ELSEVIER

Caring for Identified Versus Statistical Lives: An Evolutionary View of Medical Distributive Justice

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A central medical ethical concern is distributive justice, which may be framed as a problem in valuing identified lives versus statistical lives. Framing the issue in this way is important for two reasons. First, the growth of medical costs has been fueled and will continue to be fueled primarily by the growth of medical technology focused intensively, and often with little benefit for cost, on the care of identified lives. Second, there is some evidence that less expensive primary care, as opposed to high-tech medicine, is positively correlated with improved life expectancy, decreased infant and neonatal mortality, and fewer cases of low birth weight. However, shifting resources from high-tech medicine to primary care will be difficult because people find it psychologically painful to deny care to identified lives. People value identified lives more than statistical lives because we are influenced by certain cognitive preferences inherent to human nature. Natural selection has primed these cognitive preferences. There are no easy solutions to the profound problems facing healthcare systems. However, evolutionary insights can help us understand these problems and could productively inform attempts to promote primary care as opposed to high-tech medicine, thereby improving benefit for cost and enhancing social welfare.

KEY WORDS: Benefit; Cognitive; Cost; Distributive justice; Evolution; Identified lives; Medical inflation; Medical technology; Primary care; Statistical lives.

A central medical ethical concern is distributive justice (Beauchamp and Childress 1989), which may be framed as a problem in valuing identified lives versus statistical lives (Fried 1969). This essay presents the following hypotheses: (1) Human beings value and care for identified lives more than statistical lives, and humans do so because we are influenced by cer-

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tain cognitive preferences that inhere in human nature. (2) Natural selection has primed these cognitive preferences.

This paper presents several lines of theoretical and empirical evidence to support the stated hypotheses. These lines of evidence are summarized at the beginning of the section entitled Conclusions.

Identified lives are those of specific individuals who are explicitly recognized, for example, by name or by having met healthcare providers face to face. Identified lives may be helped if care is offered to them, but may be harmed if care is not offered to them. Statistical lives are those of individuals who are not specifically identified, but who might be helped by a program of general preventive aid or harmed by the failure to extend such aid. For example, a hospitalized premature neonate of low birth weight and with the problems that attend prematurity and low birth weight, and who might benefit from medical care, is an identified life. However, an indigent pregnant woman, who might benefit from prenatal care that she is not receiving and who is at significant risk of bearing a premature, underweight infant, is a statistical life. Of the women at risk to deliver premature or underweight infants, we do not know which women would benefit from prenatal care and which would not. Thus we cannot specifically identify the women who would benefit from prenatal care and extend aid only to them.

Oregon's plan to reform Medicaid is partly an attempt to explicitly ration resources and to redistribute resources from identified lives, such as potential recipients of organ transplants, to statistical lives, such as poor women in need of prenatal care. This attempted rationing and redistribution has generated controversy that has been especially intense because identified lives, such as children who might benefit from organ transplantation, have widely publicized their inability, without the assistance of Medicaid, to pay for services such as transplantation (Larson and Welch 1988). For example, Oregon denied a bone marrow transplant to a 7-year-old boy with acute lymphocytic leukemia. His death elicited national attention. Under the headline "Oregon Cut in Transplant Aid Spurs Victims to Turn Actor to Avert Death," *The New York Times* complained that the boy had been forced to resort to a "performance" to raise money to attempt to privately fund a transplant (Egan 1988). However, given that at some point the distribution of medical resources is a zero-sum process, the identified lives in Oregon have asked not only for resources for themselves, but in effect have asked that resources be withheld from statistical lives.

Framing the issue of medical distributive justice as a matter of favoring identified lives more than statistical lives is important for two reasons. First, in the industrialized world, medical inflation has been fueled primarily by the growth of medical technology (Newhouse 1992, 1993; Schwartz 1987; Schwartz and Mendelson 1992, 1994). The steady growth of medical care costs has not been caused as much by popularly asserted factors such as aging of the population, care of the terminally ill, administrative inefficiencies, increased numbers of physicians (supplier induced demand), defensive medicine, favorable tax treatment of health insurance, increased availability of health insurance, or increases in personal income (Newhouse 1992, 1993). We will not be able to adequately limit the growth of medical costs by increasing enrollments in health maintenance organizations, squeezing out categori-

cally ineffective care, shifting further from inpatient to outpatient care, increasing the cost sharing of consumers, ending the tax subsidy for health insurance, reforming the medical malpractice system, or capping the incomes of physicians (Newhouse 1992; Schwartz 1987; Schwartz and Mendelson 1992, 1994). Developing more efficient technologies, such as laparoscopic surgery, will not decrease the growth of medical costs because more efficient technologies will be applied to many additional patients such that total spending will increase (Schwartz 1994).

Technological progress is accelerating such that new drugs, genetic therapies, and devices such as truly useful artificial hearts may soon add tens of billions of dollars a year to national health care budgets. Most of these high-tech advances will be expensive and will be focused on a relatively small percentage of the population (Schwartz 1994, Terry 1994). If medical inflation and the Gross Domestic Product (GDP) continue the trajectories they followed through the early 1990s, then by the year 2030 medical care will consume 30% of the United States' GDP (Fuchs 1993). To prevent medical technology from dominating the economy in this way will eventually require denying some high-tech services to at least some identified individuals. That is, limiting the growth of medical costs will eventually require the rationing of beneficial services (Fuchs 1993; Schwartz and Mendelson 1992, 1994).

Rationing could be either explicit or implicit ("silent"). Explicit rationing would deny proven, beneficial technologies to identified lives. Given that we cannot predict the future and whether an intervention will work in a particular case, the economic ideal would be to apply an intervention only when its cost would be equaled or exceeded by the benefits of the intervention multiplied by its likelihood of success. This means that some beneficial interventions would not be applied in some cases because the cost would exceed the probable benefit. We will never calculate the costs and expected benefits of every intervention considered for every patient, but at some point we must draw the line. In the United States, providers currently render a great deal of care that is not cost-beneficial, but we cannot afford to do so forever. The first step in controlling detrimental medical inflation will require spending less on "negative yield" interventions that produce more harm than good and spending less on "no yield" interventions that produce neither harm nor good. The much more difficult and important second step will require denying to identified lives at least some of the enormous number of "low yield" interventions that we now pay for and that produce benefits, but benefits that do not equal the costs of the interventions (Fuchs 1993).

