

Perceiving Mortality Decline

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THE TOPIC of mortality risk perceptions has somehow failed to engage the interest of demographers. Perhaps this is because in demography, as in social science more generally, the passage from socioeconomic change to individual perceptions of change has been assumed to be immediate, or to involve lags of little consequence. If individual perceptions adjust quickly to changing empirical realities, such perceptions can justifiably be ignored. In the case of mortality decline in developing countries, however, there is good reason to believe that perceptions are likely to be diffuse, are quite possibly biased upward in relation to the empirical risks, and are probably rather slow to adjust to declines in those risks.

I base these propositions not on a large empirical literature in demography—there is almost no literature of this kind to cite—but on findings from cognitive and social psychology, disciplines in which probability and risk assessment have been intensively studied. A sketch of the findings from their literatures is as follows. When laypersons attempt to understand mortality decline, they are apt to bring to the task a great variety of rules of thumb and heuristic standards of judgment (see, among others, McKenzie 1994; Mellers, Schwartz, and Coale 1998; Nisbett and Ross 1980; Tversky and Kahneman 1974). The layperson's understanding of probability and risk is imperfect at best, and is particularly so when the probabilities are changing or when a correct assessment requires fine discrimination among levels of risk. Individual perceptions and individual experience alone may not then suffice. Furthermore, social learning—that is, learning from the experiences of family, peers, social network partners, and mass media—may suffer from biases and uncertainties that are similar to those affecting individual perception.

The usual perceptual difficulties are greatly amplified in the case of mortality by the fact that mortality decline is not fully exogenous. Rather,

in developing countries it involves a new set of social and political actors and institutions—those constituting the modern health care system—whose methods may not initially be accepted or judged to be clearly effective. Whether mortality decline is perceived is not just a matter of correct assessment of the external environment, but also a matter of how such new institutions establish credibility and win the trust of their clients.

Biases and lags in mortality perception may have a number of implications for demographic behavior. The most immediate of these may be seen in the motivations for modern health care, in which perceptual lags may leave doubts about the net gains to be expected from such care. The concepts of perceived efficacy and personal agency are pertinent here. But mortality decline has also been regarded as an important mechanism in fertility decline, taking a leading role in the formulation of demographic transition theory by Notestein (1945). It may be that biases in the perception of mortality decline, which cause the full extent of change to be screened from view, have much to do with delays in the response of fertility. Lloyd and Ivanov (1988) wrote of a “transition effect,” by which mortality decline brings greater predictability to the external environment and enhances individual confidence and the sense of personal control. These developments, in turn, may encourage a longer-term view of family-building and thereby set the stage for adoption of fertility control. One can imagine situations in which the motivation of parents to invest in the schooling of their children are also linked to perceived mortality risks. Lags and upward biases in mortality perception could therefore delay progress in both the quantity and quality dimensions of the fertility transition.

In the first section to follow, I sketch the health decision environment as it might be seen by a developing-country family, and single out the features of this environment that depend on perceptions. In the second section, drawing upon the rich literature in cognitive and social psychology, I stress the limits and potential biases that can distort probability perceptions and discuss how social learning—learning from others—can either correct or amplify individual biases. The third section presses the argument further, linking it to aspects of both modern and traditional health care. The key question in this section is how perceptions and social definitions shape beliefs about the relative efficacy of modern health care as compared to the traditional alternatives.

In the fourth section, I turn to the implications for fertility and investments in human capital. The links of mortality to fertility include the aforementioned transition effect and the three mechanisms identified by Preston (1978)—the insurance, replacement, and lactation-interruption effects. Although the connection of mortality to fertility has been the subject of considerable research (see Preston 1978; Montgomery and Cohen 1998), the insurance and transition effects remain poorly understood, and I argue that mortality perceptions are a central factor in these effects. As for hu-

man capital investments, I consider several pathways of influence through which perceived mortality decline might enhance motivations for investment. In the concluding section, I offer suggestions for a new research agenda.

The health decision environment

The task of detecting lower mortality might seem trivial at first glance, but consider the many social and perceptual issues that face families as they attempt to evaluate mortality risk. There is, first, the difficulty posed by multiple levels and actors. Mortality is partly the result of endogenous behavior on the part of families, as they choose among various forms of health treatment and prevention. The risk level also depends on exogenous factors that lie outside family control, such as state-initiated investments in water supply and sanitation, the extension of modern health service delivery, and the development of a modern private sector in health care. The second difficulty, which follows from the first, is that the parameters of the decision environment are changing, as new ideas about health care are introduced and new behavioral options are made available. The resulting trends in mortality are thus the product of powerful exogenous forces and the multiple endogenous responses to them.

Owing to this mix of the exogenous and endogenous, families seeking evidence on mortality risk will probably draw their information from a variety of sources. For some families, perhaps, a general sketch of the situation might suffice to summarize the risks. Others will require more information, seeking to understand what features of the changing health environment and what new options for health care yield demonstrably lower risks overall. For such families, the question of mortality decline is linked inextricably to changing information and transformed perceptions of modern and traditional health care.

In what follows, my central thesis is that it is far more difficult than one might suppose for families left to their own devices to perceive even the general outlines of mortality decline. The empirical facts will often be hidden from their view, obscured at least for a time by a number of perceptual barriers. For more accessible evidence, families may turn to the immediately surrounding health and health care environment, which will present both modern and traditional features. They may be persuaded of mortality decline if they can see in this heterogeneous environment clear evidence of the efficacy of modern health care. In this way, perceptions of mortality decline may depend to a considerable extent on perceptions of the modern health system.

