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the transplant team to select recipients on the basis of other than the publicly stated medical and sociopsychological criteria."

Addressing such sensitivities, nine of NHLBI's heart transplant experts decided at a meeting on 27 May that these thorny patient selection questions might be sidestepped if the criteria were stated in more explicitly medical language. "For the purposes of HCFA," says a memo summarizing the discussion, "these criteria must be stated more generally and exclusively in terms of enhancing the likelihood of successful medical outcome."

While the memos were flying and the HHS legal department was vacillating about selective reimbursement, an event in Arizona this spring nearly toppled all the resource allocation arguments that some were trying to pile up against the reimbursement gate.

In early March, Administrative Law Judge Walter McCormies of the Social Security Administration ruled that Medicare must pay a $30,533.68 claim for the heart transplant of Norman E. "Dutch" Tarr, a 50-year-old retired Air Force master sergeant who lives in Tucson. Tarr was one of the first patients in the heart transplant program set up at the University of Arizona Health Sciences Center by Jack Copeland, a Shumway trainee.

Blue Cross of Arizona, the Medicare intermediary locally, denied the University of Arizona's claim for Tarr's transplant because the operation "is considered experimental or investigational."

Charles E. Buri of the Arizona Attorney General's office countered successfully before Judge McCormies that "experimental" had nothing to do with it. The only test, Buri asserted, was whether a heart transplant was "reasonable and necessary" treatment for Tarr. It didn't hurt Buri's case to have Tarr at the hearing, looking fit nearly a year after his transplant—living proof that the operation was at least "necessary" for him.

Norman Tarr's case, which was supported by Arizona Senators Barry Goldwater and Dennis DeConcini and by Congressman Morris K. Udall, exactly illustrates the dilemma the government faces as it tackles heart transplantation and other potentially lifesaving but very expensive technologies. Confronted with a dying patient, resource allocation arguments tend to appear bureaucratic, if not academic, to politicians and perhaps to some nonpoliticians as well.

To prevent more Norman Tarrs from determining the outcome of the process that Harris has set in motion, HHS has declared that any potential Medicare beneficiary now in the heart transplant selection "pipeline" will be covered retroactively as participants in the study. (So far HHS officials can identify only one such patient.)

A larger question remains. The government has no power to prevent any doctor or hospital from doing a heart transplant. In fact, the Mayo Clinic plans to begin doing heart transplants this fall despite the recent government decision, and whether or not it receives patient care funds under the study.

Moreover, government funds are not the only funds available for heart transplants. Some private insurance companies pay for the operation, as do some but by no means all Blue Cross plans. And HHS can do nothing about entire towns raising the money to pay for some patient's new heart, just as they used to pay for dialysis in the days before Congress placed that burden on the Medicare trust funds.—RICHARD A. KNOX

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Global 2000 Report: Vision of a Gloomy World

Projections in CEQ–Department of State study show trouble ahead unless the international community takes strong corrective action

The *Global 2000 Report* issued by the Carter Administration on 24 July indicates that, unless the nations of the world act decisively to alter current trends, life for most people will be increasingly precarious.

"If present trends continue, the world in 2000 will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now," says the report.* "Despite greater material output, the world's people will be poorer in many ways than they are today."

Work on the report began in 1977 after President Carter called for it in his first environmental message. Although some 11 agencies participated in its preparation, the report has been issued only in the name of its two sponsoring agencies, the Council on Environmental Quality (CEQ) and the Department of State. Gerald O. Barney, a consultant to these agencies, was the study director.

The chairman of CEQ, Gus Speth—who, together with Assistant Secretary of State Thomas R. Pickering, headed the study—has now been asked by the President to chair a interagency task force on global resources and environment. Other members of this task force will include the directors of the Office of Management and Budget and the Office of Science and Technology Policy, the head of the White House domestic policy staff, and the Secretary of State. The President said that "the projected deterioration of the global environmental and resource base" was among the world's "most urgent and complex challenges," and he called on the task force to give high priority attention to the global resource, population, and environmental problems and seek ways to improve the government's capability for analyzing global trends. The task force will in effect develop policy recommendations to go with the report, which, as it stands, contains none.

Speth told *Science* that carrying out this assignment will be his highest priority. As an example of the kind of initiatives that may be proposed, Speth pointed to the U.S. strategy for the conservation of the world's tropical forests, which has been developed by an interagency task force cochaired by officials from the State Department and the Department of Agriculture. This policy calls for U.S. government agencies to promote wise use of tropical forests

**The Global 2000 Report to the President*. For sale by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402; $3.50 for volume I (the summary); $13 for volume II (the technical report); and $8 for volume III (describes the government's global model).

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through American foreign assistance and education programs, the programs of international institutions (such as the United Nations' Food and Agriculture Organization), and new initiatives in research and technology which can reduce the pressures for exploitation of tropical forests.

Speth suggested that development of similar strategies might be prepared to deal with problems such as water shortages and the loss of croplands from erosion, desertification, and other causes.

$450 billion a year is spent on arms, compared to economic aid of $20 billion.