However, this essay argues that human beings have evolved certain cognitive and emotional preferences that cause us to resist explicit rationing when lives in need have been specifically identified. Americans are particularly unlikely to ration explicitly. For example, hemodialysis was initially rationed to only a few persons with end-stage renal disease (ESRD), but because this was perceived to be unfair, Congress extended Medicare coverage to provide dialysis for almost all patients with ESRD (Annas 1985).

Implicit rationing would involve limiting the development of new medical technologies and limiting the supply of the personnel required to operate or administer new products. In contrast, explicit rationing could be effected on a case-by-case basis if we developed all technologies that could be used for at least some patients in

a cost-beneficial manner. In comparison, implicit rationing would be less precise and less economically efficient because some technologies would not be developed at all, even if they might have cost-beneficial applications in some cases. However, implicit rationing would be more politically palatable. If properly effected, implicit rationing would limit overall technological growth while still allowing market forces to help determine which new technologies would be developed and which would not. At its conclusion, this essay employs evolutionary insights to suggest ways to enhance implicit rationing.

Framing the issue of medical distributive justice in terms of identified versus statistical lives is important for a second reason. There is dispute about the value of preventive care and about the value of high-tech medicine versus primary care. However, there is some evidence that primary care, as opposed to high-tech medicine, is positively correlated with generally improved life expectancy, decreased infant and neonatal mortality, and fewer cases of low birthweight (Shi 1992). If we wish to broaden the Oregon initiative to shift resources from expensive, intensive care for identified lives to less expensive, broadly available primary care for statistical lives, then we will have to expand the denial of high-tech care to identified lives. We might also choose to deny high-tech care to identified lives in order to shift resources to nonmedical needs, for example, education. The motivation for shifting resources is utilitarian: improving benefit for cost and enhancing the general social welfare.

However, shifting resources to primary care or to nonmedical needs will be difficult, as in Oregon, because people seem to be much more willing to extend aid to identified lives than to statistical lives. People resist allowing identified individuals to go without care or to die, even if doing so and reallocating funds would enhance benefit for cost by improving the lives of many people who cannot be specifically identified. Why, in considering benefit for cost, are we seemingly so illogical?

A NOTE ON DESCRIPTIVE AND NORMATIVE ETHICS

Certain sections of this essay argue that human beneficence arises in part from selfishness as understood in the complex evolutionary sense of inclusive fitness and that, in turn, this form of beneficence causes medical resources to be allocated in a way that favors identified lives more than statistical lives. This essay also argues that the way we distribute resources is determined in part by cognitive preferences that have nothing directly to do with morality. Such morally neutral preferences include a preference for small numbers as opposed to large numbers and a preference for basing decisions on directly observable phenomena as opposed to abstract concepts.

However, to argue that human beings have evolved certain cognitive preferences is not to argue that culture and learning are unimportant to ethical decision-making. As explained immediately below, this essay argues that we can learn to make distributional choices that are disfavored by certain of our brain-based cognitive preferences. That is, this essay argues that we can avoid committing the "naturalistic is–ought fallacy" (Alexander 1987; Keith 1947).

THE EVOLUTIONARY CONTEXT OF IDENTIFICATION

Hamilton argued that natural selection favors behaviors that maximize an individual's inclusive fitness (Hamilton 1964, 1970, 1971, 1972). The social learning model of kin recognition posits that natural selection should have favored people who maximized their inclusive fitness by intelligently using the information available to them about consanguinity, even if the information only approximated objective reality. That is, a person who helped those she was familiar with *likely* enhanced the transmission of her genes more than did a person who provided little or no help to those she was familiar with. Thus, in general, if a person aided the people she knew, then her genes were better represented in succeeding generations (Alexander 1979). (The means of recognizing a person—recognizing his face, body and voice—would promote a sense of familiarity even if the person was witnessed only on television, such as the boy from Oregon who advertised his need for a bone marrow transplant. Thus recognizing a person, even just on television, would evoke at least some of the evolutionarily selected cognitions and emotions that cause us to consider a person to be familiar to us.)

Therefore a person would have had more resources to invest in her own reproductive efforts and in those of her relatives if she had not "wasted" resources helping unfamiliar people who were likely unrelated or of distant relationship to her. This is one way in which evolution may have primed us to be beneficent toward people we have specifically identified, but may not have primed us to be beneficent toward people we have not specifically identified. This fact does not derogate our natural beneficence, but merely shows that such beneficence is limited and imperfect.

In general humans favor people who are similar to themselves and disfavor people who are less similar. People who belong to a group favor members of the group more than outsiders and easily develop prejudices against outsiders. These patterns hold true even when people are experimentally and randomly assigned to arbitrarily constituted groups (Tafjel, Billig, and Bundy 1971; Zimbardo et al. 1974). These patterns might arise from the context in which we evolved, as discussed above, and may represent other examples of using group membership or familiarity as proxies for relatedness. That is, the satisfaction we derive from helping those we know is a proximate psychological mechanism that evolved because of its ultimate value in benefiting our relatives and thereby enhancing the transmission of our own genes.

One historical example is particularly instructive because the discrimination was so remarkable. In the early 1960s patients with chronic renal failure far exceeded the number who could be treated with the available hemodialysis machines. In King County, Washington, the Seattle Admissions and Policy Committee, which became known as the "God Committee," determined who received dialysis and who did not, and thus determined who lived for a time and who died. The committee worked anonymously and all of its members belonged to the urban middle class. The committee favored males, married people, patients with greater numbers of children and patients who were wealthier, better educated, professional, more emotionally stable, and more likely to return to work (Fox and Swazey 1978). That is, the committee's nonphysiological selection criteria favored patients most like the

committee members and prompted two commentators to remark that the Pacific Northwest was "no place for a Henry David Thoreau with bad kidneys" (Sanders and Dukeminier 1967–68).

