

Maximum

How should we cope with rapid growth in the earth's population? Experts pin their hopes on three things: improving technology, reducing material wants, and encouraging better manners. How many people can the earth support? The estimates range from 1 billion to 1 trillion people. But it's a trick question, because the answer really depends on what people want out of life.

by Joel E. Cohen

Since 1600, the human population has increased from about half a billion to nearly 6 billion. The increase in the last decade of the 20th century exceeds the total population in 1600. Compared with

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human history prior to World War II, the world's population growth rate since 1950 has been and still is unprecedented. Within the lifetime of some people now alive, world population has tripled; within the lifetime of everyone older than 40 years old, it has doubled. Yet never before the last half of this century had world population doubled within the life span of any human.

If global average fertility falls to 2.5 children per woman in the 21st century, according to the United Nation's highest projection published in 1992, the world's



population will grow to 12.5 billion by 2050 and continue to rise thereafter. If world-wide average fertility falls to 1.7 children per woman, as in the U.N.'s lowest projection series, population will peak at 7.8 billion in 2050 before beginning to decline.

Estimates of the Earth's human carrying capacity (loosely defined as the number of people the planet can support) range from fewer than 1 billion to more than 1 trillion. This enormous spread follows from widely varying concepts, methods, and assumptions. Most frequently, estimates fall between 4 billion and 16 billion. Counting the highest figure when an author gives a range of possibilities, the median estimate is 12 billion. Counting the lowest estimate when an author gives a range, the median estimate is 7.7 billion. The lowest and highest U.N. population projections for 2050 show that within the next century, the world's population could face exceedingly difficult choices in trading off human well-being and human numbers.

A population problem arises whenever human welfare—any value held by the people concerned—suffers because of more or fewer people, or a different age distribution of people, or a faster or slower population growth rate, or a changed spatial distribution of population. A population problem can sometimes be averted by changing other factors that affect human welfare, as well as by changing the demographic situation.

Proposals for dealing with population problems confront an intellectual and ideological minefield. While plausible and well-intentioned suggestions for mitigating population problems abound, no one knows exactly what will work across the whole range of population problems, or will work most efficiently in a given situation. Since generally accepted conclusions about what works in which circumstances are scarce, almost all proposed actions are motivated by some explicit or implicit ideology.

Suggestions for ameliorating population

problems fall into three main groups. The "bigger pie" school intends to amplify human productive capacities, given the number and expectations of people to be served. The "fewer forks" school aims to reduce the number or expectations of people to be served, given human abilities to find well-being. The "better manners" school seeks to change the terms under which people interact, whatever the technology or population. The enthusiasts of one school often neglect and suspect suggestions from the others.

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The "bigger pie" school calls for new industrial, agricultural, and civil technology of all types for both developed and developing countries. One enthusiast of technology, Jesse H. Ausubel of the Program for the Human Environment at Rockefeller University, writes: "The only way to meet the challenge of the multiplication of needs is to substantially enhance the contributions of science and technology to development and to enhance the cooperation between the science-rich and the science-poor."

The "fewer forks" school calls for family-planning programs, for more effective and more acceptable contraceptives, and sometimes for vegetarian diets (to reduce demand for animal feeds). Some proponents of the "fewer forks" school view technology as responsible for many adverse human impacts on the environment. Some argue, at the opposite extreme from Ausubel, that "the only way" to save the natural systems that support human life is to decrease human population growth rates, human numbers, or human levels of consumption.

The "better manners" school calls for freer markets or socialism (depending on taste), the breakup of large countries or

the institution of world government or new forms of shared governance for sovereign states (depending on taste), democratic institutions, improved public policies, less corruption, and the full lifecycle costing of business products. If poverty is the problem, the "better manners" school would propose to help poor people obtain increased access to credit, land, public infrastructure, education, and health. In this approach, "a family planning program that emphasizes health services to the poor may be more easily justified on the grounds that it directly redistributes health resources to the poor than on the grounds that lower fertility may decrease poverty," says Dennis A. Ahlburg, professor of industrial relations at the University of Minnesota in Minneapolis.

There are six principal approaches to slowing population growth: promoting contraceptives; developing economies; saving children; empowering women; educating men; and doing everything at once.