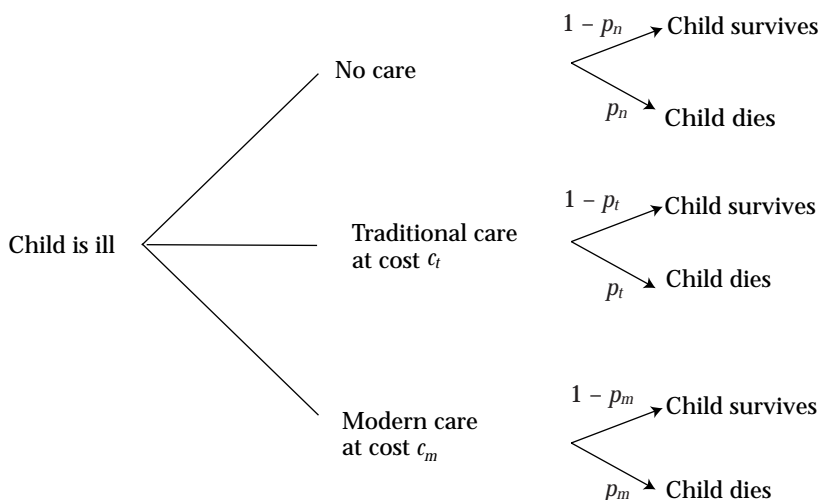
To appreciate these issues, let us consider a family's perspective in more detail. Figure 1 depicts the situation that a family might face when one of its children falls ill. Three choice options are assumed to be avail-

able: do nothing and hope for the child's recovery; make use of traditional care, which entails costs c_t ; or seek modern medical treatment, with associated costs c_m . The outcome of any of these choices is uncertain, and such uncertainty is expressed in the mortality probabilities p_n , p_t , and p_m that are associated with the choice alternatives.¹ A rational decisionmaker, upon surveying this range of costs and probabilities, would select the type of care offering the highest expected net benefit.

For those who have adopted Western views about medical care, it might be taken as a given that $p_m < p_t$ and $p_m < p_n$. That is, holding constant the severity of the child's illness, such decisionmakers would rate the prospects for survival as better if the child is given modern treatment rather than traditional or no treatment. But how widely shared are such Western-influenced views? Are they mainly the beliefs of the better educated? What heterogeneity in views exists? Even if modern health treatment is commonly acknowledged to have a higher payoff than traditional care (in the sense that $p_m < p_t$, the perceived margin of difference in these probabilities might be regarded as slight. Furthermore, if high costs c_m hinder access to modern care, this could reverse its net advantage over the traditional modes. Important determinants of such costs lie on the supply side, where shortages of medicines and personnel can render the modern system's superiority largely hypothetical. When taken together, all these costs and probabilities determine the proportions of families choosing modern health treatment.

The likelihood of obtaining modern treatment will vary over time in response to trends in the outcome probabilities, the associated costs, or both.

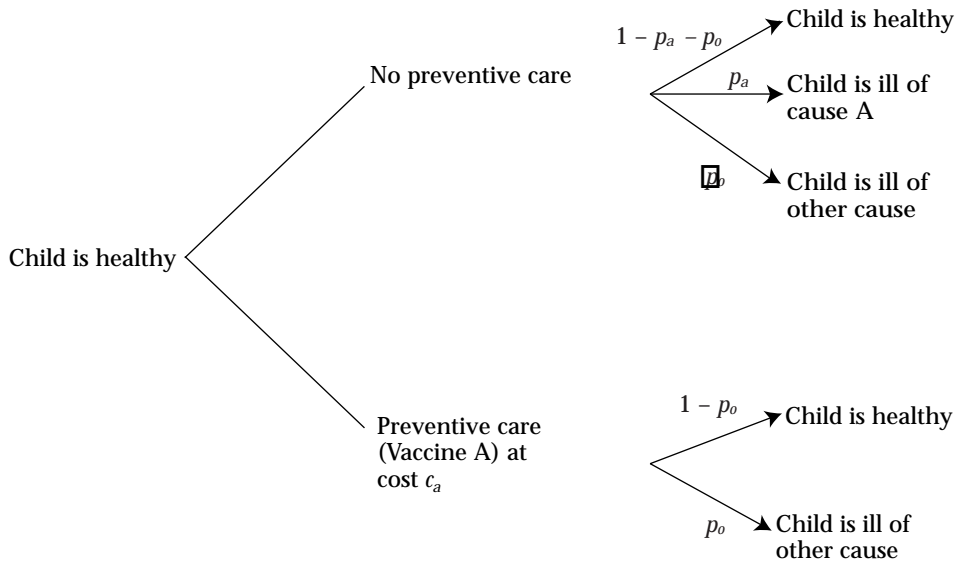
FIGURE 1 Decision options for the parents of an ill child



For example, as general living standards improve, the probabilities of recovery from illness may rise, so that p_n , p_t , and p_m all decline. These changes may be proportional, or, if the quality of modern treatment also improves, p_m may decline by the greatest proportion. If such changes are mirrored in perceptions, they should increase the motivation to use modern treatment and lead to a greater overall decline in mortality than would otherwise have occurred. Likewise, program-driven improvements in access to modern care will reduce c_m and thereby increase the likelihood of modern care.²

Figure 2 extends consideration to the prevention of illness. Here, the child is assumed to be initially healthy, and the question is whether to invest family resources c_a in obtaining a vaccination against a particular cause of illness (“Cause A”). The issues are not specific to vaccines; they could be illustrated with any relatively new preventive behavior. The expected net benefit of the vaccine will depend on the perceived incidence of this cause (as expressed in the probability p_a that an unvaccinated child will contract the illness) and will also depend on lay understandings of the efficacy of vaccines. Figure 2 depicts a situation in which the vaccine is believed to be perfectly effective in preventing Cause A illnesses. Of course, this may not be the way that vaccines are actually viewed. Suppose it is difficult to distinguish between the symptoms of Cause A and the symptoms of other causes of illness. How, then, does a layperson come to know that the vaccine is perfectly effective? Under what circumstances do the assurances of modern health personnel become credible?

FIGURE 2 Decision options for the parents of a healthy child



The family's motivation to adopt a new preventive behavior (here, a vaccination) will be derived, in part, from the consequences it would face if prevention fails. In this way, the costs of health treatment and the outcome probabilities that were sketched in Figure 1 would affect the perceived net benefits of the preventive vaccination option shown in Figure 2. If families behave as if they conceptually linked Figures 1 and 2, then their decisions about prevention would depend in a complicated fashion on a host of probabilities and costs.