IDENTIFIED AND STATISTICAL LIVES AND DIRECT AND INDIRECT RECIPROCITY

In *The Biology of Moral Systems*, Alexander (1987) comprehensively reviewed direct and indirect reciprocity. When a first person helps a second person, then direct reciprocity is aid that the second person gives in return to the first person. For example, when "A" helps "B" and "B" helps "A" in return, "B" has rendered direct reciprocity to "A." When a first person helps a second person and the second person reciprocates and a third person witnesses the reciprocation, then indirect reciprocity is aid that the third person gives to the second person. For example, if "A" helps "B" and "B" reciprocates and "C" witnesses that exchange and then helps "B," then "C" has rendered indirect reciprocity to "B." The evolutionary view is that direct and indirect reciprocity are ultimately selfish strategies.

Both direct and indirect reciprocity require specific identification of parties. If "A" helps "B" but "B" does not know who has helped him, then "B" will not know to whom he should directly reciprocate. If "A" helps "B" and "B" reciprocates but "C" does not witness the reciprocation or cannot identify "B," then "C" will not know to whom to indirectly reciprocate. If "B" helps someone who cannot be specifically identified, then "C" may suspect (consciously or subconsciously) that "B" is less likely to help an identifiable party such as "C"; thus "C" will have less incentive to indirectly reciprocate aid to "B."

When people help an identified person, such as a premature neonate, the helpers may subconsciously expect that the neonate or his relatives will later directly reciprocate aid to the helpers. If people provide prenatal assistance, such as supplemental nutrition, to women at risk of bearing premature and low-birth-weight infants, then the helpers will not know which mothers and fetuses benefited and which did not. (This is because the great majority of fetuses at risk for premature birth will be born at term even if their mothers do not receive prenatal care [Joyce et al. 1988].) The pregnant women who were helped will also not know whether the help made a difference or not and thus will not know whether they benefited or how much they benefited. Therefore the grounds for direct reciprocity are diminished or destroyed.

When people help a premature neonate, the helpers may subconsciously anticipate that third parties will witness the help and may indirectly reciprocate aid to the helpers. If people provide prenatal assistance to women at risk to deliver premature, low-birth-weight infants, then third parties will not know which mothers and fetuses benefitted and which did not. The third parties will not know which acts of assistance were helpful and which were unnecessary. Thus the third parties cannot be sure that they have witnessed useful acts of assistance. The third parties will not know which helpers have benefited some mothers and fetuses and which helpers have rendered unnecessary aid. (The third parties may subconsciously suspect that

some helpers are more adept at selecting those who will benefit from assistance, which is, in part, to be more adept at identifying specific individuals. Those more adept at identifying specific individuals may seem more likely to identify and help the third parties. But the third parties will find it difficult to determine which helpers are more adept than others at identifying specific individuals who will benefit from assistance.) The third parties may also fear that the helpers are less likely to help identifiable persons such as the third parties. (The third parties may consciously or subconsciously fear that those who help unidentified people are likely to "waste" future assistance on unidentified people, to the detriment of identifiable persons such as the third parties.) Thus the ground for indirect reciprocity are diminished or destroyed.

Theories of reciprocity may partly explain our willingness to invest significant resources in people near the end of life. Various studies suggest that the majority of the elderly want intensive care if they become critically ill (Finucane et al. 1988; Shmerling et al. 1988). In one survey of chronically ill elderly people, 89% stated that they would want cardiopulmonary resuscitation (CPR). Of all of those sampled, 67% stated that they would want CPR even if they had become so demented that they no longer recognized their family and friends (Seckler et al. 1991). Another investigation concerned elderly patients who had been in an intensive care unit within the preceding year. The patients were asked to recall what the intensive care unit had been like and were then asked if they would be willing to again be admitted to intensive care if it would guarantee them just one additional month of life. Eighty-eight percent of the respondents stated that they would definitely or probably want intensive care to gain just one month of life. The patient's preferences for additional intensive care were poorly correlated with quality of life and functional status (Danis et al. 1988). As people become more likely to need life-sustaining care—that is, moving from the general public, to general medical outpatients (Emanuel et al. 1991), to chronically ill outpatients (Lo, McLeod, and Saika 1986), to medical inpatients (Frankl, Oye, and Bellamy 1988)—people become progressively less willing to discuss limiting their own care at the end of life. And in general, family members would choose for their relatives very intensive treatment at the end of life, even treatment more intensive than the patients would prospectively choose for themselves (Seckler et al. 1991; Uhlmann, Pearlman, and Cain 1988; Zweibel and Cassel 1989).

When we sometimes inefficiently allocate medical resources to some people near the end of their lives, we do not do so because of unconstrained national altruism. Rather, we sometimes misallocate medical resources because we individually favor people we know, which is an evolved and natural way of favoring ourselves and our own inclusive fitness. Thus favoring those we have specifically identified is or can subconsciously appear to be advantageous:

1. If we are the identified patient.
2. If our relative is the identified patient.
3. If an unrelated person is the identified patient and specific identification is, in ultimate terms, a proxy for relatedness. (Medical professionals often see and touch their patients' intimate body parts and learn intimate details about the patients'

lives. Such close contact might mimic the intimacy of the ancestral environment and thus reinforce the power of familiarity as a proxy for relatedness.)

4. If helping an identified life could engender direct or indirect reciprocity. (If we do not help identified lives, then other people may believe that we would be poor partners in other relationships of reciprocity and might exclude us from such relationships. When a physician renders medical care that she believes is useless, but which a patient or his family demands, the physician's subconscious motivation may be to protect her own reputation as a worthy partner in relationships of reciprocity. In such a case an insured patient and his family will pay little or no money for the probably useless therapy, but it may offer or seem to offer at least a small chance of helping the patient or even saving his life. The patient or his family may feel that the physician's only cost will be the minimal time and effort required to write in the medical chart an order for the probably useless treatment. Therefore, the patient or his family may view quite negatively a physician who is unwilling to expend minimal overt effort when it seems that such effort might even save the patient's life. That is, the patient or his family might view such a physician as being like a lazy bystander who is unwilling, at no risk to herself, to exert the minimal effort needed to throw a life preserver to a drowning man.)