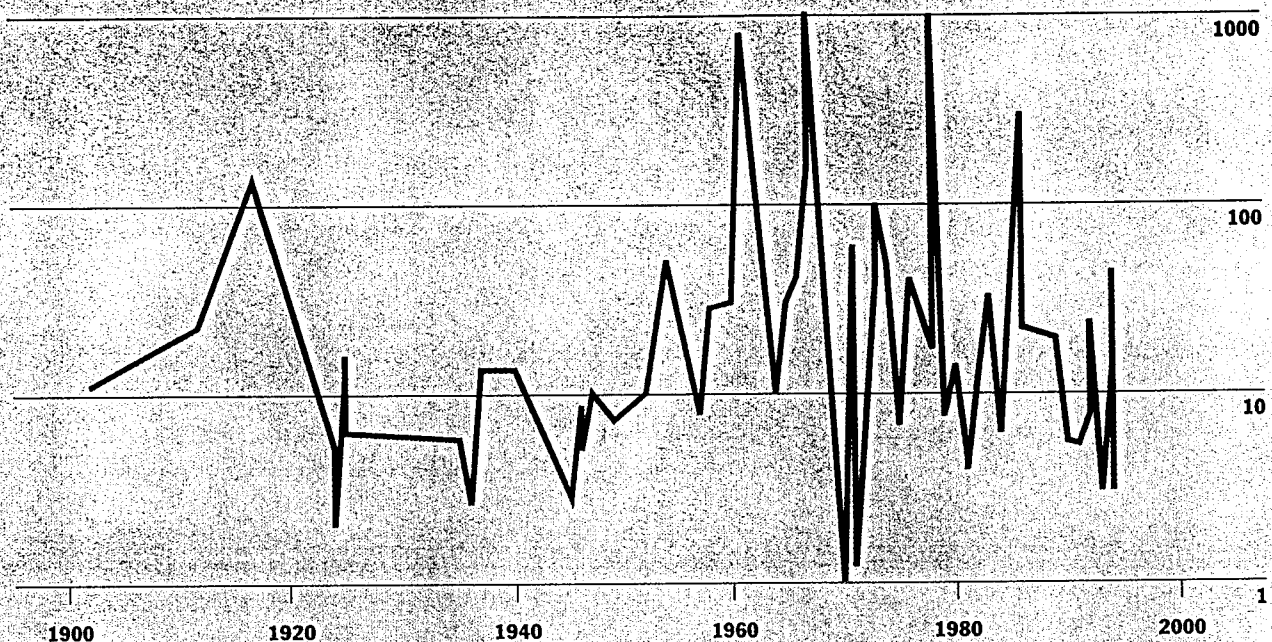
The Oxford economist Robert Cassen rightly emphasizes that "virtually everything that needs doing from a population point of view needs doing anyway." Here are four examples of people and institutions who have adopted one or more of these approaches.

Shortly before his election to the vice-presidency of the United States, Albert Gore offered five "strategic goals [to] direct and inform our efforts to save the global environment." His first goal involves accelerating or inducing a global demographic transition—that is, a shift from high mortality and fertility to one of lower birth and death rates. Gore proposes three major approaches toward this end. First, programs should be funded to assure "functional literacy [in] every society where the demographic transition has yet to occur. Although the emphasis should be on women, the programs should be directed to men as well. Coupled with this program should be a plan for basic education, emphasizing simple techniques in sustainable agriculture."

What's Our Capacity?

Twentieth-century scientists' estimates of the earth's maximum human population have varied from 1 billion to 1 trillion.

(estimates of maximum human population made by various scientists, 1902-94; numbers in billions)



Source: Author's research

Second, programs should be developed "to reduce infant mortality and ensure the survival and excellent health of children." Third, programs should "ensure that birth control devices and techniques are made universally available along with culturally

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appropriate instruction." Depending upon the culture, delayed marriages and birth spacing should also be emphasized.

A private research institute calls for a different approach. The Population Council in New York City is one of the world's

leading private, nonprofit population institutes, and one of the few to carry out research in both the biomedical and social sciences related to population. It created the long-acting implantable contraceptive called Norplant and carried out long-term evaluations of the effectiveness of family-planning programs. It shapes and reflects the view of many demographers and national and international officials responsible for population-related policies.

John Bongaarts, vice president in charge of research at the Population Council and a leading demographic researcher, has quantitatively analyzed three factors responsible for the anticipated rise in population of the developing countries: population momentum, unwanted fertility, and large desired family size. He proposes programs to counteract each of these factors.

