References

Adato, Michelle, Michael R. Carter, and Julian May. 2006. "Exploring Poverty Traps and Social Exclusion in South Africa Using Qualitative and Quantitative Data." *Journal of Development Studies* 42, no. 2:226–47.

Alger, Horatio. 1868. *Ragged Dick*. Electronic Text Center, University of Virginia Library. http://etext.virginia.edu/toc/modeng/public/AlgRagg.html

Antman, Francisca, and David McKenzie. 2006. "Poverty Traps and Nonlinear Income Dynamics with Measurement Error and Individual Heterogeneity." *Journal of Development Studies*, forthcoming.

Jalan, Jyotsna, and Martin Ravallion. 2002. "Geographic Poverty Traps? A Micro Model of Consumption Growth in Rural China." *Journal of Applied Econometrics* 17, no. 4:329–46.

Lokshin, Michael, and Martin Ravallion. 2004. "Household Income Dynamics in Two Transition Economies." *Studies in Nonlinear Dynamics and Econometrics* 8, no. 3, article 4. http://www.bepress.com/snde/vol8/iss3/art4.

Lybbert, Travis, Christopher Barrett, Solomon Desta, and D. Layne Coppock. 2004. "Stochastic Wealth Dynamics and Risk Management among a Poor Population." *Economic Journal* 114:750–77.

McKenzie, David, and Christopher Woodruff. 2006. "Do Entry Costs Provide an Empirical Basis for Poverty Traps? Evidence from Mexican Microenterprises." *Economic Development and Cultural Change* 55, no. 1 (October): 3–42.

Raddatz, Claudio, and Aart Kraay. 2005. "Poverty Traps, Aid, and Growth." World Bank Policy Research Working Paper no. 3631, World Bank, Washington, DC.

Michael Kremer and Rachel Glennerster. *Strong Medicine: Creating Incentives for Pharmaceutical Research on Neglected Diseases*. Princeton, NJ: Princeton University Press, 2004. Pp. xiv+153. $26.95 (cloth).

STEPHEN W. SALANT
University of Michigan

In this provocative and timely book, Michael Kremer and Rachel Glennerster argue that developing vaccines to prevent malaria, tuberculosis, and HIV/AIDS in Africa "would be extremely cost-effective, saving more lives than virtually any imaginable and comparable health expenditure" (5). Drug companies have no incentive to develop these vaccines, however, since victims of these diseases cannot afford to pay the prices that would permit a company to recoup its sunk R&D costs. Moreover, vaccinating enough of a population protects the remainder who are unvaccinated, a positive externality market participants would not take into account.

The authors divide government interventions designed to promote vaccine

development into "push" programs and "pull" programs. Push programs subsidize the search for a vaccine whether or not the search is successful. Pull programs pay off if and only if an effective vaccine is developed. The United States Agency for International Development attempted to use a push program to promote development of a malaria vaccine and ended up with huge bills and no vaccine. The authors advocate pull programs since the government pays nothing in the absence of a discovery.

The patent system, which rewards discovery by permitting the patent holder to reap monopoly profits for a limited time, is the "pull" program with which most of us are familiar. But a patent generates its reward by limiting dissemination of the product once it is discovered, and the authors regard denying life-saving medicine to victims of these dreaded diseases as unconscionable.

Kremer and Glennerster therefore focus on awarding a monetary prize for the discovery of an effective vaccine. The government would buy the vaccine at $15–$20 per person for up to 250 million people and distribute it free or at minimal cost. Historically, prizes have been used to stimulate many discoveries, including Archimedes' method for measuring the volume of the king's crown, the canning process to preserve food needed by Napoleon's troops, and the use of the chronometer to determine longitude so ships would not run aground. Indeed, the smallpox vaccine itself was developed by Edward Jenner in pursuit of a financial prize offered by Parliament. Kremer and Glennerster rely on the rule of thumb that at least $250 million in revenues is required to get the attention of the pharmaceutical companies.

As the authors recognize, no government pull program can stimulate private investment unless ways can be found to make the government's promise of a prize credible. For, if it is not costly to do so, the government has an incentive to reduce its offer once a company that has invested millions comes up with a vaccine. The authors argue that "since legally binding contracts can be written, placing funds in escrow would not be necessary as long as the sponsor of the vaccine commitment had sufficient funds to meet its obligation" (117). However, many drug companies might regard the government's reluctance to deposit funds in an interest-earning escrow account as a signal of future bad faith.

Despite the promise of the intervention that Kremer and Glennerster advocate, we should remember that past efforts to help the poor on a massive scale have instead sometimes ended up increasing their misery. Indeed the very organizations that would distribute vaccines in Africa previously installed tube wells in Bangladesh. Intended to bring clean drinking water to the poor of Bangladesh, they delivered instead arsenic-laced groundwater, resulting in the most massive poisoning in history. And, since arsenic is known to occur nat-

urally in mountainous areas like the Himalayas, the failure to test for this condition at the outset seems a grave oversight. In what space remains, therefore, let me mention a few aspects of their proposal that warrant further study.

Before the prize money is awarded, Kremer and Glennerster emphasize, the medicine must be deemed safe and effective. They suggest that the FDA or its European counterpart are well positioned as arbiters of these matters. The FDA would be under enormous pressure if it stood between a drug company and a huge financial award. Given recent disclosures about the FDA's cozy relationship with the drug companies it regulates, the FDA may prove unable to withstand the pressure to approve a vaccine. As for the involvement of a second arbiter, the authors do not explain what would happen if the FDA approved the drug while the European counterpart found it unacceptable, or vice versa.