SOCIAL LOAFING AND THE VICTIMIZATION OF STATISTICAL LIVES

In March 1964 Kitty Genovese was stabbed to death by Winston Moseley in Kew Gardens, Queens, New York. The attack lasted about 30 minutes as Moseley stabbed Genovese, then twice departed and returned to stab her again as she repeatedly screamed for help. Thirty-eight people saw and heard the attack, but no one went to defend or to help Genovese. One person finally called the police after Genovese had died.

Pundits posited that the inhumanity and anomie of modern life accounted for the witnesses' inaction, but Darley and Latané proposed that diffusion of responsibility explained the failure to help. That is, when many people can help, then each one is responsible for a smaller share of the collective obligation. Darley and Latané's experiments and dozens of others have confirmed the theory of diffusion of responsibility and that the "bystander effect," or "social loafing," increases as the number of potential helpers increases (Darley and Latané 1968; Latané and Darley 1970; Latané and Nida 1981; Latané, Williams, and Harkins 1979).

In a typical experiment, the naive subject (the potential helper) never met the "victim" before the experiment began or while it was being conducted. The subject was placed in one room and was instructed to work on a task that was supposedly the object of the experiment, but which was actually just a ruse. From zero to several other people were also placed in the room, also supposedly to work on the requested experimental task. However, the other people were experimental collaborators whose presence was designed to test the effect of the variable number of potential helpers. The supposed victim was placed in another room and the subject could only hear the voice of the victim, but could not see him. As the subject and the collabora-

tors worked on the artificial task, the victim began to complain about having epilepsy and eventually feigned a seizure. The subjects would sometimes rise to go to the other room to help, but by design the collaborators would never rise to help. In accordance with the theory of diffusion of responsibility, the subjects were more likely to help when there were fewer collaborators in the room.

However, in one experiment the subjects were allowed to "adventitiously" meet the supposed victim for just a moment before the victim was placed in one room and the subject was placed in a different room along with the variable number of experimental collaborators. In the one protocol in which the subjects had met the victim, the subjects were significantly more likely to help the victim when he cried out in distress, even if there were several collaborators who did not rise to help. That is, face-to-face identification of parties, albeit brief, significantly diminished social loafing (Latané and Darley 1970).

The experiments in social loafing provide cogent empirical evidence for one of the principal hypotheses of this paper, namely, that lack of specific identification tremendously undermines caring and that specific identification significantly enhances caring.

In most cases, an identified life will be known by a relatively small number of people and not by society at large. In contrast, by definition statistical lives are not specifically identified, although the problems of groups of statistical lives may be known by society at large. Thus, identified lives are much more likely to be the responsibility of a few people, while responsibility for the problems of statistical lives is highly diffused. Therefore, it is more likely that identified lives will be cared for and that statistical lives will be victimized by social loafing.

Evolutionary theory is consistent with the theory of diffusion of responsibility. First, humans and their relationships of helping and of reciprocity evolved in small groups of people who were often related to each other and who dealt with each other face-to-face on a daily basis. Human evolution did not occur in mega-societies concerned with pan-social utilitarianism. Thus it is unlikely that we evolved the cognitive paradigms needed to think easily about the welfare of very large societies or about people with whom we have no direct interactions. Second, evolutionary theory posits that humans are often selfish and that many acts of apparent altruism are actually likely to selfishly promote a person's inclusive fitness. Evolution selects against genetically unselfish altruism, such as an unrelated person's willingness to help Kitty Genovese. Helping Genovese might have resulted in harm to the helper with no genetic benefit to him. The larger the cohort of potential helpers, the less responsibility any one person has to risk his genetic future for someone else. Third, when we do assist a person in danger, we often do so primarily to selfishly reduce our own emotional distress (Hunt 1990). Such selfish distress would have promoted inclusive fitness in the small groups in which we evolved: Anxiety about the peril of a relative and rescue of the relative would have meant rescue of some proportion of the rescuer's own genes. When fewer relatives were available to help, then individual self-interest in saving the endangered person would have been greater and social loafing would have been less adaptive. When more relatives were available to help, then individual self-interest in saving the endangered person would have been di-

minished and social loafing would have been more adaptive. (A similar analysis would hold for unrelated group members who were partners in relationships of reciprocity. When fewer people were available to rescue a valuable and mutual partner, then social loafing would have been less adaptive and vice versa.)

IDENTIFIED LIVES AND THE SELF INTEREST OF MEDICAL PROFESSIONALS

As noted above, evolutionary theory posits that people are often selfish. Medical professionals serve their own interests by focusing on identified lives. First, identified people can often pay for medical services, but statistical lives cannot pay unless and until they are identified and brought into the medical care system. Few medical professionals have any direct personal incentive to identify statistical lives so as to bring them into the medical care system to receive relatively inexpensive primary care preventive services. Second, physicians who perform procedures make more money than do primary care physicians, even when the lengthier training periods of procedural specialties are accounted for (Weeks et al. 1994). Third, a medical professional who withheld services from an identified patient might well be sued, but no practitioner will be sued for failing to identify statistical lives.

AUTOMATIC VIGILANCE AND IMMEDIACY OF HARM

Pratto and John (1991) have shown that negative words subconsciously interfere with conscious human thought more than positive words do. We also remember negative information better than we remember positive information, and because negative information is thus more available to us, it probably has a greater influence on decision-making. Indeed, other studies have shown that humans attend more to negative than to positive information in forming impressions (Anderson 1974; Hamilton and Zanna 1972) and in making decisions (Kahneman and Tversky 1979).

Pratto and John (1991) believe this "automatic vigilance," this keen bias toward the negative, may be an evolutionary adaptation that protects people from immediate dangers. The everyday life-threatening perils of prehistoric existence primed us to worry about today, not tomorrow. Concern about the immediate future makes good evolutionary sense, because natural selection favors genes that are reproduced at higher rates than other genes (Dawkins 1989). Thus natural selection favored the survival of people who carried advantageous genes until the time that those people completed the bearing and raising of their children. After bearing and raising her children, a person's residual evolutionary significance is limited to her capacity to further assist her children and other relatives. Thus we are primed to beware and to struggle to survive immediate dangers, probably so that we can complete the bearing and raising of children. We are not primed to beware and avoid postponed dangers, probably because such dangers are less likely to affect our reproductive success.

