



ECOSCIENCE: POPULATION, RESOURCES, ENVIRONMENT

PAUL R. EHRLICH
STANFORD UNIVERSITY

ANNE H. EHRLICH
STANFORD UNIVERSITY

JOHN P. HOLDREN
UNIVERSITY OF CALIFORNIA, BERKELEY



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Nor can the public-service functions of the environment be safely replaced by technology if technology destroys them. Often the foresight, scientific knowledge, and technological skill that would be required to perform this substitution just do not exist. Where they do exist, the economic cost of an operation on the needed scale is almost invariably too high; and where the economic cost at first seems acceptable, the attempt to replace environmental services with technological ones initiates a vicious circle: the side effects of the additional technology disrupt more environmental services, which must be replaced with still more technology, and so on.

THE PROSPECTS: TWO VIEWS

The foregoing brief survey of the dimensions of the human predicament suggests a discouraging outlook for the coming decades. A continuing set of interlocking shortages is likely—food, energy, raw materials—generating not only direct increases in human suffering and deprivation, but also increased political tension and (perversely) increased availability of the military wherewithal for LDCs to relieve their frustrations aggressively. Resort to military action is possible, not only in the case of LDCs unwilling to suffer quietly, but, with equal or greater likelihood, in the case of industrial powers whose high standard of living is threatened by denial of external resources. The probability that conflicts of any origin will escalate into an exchange of nuclear weapons, moreover, can hardly fail to be greater in 1985's world of perhaps fifteen or twenty nuclear-armed nations than it has been in the recent world of five.

The growth of population—very rapid in the LDCs, but not negligible in most DCs, either—will continue to compound the predicament by increasing pressure on resources, on the environment, and on human institutions. Rapid expansion of old technologies and the hasty deployment of new ones, stimulated by the pressure of more people wanting more goods and services per person, will surely lead to some major mistakes—actions whose environmental or social impacts erode well-being far more than their economic results enhance it.

This gloomy prognosis, to which a growing number of scholars and other observers reluctantly subscribes, has motivated a host of proposals for organized evasive action: population control, limitation of material consumption, redistribution of wealth, transitions to technologies that are environmentally and socially less disruptive than today's, and movement toward some kind of world government, among others. Implementation of such action would itself have some significant economic and social costs, and it would require an unprecedented international consensus and exercise of public will to succeed. That no such consensus is even in sight has been illustrated clearly by the diplomatic squabbling and nonperformance that have characterized major international conferences on the environment, population, and resources, such as the Stockholm conference on the environment in 1972, the Bucharest Conference on World Population in 1974, the Rome Food Conference in 1974, and the Conferences on the Law of the Sea in the early 1970s.

One reason for the lack of consensus is the existence and continuing wide appeal of a quite different view of civilization's prospects. This view holds that humanity sits on the edge of a technological golden age; that cheap energy and the vast stores of minerals available at low concentration in seawater and common rock will permit technology to produce more of everything and to do it cheaply enough that the poor can become prosperous; and that all this can be accomplished even in the face of continued population growth. In this view—one might call it the cornucopian vision—the benefits of expanded technology almost always greatly outweigh the environmental and social costs, which are perceived as having been greatly exaggerated, anyway. The vision holds that industrial civilization is very much on the right track, and that more of the same—continued economic growth—with perhaps a little luck in avoiding a major war are all that is needed to usher in an era of permanent, worldwide prosperity.¹

¹Outstanding proponents of this view include British economist Wilfred Beckerman (*Two cheers for the affluent society*, St. Martin's Press, London, 1974); British physicist John Maddox (*The doomsday syndrome*, McGraw-Hill, New York, 1972); and American futurologist Herman Kahn (*The next 200 years*, with William Brown and Leon Martel, William Morrow, New York, 1976).

this, perhaps 2 micrograms is retained. Smokers may absorb 0.2 micrograms per cigarette, making a pack per day equivalent to twice the absorption in the diet. An intake of 5 parts per million cadmium in air for 8 hours delivers a lethal dose, and 1 part per million for 8 hours is dangerous. The recommended Threshold Limit Value (recommended not to be exceeded in work environments) in the United States is 100 parts per billion (0.1 ppm), although it is unlikely that this level is harmless. Part of the cadmium problem is that the fraction not excreted immediately has an exceedingly long half-life in the body—around several hundred days—so that low doses received over a long period can lead to accumulation of a high body-burden. The U.S. drinking water standard for cadmium is 10 parts per billion, a level that is not infrequently exceeded.

Major toxic effects due to cadmium poisoning have been documented in industrial workers and in villages in Japan whose water supply was contaminated with drainage from a cadmium mine. Acute cadmium poisoning received the name *Itai-Itai* or “ouch-ouch” disease in Japan, because of the painfulness of the associated bone and muscle abnormalities. Effects on people at lower dose rates are still undocumented, but are suspected.

There is every reason to believe that cadmium is accumulating steadily in the environment, and its known characteristics as a persistent cumulative poison in the body give much reason for concern.¹²³

FLUORIDES

Fluoridation of public water supplies for partial protection against tooth decay is an emotion-charged subject. The scientific evidence supporting the efficacy and safety of mass fluoridation at the generally recommended level of 1 milligram per liter of water (1 ppm) is not as good as it ought to be, but neither is there convincing evidence that it is harmful.¹²⁴ Although there are certainly some cranks in the antifluoridation school, there are also some

serious and competent scientists and responsible laymen who have been unmercifully abused because of the position they have taken on this controversial issue. Perhaps the strongest argument against mass fluoridation of drinking water is that individual treatment with fluoride is simple and can be supplied cheaply on public funds for those wishing to use it.

There is no question that fluoride is toxic in high concentrations, and fluoride pollution from a variety of industrial activities is a significant problem. Fluorides are discharged into the air from steel, aluminum, phosphate, pottery, glass, and brick works. These sources together emit perhaps 150,000 tons of hydrogen fluoride annually, and the same activities emit some tens of thousands of tons of fluorides annually into waterways.¹²⁵ Intentional addition of fluorides in fluoridation programs makes a modest but not negligible contribution of perhaps 20,000 tons per year to the human-caused fluoride inputs to the environment.

The main problems encountered in trying to evaluate health threats from fluoride pollution are familiar ones: the boundary between safe and unsafe levels is a fuzzy one; some individuals are more sensitive than others; and fluorides may act in combination with other pollutants to do damage at concentrations where the fluorides alone would not be harmful.

Fluorides have been shown to concentrate in food chains, and evidence suggesting a potential for significant ecological effects is accumulating.¹²⁶ Harm to terrestrial plants and algae at concentrations encountered in polluted environments has been documented, and the ability of certain plants and microorganisms to synthesize particularly toxic organic fluorides has been demonstrated. The toxicity of inorganic and organic fluorides to soil organisms is essentially unexplored and is a potential danger point.

CHEMICAL MUTAGENS

Many chemicals found in the environment are considered hazardous because they, like ionizing radiation (discussed in the following section), are able to cause

¹²³For a discussion of the difficulties of dealing in an economic framework with cadmium and pollutants with similar characteristics of accumulation and longevity, see C. L. Nobbs and D. W. Pierce, The economics of stock pollutants: The example of cadmium.