Nor do they clarify what happens if an unsafe drug is nevertheless approved and distributed. Who, if anyone, would be liable? After all, some experts (Offit 2005) say that it was the legal liability of Cutter Laboratories for its botched Salk vaccine, which created a mini polio epidemic a half century ago by infecting hundreds of thousands of healthy children with live virulent polio virus, that explains the reluctance of the private sector even now to develop other vaccines. Without knowing the extent of their liability, how can pharmaceutical companies evaluate the expected profitability of the "pull" program the authors propose?

While the authors argue compellingly (liability issues aside) that prizes exist that are simultaneously large enough to induce R&D investments and small enough to dominate other health interventions that would save as many lives, they are vague about the consequences of offering a prize of the wrong size. It seems feasible to approximate the social value of a given vaccine. But offering such a large prize would stimulate socially excessive investment whenever more than one firm raced for the prize. For, as the literature suggests (Loury 1979; Baye and Hoppe 2003), in deciding how much to invest no firm would take any account of the negative impact of its investment on the expected payoffs of its rivals, a manifestation of the common property problem. Kremer and Glennerster suggest that the government solve this problem by scaling down the prize to some fraction of social value. But what fraction? While a fraction exists that would induce the optimal aggregate investment, these funds would not be distributed optimally among the n research projects.

A standard cure for common property problems is "unitization." Why not designate only one firm as eligible to win the TB vaccine prize? Then, if the prize is set at the full social value, that firm (after contracting with firms utilizing other research approaches) would invest exactly enough in every

research avenue that might deliver a TB vaccine to maximize the expected discounted net social surplus taking full account of the negative externalities across projects. This follows since the firm's payoff would coincide with the planner's objective function. Like the Manhattan Project to develop the Bomb, such a coordinated approach would reduce duplication of effort and would facilitate the adoption of the research insights of one team by other teams working toward the common goal—in this case, winning the prize money for the company by developing the vaccine. Under this proposal, the government would require no information about costs or success probabilities of competing research paths to induce the private sector to achieve the social optimum—only a reliable estimate of the social value of a safe and effective TB vaccine and the means to ascertain whether the vaccine submitted to win the prize met that standard. Which firm should monopolize the right to have its vaccine evaluated and to win the prize if it is certified safe and effective? Eligibility could be auctioned off to the highest bidder—the firm expecting the largest discounted prize net of expected development costs. After collecting the auction revenue, the government would be under a legal obligation to pay out the promised prize.

This unitization proposal itself has two vulnerabilities. What happens if an outsider, having failed to win the auction and having declined to subcontract with the winning firm, nonetheless either (1) discovers a vaccine *before* the winning firm does or (2) discovers a superior vaccine soon *after* the auction winner's vaccine has been certified safe and effective. Under the unitization scheme, the FDA and its European counterpart are only obligated to evaluate the safety and effectiveness of vaccines submitted by the winner of the auction. Given this, no firm losing the auction is likely to invest in vaccine development unless it first subcontracts with the auction winner.[1]

The second situation poses more of a problem, however, not only for the proposed unitization scheme but also for the scheme proposed by Kremer and Glennerster. If, under their scheme, the entire prize money were exchanged for the entire vaccine inventory the moment the winner's vaccine was certified safe and effective, then the recipient of the prize money would have no further involvement and the subsequent discoverer of a vaccine—even one certified superior—would receive little compensation from a government already holding huge inventories of a safe and effective vaccine. But realistically the exchange of money for inventory would take place slowly since vaccines take

[1] In the unlikely event that an outsider nonetheless happens to develop a vaccine before the winner of the auction does, an interesting bargaining game ensues. See the unpublished discussion paper by Chuyl-Kyu Kim, Nayla Kazzi, and Lucas Threinen, "Making Markets for Vaccines: A Critique and Improvement of the GCD Report" (2006).

time to produce in large quantities. During this time, a second firm may well discover a superior vaccine. What happens in this situation is something Kremer and Glennerster should clarify since it will determine the intensity of investment in vaccine development.

References

Baye, Michael, and Heidrun Hoppe. 2003. "The Strategic Equivalence of Rent-Seeking, Innovation, and Patent-Race Games." *Games and Economic Behavior* 44: 217–26.

Loury, Glenn. 1979. "Market Structure and Innovation." *Quarterly Journal of Economics* 93 (August): 395–410.

Offit, Paul. 2005. *The Cutter Incident: How America's First Polio Vaccine Led to the Growing Vaccine Crisis*. New Haven, CT: Yale University Press.

Sudhir Anand, Fabienne Peter, and Amartya Sen, eds. *Public Health, Ethics, and Equity*. Oxford: Oxford University Press, 2004. Pp. xii+385. £55.00 (cloth).

DAVID BISHAI
Johns Hopkins University

Readers with an interest in development typically share a fascination with understanding and remedying the stunning disparities in well-being in the world today. Political philosophers have attempted for centuries to offer coherent theories to rationalize the human fascination with disparities in well-being. Until recently, philosophical conceptualizations of well-being had not strayed deeply into studying special features of health that make its distribution so compelling. Everybody seems to recognize that health is a basic element that can enable or confound efforts to achieve well-being. Beyond that, the dynamics of how health ebbs and flows in individuals and in populations is seldom explored for their ethical ramifications. This book is premised on the assertion that health is qualitatively different from other aspects of well-being and on a corollary claim that disparities in health require qualitatively different considerations from other disparities in access to goods. If health is not special, then this book is another bowl of sophist hash extrapolating nuanced restatements that a concern for disparities is part of the human condition. That health is unlike other commodities underlies the great contribution provided by this innovative book.

Each of the authors in this collection of 15 essays makes the health aspects of well-being their chief concern. The essays emerged from workshops and