The image just invoked, of rational family decisionmakers assessing various health decision options, requires further elaboration. The costs and probabilities of Figures 1 and 2 are properly viewed as subjective quantities, having values that are dependent on the information available to the family and the way in which that information is processed. In no socioeconomic setting—not even in the most highly developed of Western societies—will very many families have knowledge of disease incidence probabilities and mortality risks. In general, and particularly in poor developing countries, such risks will be understood in terms of approximate comparisons and subjective rankings or ranges.³

A developing-country family thus faces a complex set of tasks in seeking to understand mortality risks. A correct assessment—one that accords with the objective risks—would seem to require unusual sophistication and powers of discrimination. Sorting through the risks would be difficult enough in an unchanging environment, but the task is rendered even more difficult by variation over time in the exogenous probabilities and costs.

Mortality perceptions

In this section, I argue that individual perceptions of mortality risk are not likely to track the improving empirical realities without an intervening period of upward bias and uncertainty. Remarkably little demographic research has considered the possibility of a gap or lag between the changing empirical risks of mortality, on the one hand, and the perception of these risks, on the other. Some gaps and lags in understanding are to be expected, of course, but the social circumstances associated with long lags and enduring biases in perception have not been studied. Although the demographic literature has been largely silent on the matter, some insights can be gleaned from an extensive literature in cognitive and social psychology on the issue of lay perceptions and understandings of risk and probability (for a review, see Montgomery 1998).

This literature suggests that, if left to their own perceptual devices, individuals may be poorly equipped to comprehend the improvements in survival that are underway. The facts that are readily accessible to them will seem to support alternative interpretations, and considerable time can

elapse before the downward trend in risk becomes fully apparent. One should therefore expect the initiation of mortality decline to be followed by an interim period during which the phenomenon is in doubt. Mortality decline will be dimly perceived by some but stoutly denied by others, and most will be left uncertain.

In many ways, the case of mortality decline exemplifies the perceptual difficulties that confront laypeople in matters of probability and risk.⁴ Some form of probabilistic thinking may well be required even to organize the relevant data. A lay counterpart to the concept of events (deaths) in relation to the population at risk seems to be needed, as well as a means of gathering the numerators and denominators. It is not at all obvious how the layperson, situated in a rural village or living amidst the bustle of a developing-country city, would find himself equipped with such concepts and information. Since mortality decline gives rise to more rapid natural increase, total deaths may increase even as the crude death rate decreases. This no doubt compounds the problem.

A further difficulty is the natural tendency among laypeople to view death as the noteworthy event, with its logical complement, survival, attracting less attention. Psychologists would term survival a “null event” from the viewpoint of the layperson (Estes 1976; Nisbett and Ross 1980). As long as a child survives, nothing really seems to have happened, whereas a child’s death is readily marked as an event.⁵ Such perceptual biases are accentuated by the tendency, well documented in the psychological literature, for negative events to exert a disproportionate influence on beliefs, with positive events appearing to have much less subjective impact (e.g., Skowronski and Carlston 1989; Taylor 1991; Viscusi 1997).

The literature also shows that, often, the layperson will attach too much weight to a small sample of immediate experience—say, a few years’ worth of births in his own village—a tendency that can overwhelm the efforts of public health campaigns to convey the broader and more representative picture. Adding to these difficulties is what psychologists term the “primacy effect,” by which events that occur early in a temporal sequence appear to exert disproportionate influence over later beliefs. In the case of mortality experience, one might form one’s first impressions of risk during childhood or adolescence, these being relatively high-mortality periods in an era of secularly declining mortality. This early experience may establish a durable perceptual frame that resists revision. One’s own direct experience with risks, derived from a lower-mortality period, might prove insufficient to dislodge earlier beliefs.

Another aspect of the problem is the need to separate average mortality risk from its variance (Slovic 1972). High-mortality environments often exhibit considerable variability in mortality, with experience being punctuated by occasional episodes of famine, flood, and epidemic. Looking back

on such experience, the layperson might find it difficult to discern the general downward trend in risk, with memory distracted by such vivid and catastrophic occurrences.

The common theme in these observations—necessarily offered tentatively, given the absence of demographic research—is that individual perception alone is probably a poor device for detecting downward trends in mortality. Individuals cannot be expected to act as lay statisticians: they lack both the necessary information and the conceptual framework for organizing it. If left to themselves, they would seem to be ill equipped to filter the signal from the surrounding noise.

In time, of course, perceptions will come to be corrected and mortality decline will come to be recognized. But if unaided individual perception is as weak a discriminator as I have suggested, might the key to learning be the information that individuals draw from their social interactions? Information can be gathered from interactions with family, discussions in peer groups and other social networks, and conversations with the better-educated; it can be distilled from media messages and from the modern health sector. All these can be regarded as avenues for social learning and diffusion (Montgomery and Casterline 1996), by which new ideas about mortality risks come to intermingle with the old.

Learning from family

Children growing up in high-mortality environments will inevitably know or hear of the deaths in infancy and childhood of their siblings and other relatives. Mothers, fathers, and elders may sometimes tell children of their own family histories, which unfolded in even higher-mortality eras. As children enter adulthood and begin to build their own families, much of the social knowledge they inherit would thus seem to exaggerate the current level of mortality risk.

Counteracting this perception, however, is the possibility that with declining mortality, the parents of one generation will find themselves surprised by the number of their children who have survived, that is, surprised in relation to the smaller number they had somehow expected to survive. Parents may find their larger-than-anticipated families pressing against scarce resources such as land. Looking about them, they may observe their peers also struggling to accommodate larger surviving families. When it can be set against some readily understandable denominator—such as arable land—the fact of improved child survival may then clearly impress itself upon the older generation and become part of the social knowledge they bequeath to their own adult children.