Studies of modern humans suggest that we do fear rare, but catastrophic and immediate, health hazards much more than we fear common, but delayed, health

hazards (Combs and Slovic 1979; Starr and Whipple 1980). We value the present and discount the value of the future, and the marginal utility of future years decreases as the number of years increases (McNeil, Weichselbaum, and Pauker 1978). Again, this makes good evolutionary sense, because survival is selectively valuable through the years of bearing and raising children, but later survival is of less evolutionary importance, and genes that enhance such extended survival grant less advantage in natural selection.

These concepts may apply in two ways to this essay. First, an identified person who is sick is at immediate risk. An unidentified statistical life is usually not at immediate risk, but may be at risk of future harm. For example, a sick premature neonate is at immediate risk of harm and possibly death. A fetus who may be born prematurely is not at risk now, but may be at risk later. However, even when it is irrational to do so, we seem to care more about risk now than about risk later.

Second, an identified person who is sick has a problem that we frame in negative terms. Simply put, sickness is bad. However, programs to help unidentified statistical lives are usually preventive programs that promote health. Health and preventive care are good, but sickness—a negative thing—seems to dominate our attention more easily.

CONCRETE DATA AND DEMANDS

Human beings did not evolve with sophisticated mathematics and statistics to aid decision-making. We evolved using what was important to daily survival, that is, situationally specific data about the directly observable world. In many ways we still prefer to use such data even when they favor decisions that are irrational in light of more sophisticated information. For example, we seem to prefer to help a single, identified, directly observable sick person in a manner that is not cost-beneficial as opposed to helping statistical lives in a cost-beneficial manner.

Studies confirm that modern humans deal better with concrete problems (such as caring for individual identified patients) than with abstract problems (such as making decisions about statistical lives or performing complex cost-benefit analyses). Modern humans, even scientists trained in the use of statistics, have great difficulty dealing with abstract statistical data and frequently make gross errors in statistical judgment. We work much better with limited data, and we are easily overloaded with and confused by too many data (Fischhoff and Bar-Hillel 1984a; Gorry and Barnett 1968). One author has explicitly argued that complex thinking is an activity of significant dysutility (Shugan 1980). That is, statistical thinking is hard work that most of us would rather not do.

Humans, including scientists trained in statistics, also handle small numbers much better than large numbers (Tversky and Kahneman 1971). This is consistent with our evolutionary need to deal with small numbers of people and objects and not with large numbers. Throughout the great majority of human history, an ability to easily understand and manipulate large numbers would have been wasted and wasteful. We would expect that evolution did not emphasize cognitive abilities that

would be little used, because such an emphasis would waste neurological energy that could be spent on more practical tasks. Even today, technologically primitive peoples such as the Yanomamö of Amazonia do not have words for numbers greater than two (Steinvorth-Goetz 1969). Any number of things more than two is simply described with the Yanomamö term for "many." Our preference for small numbers suggests again that we find it easier to care for individual, identified patients than to think about large numbers of statistical lives.

We can directly see and hear individual patients, but we cannot directly sense the large number of statistical lives that might be helped by preventive health care. As we evolved, life demanded that we attend more to people and objects we could sense and that we attend less to abstract concepts. Perhaps that is why "out of sight, out of mind" is a truism of great truth. Fischhoff and co-workers confirmed this principle by presenting decision trees to lay people and expert mechanics. The decision trees outlined possible reasons for a car's failure to start. The subjects were first exposed to a comprehensive decision tree and later to pruned versions from which decision branches had been eliminated. After removal of the comprehensive versions and upon exposure to the pruned versions, both the lay subjects and the expert mechanics failed to consider the missing branches and possibilities, even when alerted to focus on the completeness or incompleteness of the pruned versions (Fischhoff, Slovic, and Lichtenstein 1978). In general, humans frequently neglect relevant information, and it may be easier to learn to ignore irrelevant information than to attend to relevant information (Fischhoff and Bar-Hillel 1984b). Unfortunately for statistical lives, "out of sight, out of mind" may control much of our distribution of medical resources.

An identified person or those who care about him can demand help. The assistance might or might not make an important difference for the person, but nevertheless, the demand is concrete and immediate. In contrast, statistical lives often cannot speak for themselves. For example, an indigent child who is at risk of contracting the measles and who might benefit from vaccination is unlikely to understand or to be able to publicize his situation. Others may speak for the child, but can only point out that there is a calculable chance that the assistance will help some members of a class, but not a known, particular individual. That is, the demand on behalf of the statistical life seems less concrete and less immediate, even if the chance of true benefit is no less than the chance that assistance will help an identified person.

AVAILABILITY OF INFORMATION AND ESTIMATIONS OF IMPORTANCE

Both lay persons and physicians systematically overestimate the prevalence of diseases or causes of death that receive a great deal of attention. Lay people overestimate the risks of death from sensational events such as homicides and storms and underestimate the risks associated with chronic diseases such as diabetes, asthma, and emphysema. Estimated frequencies are related to the amount of newspaper space devoted to the various events or diseases (Combs and Slovic 1979; Slovic,

Fischhoff, and Lichtenstein 1979). Physicians overestimate the risks of diseases that receive a great deal of medical journal coverage (Christensen-Szalanski et al. 1983). Increased news media coverage of sensational events or diseases might arise from our keen concentration on negative information, that is, from automatic vigilance, as discussed above. (Perhaps automatic vigilance explains why the news media focus so heavily on murders, rapes, fires, airplane crashes, and disasters, and why we find such information so fascinating.) In turn, increased attention to and overestimation of the risks of certain medical problems may lead us to devote disproportionate resources to those problems.