¹²⁴NAS, *Fluorides*; World Health Organization, *Fluoride and human health*.

¹²⁵Edward Groth III, Fluoride pollution.

¹²⁶*Ibid.*

length of the growing season substantially. Not surprisingly, then, there is a strong and well-documented connection between weather and agricultural production nationally and worldwide—"good" weather means high yields; "bad" weather means low yields. Furthermore, increased *variability* in weather can be as disruptive of agriculture as changes in mean conditions.²²¹

This phenomenon is the reason that *no* rapid change in climate is likely to be an improvement; the crops grown in a given region generally are quite closely adapted to the typical weather pattern—the climate—in that region. Therefore, any significant change tends to be, from the standpoint of growing a particular crop, a change from good weather to bad. Farming practices—time of planting, in particular—are also based on expected weather patterns. Naturally, patterns of agriculture could be modified to follow at least some kinds of climatic change, if the change were gradual enough. Artificially induced climatic change might be quite rapid, however, as indeed some natural changes apparently have been in the past. As discussed in Chapter 7, there is no leeway in the world food situation to absorb a significant climate-induced drop in production over broad areas of the world. Whatever adjustments in crop characteristics and cultivation patterns might *eventually* be made in response to rapid climate change would come too late to save hundreds of millions from famine.

Another, somewhat more speculative respect in which climate change could lead to great increases in human misery is by altering the abundance and the geographical distribution of various disease-producing organisms. As is the case with crops, the degree to which such organisms and the other organisms that transport them (vectors) thrive is governed by such environmental conditions as temperature and moisture, in terms of both averages and extremes. Changes in climatic patterns therefore might give certain of those organisms access to human populations that have no prior evolutionary experience with them and hence little or no resistance to them. Alternatively, such changes might remove checks on the abundance of organisms preexisting in an area, to the extent that a previously minor hazard becomes a

²²¹For more extensive discussion and more reviews of recent statistics, see Chapter 7 and Schneider and Mesirow, *The genesis strategy*.

plague. (This is true of pathogens that attack crops and trees, as well as those that attack people.)²²²

It is obvious, of course, that sustained climatic change either in the form of a new glaciation or a prolonged warming that involved substantial melting of the Greenland and Antarctic ice sheets would change the pattern of human settlement as well as that of agriculture. The melting of half the volume of present ice sheets would raise sea level by about 40 meters, enough to flood most coastal cities and cover many fertile coastal plains. Such extensive melting would require enormous amounts of energy, however, and so could not occur overnight. If climate changed so drastically that an additional 5 percent of all the solar energy now reaching Earth's surface were absorbed in the melting of ice (compared to the fraction of a percent presently absorbed in summer melting of ice that is restored in winter), sea level would rise about 1.1 meters per year.²²³ A climate change great enough to produce this result would damage world agriculture so severely that the effect of the initial change in sea level would hardly be noticed by comparison.

Intentional Modification of Weather and Climate

The idea of influencing the weather intentionally dates back to the rain dances and related rituals of many nontechnological civilizations. Modifying the weather by technological means, however, had its real beginnings in 1946, when it was demonstrated that seeding clouds with dry ice or silver iodide could produce precipitation when none would have occurred naturally. Thirty years later, rainmaking was rather widely practiced in some parts of the world, but many details of its effectiveness and side effects remained controversial. Rainmaking works under some meteorological conditions but not under others; sometimes the attempt may actually pro-

²²²See J. M. May, Influence of environmental transformation in changing the map of disease, in *The careless technology*, Farvar and Milton, eds.; G. H. Hepting, Climate and forest diseases, in *Man's impact*, Matthews, Kellogg, and Robinson, eds., pp. 203–226.

²²³This figure is readily obtained from the following data: heat of melting of ice, 330 megajoules per cubic meter of water produced; area of oceans, 360×10^{12} square meters; solar energy reaching Earth's surface, 2.7×10^{18} megajoules per year.

duce less precipitation than would have occurred naturally. How far downwind of the seeding activity the effects persist is not known, and the genuine possibility of decreasing needed rainfall on neighboring regions (including neighboring nations) poses serious political problems.²²⁴

Seeding has been used not only to produce rain, but also, under varying circumstances, to dissipate cold fog (by initiating formation of ice crystals that fall out), to suppress hail (by fostering formation of many small particles rather than fewer large ones), and to steer hurricanes and/or weaken the winds associated with them. These measures, too, have the potential for inadvertent side effects and for transferring bad weather to one's neighbors. Indeed, Honduras blamed its disastrous hurricane (Fifi) of 1974 on just such activity by the United States, although there is no evidence to support the claim and the United States weather bureau denied it.

The practice of altering hurricanes contains the remarkable possibility that intentional weather modification on one scale will lead to unintentional climate modification on another. This is so because those tropical storms play a crucial role in the global climatic balance by transporting energy from the warm tropics into the cooler middle latitudes. Systematic disruption of that function would unquestionably produce significant alterations of climate over large regions, in forms not now predictable in detail.

Intentionally modifying not merely the local phenomena that make up the weather, but also the climate over large regions, has been discussed for years. We might hope that the rather primitive state of knowledge concerning climatic machinery and how civilization may unintentionally be modifying it would discourage all groups from any deliberate intervention for a long time to come, but governments and other bodies have all too often shown themselves incapable of sensible restraint. Among the schemes that have been mentioned are: sprinkling soot on the Arctic sea ice to melt it, causing warmer but probably more snowy winters in the Arctic

region; damming the Bering Strait, another way of causing the Arctic sea ice to melt; damming the Gulf Stream between Florida and Cuba; and creating a layer of stratospheric dust to counteract global warming due to carbon-dioxide buildup.²²⁵ In all these cases, present knowledge is inadequate to show that the unintended consequences would not exceed the intended ones.

Naturally, the possibility of using weather modification as a weapon has not escaped the notice of military planners. The only known instance of actual use of such techniques, as of 1977, was the use of cloud seeding by the United States in Vietnam between 1967 and 1972. The aim of those operations was to inhibit the movement of troops and supplies along the Ho Chi Minh Trail. The actual physical effect was probably minimal: 5 or 6 centimeters may have been added to the typical monsoon rainfall of about 50 cm.²²⁶ The international political impact of the precedent of American use of weather as a weapon may be much greater.

As understanding of climatic processes increases, the possibilities of misusing the new knowledge for weaponry become more awesome. The possibility of using chemicals to poke holes deliberately in another nation's ozone shield is now obvious enough, and intentional manipulation of storms and droughts does not seem entirely farfetched. Geophysicist Gordon MacDonald has emphasized the possibility that environmental warfare using climate modification could be carried out covertly over a period of years without the victims' being aware of the cause of their misfortunes.²²⁷

The potential for destruction, both intentional and inadvertent, associated with climatic warfare is second only to that of biological and nuclear war (and even this ranking may eventually prove to be questionable). It is therefore of the greatest importance to outlaw the use of weather- and climate-modification weapons by international agreement, notwithstanding the obvious difficulties of monitoring and enforcement. The Soviet Union and the United States submitted a joint proposal for a

²²⁴For good introductions to the subject of weather modification, see National Academy of Sciences, *Weather and climate modification: Problems and prospects*, 1966, and *Weather and climate modification: Problems and progress*, 1973, Washington, D.C.