Social learning of this form would seem to require considerable time, during which the data are pieced together by the older generation, slowly

understood, and the implications then imparted to the young. If this is indeed the dominant form of social learning, it would imply very long lags—perhaps as much as a generation—between the initial stages of mortality decline and the beginnings of a response in fertility or other demographic behavior. The mechanism requires something akin to a comprehensible denominator, and the role suggested above for land might not apply to rural areas with substantial out-migration and might not have any obvious counterpart in urban areas.

Learning from social networks

Networks of peers and other contemporaries may allow social learning to proceed at a faster pace. Just as with familial experience, however, it is difficult to say whether information drawn from social networks must necessarily reduce the upward biases of individual perceptions. Much depends on the nature of these networks and the variety of information possessed by network members. The notion of “weak ties” is pertinent here (Granovetter 1973).

Consider an individual woman whose social network is homogeneous, being largely populated with her peers. Her network is then rather like a small population in which, over a short period, the stochastic nature of births and deaths can give a misleading picture of the underlying probabilities. If her attention is selective, tending to focus on negative events, then instances of child death within the network will come readily to mind, will have the force of immediate example, and will seem to disprove the hypothesis of mortality decline. Moreover, in a high-mortality population, at least one woman in each network can be expected to know of a statistically unusual case, such as a family that has lost all of its children. Her experience can be shared with her network partners, and if such atypical cases dominate perception, the propagation of information by networks might further exaggerate individual bias.⁶ As long as the perceptual biases described above are widely shared, and as long as individual network members possess no novel information that forces long-held beliefs to be reexamined, the fact that individuals are linked to each other by networks need not bring perceptions any closer to the empirical realities.

If social networks are heterogeneous, however, either in perceptual style or in information, then social interaction can serve as a corrective. Consider a case in which an uneducated woman is linked to a network partner who has some experience of primary school. Through schooling, this somewhat better-educated woman might have absorbed a few facts about health conditions and changes in survival. She could have learned to be more attentive to the messages about health and health care that emanate from government and the media.⁷ She might at least have been

exposed to the idea that mortality is controllable, a view that in itself would tend to heighten attention to information (Simons 1989). When shared with her network partners, the educated woman's example or experience might lead her partners toward a new way of thinking about their own environments. Functioning in this way, heterogeneous networks, in which some members are connected to others who possess distinctive information, can assist in spreading new views of mortality risks and the emerging health care options.

New conceptions of adult mortality risks may also be shaped by information exchange. Adult beliefs about risk may be much affected by the perceived incidence of premature death, whether resulting from maternal mortality, accident, or AIDS. In some developing-country settings (notably, in West Africa), adult social networks can exhibit an extraordinary breadth.⁸ Such wide networks facilitate transmission of information about premature adult death, and this alone might cause the risks to be exaggerated. Yet, wide networks may also offer weak links to better-educated or urban residents who have new ideas to share about improvements in health and declining mortality risks. Here, too, the net effects of social interaction are ambiguous and dependent on network structure and heterogeneity.

Other social effects

I have stressed the role of social learning in the transmission of information about risk, but some potentially important byproducts of social interaction need not involve learning as such. Ewbank and Preston (1990) and Lindenbaum (1990), among others, have stressed the power of social example to spread new models of personal hygiene. In Lindenbaum's depiction of rural Bangladesh, better-educated women often adopt distinctive practices in their childrearing and discipline, in their treatment of food, and in the cleanliness and order they impose on home and courtyard. They do so not because they expect benefits to materialize in the form of better child survival—there may be no perceived connection whatsoever—but rather to establish a certain social distance between themselves and the other villagers. Nevertheless, if the better-educated women succeed in presenting themselves as models worthy of emulation, their example may encourage new and beneficial forms of behavior.

Perceptions of modern health care

As I noted above, exogenous mortality decline can occur as the result of economic development and the improvements it brings in individual incomes and government investment in public health. Particularly in the early stages of development, however, such improvements are likely to be dis-

tributed unevenly, with benefits conferred on some socioeconomic groups while others are left in isolation. Furthermore, although exogenous factors will remain important, deep declines in mortality almost surely require access to modern methods of disease prevention and cure. Access to these methods entails money, time, and social costs, so that if their use is to be widespread the benefits of modern methods must be commonly perceived to outweigh the costs. The perception-based motivations for modern health care use are therefore central to the endogenous aspects of mortality decline.

In high-mortality, pretransitional societies, individuals engage in any number of preventive and curative health behaviors. The developments needed to produce sustained mortality decline are, first, that these individual energies are redirected to the modern health system; and, second, that the modern system obtains the resources it needs to supply effective health care. The two developments are, of course, closely related. In addition, they are linked by potentially beneficial feedbacks.

This discussion returns the focus to Figures 1 and 2, in which several factors involved in health decisionmaking were schematically presented. The concept that encompasses these figures is that of "agency," a term that refers to the choice options available to a decisionmaker (e.g., the presence of a vaccine option in Figure 2), the accessibility of these options (e.g., the costs c_m in Figure 1), and the degree to which choices make a difference to outcomes (e.g., the differences among the mortality probabilities p_m , p_t , and p_n of Figure 1). The concept of agency is central to much of the literature on health decisionmaking, where it appears under various guises—internal locus of control (Higginbotham and Connor 1990; Landau 1995), coherence and predictability (Lundberg 1997, citing Antonovsky), and self-efficacy (Bandura 1988). It is an important feature of economic expected-utility models of health decisions and figures as well in the closely allied health belief model (Becker et al. 1977) and the theory of reasoned action (see Vanlandingham et al. 1995).