AN INTRODUCTION TO RISK REFERENCES

To maximize reproductive potential, a parent should raise as many children as possible to reproductive age. But resource limitations may demand that a parent devote resources to one child while withholding them from another. That is, under certain circumstances, ensuring the survival of one child may maximize reproductive success, whereas dividing resources between two children may doom both to inadequate care and death, thus damaging the parent's reproductive potential. For example, in certain societies, a woman who has had two children in quick succession sometimes kills her newborn so that she can continue to nurse her older infant to robust health (Daly and Wilson 1984). Trying to nurse two infants might deprive and kill both of them; so the safer strategy is to invest in the older infant who has already survived the riskiest early months and years of life.

A similar impulse may drive us to continue to invest in children who have already consumed resources, such as sick neonates, rather than to wager on children yet unborn, such as fetuses who might be born prematurely. Again, our affinity for the immediate and directly observable may be important here, leading us to invest in the child we can see and not in the fetuses we do not see.

Empirical evidence supports this analysis. Recall that the section Automatic Vigilance and Immediacy of Harm assumed that we consider withdrawing care from an identified person to be bad, but that we consider preventive care promoting the health of statistical lives to be good. Another view would be that we consider both saving an identified life and saving statistical lives to be positive acts or gains. Experiments in cognitive psychology consistently suggest that humans are generally averse to risk when gain is possible. That is, people generally prefer a certain gain of a smaller amount over an uncertain gain with a statistically larger payoff but also coupled with a chance of no gain at all (McNeil et al. 1982; Slovic, Fischhoff, and Lichtenstein 1982). For example, most people prefer a certain award of $80 to an 85% chance of winning $100 coupled with a 15% chance of winning nothing (Kahneman and Tversky 1981). (An 85% chance of winning $100 is statistically worth $85, i.e., more than $80.) Another experiment involved the following scenario:

> Imagine that an infectious disease is expected to kill 600 people. Two programs have been developed to combat the disease. Program "A" will save 200 lives. If program "B" is adopted, there is a 1/3 probability that 600 people will be saved and a 2/3 probability that no one will be saved (Kahneman and Tversky 1981).

Statistically, programs "A" and "B" offer identical outcomes, but the physician test subjects overwhelmingly preferred the risk-averse option, program "A." As noted above, prehistoric existence was perilous. In such times a small but certain food supply would have sustained the body day to day. A large food supply would have been better, but a chance for a large food supply coupled with a chance of no food at all (starvation) could have meant death. Having two children would promote reproductive fitness more than having just one child, but one child might have promoted fitness more than dividing resources among two children and losing both of them.

These arguments also remind us of the psychological theory of cognitive dissonance. The more we have invested in something, the more we defend its value. This allows us to feel good about our choices and thus good about ourselves (Festinger 1957). Having invested time, effort, and money in a sick newborn, we may find it hard to withdraw resources from her and see her die, even if the resources could be reallocated to save several other lives.

REGRETS

Experiments in cognitive psychology indicate that we regret acting and failing more than we regret failing to act in the first place. Consider the following example:

> Paul owns shares in Company A. A year ago he considered selling his shares and investing the proceeds in the stock of Company B, but eventually he did not do so. At the end of the year he realizes that if he had sold his stock and reinvested in Company B, then he would have made $1200. A year ago George owned shares in Company B, but he sold his stock and invested in Company A. The switch cost him $1200 in lost stock appreciation (Kahneman and Tversky 1981).

Paul and George are each $1200 worse off than they would have been if they had respectively invested in or maintained their investments in Company B. However, most people would agree that George feels more regret. Studies suggest that the differences in regret arise from differences in imagination. It seems that humans find it easier to imagine not taking an action (e.g., not selling stock and reinvesting the proceeds) than to imagine taking an action. The greater ease of imagining inaction seems to lead to greater regret when an action is taken and failure results. Anticipation of regret is likely to favor inaction over action and routine behavior over innovative behavior (Kahneman and Tversky 1981).

These findings can be applied to the discussion of identified and statistical lives. If anticipation of regret favors inaction over action and routine over innovative behavior, then that should lead to a preference for the status quo. The status quo is to favor identified over statistical lives and to not institute new programs to identify and help statistical lives. Thus not only have identified lives won out in the past, it is probable that they will continue to do so even when favoring them is inefficient.

Can evolutionary theory help explain why we regret failed action more than inaction? As an example, recall the discussion of mothers who may kill a new infant if he is born while an older infant is still being nursed. A mother who does so and who

successfully raises the older infant has less to regret than does a mother who attempts to raise both infants if that attempt divides resources such that both infants die. (Immediately after giving birth many mothers show little attachment to or interest in their new infant. This phase of assessment and emotional indifference may ease the process of abandoning the infant and reduce the pain of doing so [Daly and Wilson 1988].) Even a mother who tries to raise both infants and succeeds in raising only one may regret the lost reproductive effort. Such a mother may be weakened by the Herculean attempt and may fall ill or may simply have less energy and fewer resources to invest in future offspring. That is, the mother who does not make the extraordinary effort has less to regret than does the mother who makes such an effort and fails. The latter mother indeed has more to regret and is likely to keenly remember the negative experience, in accordance with the findings noted above with respect to automatic vigilance. Further, regretting might have adaptive value in promoting learning and discouraging future miscalculations.

MORE ON RISK PREFERENCES AND WHY RISK-TAKING SURVIVES

As noted, experiments consistently find that humans are generally averse to risk when gain is possible. Studies also consistently find that humans generally prefer risk when loss is possible. Whether a potential outcome is perceived as a gain or a loss often depends on how the possible outcomes are presented or framed. One example concerns the disease paradigm mentioned above, but this time framed in terms of losses:

> Imagine that an infectious disease is expected to kill 600 people. Two programs have been developed to combat the disease. If program "C" is adopted, then 400 people will die. If program "D" is adopted, then there is a one-third probability that no one will die and a two-thirds probability that 600 people will die.

Again, programs "C" and "D" offer statistically identical outcomes and, except for being framed in terms of losses instead of gains, this version of the problem is identical to the version presented above with respect to options "A" and "B." However, this time a control group of physician test subjects overwhelmingly preferred program "D," the risk-seeking option (Kahneman and Tversky 1981).

