearly complete protection	74% pre school 98% entering school	15–20
Rubella syndrome	All	0.5 to 1% prior to 1969	Maternal vaccine	Nearly complete protection	98%	18
Non-fatal stroke	1.9 million[a]	5% by age 70	Treatment of hypertension	50% reduction in incidence	50%	10–20
Asthma	10 million[a]	5–10%	Medication	Relief of dyspnoea cough & wheezing	50%	65–70
Myopia and presbyopia	All but blind	nearly 100%	Lenses	Visual acuity adequate for most activities	Nearly all at some time	
Cataract:	6 million[a]	5–10%	Lens removal; intraocular implant	75–95% improvement in visual acuity	?	20–40
Impaired hearing	18 million[a] elderly	35–50%	Hearing aid	Improved social function, communication	?	50
Trauma	50–65[b] million	Nearly all	Surgical correction rehabilitation	Restoration of function, pain relief improved appearance	?	20–30

? = not known; [a] = prevalence; [b] = incidence.

reported in 1986 by Drizd and associates [21] could further increase this benefit, perhaps to as high as 20 years per 100 population.

The age-adjusted death rate from cerebrovascular disease in the United States declined from 88.6 per 100,000 in 1950 to 28.0 in 1989 [17]. The reported death rate for strokes varies between 20% and 33%. We estimated, therefore, that between 120 and 240 fewer non-fatal strokes per 100,000 occurred in 1989 than occurred in 1950. Assuming a five year average survival for patients suffering non-fatal stroke, and therefore 600 to 1,200 fewer years per 100,000 of survival with stroke, I estimate that there has been a decline in years with stroke of between 45 and 90 per 100 population. Marked increase in medical control of hypertension during this period from less than 10% to approximately 50% [21], and the 45% reduction in stroke observed in randomised trials of antihypertensive drugs [22,23] could explain as much as 15–20% of the reduction in stroke morbidity. Accordingly, I credit the treatment of hypertension with a reduction of ten to 20 years of stroke-related poor quality of life per 100 population.

The doctor-patient relationship

What happens between the doctor and patient during the medical encounter has a profound impact on outcome. Its importance is unquestioned, but it has generally been assumed that it could not be measured. On close examination, however, one can find considerable quantitative evidence of benefits.

To begin with, there are some clear-cut effects for which quantification is straightforward. The general practitioner, as primary care doctor, is, by definition, a gate keeper, in that he or she must decide whether or not to treat and whether or not to refer. The assessment and recommendation for or against therapeutic intervention have a profound impact on outcome, the magnitude of which is reflected in two and three-fold variations in rates of medical and surgical intervention. How the clinician's evaluation (with or without an explicit diagnosis) and recommendation are communicated to the patient will also have a large impact on outcome. Poor communication about drugs is considered to be largely responsible for the failure of 30–55% of patients in America to adhere to prescribed drug regimens [24].

The decision to perform discretionary surgery is similarly affected by information and advice given to the patient. Variations in what Wennberg calls surgeons' 'practice styles' [25], their preferences for one or another therapeutic approach, account for large variations in outcome. The patient's participation when adequately informed, as in the increasingly popular 'shared decision making' mode, has already resulted in large changes in operation rates for benign prostatic hypertrophy and for early breast cancer [26,27].

Knowledge and belief are also key determinants of a patient's peace of mind. The provision of information can enhance patients' sense of control or 'self-efficacy', and perhaps optimism, each of which is strongly associated with improved health status. Individuals who believe that their health is good live longer than others who manifest similar risk factors, but who assess their health as poorer [28]. Men recovering from myocardial infarction who 'comply' with prescribed medicine, whether active or placebo, and who can be assumed to have a more optimistic view of their prospects, die at half the rate of those who fail to take the randomly prescribed medication [29,30].

Optimism, a sense of hope, perhaps, a sense of control over one's medical destiny (or, at least, that one's destiny is in the hands of a trusted doctor) may be the common features that lead to better outcomes. If optimism and sense of control promote health, can they be enhanced by doctors in their capacity as information givers and carers? Surgical patients randomised to preoperative instruction on how much pain to expect after the operation required less postoperative medication and were discharged earlier by the medical staff (who were uninformed as to the randomised status of each patient) [31,32]. Patients suffering from rheumatoid or osteoarthritis randomised to instruction in self-management reported less pain and required fewer subsequent medical visits than control patients [33]. Surprisingly, the better outcomes were independent of subsequent memory of the instructions or whether the recommended practices were adopted, leading the investigators to conclude that the positive effects were mediated by enhancing a sense of control.

The mechanism by which the positive effects of counselling, encouragement, and reassurance are mediated may not be known, but the effect is a large one. The placebo effect that accompanies a wide spectrum of medical and surgical interventions is estimated to be responsible for about a third of their therapeutic effects [34,35]. The effect is equally large in 'natural experiments' such as the Whitehall study of British civil servants, in which mortality rates vary two-fold across employment levels, even after adjustment for all relevant risk factors, an effect that has been attributed to control over one's professional and personal life in higher employment grades [19].

Finally, the transfer of information alone is a product of the doctor-patient encounter and has an important value independent of its use in any medical decision. Asch and his colleagues, in an article entitled 'Knowing for the sake of knowing: the value of prognostic information', developed a data-based model in which the practice of performing tests that cannot alter management plans is justified by the prognostic information it provides to patients [36]. Berwick has demonstrated that such information has monetary value to patients [37], and Sox has reported an earlier return to full activity of men with clinically unimportant chest pain when randomised to receive an electrocardiogram and measurement of serum creatine phosphokinase [38].

Conclusions

In a time of political ferment when hard choices must be made as to where and how to spend public and private funds, it is important that decisions be made on the basis of the best available information. Our estimates of medicine's contribution to health are more than speculative and less than precise; they are approximations extrapolated from secondary sources. We have urged that better data, analysed with more sophisticated methods, be developed as the basis for a continually updated inventory of life-expectancy and quality of life as improved by medical care [3].

These, or similar data, do not tell decision-makers what choices to make, but they do help to inform the decision process. The public and its representatives in Parliament or in Congress must choose among a large spectrum of competing social programmes, only some of which are designed to improve health; and among programmes to improve health, medical care is only one of several. Education, housing, and employment, as the *British Medical Journal* has reminded us [2], also affect health. But if we have been slow to document the effects of medical care, and if our data are less precise than we would like, they are considerably firmer than any that can be presented for the non-medical determinants of health [9].

It is true that education, income, and occupation are strongly associated with health, but, except for occupation, they are not independent determinants; they may, indeed, be proxies for other determinants yet to be identified, and we have only the vaguest idea of the mechanism by which they may affect health. Education, housing, and employment are all highly important goods in their own right, of course, with urgent and valid needs. Let us not, however, imagine that enough is known about their effect on health to divert resources to them for that reason alone.

The association of socioeconomic status with health has been known for a great many years, but governments have been reluctant to take compensatory action. Governmental inaction might reasonably be attributed to the absence of a practical solution; indeed it is still unclear how to correct the disparities in health that have been documented across all income and occupational levels, not merely between the well-to-do and the poor and unemployed [19]. By contrast, the scientific basis of medicine is increasingly well understood, the outcomes of medical care are being widely documented, and the cumulative benefits to the population can now be tabulated as the basis for political action.

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