Conditional linkages to modern care

In high-mortality societies the link between individual agency and use of modern health care can be weak or elusive, sometimes dependent on circumstance and emerging only in certain stages of illness. Some illnesses first manifest themselves in a benign, everyday form that, even in pretransitional settings, allows considerable latitude for individual decision and experimentation. In the early stage of illness, modern health treatments can be employed along with various home or traditional remedies; the caretaker or afflicted individual is permitted some freedom in choosing among the options. If the illness progresses, however, understandings of its root cause may also shift, and it may come to be recognized as the ex-

pression of malevolent earthly or supernatural forces. Once the new interpretation is adopted, modern health treatments may be discarded as largely irrelevant. The locus of control may then pass from the individual to the wider social group, sometimes involving family elders and traditional healers, who attempt to understand the full meaning of the illness and act accordingly.

Kirby (1997) describes the case of the Anufo of northern Ghana, whose vocabulary of illness distinguishes a “cool” or “white” stage of illness from a hotter or “red” stage and, as death approaches, a final “black” stage. These categories represent ways of ordering the interpretations of illness and allow the Anufo to express their shared understandings of the causes and remedies that apply to a given stage. In the white stage of simple, everyday illness, individuals may experiment freely with Western and traditional medicines. But, as the illness worsens and enters the more serious red stage,

Now everyone has a specific role to play and the entire process is orchestrated by the elders. Ill persons are no longer free to exercise their individual decisions in the matter, mothers are no longer free to take their children to the clinic or to prepare amateur herbal treatments. All activities of self-help, characteristic of the pre-diagnostic [white] stage, cease. (Kirby 1997: 223)

Although the transition from individual to collective action is not always so marked as in West Africa, a great number of societies show similar tendencies in classifying illnesses and tailoring responses.⁹

In many settings, illnesses such as neonatal tetanus and measles present symptoms that are immediately recognized as the expression of powerful external forces working against the child, its parents, or the community. Illnesses such as these will not naturally fall within the scope of the modern health care system. In West Africa, a belief in “spirit children” (Feyisetan, Asa, and Ebigbola 1997) remains common: these are children who, because of their circumstances of birth or distinctive early behavior, are understood to be only tenuously linked to life and who may easily slip back into the other world. In other societies, such as in northeastern Brazil (Scheper-Hughes 1992), some children are thought to be born lacking sufficient will to survive. Through no one’s fault, it is believed, they are unlikely to live and there is really nothing that can be done about it. These are situations in which social definitions limit the reach of modern health care.

Extending the modern system’s reach

For the modern health care system to take a more prominent place in decisionmaking, it must first display its superior effectiveness in regard to either prevention of illness or cure, and the system must be organized to

permit access to care of adequate quality. How, then, does the modern system prove its effectiveness? To the layperson, what constitutes evidence? When is such evidence felt to be persuasive?

Views of effectiveness are dependent on both individual and social experience, with each of these being filtered by perception. In health, the modern system proposes new causal explanations for illness and advances claims for new causal links between modern care and positive health outcomes. At least where treatment is concerned, one might think that a few rounds of exposure to the modern techniques would prove sufficient to sway any skeptics, leaving it incontrovertibly clear that the new methods will improve survival.

Yet, as discussed by McKenzie (1994) and Nisbett and Ross (1980), there are severe constraints on laypeople's abilities to detect such covariation in their immediate experience. The key concepts in covariation detection are those of "distinctiveness," or the extent to which the outcome of interest is mainly observed in the presence of one cause, and "consistency," which describes whether the outcome is always observed when the proposed cause is present. If such criteria are applied to health care, in which the link between treatment and response is necessarily probabilistic, the advantages offered by the modern system may seem less than obvious. After all, sick children sometimes recover after being treated by a traditional healer, and not all children will thrive after receiving modern treatment. Potential users must learn to appreciate the higher recovery probabilities associated with use of modern care, a task that may call for finer powers of discrimination than they possess. Selectivity biases associated with the costs of access to modern care may further cloud the picture. When the modern system imposes high fees for its services or access is delayed by time and travel costs, children may not be brought to the clinic until their conditions are too far advanced for simple treatments—or any modern care—to be effective. Understandings of modern preventive health care, in which behavior and outcome are separated in time, may prove even more difficult to achieve.

Perceptual difficulties are especially likely if long-established health beliefs act so as to screen the proposed new relationship from view. In some settings, the relative ineffectiveness of traditional health care may be well disguised, for as Nisbett and Ross write,

...objectively low or nonexistent covariations can be parlayed into massive perceived covariations through *a priori* theories and assumptions.

...

...Unexpected, true covariations can sometimes be detected, but they will be underestimated and are likely to be noticed only when the covariation is

very strong, and the relevant data set excludes 'decoy' features that bring into play popular but incorrect theories. (1980: 97, 109)

In a society with coherent and internally consistent traditional beliefs about the origins of illness, appropriate means of prevention, and routes to cure, modern health care may initially struggle to make a persuasive case (Caldwell, Reddy, and Caldwell 1983).

The difficulties facing advocates of the modern system should not be exaggerated, however. Most societies have seen a good deal of inter-penetration of modern and traditional health systems (e.g., Pitts et al. 1996; Haddad et al. 1998). The layperson's understanding of health is often loosely organized, and in many settings individuals seem to adopt eclectic and improvisatory approaches. Bierlich describes health decisions in northern Ghana as follows:

People make use of both local and Western medicines, without knowing or being committed to the technical or philosophical premises of one or the other medical system. People are generally uncertain about the cause and outcome of illness and often act in advance of evidence about its cause. Their practices are not homogeneous, but diverse or 'un-systematized,' and highly innovative. Their approach to treatment shows itself in their general readiness to experiment with all kinds of medicine, simultaneously or serially. Medicines, local and Western, are used in a trial-and-error manner. If one does not produce the desired result, another medicine is tried instead. 'We are just trying,' people say. (1995: 505)

Such fluidity is also noted by Ryan (1998) and Cantrelle and Locoh (1990), who mention the practice of double consultations for illnesses that might be seen to have either a natural or a spiritual cause.