²²⁵See Kellogg and Schneider, *Climate stabilization*.

²²⁶The Vietnam operations and other important elements of military weather modification are described in G. J. F. MacDonald, *Weather as a weapon*, *Technology Review*, vol. 78, no. 1 (Oct./Nov. 1975), pp. 57-63.

²²⁷*Ibid.*

pact prohibiting environmental warfare to the Geneva disarmament talks in August 1975. The pact would rule out "military or other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage, or injury to another state."²²⁸ This wording would preclude not only modification of weather and climate for military purposes, but also the intentional production of earthquakes, tidal waves, and ecological imbalances of various kinds.

THERMONUCLEAR WARFARE

Much has been written, especially by military theoretician Herman Kahn, on the effects of thermonuclear warfare, the possibilities of limited thermonuclear warfare, and so on.²²⁹ Since modern societies seem bent on continuing to prepare for such conflicts, we have little sympathy for those of Kahn's critics who feel that it is immoral to try to analyze the possible results. It would be pleasant (but probably incorrect) to assume that if everyone were aware of the terrible magnitude of the devastation that could result from a nuclear war, the stockpiles of fission and fusion weapons would soon be dismantled. This does not mean that Kahn's analysis is sound—quite the contrary. It has the major flaw of grossly underrating the possible environmental consequences of those projected wars. In addition to the instantaneous slaughter of millions of people and the demolition of property, the effects of any large thermonuclear exchange would inevitably constitute an enormous ecological and genetic disaster—especially for a world already on the edge of nutritional and environmental catastrophe.

Consider the effects that even a rather limited nuclear exchange among the United States, USSR, China, and various European powers would have on the world food supply. Suddenly, international trade would be greatly reduced, and the developed world would be in no position to supply either food or technological aid to the less developed. No more high-yield seed, no more fertilizers, no more grain shipments, no more tractors, no

more pumps and well-drilling equipment, trucks, other manufactured products or machines would be delivered. Similarly, the LDCs would not be able to send DCs minerals, petroleum, and food products. The world could be pitched into chaos and massive famine almost immediately, even if most countries were themselves untouched by the nuclear explosions.

But of course no country would be left unscathed. All over the world radiation levels would rise, possibly preventing cultivation of crops in many areas. Blast effects and huge fires burning in the Northern Hemisphere would send large amounts of debris into the atmosphere, conceivably dwarfing the volcanic and pollution effects previously discussed.²³⁰ The entire climate of the Earth could be altered, especially since large holes would probably be punched in the ozone layer. In many areas, where the supply of combustible materials was sufficient, huge fire storms would be generated, some of them covering many hundreds of square kilometers in heavily forested or metropolitan areas.

Something is known about such storms from experience during World War II. On the night of July 27, 1943, Lancaster and Halifax heavy bombers of the British Royal Air Force dropped 2200 metric tons of incendiary and high-explosive bombs on the city of Hamburg. Thousands of individual fires coalesced into a fire storm covering about 15 square kilometers. Flames reached 4500 meters into the atmosphere, and smoke and gases rose to 12,000 meters. Winds, created by huge updrafts and blowing in toward the center of the fire, reached a velocity of more than 240 kilometers per hour. The temperature in the fire exceeded 787° C, high enough to melt aluminum and lead. Air in underground shelters was heated to a point where, when they were opened and oxygen was admitted, flammable materials and even corpses burst into flame. The shelters had to cool for *ten days to two weeks* before rescuers could enter.

Anyone interested in further details of what a *small* fire storm is like is referred to Martin Caidin's excellent book, *The night Hamburg died*.²³¹ From his account, we

²³⁰The extent of fires is a matter of some controversy—see W. S. Osburn, Jr., *Forecasting long-range ecological recovery from nuclear attack*.

²³¹Ballantine, New York, 1960. For a literary view, see Kurt Vonnegut's *Slaughterhouse five*, which describes the results of a similar raid on Dresden (Dell, New York, 1971).

²²⁸Ibid., p. 63.

²²⁹Herman Kahn, *On thermonuclear war*; and *On escalation*.

can imagine the ecological consequences of generating numerous fire storms and burning off a substantial portion of the Northern Hemisphere. In areas where conditions led to the development of fire storms, the removal of all vegetation would not be the only effect; the soil might be partly or completely sterilized, as well. There would be few plant communities nearby to donate the seeds for rapid repopulation, and rains would wash away the topsoil. Picture what now happens on defoliated California hills during the winter rains, and then imagine the vast loads of silt and radioactive debris being washed from immense bare areas of northern continents into offshore waters, the site of most of the ocean's productivity. Consider the fate of aquatic life, which is especially sensitive to the turbidity of the water, and think of the many offshore oil wells and supertankers that would be destroyed by blast in the vicinity of large cities and left to pour their loads of crude oil into the ocean. Think of the runoff of solvents, fuels, and other chemicals from ruptured storage tanks and pipelines. And radioactivity from nuclear reactors, fuel reprocessing plants, and other nuclear-power facilities would be added to that of the bombs themselves.

Ecosystems would be assaulted as they are assaulted in peacetime (as we have seen, radiation stresses do not differ greatly from others), but the scale of the assault and its rapidity would be unprecedented. Recovery would inevitably be much slower than from other kinds of ecocatastrophes.²³²

The human survivors of any large-scale thermonuclear war would face a severely devastated environment. If a full-scale war were waged in which a substantial portion of United States and Soviet weapons were detonated, most of the survivors would be in the Southern Hemisphere. They would lack many of the tools needed to maintain a modern civilization, since much technology would be irretrievably lost. If the technological structure of society were destroyed, it would be almost impossible for survivors to rebuild it because of resource depletion. Most high-grade ores and rich and accessible fossil-fuel deposits have long since been used up. Technology itself

is necessary for access to what remains. Only if enough scrap metals and stored fuel remained available would there be a hope of reconstruction, which would have to begin promptly before those stocks rusted, drained away, or were lost in other ways. Even more serious, banks of plant genetic material would certainly be destroyed or lost through lack of care, making the regeneration of high-yield agriculture difficult or impossible. From what is known of past large disasters, it seems unlikely that survivors, without outside assistance, would be able psychologically to start rapid reconstruction.²³³

If there were extensive use of nuclear weapons in both hemispheres, or if chemical or biological weapons were used simultaneously, the survivors would probably consist of scattered, isolated groups. Such groups would face genetic problems, since each would possess only a small part of humanity's genetic variability and would be subject to a further loss of variability through inbreeding. Studies of human populations have shown that inbreeding increases infant mortality. In addition, it appears that prenatal damage increases linearly with the degree of inbreeding.²³⁴ In such a situation it is problematical whether culturally and genetically deprived groups of survivors could persist in the face of much harsher environmental conditions than they had faced previously. In short, it would not be necessary to kill every individual with blast, fire, radiation, nerve gas, and pathogens in order to force *Homo sapiens* into extinction.