We previously assumed that we view as gains both saving an identified life and saving statistical lives. When we save an identified life, we save the life of a person known to be ill. Such a rescue certainly seems to be a gain about which we are likely to be averse to risk. In contrast, most of the members of a statistical class at risk may do well without assistance. For example, most fetuses at risk of premature birth will not be born prematurely (Joyce, Corman, and Grossman 1988). The fetuses that are born prematurely will be seen as losses relative to statistical expectations. If we prefer risk with respect to such losses, then we would likely not extend assistance to such statistical lives.

Why do humans prefer risk with respect to losses? During most of human history people possessed only discrete goods, such as tools or items of food. Early hu-

mans would not have possessed many easily divisible goods, and certainly did not possess mathematics or mathematically divisible wealth such as money. (An individual child is the most valuable reproductive resource and is also a discrete and indivisible resource.) Thus during most of human history, if threatened with the loss of a discrete item, the only options would have been to defend the whole item or to give it up entirely. In many, if not most cases, it would not have been possible to retain a portion of the item and to yield a portion. In some technologically primitive societies, total wealth, including wealth derived directly from nature, is believed to be absolutely limited. Thus competition for resources is thought to be a zero-sum process: when one person gains resources, it is believed that someone else must have lost resources (Foster 1965, 1972). In a subsistence economy loss of resources could critically impair reproductive potential, and thus it could be adaptive to assume the risks of fighting to prevent the loss of discrete resources. Although humans now understand mathematics and possess much wealth that is mathematically divisible, our brains may still operate more easily according to a simpler, prehistoric risk calculus premised on the assumption that valuable items are discrete and not easily divisible.

Finally, taking risks may hinder individual fitness, but may promote inclusive fitness. In Darwinian terms, to die is not to lose if dying promotes the propagation of your genes, even if they are passed along not by you but by your relatives. During our own evolution, small and closely interrelated bands might have benefited from members willing to take grave risks that protected the reproductive welfare of relatives (Konner 1990).

Can one principle help explain both aversion to risk with respect to gain and seeking of risk with respect to loss? Perhaps the principle is that it is better to have a little something to ensure immediate survival or at least minimal reproductive success and worse to have nothing and risk hardship, starvation, death, or total reproductive failure. For example, it might be better to be certain of having a little food, and worse to gamble to acquire much food and lose the gamble and have nothing. If you have food but face a risk of losing it, then it might be better to take the risks of defending what you have and worse to avoid risk, surrender the food, and go hungry. (In fact, empirical studies affirm that for most people aversion to risk is greater with respect to small gains than with respect to large gains and that seeking of risk is greater with respect to small losses than with respect to large losses. As potential gains or losses become large, humans become more risk neutral [Kahneman and Tversky 1981].)

GENDER DIFFERENCES, PROCEDURAL MEDICINE, AND PRIMARY CARE

Men dominate American medicine and overwhelmingly dominate the procedural specialties and subspecialties. Female physicians are much more likely to practice primary care medicine (Moore and Priebe 1991). Procedural medicine focuses intensively on identified lives, but a major goal of primary care is to identify and then

extend care to people who could benefit from care but who have not been previously identified as needing it.

As long as men dominate medicine, it may prove difficult to shift resources from procedural medicine to primary care. The difficulty will likely be due in part to male preferences for the visuo-spatial, mechanical, and object-oriented tasks (McGuinness and Pribam 1979) required in surgery, catheterization, and endoscopy. A large body of evidence supports the view that, in general, men prefer such tasks more than women do. A similarly impressive body of evidence suggests that, in general, women have greater verbal abilities than men (Maccoby and Jacklin 1974). Verbal skills are critical in the work of primary care: listening to patients, reasoning about their problems, and explaining the therapeutic plan and reinforcing compliance with it.

Primary care emphasizes enduring and nurturing relationships. Growing evidence suggests that, in general, women are more nurturing than men (Fisher 1992) and thus may be more comfortable in the interdependent personal relationships (Gilligan 1982) inherent in primary care. In general men are more aggressive than women (Fisher 1992; Maccoby and Jacklin 1974). Aggression and assertiveness are essential for academic physicians attempting to establish and enhance their careers by developing, applying, and writing journal articles about new, expensive, and intensive technologies, for example, organ transplantation. Assertiveness is also important for private practitioners competing to offer the latest technologies and procedures to the public. In contrast, primary care is often considered to be comparatively inglorious (Fitzgerald 1993). Unfortunately, comparison of monozygotic and dizygotic twins demonstrates that aggressiveness is significantly and inversely correlated with altruism, empathy, and the capacity to nurture, and further suggests that all of these traits are largely genetically influenced (Rushton et al. 1986) and are difficult to modify. To the extent that gender determines these traits, the sexual dichotomy manifests itself despite even intense socialization applied from infancy onward to attempt to produce gender-neutral behavior (Spiro 1979; Tiger and Shepher 1975).

The sexual dichotomy with respect to task preferences, aggression, and the capacity to nurture is reinforced by culture, but based in hormonally generated differences in brain structure and function. The male and female hormones affect both the developmental organization of the brain and the later activation of certain behaviors (Moir and Jessel 1991). Testosterone is complexly related to visuo-spatial abilities: Such abilities are highest in men with testosterone levels below the male norm and are also high in women with levels above the female norm (Gouchie and Kimura 1991). (The pattern seems to be that an intermediate level of testosterone maximizes spatial abilities. Pubescent boys with abnormally low levels of testosterone or with abnormally high levels of estrogens, or who were exposed to exogenous estrogens *in utero*, perform poorly on spatial tasks [Kimura 1989; Moir and Jessel 1991].) In women as well, estrogens depress spatial abilities (Moir and Jessel 1991) but enhance verbal abilities (Kimura 1989; Weiss 1988). Testosterone promotes assertiveness and a readiness to respond to environmental and social challenges (Bahrke, Yesalis, and Wright 1990). The inverse relationship between aggression and the capacity to nurture is probably mediated by testosterone. Girls with Turner's Syndrome (genotype XO) have no gonads and produce neither testosterone nor estrogens. These girls are

hyper-feminine, are extremely nurturing, and are fascinated by romance and children (Reske-Nielsen, Christensen, and Nielsen 1982).