In settings such as these, the modern health care system can seize upon opportunities to associate its methods with the traditional vocabulary and understanding of health. Kirby (1997) notes that Western medicines can be associated with the "white" or "cool" initial stages of illness to encourage timely use. Vaccines can be described as strengthening the protection already being provided by amulets (Findley 1990; Nichter 1995); injections can be likened to beneficial fluids in settings where good health is thought to require a balance of positive and negative fluids (Bastien 1995); and oral medications can be left unsweetened and bitter to underscore the point that they are powerful.

Of course, the mapping of traditional labels onto modern methods will often prove to be imprecise (Gove and Peltó 1994). The consequences of such mis-mapping have been explored by Nichter (1990, 1995) in regard to community views of vaccination campaigns in South Asia. Nichter's research illustrates the consequences stemming from folk labels that are

too broad in relation to the specific protective powers of a given vaccine. Suppose that the local label covers a cluster of illnesses with similar symptoms, with the vaccine being effective against only one illness in the cluster. This can lead to instances of apparent vaccine failure, which would undermine confidence in the vaccine's efficacy and cast doubt on the claims of health personnel.¹⁰ The modern system may succeed in conveying the simple and general message that vaccines are good for health, but then fail to clearly differentiate these vaccines. In consequence, the local population may come to believe that vaccines are all very much alike. Parents may lack motivation to comply with the full regimen for any one vaccine and may not grasp why they should keep track of the number of vaccinations of a particular type a child has received. This, too, can lead to cases of apparent vaccine failure.

The matching of modern methods to folk concepts is therefore not a simple task. Fortunately, the widespread use of modern health care does not require the local population to discern the root causes of illness in the same way as their Western-influenced health providers. Disparities in the understanding of causes are not necessarily inconsistent with use of the modern system (Feyisetan, Asa, and Ebigbola 1997; Cleland 1990; Raharjo and Corner 1990). Indeed, as Cleland (1990) argues, health-related behavior is likely to change faster than underlying cultural beliefs about root causes. What matters is that the modern system is perceived to be effective and that it has the resources needed to deliver on its promises.

Social and political agency

As the modern health sector's potential advantages gradually become clarified, so, too, will many of that sector's limitations. Continuing shortages of medicine, high fees and long waits, the intermittent presence of key personnel, the abusive or condescending treatment of patients—all these will be exposed as the population comes into increasing contact with clinics and hospitals. Having been persuaded of the theoretical superiority of Western medicines, people may nevertheless avoid the modern system because of its higher social and monetary costs.

In successful transitions, this tension is eventually resolved with the emergence of new forms of social and political agency with respect to health. The concept of equity begins to be applied to the distribution of state-controlled health resources, and, with it, the definition of a right to press demands on the state for resource provision. Local, regional, and national political networks may evolve and provide a forum for voicing such demands. Such new political dialogue can eventually succeed in redirecting governmental priorities and improving the quality of health systems. When groups succeed in drawing the attention of the state to their needs, this may further enhance the sense of individual agency on the part of their

members, generating a kind of beneficial feedback. A number of accounts, both historical and contemporary, have emphasized the importance of such social and political dynamics (Dye and Smith 1986; Caldwell 1986; Lindenbaum 1990; Ewbank and Preston 1990; van de Walle and van de Walle 1990; Preston and Haines 1991).

The record of the United States from the late eighteenth to early twentieth centuries provides one case in point. Dye and Smith (1986), drawing their evidence from women's diaries, find in this period that the possibility of child death was an ever-present concern. Vinovskis (1991), using similar materials, argues that mortality perceptions were likely to have been inflated in relation to the empirical realities. He locates one source of this exaggeration in the influence of religious institutions and the social emphasis attached to funerals.

Yet, with mortality still high, and even before the advent of modern medicine in the last years of the nineteenth century, a shift in the scope of personal agency began. The key change was that, over the century, child-rearing responsibilities were increasingly assigned to mothers, rather than being distributed among various kin and caretakers as in the earlier era (Dye and Smith 1986). As mothers began to be entrusted with the task of safeguarding their children, and as good mothering began to be defined in these terms, the lack of any truly effective medical care led to tensions between the newly assigned social roles and the limited health care options. Until the very end of the century, these socially defined obligations could not always be properly discharged; the result was mounting anxiety and a sense of frustrated personal agency.

When the medical breakthroughs were finally made, women responded in both personal and political terms (Dye and Smith 1986; Ewbank and Preston 1990; Preston and Haines 1991). In personal terms, they enthusiastically adopted the new medical techniques of the late nineteenth and early twentieth centuries, and were attentive to and adhered to advice. In the political sphere, activists channeled collective energies to the creation of the Children's Bureau, supported local conferences and instruction for young mothers and girls, and aided other government and public health institutions. Thanks to the prevailing levels of literacy, pamphlets and even newspapers helped to diffuse information.

The foregoing account of the US experience illustrates more general themes that have been given little research attention by demographers. The American case raises the issue of perception of mortality risks, as against the empirical risks themselves. It underscores the distinction between high risks and risks that, although still high at the end of the nineteenth century, were increasingly believed to be controllable. The key role was played by new health care options that emerged at the dawn of the twentieth century, with support from new germ theories that gradually supplanted the older notions based on miasmas, sewer gases, and the like. Literacy

helped to spread the new ideas among women; but also important was the diffusion of information between public health practitioners, on the one side, and a sometimes reluctant medical profession, on the other (Preston and Haines 1991). The mix of personal, institutional, and political responses is not unique to the United States—Caldwell (1986) presents a similar account of the factors involved in mortality decline in Kerala.

Mortality decline and the quantity–quality transition

Where both mortality and fertility have been high, to adopt a new strategy of family limitation is to embark on a risky course of innovation, one that will often lack clear social guidance and normative support. Few people in such circumstances would be likely to experience criticism by adhering to the status quo. Potential innovators might be deterred by the prospect of child loss, even if they suspect that mortality rates are lower than they were in the past. They might feel unable to proceed without additional confirmation of their views and may therefore delay until very sure of the lower risks.