ECOLOGICAL ACCOUNTING

Many existing and potential forms of ecological disruption have been described in this chapter, sometimes in rather technical detail. It may be helpful at this point to summarize the relevance of these considerations to human welfare. In other words, just what could an ecological catastrophe mean for human beings?

The various ways in which the biosphere supports human life were outlined at the beginning of the chapter.

²³²E. P. Odum, Summary, in *Ecological effects of nuclear war*, G. M. Woodwell, ed., pp. 69-72. See also NAS, *Long-term*, which is incomplete and has poorly-thought-through conclusions but contains useful data and bibliographies.

²³³There is a fascinating literature on reactions to and recovery from catastrophes. See A. H. Barton, *Communities in disaster: A sociological analysis of collective stress situations*, especially the last chapter.

²³⁴L. L. Cavalli-Sforza and W. F. Bodmer, *The genetics of human populations*, W. H. Freeman and Company, San Francisco, 1971.

many benefits of specialization and division of labor, of economies of scale in the use of technology, of cultural diversity, and so on. The optimum population size, then, lies somewhere between the minimum and maximum possible sizes.

THE OPTIMUM POPULATION

Biochemist H. R. Hulett has made some interesting calculations bearing on the subject of an optimum population. He assumed that the average United States citizen would not consider the resources available to him or her excessive, and he then divided estimates of the world production of those resources by the American per-capita consumption. On this basis, Hulett concluded: "... it appears that (about) a billion people is the maximum population supportable by the present agricultural and industrial system of the world at U.S. levels of affluence."¹ By Hulett's criteria, then, even ignoring depletion of nonrenewable resources and environmental deterioration, the population of the Earth is already 3 billion people above the present optimum.

Since decisions that determine population size are made, consciously and unconsciously, by the people alive at a given time, it seems reasonable to define the optimum size in terms of their interests. Accordingly, one might define the optimum as the population size below which well-being per person is increased by further growth and above which well-being per person is decreased by further growth.

Like most definitions of elusive concepts, this one raises more questions than it answers. How is well-being to be measured? How does one deal with the uneven *distribution* of well-being and particularly with the fact that population growth may increase the well-being of some people while decreasing that of others? What if a region is overpopulated in terms of one aspect of well-being but underpopulated in terms of another? What about the well-being of future generations? One cannot define an optimum population for any part of the

world at any time without reference to the situation in all other parts of the world and in the future.

No complete answers are possible, but it is time that such questions be seriously addressed. The following observations are intended mainly to stimulate further discussion.

Priorities

The physical necessities—food, water, clothing, shelter, a healthful environment—are indispensable ingredients of well-being. A population too large and too poor to be supplied adequately with them has exceeded the optimum, regardless of whatever other aspects of well-being might, in theory, be enhanced by further growth. Similarly, a population so large that it can be supplied with physical necessities only by the rapid consumption of nonrenewable resources or by activities that irreversibly degrade the environment has also exceeded the optimum, for it is reducing Earth's carrying capacity for future generations. If an increase in population decreases the well-being of a substantial number of people in terms of necessities while increasing that of others in terms of luxuries, the population has exceeded the optimum for the existing sociopolitical system. The same is true when population increase leads to a larger *absolute* number of people being denied the necessities—even if the fraction of the population so denied remains constant (or even shrinks).

It is frequently claimed that the human population is not now above the optimum because if the available food (and other necessities) were in some way equitably distributed there would be enough for everyone.² But it is only sensible to evaluate optimum population size in terms of the organisms in the population under consideration, not in terms of hypothetical organisms. Thus, if an area of Africa has more lions than the local prey can support and the lions are starving, then there is an overpopulation of lions even though all the lions could have enough to eat *if* they evolved the capacity to eat grass.

Grossly unequal distribution of food and other goods is characteristic of contemporary *Homo sapiens* just as

¹Optimum world population. Note that there is a large volume of conventional economic literature in existence that focuses on a narrowly defined economic optimum. This literature is of little interest to the discussion here (see, e.g., Spengler, Optimum population theory).

²For example, Barry Commoner, How poverty breeds overpopulation (and not the other way around), *Ramparts*, August/September 1975.

Their results showed that some form of disaster lies ahead unless *all* the factors are controlled: population growth, pollution, resource consumption, and the rate of capital investment (industrialization).

This was hardly a new conclusion in 1972. Indeed, the argumentation and evidence for this general world-view had been accumulating steadily since the time of Malthus (see Box 13-2), and a rash of books drawing substantially similar conclusions had appeared in the decades following World War II.^c What accounts, then, for the extraordinary response—both disparaging and laudatory—that these views elicited when they appeared in *Limits to Growth* in 1972?

Several factors contributed: first, the status of M.I.T. as virtually a worldwide synonym for careful scientific analysis; second, the sponsorship of the project by the vaguely mysterious Club of Rome, an international collection of influential academicians, industrialists, and public figures; third, the extraordinarily direct and lucid style with which the authors presented their conclusions; and fourth, the major role played in the underlying analysis by a “computer model” of the world.

Of these factors, the last was almost certainly the most important. The book appeared at a time when the capabilities of large computers had already become part of public conventional wisdom (or folklore), but when the idea that computer results are no better than the information fed into them was not so widespread. Thus the notion that a computer had certified the bankruptcy of growth gave the conclusion public credibility, and at the same time provided a target for indignant economists and others who saw the outcome as an illustration of the syndrome known in the computing trade as “garbage in, garbage out.”^d

How do computer models in general, and the *Limits* model in particular, actually work? The

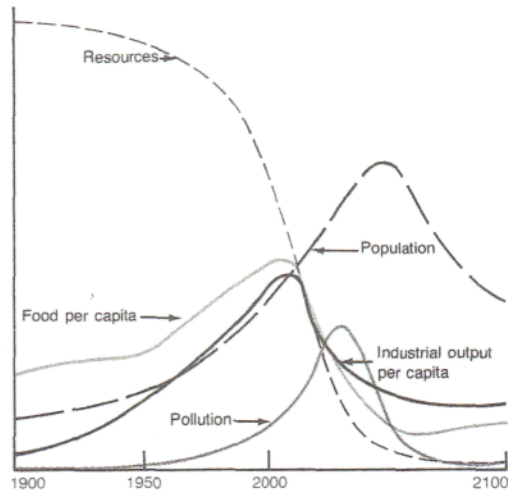


FIGURE 12-2

The “standard” world model run assumes no major change in the physical, economic, or social relationships that have historically governed the development of the world system. All variables plotted here follow historical values from 1900 to 1970. Food, industrial output, and population grow exponentially until the rapidly diminishing resource base forces a slowdown in industrial growth. Because of natural delays in the system, both population and pollution continue to increase for some time after the peak of industrialization. Population growth is finally halted by a rise in the death rate due to decreased food and medical services. (After Meadows et al., 1972.)

idea behind computer modeling is to simulate in a general way the behavior of complicated physical systems. The technique is used when the situation of interest is too complicated to analyze with equations solvable with pencil and paper, or with laboratory or field experiments on a reasonable scale; and when it is too time-consuming or too risky simply to observe the real system and see what happens. Systems or processes that meet these conditions and that accordingly have been studied with computer models include the global meteorological system, various ecosystems, the safety systems of nuclear reactors, the growth of cities, and the evolution of galaxies.