It is not surprising that men and women evolved different preferences with respect to certain tasks. As humans evolved, men hunted, often as silently as possible. Hunting required keen visual and spatial abilities in spotting and tracking animals and in aiming rocks, spears, and arrows. Compared to women, men also competed more fiercely for reproductive opportunities (Symond 1981). With relatively limited reproductive potential, women carefully nurtured their few young at the campsite or on gathering expeditions, social settings more conducive to conversation than was the hunt. Women may have also benefitted from an especially keen ability to hear and understand the cries or verbalized distress of children (Fisher 1992; Leakey and Lewin 1992).

This discussion does not argue that women cannot be good technicians in the procedural specialties, such as surgery, that demand fine motor skills. In fact, women generally possess better fine motor skills than men do (McGuinness 1985). Instead, the argument is merely that women are less likely to be satisfied by purely technical achievements and are more likely to prefer primary care because it emphasizes closer interpersonal relationships. The gender dichotomy with respect to task preferences does argue that promoting the number and influence of women in medicine will enhance primary care and the welfare of statistical lives.

CONCLUSIONS

This essay has argued that evolutionary perspectives may explain human cognitive preferences that lead to our tendency to favor identified lives more than statistical lives. The main arguments have been:

1. The evolutionary context of identifiability suggests that healthcare providers are likely to allocate resources to people the providers know. When added together, these individual allocative decisions result in a distributive system that favors members of the cultural majority that controls medical resources.
2. Theories of direct and indirect reciprocity suggest a tendency to help identified people more than unidentified people.
3. Social loafing implies that we each individually feel little obligation to help statistical lives.
4. Most medical professionals serve themselves better economically by helping identified lives as opposed to statistical lives.
5. We are inclined to attend to potentially immediate harms affecting identified lives more than to delayed harms that may afflict statistical lives.
6. We deal with concrete situations, small numbers, and directly observable phenomena better than we do with the abstract statistics that describe the needs of statistical lives.
7. Cognitive dissonance and regret in acting and failing incline us to invest in patients who are identified and who have already consumed resources. In con-

trast, less regret for failing to act disinclines us to invest in statistical lives, which are less likely to have already consumed resources.

8. Aversion to risk with respect to gains promotes care of identified people and seeking of risk with respect to losses disfavors preventive care for statistical lives.
9. Men dominate medicine and generally have cognitive preferences that favor procedural medicine and that disfavor primary care.

I do not contend that people very often consciously calculate the benefits and costs of direct and indirect reciprocity, or that people consciously consider their preferences for controlling negative influences, or for preventing immediate rather than delayed harm, or for case-specific data rather than statistical data, or for certain risks as opposed to others. I do not even contend that people very often consciously decide to assist identified persons rather than statistical lives. I do contend that evolution may have indirectly primed us to prefer to help identified persons rather than statistical lives.

Finally, even if this essay is largely correct, and even if the ideas in this essay are broadly disseminated, it is doubtful that individual behavior or public policy will change so as to dramatically shift medical resources from identified to statistical lives. This essay argues that certain of our cognitive preferences are deeply and biologically rooted in human nature and that they would thus be very difficult to change. For example, our unease in dealing with statistics is greatly refractory to change, despite even considerable re-education (Fishhoff 1982; Fischhoff and Bar-Hillel 1984b). As one author has observed:

> [P]eople simply do not have the cognitive schemata necessary for efficient performance in probabilistic tasks. . . . [P]eople do not learn optimum strategies from experience, even if they are given massive amounts of practice (Brehmer 1980).

The state of Oregon has attempted to improve benefit for cost by shifting resources from identified to statistical lives, but has met fierce resistance (Larson and Welch 1988). I believe such resistance will confront every major attempt to explicitly ration medical resources or to redirect resources from identified to statistical lives, but I also believe that some degree of change is possible, as the Oregon initiative illustrates. Almost certainly we cannot completely transform our basic cognitive preferences or the ways in which people deal with each other face to face. It would be literally inhuman to attempt to undermine our desire to help those we individually know as relatives, friends, and patients.

However, we could make changes on a public policy level to promote primary care and the welfare of statistical lives. We could recruit as physicians more candidates likely to prefer primary care. One way to do this would be to recruit a greater number of women into medicine. Government funding for medical training could be shifted to favor primary care and government could modify Medicare and Medicaid reimbursement rates to make careers in primary care more attractive. Training more primary care physicians and fewer specialists and subspecialists would constrain the use of high-tech services and would thereby constrain technologically fueled medi-

cal inflation. Government could reduce funding for research and development into new medical technologies (Schwartz 1987), thereby allowing market forces to help select the most cost-beneficial of the possibilities. If some possible new technologies were not developed at all, then we would not have to ration those technologies to some people while denying the technologies to other people. This method of implicit rationing would be more psychologically and politically palatable than explicit rationing. Government could constrain the growth of new high-tech procedures by reducing funds for the training of the ancillary medical personnel who would operate or administer new high-tech products. Finally, government could invest more in broad-based, low-cost-per-subject public health initiatives, such as vaccination programs, that would produce greater benefit for cost than do many high-tech interventions.

With respect to paying for particular treatments and not others, redistributive decisions should be made on a public policy level as in Oregon, so that individual care providers will not have to pervasively ration resources among the provider's own patients. Individual providers should certainly consider benefit for cost in making medical decisions, but should focus on the best interests of the provider's own patients.

However, as a society we must fact the fact that at some point we will have to deny at least some high-tech, low-yield services to at least some identified lives. Otherwise technologically driven medical inflation will consume an unbearably large proportion of our human and material resources. There are no perfect or easy solutions to the problems facing healthcare systems. However, evolutionary insights can help us understand how difficult and deeply rooted some of the problems are. Evolutionary insights can also help us lessen medical inflation and can simultaneously help us design policies to enhance the general social welfare by promoting primary care and the health of statistical lives.

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