The biggest source of population growth,

population momentum, is responsible for nearly half the anticipated increase. It results from the very high fraction of young people in developing countries, including young people of an age to bear children and those still too young to bear children. Today's high fraction of young people in developing countries is a legacy of the failures of both developed and developing countries over the past few decades to create the conditions for a rapid fall in fertility.

One way to counteract population momentum is to induce women to have far fewer than an average of two children each, as in the one-child policy of China. Bongaarts considers this possibility briefly and discards it. Instead, he recommends trying to raise the average age of women at childbearing in developing countries. His simulations suggest that if all women, now

and henceforth, delayed having children by five years compared with the present ages at which they bear children, the rise due to population momentum could be reduced from 2.8 billion to 1.6 billion, assuming that fertility is just at replacement level.

Policy options to raise the age of child-bearing include raising the legal age of marriage and prolonging the education of girls, especially in secondary schools. Bongaarts also recommends making contraceptive information and services available to adolescents. Adolescents often use contraception sporadically or not at all when they become sexually active, and consequently begin to bear children much earlier than they would if they had better information and services. Bongaarts understates the difficulty of implementing this suggestion when he remarks: "Governments have been reluctant to address these problems of adolescents for social and political reasons."

The second largest source of increased population is unwanted fertility. Bongaarts estimates that in developing countries outside China, about one married woman in six has an unmet demand for contraception, and about one birth in four is unwanted. Family-planning programs would provide women and men with the information and means to decrease the number of mistimed and unwanted pregnancies. Such programs would also be likely to improve the health of women and children, in part by putting them in regular contact with providers of medical services.

In some places, people still want lots of children. Surveys in the late 1980s in 27 countries in Africa, Asia, and Latin America found that desired family sizes everywhere exceeded two children; in sub-Saharan Africa, people wanted nearly six children. Bongaarts proposes to lessen the desire for large families by "investments in human development" so parents will value smaller families and invest more in the children they have. Governments could

aim for improvements in levels of education, the status of women, and the survival of children.

Educational opportunities for children diminish the immediate value of children as workers and make them more expensive because the children require books, uniforms, and school fees. Improving the legal, social, and economic status of women raises the opportunity cost of children by giving women potential roles other than motherhood. It also encourages women to act independently and innovatively in contraception. Public health programs to reduce death rates among infants and chil-

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dren would reduce the fatalism of parents, encouraging investments in the health and education of children, and would increase the likelihood that the desired number of children will survive to adulthood. Other tactics to encourage parents to have fewer children include monetary incentives for contraception and disincentives for large families, and messages in mass media about styles of life incompatible with large families.

A third prescription comes from scientific academies. In October 1993, representatives of 58 scientific academies signed a brief report called *Population Summit of the World's Scientific Academies*. The report reviews the United Nations' long-term population projections; identifies the key determinants of population growth; sketches relations among human population size, economic development, and the natural environment; and makes recommendations for action.

The report urges that "all reproductive health services must be implemented as a part of broader strategies to raise the quality of human life." These strategies include reducing and eliminating in-

equalities between men and women in sexual, social, and economic life; convenient reproductive health services (including family planning), regardless of ability to pay; "elimination of unsafe and coercive practices" in family planning (a two-edged reference, presumably, to reportedly forced abortions in China and backroom abortions in countries where abortion is illegal); and more attention to clean water, sanitation, primary health care, education, and power for the poor and for women.

The report reserves its most specific, detailed, and ambitious suggestions for scientists, engineers, and health professionals. It urges them to study and offer advice on an enormous range of topics.

Among the signers of this report were representatives of six African national academies, including those of Ghana, Kenya, Nigeria, and Uganda from sub-Saharan Africa. However, the African Academy of Sciences, one of the 15 academies that convened the summit meeting, did not sign the main report but issued its own statement instead.

Acknowledging that rapid population growth rates may be a problem for some countries, the dissent argues that "for Africa, population remains an important resource for development, without which the continent's natural resources will remain latent and unexplored. Human resource development must therefore form part of the population/resource issue." Because population problems vary widely among countries and regions, not all countries can share the same population goals. "...For certain parts of Africa, infertility is a major problem.... In Africa, many of the so-called impediments to family planning have a rationality which require[s] careful assessment." As for natural limits on population, the African dissent states: "Whether or not the earth is finite will depend on the extent to which science and technology [are] able to transform the resources available for humanity. There is only one earth—yes;

but the potential for transforming it is not necessarily finite."