In all such cases, models are constructed by identifying what seem to be the most important

^cFor example, William Vogt, *Road to survival*; Fairfield Osborne, *Our plundered planet*; Harrison Brown, *The challenge of man's future*; Georg Borgstrom, *The hungry planet*, Macmillan, New York, 1965; Paul Ehrlich, *The population bomb*, Ballantine, New York, 1968; Preston Cloud, ed., *Resources and man*, W. H. Freeman, San Francisco, 1969; P. R. Ehrlich and A. H. Ehrlich, *Population resources, environment*, W. H. Freeman, San Francisco, 1970.

^dSee, for example, K. Kaysen, The computer that printed out W*O*L*F, *Foreign Affairs*, 1972, which tries but fails to stick the “garbage” label on *Limits to Growth*, missing the point in major respects.

(Continued)

technology would reduce resource input and pollutant output per unit of material standard of living to zero.

The first assumption is contrary to all recent experience; doublings of agricultural productivity have required triplings and quadruplings of technological inputs. The second assumption is impossible in principle since it violates the second law of thermodynamics, one of the most thoroughly verified laws of nature. All one could safely conclude from this work is that Forrester's model is "sensitive" to the introduction of miracles into the assumptions. Presumably, the more sophisticated model in *Limits to Growth* would also be "sensitive" in this way, but that is hardly a defect.

The most detailed critique of the *Limits* model was performed by a group at the University of Sussex, England, and was published together with a reply by the authors of *Limits to Growth* in a book called *Models of Doom*.^h The Sussex critics accused the *Limits* group of leaving out economics and social change, of underestimating the power of technology, and of daring to make policy recommendations on the basis of a flawed model. The response of the *Limits* group was that their model probably overestimated the effectiveness of the price mechanism rather than underestimated it, that evidence of the limitations of technology has been accumulating rapidly, that in the absence of any perfect models one must make policy recommendations with the best ones available, and that social change (which is hard to model) is precisely what they were trying to stimulate by their recommendations. On the issue of whether the model overstated or understated the imminence of disaster, we might add that the simplistic treatment of environmental risks probably understated the danger more than other flaws overstated it.

Probably the most imposing attempt to construct a more realistic model than that in *Limits* was described in 1974 in *Mankind at the Turning Point: The Second Report to the Club of Rome*, by M. Mesarovic and E. Pestel. This model divided the world into ten political/geographical regions, modeling each of these on five "strata": (1) physical environment; (2) technology; (3) eco-

nommic systems; (4) institutional and social responses; and (5) individual needs and responses.

Notwithstanding *Turning Point*'s occasional gratuitous disparagement of the oversimplification in *Limits to Growth* (difficult to understand in view of its obvious debt to the earlier work), the conclusions were strikingly similar: continuation of recent trends in population growth, industrialization, and environmental disruption will lead to disaster; deliberate and massive social and economic change will be necessary to avoid this outcome. The added sophistication of *Turning Point*'s regional disaggregation, showing the problems that can arise from such interactions as competition among regions for scarce resources, should be welcomed. At the same time, it seems fair to say that the net effect of this added degree of detail is to make the prognosis *more* pessimistic than that in *Limits*, not less so. Basically, regional disaster or negative interactions leading to wars seem more imminent than a uniform global disaster, which was the only kind the aggregated model in *Limits* could reveal. (This, of course, is another conclusion that many analysts have reached over the years without benefit of computer modeling).

Obviously, the model in *Turning Point* is still far from perfect. Certainly neither it nor other computer models can be used to predict the future in detail. Nevertheless, computer modeling seems a useful way to acquire or communicate insights about the implications of present trends, and it has the great advantage of requiring that assumptions about relevant relationships be made explicit. Surely this is an improvement over the situation most likely to prevail when people think about the future of a complicated world—the "models" in their heads are full of assumptions that are not only unstated but perhaps even unrecognized. In short, those critics who believe the world cannot be modeled should stop thinking about the future entirely, for implicitly all who do are modeling in their heads.

The purpose of caring at all where humanity is going, of course, whether one finds out with or without the aid of a computer, is not prediction for its own sake. It is, rather, that if we do not like the projected consequences of present trends and values, we can take conscious action to change course.

^hH. Cole, C. Freeman, M. Jahoda, K. Pravitt, eds., *Models of doom*, Universe Books, New York, 1973.

Of all things people are the most precious.

—Mao Tse Tung

CHAPTER 13

Population Policies

Any set of programs that is to be successful in alleviating the set of problems described in the foregoing chapters must include measures to control the growth of the human population. The potential goals of such measures in order of possible achievement are:

1. Reduce the *rate* of growth of the population, although not necessarily to zero.
2. Stabilize the *size* of the population; that is, achieve a zero rate of growth.
3. Achieve a negative rate of growth in order to *reduce* the size of the population.

Presumably, most people would agree that the only humane means of achieving any of these goals on a global basis is by reducing the birth rate. The alternative is to

permit the death rate to increase, which, of course, will inevitably occur by the agonizing “natural” processes already described if mankind does not rationally reduce its birth rate in time.

Even given a consensus that curbing population growth is necessary and that limiting births is the best approach, however, there is much less agreement as to how far and how fast population limitation should proceed. Acceptance of the first goal listed above requires only that one recognize the obvious adverse consequences of rapid population growth—for example, dilution of economic progress in less developed countries, and aggravation of environmental and social problems in both developed and less developed countries. Economists and demographers, many of whom will not accept

the third goal at all and ascribe no urgency to the second, generally do espouse the first one (at least for the LDCs).

Accepting the second goal simply means recognizing that Earth's capacity to support human beings is limited and that, even short of the limits, many problems are related to population size itself rather than only to its rate of growth. Accepting the idea that stabilizing the size of the population is urgently necessary requires recognizing that the limits are already being approached and that, although technological and cultural change may eventually push the limits back somewhat, the prudent course is to halt population growth until existing problems can be solved. Virtually all physical and natural scientists accept the ultimate inevitability of halting population growth, and most of them accept the urgency of this goal. Much of the first part of this book has been an exposition of why the "inevitable and urgent" position is reasonable.

The most controversial goal is the third one listed above—reducing the size of the human population. Accepting this goal implies a belief that there is an optimum population size and that this optimum has already been exceeded (or will have been exceeded by the time population growth can be stopped). It also implies that each society has a right—indeed a responsibility—to regulate its population size in reference to the agreed-upon optimum. In a world where the right (and the responsibility) of married couples to determine their own family size has become a widely accepted notion only in the past generation or two, the idea that nations have such a right or obligation is a truly radical one. Unfortunately, humanity cannot afford to wait another quarter century for the idea to gain complete acceptance.