The *Global 2000 Report* does not predict what conditions will be like at the start of the next century. But it does depict, by projections made from current trends, the conditions likely to exist at that time—absent changes in public policies, major advances in technology, or unforeseeable events such as an outbreak of war. Here are some of the conditions described:

> The gap between the richest and the poorest [countries] will have increased. By every measure of material welfare the study provides—per capita GNP and consumption of food, energy, and minerals—the gap will widen. For example, the gap between GNP per capita in the LDC's [less developed countries] and the industrialized countries is projected to grow from about $4000 in 1975 to about $7900 in 2000. Great disparities within countries are also expected to continue.
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> There will be fewer resources to go around. . . . By 2000 nearly 1000 billion barrels of the world's total original petroleum resource of approximately 2000 billion barrels will have been consumed. Over just the 1975-2000 period, the world's remaining petroleum resources per capita can be expected to decline by at least 50 percent. Over the same period world per capita water supplies will decline by 35 percent because of greater population alone. . . .
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> The environment will have lost important life-supporting capabilities. By 2000, 40 percent of the forests still remaining in the LDC's in 1978 will have been razed. The atmospheric concentration of carbon dioxide will be nearly one-third higher than preindustrial levels. . . . Desertification (including salinization) may have claimed a significant fraction of the world's rangeland and cropland. Over little more than two decades, 15-20 percent of the earth's total species of plants and animals will have become extinct—a loss of at least 500,000 species.
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> Prices will be higher. . . . In order to meet projected demand, a 100 percent increase in the real price of food will be required. To keep energy demand in line with anticipated supplies, the real price of energy is assumed to rise more than 150 percent over the 1975-2000 period. . . .
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> The world will be more vulnerable both to natural disaster and to disruptions from human causes. Most nations are likely to be still more dependent on foreign sources of energy in 2000 than they are today. Food production will be more vulnerable to disruptions of fossil fuel energy supplies and to weather fluctuations as cultivation expands to more marginal areas. The loss of diverse germ plasm in local strains and wild progenitors of food crops, together with the increase of monoculture, could lead to greater risks of massive crop failures. Larger numbers of people will be vulnerable to higher food prices or even famine when adverse weather occurs. The world will be more vulnerable to the disruptive effects of war. The tensions that could lead to war will have multiplied. . . .

The findings in the *Global 2000* study, obtained from what the report refers to collectively as the "Government's global model," are described in the report as generally consistent with projections made in the past with several other global models, such as the United Nations World Model and the Club of Rome's World Integrated Model.

According to the report, all of the studies indicate more or less similar trends for the remainder of this century: continued economic growth in most areas, continued population growth everywhere, reduced energy growth, an increasingly tight and expensive food situation, increasing water problems, and growing environmental stress. But, unlike the government model, the others carry their projections beyond the year 2000; the most dramatic developments, such as severe environmental deterioration and population declines caused by rising death rates, occur in the first half of the next century. (Even the Latin American World Model, though based in part on some near-Utopian assumptions, projects a food crisis in Asia by 2010.)

The *Global 2000* study begins and ends with the confession that there is no single well-integrated government model but rather a patchwork of various agency models that present serious inconsistencies in methods and assumptions. It concludes, however, that the fact the government model is deficient in linkages and feedback actually imparts an "optimistic bias" and makes its projections somewhat less disturbing than they might be otherwise. As the President's directive to the Speth task force indicates, improving the government's capability for projecting global trends is a first order of business.

Speth says that the *Global 2000 Report* should be seen as a companion document to the *World Conservation Strategy* announced earlier this year in Washington and other capitals. This strategy, which has the endorsement of major international organizations such as the United Nations and the Organization of American States, is designed to make conservation and development mutually supportive (*Science*, 21 March). It recognizes, on the one hand, that development cannot be sustained if ecological systems are disrupted and renewable resources (such as croplands, forests, and watersheds) are abused; and, on the other hand, that human poverty and degradation cannot be relieved without economic growth and that abuse of resources—such as the wholesale clearing of forests for croplands—is often the result of people acting out of desperate need.

The *Global 2000 Report* follows still another report, *North-South: A Program for Survival*, which was issued earlier this year by the independent international commission headed by Willy Brandt, former chancellor of West Germany. The *North-South Report* does not merely seek a series of piecemeal improvements, in the manner of the proposed follow-up to the *Global 2000 Report*, but major political and economic initiatives to change dramatically the entire course of events. In particular, the changes would include stopping the massive spending on arms that diverts resources that might otherwise go to conservation and development. The Brandt commission says that military spending worldwide is approaching $450 billion a year, compared to the $20 billion contributed by governments in development assistance.

The *North-South* report is now under review by the Carter Administration, but, in this political season—with Carter under attack by Ronald Reagan for spending too little, not too much on defense—nothing dramatic is going to come of it. In fiscal 1979, U.S. foreign aid payments totaled $4.5 billion. In absolute terms, this was substantially more than any other nation contributed (West Germany was second, with $3.3 billion); but in relation to gross national product (GNP), the U.S. contribution was miserly, representing not quite one-fifth of 1 percent of the U.S. GNP, or a smaller fraction than that contributed by any other industrial country except Italy.

A major international effort to cope with global conservation and development problems seems unlikely unless people in the United States and other countries of the "North" become convinced that their welfare depends on it. Speth thinks that at the moment most Americans view such global problems as "distant and remote from their everyday lives."—LUTHER J. CARTER