The fourth example is from a multinational agency. The United Nations Fund for Population Activities (UNFPA) is foremost, though not alone, among U.N. agencies that attempt to affect population growth. Other agencies with related responsibilities include the World Health Organization (with responsibilities for reproductive health and sexually transmitted diseases), the Food and Agricultural Organization, the U.N. Development Program, the U.N. Environmental Program, the U.N. Children's Fund (UNICEF) and the U.N. Educational, Scientific and Cultural Organization (which has sponsored studies of the Earth's human carrying capacity).

The UNFPA's 1993 *Population Issues: Briefing Kit* highlights the agency's major concerns. They are rapid population growth; special burdens of developing countries; more adequate financing for population programs; family planning as a human right; comprehensive national population policies embracing family planning, demographic research, data collection, the wants of children and the elderly, urbanization, migration, education, and communication; "gender equality: a country's best investment," to be achieved through equal educational opportunities for girls and boys, men and women; and degradation of air, land, water, and biota "from ever-increasing numbers of people, ever-increasing demands for resources, and ever-increasing pollution;" urbanization and migration; information, education, and communication adapted to local cultures; and population data.

The UNFPA estimates that the world spent about \$4.5 billion per year on population programs in the early 1990s, a bit less than \$1 per person per year. Developing countries spent about \$3.5 billion of their own resources and received about \$958 million as population assistance. In 1991, only 1 percent of total official development assistance went for population

programs, and more than one-third of that (\$852 million) came from the United States. Funding for the UNFPA was constant in real terms for the few years before the 1993 report. Not surprisingly, the UNFPA called for doubled funding for population programs by the year 2000.

PUTTING OUR MONEY WHERE OUR MOUTHS ARE

Many organizations are advocating diverse approaches to slow population growth. "The issue now is where to put the marginal population-control dollar," wrote journalist Peter Passell during the wrangling at the United Nations in April 1994 in preparation for the International Conference on Population and Development. A major issue is whether to focus on increasing the supply and lowering the cost of contraception, or on increasing the demand for reduced fertility through economic development, improvements in the status of women, and mass communications.

Unfortunately, there appears to be no believable information to show that a dollar spent to put girls through primary school will lower the total fertility rate more than a dollar spent on radio programs about small families or a dollar spent on health clinics for mothers and children or a dollar spent to distribute contraceptives. The experiences of Indonesia, which had a very rapid fall in fertility from 1970 to 1985, and Kenya, where fertility began to fall in the last half of the 1980s, suggest that well-developed family-planning programs can interact with educational, cultural, and economic changes to lower fertility by more than the sum of their separate effects.

Are family-planning programs or desires for children the primary determinants of fertility? This is like asking whether airline passengers fly because airplanes exist or because passengers want to go somewhere. Aristotle, who distinguished efficient causes from final causes (or means from goals) more than two millennia ago,

would have been amused. People can travel without airplanes, but the great convenience of airplanes promotes travel. People can reduce their fertility without family-planning programs, but the great convenience (relative to the alternatives)

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of modern contraception facilitates lowered fertility.

The crucial importance of human values is illustrated by an apocryphal story. A little boy wanted to know the sum of one plus one. First he asked a physicist, who said, "If one is matter, and the other is antimatter, then the answer is zero." Unenlightened, the boy asked a biologist. She said, "Are we talking bacteria, mice, or whales? And for how long?" In desperation, the boy hired an accountant, who peered closely at the boy and said, "One plus one? Tell me, little boy, how much do you want one plus one to be?"

An end to long-term average human population growth is inevitable, very probably within the 21st century. The question is: how soon, by what means, and at whose expense? How many people the Earth can support depends on what people want from life. Moral and ethical values, tastes, and fashions will affect all of the choices we make.

Why should we help each other? Think of it this way. Thirty generations back, your ancestors and mine, if distinct, would have numbered more than 1 billion, at a time when the planet's population was fewer than half a billion. Thus, the possibility is strong that every two human beings are related 30 or 40 or 50 generations back, and that each of us is related to a famine-stricken child somewhere. Therefore, when in want, each of us is entitled to ask the other, as the song goes: "Brother, can you spare a dime?"