Given the threat to the environment posed by today's population in combination with today's technology, and given the menace this situation represents to an already faltering ability to provide enough food for the people now alive, it is clear that the human population is already above the optimum size. (How far above the optimum is more difficult to determine; see Chapter 12). It is, of course, conceivable that technological and social change will push up the optimum in the time it takes to bring population growth to zero. More probably, however, the population size will have to be reduced eventually to below today's level if a decent life is to be assured for everyone.

Whether this view of long-term necessity is accepted or not, of course, the goal of any sensible population policy for the immediate future is the same—to gain control over growth. This chapter describes the recent evolution of population policies, explores some potential (but still largely unexploited) means of achieving such control over population growth, and discusses the interacting effects of other policies (especially development policies) on population growth.

FAMILY PLANNING

An essential feature of any humane program to regulate the size of the human population must be provision of effective means for individuals to control the number and timing of births. This approach is commonly termed "family planning," and family planning programs have been introduced in many LDCs in the past two decades with the goal of providing the means of birth control to the people. These are the main population policies now in existence.

The family planning movement, however, historically has been oriented to the needs of individuals and families, not of societies. Although birth control is essential for achieving population control, *family planning and population control are not synonymous*. Before proceeding to an examination of the important difference between the two, some historical perspective on the practice of birth control and the family planning movement is in order.

Birth Control

Many birth control practices are at least as old as recorded history. The Old Testament contains obvious references to the practice of withdrawal, or *coitus interruptus* (removal of the penis from the woman's vagina before ejaculation). The ancient Egyptians used crude barriers to the cervix made from leaves or cloth, and even blocked the cervical canal with cotton fibers. The ancient Greeks practiced population control through their social system as well as through contraception; they discouraged marriage and encouraged homosexual rela-

BOX 13-1 Institutionalized Infanticide in the Eighteenth Century*

Where the Number of lusty Batchelors is large, many are the merry-begotten Babes: On these Occasions, if the Father is an honest Fellow and a true Church of England-Man, the new-born Infant is baptized by an indigent Priest, and the Father provides for the Child: But the Dissenters, Papists, Jews, and other Sects send their Bastards to the Foundling Hospital; if they are not admitted, there are Men and Women, that for a certain Sum of Money will take them, and the Fathers never hear what becomes of their Children afterwards . . . in and about London a prodigious Number of Infants are cruelly murdered unchristened, by those Infernals, called Nurses; these detestable Monsters throw a Spoonful of Gin, Spirits of Wine, or Hungary-Water down a Child's Throat, which instantly

*This material is quoted from George Burrington's pamphlet "An answer to Dr. William Brakenridge's letter concerning the number of inhabitants, with the London bills of mortality," London, J. Scott (1757).

strangles the Babe; when the Searchers come to inspect the Body, and enquire what Distemper caused the Death, it is answered, Convulsions, this occasions the Article of Convulsions in the Bills of Mortality so much to exceed all others. The price of destroying and interring a Child is but Two Guineas; and these are the Causes that near a Third die under the Age of Two Years, and not unlikely under two Months.

I have been informed by a Man now living, that the Officers of one Parish in Westminster, received Money for more than Five Hundred Bastards, and reared but One out of the whole Number. How surprizing and shocking must this dismal Relation appear, to all that are not hardened in Sin? Will it not strike every one, but the Causers and Perpetrators with Dread and Horror? Let it be considered what a heinous and detestable Crime Child-murder is, in the Sight of the Almighty, and how much it ought to be abhorred and prevented by all good people.

tionships, especially for men. The condom, or penis sheath, dates back at least to the Middle Ages. Douching, the practice of flushing out the vagina with water or a solution immediately after intercourse, has had a similarly long history. Abortion is a very ancient practice and is believed to have been the single most common form of birth control in the world throughout history, even during the past century when it was illegal in most countries. The simplest, most effective, and perhaps the oldest method of birth control is abstention; but this method seems to have been favored mainly by older men, particularly unmarried members of the clergy.

Infanticide, which is viewed with horror today by prosperous people in industrialized societies, has probably always been practiced by societies lacking effective contraceptive methods.¹ It was a rather common practice among the ancient Greeks, and the Chinese and Japanese are known to have used it for centuries, especially in times of famine. In agrarian or warlike societies, female infanticide has often been practiced to provide a greater proportion of men or to consolidate upper classes. Only a century or two ago, infanticide was widely practiced in

Europe in an institutionalized, although socially disapproved system sometimes called "baby farming" (Box 13-1).²

Infanticide rarely takes the form of outright murder. Usually it consists of deliberate neglect or exposure to the elements. Among the Eskimos and other primitive peoples who live in harsh environments where food is often scarce, infanticide was, until recently, a common practice, as greater importance was placed on the survival of the group than on the survival of an additional child. There is a strong suspicion that female infanticide persists in parts of rural India. It exists even in our own society, especially among the overburdened poor, although intent might be hard to prove. Certainly "masked infanticide" is extremely common among the poor and hungry in less developed countries, where women often neglect ill children, refuse to take them to medical facilities, and may even show resentment toward anyone who attempts treatment. According to Dr. Sumner Kalman of the Stanford University Medical Center, the average poor mother in Colombia—where 80 percent or more of a large family's income may be needed to provide

¹Mildred Dickeman, Demographic consequences of infanticide in man.

²William L. Langer, Checks on population growth: 1750–1850.

The name Malthus and the terms Malthusian and neo-Malthusian are so completely identified with concern about population pressure that a note about the man seems appropriate. Robert Malthus enjoyed what was certainly one of the happiest personal situations ever devised by man; he was an eighteenth-century English country gentleman of independent means. His youth and early manhood were spent in the last years of the Enlightenment, the Age of Reason, a time when learned and wise men saw themselves on the threshold of a world of concord among men and nations in which want and oppression would not exist. Man's imminent entry into this paradise was to be achieved through his discovery of the immutable Laws of Nature which were thought to be such that they could be understood by the human faculty of Reason. All discord, want, and cruelty were held to result from an ignorance of these Laws, which led man to their disobedience. It was an age of very great hope when Nature and Reason were enshrined.

Malthus' father, Daniel, the very embodiment of these values, was well connected in the intellectual and philosophical circles of the time, being a close associate of David Hume and a correspondent, friend, and finally, an executor of Jean Jacques Rousseau.

In 1784, after a preparation through home tutoring, Malthus entered Cambridge, where in 1788 he graduated with first-class honors in mathematics. With graduation he took Holy Orders in the Church of England but remained at Cambridge, where he achieved his M.A. in 1791 and became a Fellow of his College in 1793. In 1796 he became curate of the church at Albury, where his father resided, and settled down to country life.