Such conservatism in risk-taking is predicted by a number of theories in psychology and economics. Experimental research on prospect theory (Kahneman and Tversky 1979) seems to have uncovered a fundamental asymmetry in how choices are made under risk (see Camerer and Kunreuther 1989; Camerer 1995; Conlisk 1996; Mellers, Schwartz, and Coale 1998). It appears that decisionmakers often behave as if they are more fearful of potential losses than attracted by potential gains. In addition, at least according to some psychologists (Mellers, Schwartz, and Coale 1998), regret is felt more keenly following decisions to act rather than to accept the status quo. This literature suggests that the anticipation of regret is an under-appreciated factor in decisionmaking.

If such findings can be extrapolated to the case at hand, they would suggest that new strategies of fertility limitation, insofar as they are motivated by lower mortality, should not be expected to appear on the heels of mortality decline. Potential innovators risk feeling regret should their new strategy fail, and they may also face social sanctions and criticism from family elders and others who never saw the need to deviate from the status quo. To buttress their own positions and fend off such attacks, innovators may need incontrovertible evidence of lower mortality risks before they proceed.

Fertility control: Transition and insurance effects

In high-mortality, pretransitional societies, fertility decisionmaking is sometimes described as being passive or even “fatalistic.” More accurately, perhaps, it can be seen as the result of a rational stance vis-à-vis an uncertain

environment, in which the pervasiveness of uncertainty means that decisionmaking must be reactive and highly contingent. As child survival becomes increasingly assured, a different form of decisionmaking is permitted to emerge, one that involves forward-looking strategies that play out over longer time horizons. Parents may then begin to entertain the possibility of influencing the size of their own families, instead of leaving such matters to chance or to higher powers. As the number of children begins to assume importance as a decision option, so, too, do new forms of investment in children that would have been dismissed previously as too risky. Lloyd and Ivanov (1988) have described this transition as a shift from family-building by fate to family-building by design.

As it becomes useful to consider controlling the number of children, the perceived level of mortality may then begin to exert influence on the desired number. This is the essence of the insurance effect (Preston 1978; Wolpin 1998), which in its simplest form posits an inverse relationship between the probability of child survival and the desired number of births. As the articles in Preston (1978) and Montgomery and Cohen (1998) show, it has proven difficult to test the insurance hypothesis. Some authors have taken the level of mortality in the community, variously defined, to be the empirical counterpart to mortality risks as they are perceived by individual decisionmakers. The discussion above suggests that the association between such empirical measures and the subjective risks may well be weak. If so, then alternative measures of perceptions may be required, a point to which I return in the concluding section.

Capital investment

Few economists now question the importance of human capital accumulation to economic development. Yet, it is difficult to isolate the role of mortality decline in promoting human capital investments. After all, the vast majority of child deaths occur among children who have not yet reached school age. How, then, can schooling investments be directly affected by mortality decline? As Preston (1980: 324–326) showed, the mortality risks facing children in adolescence and the early adult years are relatively low even in high-mortality environments. From the viewpoint of the child who is old enough to embark on a school career, improvements in survivorship could have little effect on the private rate of return to schooling.¹¹ The direct impact of mortality decline would therefore seem to be small.

Several indirect links, however, warrant consideration. First, high-mortality settings are often characterized by high morbidity. Morbidity may be associated with delayed entry to school, interrupted attendance, and eroded abilities to learn (Behrman 1996; Alderman et al. 1997). All these will tend to reduce the payoffs to schooling and thereby reduce the moti-

vation for parents to invest in it. A second possibility is that if the insurance mechanism is operative, higher mortality risks will be associated with higher fertility, with the result that in a typical household more young siblings may be present who will need care. Child care and related household responsibilities may then divert children's time and attention from school, particularly for girls, and this may undermine abilities to learn and lower the returns to further schooling. In this case, mortality decline—if it is accompanied by some fertility decline—could raise the net benefits of schooling.

A third mechanism involves adult mortality. Environments with high infant and child mortality are also characterized by high adult mortality, and parents may well hold exaggerated views of adult mortality risks. Since it is parents, rather than children themselves, who finance human capital investment in developing countries, the parental time horizons and perceptions of risk are key factors in determining whether the investments are made. In many developing countries, fathers take on much of the burden of paying school fees and associated charges. Particularly where substantial age gaps separate husband and wife, the fathers of school-age children may often be of middle age themselves, entering a period in which their risks of mortality are felt to be appreciable. They may well be reluctant to embark on ambitious programs of human capital investment in their children, given the possibility that the child's schooling might have to be truncated in the event of a parent's death. Even if a child's schooling can be completed, the time span during which the parents can expect to enjoy some returns will depend on adult mortality risks. Thus, when seen from the viewpoint of parents, perceived improvements in adult survivorship may considerably enhance the motivation for investing in children.

Little is known about adult perceptions of older-age mortality risks, but in recent years a small literature has emerged exploring the issues in the United States. Two studies have examined the fit between the survival perceptions of the elderly and the actuarial risks as summarized in period life tables. Hurd and McGarry (1995) drew upon the innovative measures of mortality perceptions that are being collected in the Health and Retirement Study. In their investigation, considering a highly literate population that is well supplied with information from pension and insurance systems, Hurd and McGarry found surprisingly good agreement between the subjective and objective measures. However, Mirowsky (1999), using less-refined questions from a different US survey, saw evidence of systematic differences between subjective expectations of years of life remaining and the actuarial counterparts. His results suggested that unexplained factors associated with race and socioeconomic status cause some groups to be unduly pessimistic about their survival prospects. Regrettably, no studies such as these seem to have been carried out in developing countries.

Much of the motivation for measuring old-age mortality perceptions in the Health and Retirement Study stemmed from a need to understand the determinants of financial savings. In developing countries, the expansion in parental time horizons brought about by lower adult mortality may well encourage financial savings. Lee, Mason, and Miller (2000), considering the case of Taiwan, show that the expected ratio of postretirement years to working years can increase greatly with mortality decline. This can substantially enhance the motivations for private savings.