These were the years of the French Revolution, years that Dickens called "the best of times, the worst of times." Neither the Revolution's war, internal and external, nor even its Terror yet dampened the ambience of optimism that characterized the world of thought. In 1793 William Godwin published his *Enquiry Concerning Political Justice* and the next year saw the appearance of the Marquis de Condorcet's *Essay on the Progress of the Human Spirit*, both of which sought to demonstrate that man's progress from darkness, superstition, and cruelty into the light of Concord through Reason was almost complete. Daniel Malthus, like most of the thoughtful men of the time, was much taken by these writings, but Robert could not share his enthusiasm. Cambridge had not, as he put it, given him "that command over his understanding which would enable him to believe what he wished without evidence." The concern that haunted Robert was population growth. How could a perfect society be achieved, let alone maintained, if population was constantly pressing against resources? Finally, Robert committed his misgivings to writing so he could present them systematically to his father. Daniel was so impressed with the arguments that he encouraged his son to publish them, which he did anonymously in 1798, under the title, *An Essay on the Principle of Population as it Affects the Future Improvement of Society With Remarks on the Speculations of Mr. Godwin, M. Condorcet and Other Writers*. His speculations centered on the proposition that man's "power of population is indefinitely greater than the power in the earth to produce subsistence. . . ." This he propounded with strict immutability and mathematical regularity characteristic of the Natural

sterilization had become the single most popular method. By 1970 one-quarter of American women over 30 either were sterilized or their husbands were; by 1973, 23 percent of married couples of all ages relied on sterilization for birth control. Most of the women not using birth control in the 1965 and 1970 surveys were subfertile, pregnant, or planning to use contraceptives only when their families were complete. Moreover, despite the official position of the Roman Catholic church, Catholic women in these surveys showed a level of use of

"artificial" contraceptives nearly as high as that of non-Catholic women.⁸

How much of recent U.S. population growth was due to unwanted births has been a matter for debate among demographers. The National Fertility Study of 1965 indicated that 17 percent of all births between 1960 and

⁸Charles F. Westoff, Changes in contraceptive practices among married couples, in Westoff, ed. *Toward the end of growth, population in America*; C. F. Westoff and L. Bumpass, *The revolution in birth control practices of U.S. Roman Catholics*.

Laws of the Age of Reason as "population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio . . ." The first *Essay* challenged the visions of an age and the reactions were immediate and predictably hostile, though many listened. The controversy led to the publication in 1803 of an enlarged, less speculative, more documented, but equally dampening second essay. This one was signed and bore the title, *An Essay on the Principle of Population or a View of its Past and Present Effects on Human Happiness with an Inquiry into our Prospects Respecting the Future Removal or Mitigation of the Evils it Occasions*.^{*} Malthus added to and modified the *Essay* in subsequent editions, but it stood substantially unchanged.

In 1804 he accepted a post at the East India Company's college at Haileybury which prepared young men for the rule of India, where he remained until his death. His marriage, in the same year, ultimately produced three children.

The ironies in Malthus' life are obvious. He was one of eight children. He occupied a position of comfort in an intellectual atmosphere of optimism, but was compelled by the rigor of his intellect to argue that nature condemned the bulk of humanity to live in the margin between barely enough and too little. Finally, his message as a teacher fell on the ears of future colonial bureaucrats who would guide or preside over the destinies of India.

Since the conversations between Robert Malthus and his father almost two centuries ago, two sets of factors which were beyond their ken

have emerged. The first set combined to put elements into a population-subsistence relationship that Malthus could not have foreseen. On one hand, the introduction of massive death control procedures—immunization, purification of drinking water, the control of disease-carrying organisms, improved sanitation, etc.—have removed many of the checks that Malthus assumed as "natural." On the other hand, developments in agriculture—high-yield plant strains, the powering of equipment with fossil fuels, the use of new techniques of fertilization and pest control—have massively increased food production.

The second set of factors has become widely significant only in the last quarter century and evident to most laymen only in the last decade. These are the deleterious effects on the biosphere resulting from agriculture and industry. With our planet's population bloated by death control and sustained only poorly through an agriculture based on nonrenewable resources and techniques which buy short-run, high yields at the expense of long-run, permanent damage to the "Earth's power to produce subsistence," we face a prospect inconceivable in the Age of Reason. Malthus looked into a dismal future of "vice and misery" begot of an uncontrolled, and, to his mind, uncontrollable population growth. We look into one where the dismal is compounded with peril, not because humanity cannot control its population, but because it *will* not.^{**}

^{**}This box is a modification of an essay supplied to us by historian D. L. Bilderback. For further reading about Malthus, see particularly John Maynard Keynes, *Essays in biography*; J. Bonar, *Malthus and his work*, 2d ed., 1924; G. F. McCleary, *The Malthusian population theory*; and, of course, Malthus' First and Second Essays.

^{*}Reprinted with numerous other articles on the same topic in Philip Appleman, ed., *An essay on the principle of population*.

1965 were not wanted by both parents and 22 percent were not wanted by at least one parent. The incidence of unwanted births was found, not unexpectedly, to be highest among the poor, to whom birth control and safe abortion were least available. Demographer Charles Westoff estimated that eliminating such a high proportion of unwanted births might reduce the U.S. rate of natural increase by as much as 35 to 45 percent.⁹

⁹L. A. Westoff and C. F. Westoff, *From now to zero: fertility, contraception and abortion in America*.

However, another distinguished demographer, Judith Blake, pointed out that the high incidence of unwanted births calculated by Westoff for the U.S. during 1960–1965 was caused in large part by births occurring disproportionately to women who already had several children.¹⁰ During those six years, there were unusually small proportions of first and second children born and unusually large proportions of births of higher orders (which are more likely to be unwanted). Hence, due to

¹⁰Reproductive motivation and population policy.

the age composition of the population, the *total* proportion of unwanted births in the U.S. was higher for those years than it has been at other times.

During the late 1960s, such changes as the increasing use of the pill and IUDs and relaxation of restrictions against voluntary sterilization substantially reduced the incidence of unwanted births of all orders. Results of the 1970 National Fertility Study confirmed this change, indicating that only about 14 percent of births between 1965 and 1970 were unwanted.¹¹ Most of the reduction in fertility in that period was due to reductions in unwanted and unplanned births. Since 1970, the extension of family planning services to the poor and the reversal of abortion laws (see below) have evidently further extended the trend, as attested by record low fertility rates.

There is no question that providing better contraceptives and simplified sterilization procedures, legalizing abortion, and ensuring that all are easily available to all members of the population reduces the incidence of unwanted pregnancy—a socially desirable end in itself. But even if a perfect contraceptive were available, the contraceptive-using population probably never will be perfect. People forget, are careless, and take chances. They are also often willing to live with their mistakes when the mistakes are babies. The complete elimination of unwanted births therefore is probably not possible. Nor does that alone account for the dramatic drop in the U.S. birth rate in the early 1970s. Rather, it appears that a significant change in family-size goals took place around that time, especially among young people who were just starting their families.¹²

Changing attitudes in the United States. Public surveys taken between 1965 and 1972 revealed a growing awareness of the population problem on the part of the American public. In 1965, about half of the people interviewed in a Gallup Poll thought that U.S. population growth might be a serious problem; in 1971, 87 percent thought that it was a problem now or would be by the year 2000. In January 1971 only 23 percent of

adults polled thought four or more children constituted the ideal family size, in contrast to 40 percent in 1967. One of the three most commonly given reasons for favoring small families in 1971 was concern about crowding and overpopulation; the others were the cost of living and uncertainty about the future.