Through routes such as these, recognition of lower child mortality and improved adult survivorship might increase the returns to investment in both human and physical capital. The prospects for greater returns in these dimensions could undermine much of the rationale for continued high fertility. In traditional settings, an important role for children is to serve as a form of savings: they embody parental claims upon future transfers from family. If mortality decline is accompanied by the emergence of better-developed financial systems and improved payoffs to financial and human capital investment, educated children and monetized savings might come to be seen as more effective instruments than numbers of children alone.

Conclusions: A new agenda

A main theme in this discussion has been the need to appreciate the many perceptual difficulties and biases that hinder people's understandings of social change and retard their demographic responses. Poorly equipped as they are to sort through the issues, individuals will probably be slow to recognize improvements in child and adult survival, whether these are linked to exogenous developments or to the new opportunities presented by modern health care. Without some assistance—from family, social networks, the better-educated, and health programs and policies—individuals will then be reluctant to disengage their energies from traditional forms of demographic behavior and to embark on risky courses of innovation. Although demographic research can offer no definitive proof, it is reasonable to think that the well-documented lags in the fertility response to mortality decline have much to do with the role of these perceptions and beliefs. The essence of the familiar insurance effect can be found in the complex of individuals' beliefs about the nature of the external environment they face, their sense of agency and ability to control that environment, and their understanding of the operation of cause and effect in health.

A second theme is that mortality decline can set in motion a series of reinforcing responses, with the long-term result being that higher survivorship becomes associated with a lower net reproduction rate. Little is known about the full causal chain or the important demographic and economic mechanisms that could generate such beneficial feedbacks. I have argued that both children's schooling and financial savings can be posi-

tively influenced by mortality decline and that capital formation will have broader benefits for economic development. It is at least possible that such feedbacks serve to link mortality decline to economic growth.

The discussion has taken mortality decline to be the dominant empirical phenomenon, but in some countries the prevalence of HIV infection will soon bring a halt to further declines and may sharply increase both adult and child death rates. The sheer scale of the impending losses in parts of Africa and the inability of the modern health system to mount an effective response, when coupled with the personal shame and stigma that accompany the infection, will likely bring about a profound confusion in beliefs. Individual time horizons, once lengthened by the prospect of lower mortality, will inevitably be pushed back toward the present; motivations for saving, schooling, and other future-oriented behavior may be seriously undermined.

The current state of demographic research permits very few of the effects that I have described to be quantified. Standard survey-based measures of perceptions will eventually be required, but these are probably not the tools to deploy first. Although the recent survey efforts in the United States appear promising (Hurd and McGarry 1995; Manski and Straub 2000; Mirowsky 1999), much work is required to devise appropriate measures for studies set in developing countries. Even semistructured individual interviews would need to be carefully crafted to accommodate local beliefs, vocabularies, and ways of thinking about probability and risk. In few settings will adults be able to articulate why they feel as they do about mortality risks; nor can they often trace for the interviewer's benefit the connections they see between mortality risks and fertility or schooling decisions. Thus, even a program of qualitative investigation would be required to break new methodological ground. A systematic approach to these issues is well overdue.

Notes

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1 Of course, the mortality probabilities p_n , p_t , and p_m and the costs c_t and c_m will depend on the severity of the child's illness. The costs might have multiple dimensions, including travel time, monetary outlays, and various social "transactions costs" that arise, for example, from the need to negotiate with a spouse or family decisionmaker about health outlays.

2 To integrate such factors, the mortality probabilities and costs could be represented

with a government policy index g and a time index t , yielding, for example, $p_m(g,t)$ for the modern care mortality probability and $c_m(g,t)$ for the cost of modern care.

3 There is a formal mechanism available—Bayesian analysis—for taking such uncertainties into account. I have argued elsewhere (see Montgomery 1998) that to simply recast the decision problem in Bayesian terms is inadequate.

4 I present here only a sketch of the arguments; see Montgomery (1998) for more detail.

5 Lloyd and Ivanov (1988) note that as survivorship improves, the changing age pat-

tern of risk helps to distinguish the relatively high-risk period of infancy from the post-infancy period in which survival is almost assured. In this way, as mortality decline proceeds a dividing line emerges that helps to draw attention to the fact of survival, making it easier to recognize survival itself as a noteworthy event.

6 Although it might be thought that an averaging process would eliminate individual errors of observation when opinions are exchanged in larger groups, studies of group dynamics do not consistently support this contention. See Montgomery and Casterline (1996) and the references cited therein.

7 LeVine and colleagues (LeVine et al. 1994; Stuebing 1997) have argued that schooling provides individuals with the cognitive skills they need to translate the "decontextualized" language of the formal health care sector into terms that are meaningful to individual experience.

8 It can be argued (see National Research Council 1993: Chapter 4) that the long reach of networks in West Africa is itself the outgrowth of a need for social mechanisms of insurance and support, given the great uncertainties of the natural environment.

9 See Bastien (1995) for Bolivia; Bhuiya, Streatfield, and Meyer (1990) for Bangladesh; Bierlich (1995) and Gyapong et al. (1996) for Ghana; Caldwell, Reddy, and Caldwell (1983) for south India; Cantrelle and Locoh (1990) for West Africa; Feyisetan, Asa, and Ebibola (1997) for Nigeria; Gove and Pelto (1994) on cultural understandings of acute respiratory illness and the related WHO program; McNee et al. (1995) for the Philippines; Pitts et al. (1996) for Zimbabwe; Raharjo and Cornor (1990) for Indonesia; Ryan (1998) for Cameroon; Shawyer et al. (1996) for Thailand; and Sholkamy (1996) for Egypt.

10 Nichter (1995) notes that traditional healers often draw fine distinctions among sub-categories of illness and emphasize that their methods are effective against only some of these. The modern system might try to make the same distinctions and arguments to clarify its comparative advantage.

11 Private rates of return are typically on the order of 12–15 percent; see Montgomery, Arends-Kuenning, and Mete (2000) for a recent review. According to Preston's calculations, mortality decline would increase the rate of return by about one percentage point in a typical case.

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