In October 1971, a survey sponsored by the U.S. Commission on Population Growth and the American Future disclosed a still greater level of concern about the population explosion among Americans. Specifically, it was discovered that:

1. Over 90 percent of Americans viewed U.S. population growth as a problem; 65 percent saw it as a *serious* problem.
2. Over 50 percent favored government efforts to slow population growth and promote population redistribution.
3. Well over 50 percent favored family limitation even if a family could afford more children.
4. About 56 percent favored adoption after births of two biological children if more were desired.
5. Only 19 percent felt that four or more children were the ideal number for a family; 45 percent favored two or less. The mean was 2.33.
6. Only 8 percent thought the U.S. population should be larger than its current size.

Concurrent with the rise in public concern about population growth, Zero Population Growth, Inc., was founded in late 1968 to promote an end to U.S. population growth through lowered birth rates as soon as possible and, secondarily, to encourage the same goal for world population. The organization hoped to achieve this by educating the public to the dangers of uncontrolled population growth and its relation to resource depletion, environmental deterioration, and various social problems; and by lobbying and taking other political action to encourage the development of antinatalist policies in the government. Since its founding, ZPG has taken an active role in promoting access to birth control for all citizens, legalized abortion, women's rights, and environmental protection. More recently it has begun to explore changes in U.S. immigration policies. ZPG has clearly been a factor in changing attitudes toward family size and population control.

¹¹Charles F. Westoff, *The modernization of U.S. contraceptive practice; Trends in contraceptive practice: 1965–1973; The decline of unplanned births in the United States.*

¹²U.S. Bureau of the Census, *Fertility history and prospects of American women: June 1975.*

The growth of the women's liberation movement in the U.S. since 1965 has almost certainly been another important influence on attitudes (and thus on birthrates) through its emphasis on opportunities for women to fulfill themselves in roles other than motherhood. Many young women today are refreshingly honest about their personal lack of interest in having children and their concern for obtaining opportunities and pay equal to those of men. Such attitudes were virtually unthinkable in the United States before 1965.

The women's movement was a potent force behind the liberalization of U.S. abortion laws, and has also actively campaigned for the establishment of low cost day-care centers for children and tax deductions for the costs of child care and household work. Such facilities and policies lighten the costs of childbearing, but they also encourage mothers to find work outside the home. The experience of many societies suggests that outside employment of mothers discourages large families more than the existence of child-care facilities encourages them.

Both the growing concern about the population problem and the ideas of women's liberation doubtless contributed to changing attitudes toward family size in the 1970s. The economic uncertainty of the period may also have been a factor. While it may never be possible to determine the causes exactly, the achievement of subreplacement fertility in the United States is one of the most encouraging developments since 1970.

POPULATION POLICIES IN DEVELOPED COUNTRIES

Although birth control in some form is almost universally practiced in developed countries, very few have formulated any explicit national policies on population growth other than regulation of migration. Some European countries still have officially pronatalist policies left over from before World War II, when low birth rates led to concern about population decline.

Of course, many laws and regulations enacted for economic, health, or welfare reasons have demographic effects: for instance, those governing the availability of contraceptives, sterilization, and abortion; marriage and

divorce; income taxes and family allowances; and immigration regulations.

The United States

The United States has no specific population policy, although various laws, including those regulating immigration and the administration of income taxes, have always had demographic consequences. Most tax and other laws were until recently implicitly pronatalist in effect. In the late 1960s this situation began to change as state laws restricting the distribution of contraceptive materials and information were repealed and as abortion laws were relaxed in several states. In 1970 Congress passed the Family Planning Services and Population Research Act, established the Commission on Population Growth and the American Future, and passed the Housing and Urban Development Act, which authorized urban redevelopment and the building of new towns. In 1972, an amendment to the Constitution affirming equal rights for women passed Congress, but as of 1977 it was not yet ratified by the required number of states.

The Family Planning Services and Population Research Act of 1970 had the goal of extending family planning counselling and services to all who needed them, particularly the poor. It also provided funds for research on human reproduction. Some 3.8 million women were being provided with family planning services by 1975, 90 percent of whom had low or marginal incomes. Another 1.9 million were being served by private physicians. But it has been estimated that another 3.6 million eligible women (including about 2.5 million sexually active teenagers) were still not receiving needed help in the mid-1970s. Particularly neglected were women in rural areas and small towns. Government-subsidized services have been provided through local health departments, hospitals, and private agencies (primarily Planned Parenthood), most of which are located in urban areas. A leveling-off of increases in clients in 1974 and 1975 over previous years has been attributed mainly to lack of increased funding by the government rather than to lack of need.¹³

¹³Marsha Corey, U.S. organized family planning programs in FY 1974; Joy G. Dryfoos, The United States national family planning program, 1968-74; The Alan Guttmacher Institute, Organized family planning services in the United States: FY 1975; T. H. Firpo and D. A. Lewis, Family planning needs and services in nonmetropolitan areas.

Since 1967, the U.S. Agency for International Development (AID) has been permitted to include family planning assistance in its programs. Funding for overseas family planning assistance has been steadily increasing since then, and by fiscal 1976 had reached a level of \$201.5 million.¹⁴

The U.S. Commission on Population Growth and the American Future presented its findings and recommendations in 1972 in the areas of demographic development, resource utilization, and the probable effects of population growth on governmental activities.¹⁵ After two years of study, the Commission concluded that there were no substantial benefits to be gained from continued population growth, and indeed that there were many serious disadvantages. Besides recommending the liberalization of abortion laws and numerous other population-related policies, the report strongly recommended that contraceptives be made available to all who needed them, including minors; that hospital restrictions on voluntary sterilization be relaxed; that sex education be universally available; and that health services related to fertility be covered by health insurance. It also recommended policies to deal with immigration, population distribution, and land use. Perhaps most important, the Commission stated:

Recognizing that our population cannot grow indefinitely, and appreciating the advantages of moving now toward the stabilization of population, the Commission recommends that the nation welcome and plan for a stabilized population.¹⁶

Unfortunately, apart from expressing strong disagreement with the recommendations on abortion, President Nixon took no action on the Commission's report, nor did President Ford show any inclination to do so. The abortion question was made moot by the Supreme Court's decision in 1973 (see section on abortion below). Congress has contented itself mainly with expanding

federal family planning services. Thus, although the United States has not hesitated to advocate the establishment of official antinatalist population policies in less developed countries, it has not established one for itself.

The current low fertility of American women seems to have taken the urgency from the zero population growth movement—even though that fertility trend could easily reverse itself at any time. Given its present age composition, the U.S. still could reach the higher population projections of the Census Bureau (Chapter 5) if another baby boom occurred. In the mid-1970s, however, no consensus for immediate ZPG existed, and interest in population problems has been focused on aspects other than the birth rate—primarily on distribution and immigration.

Social objections to ZPG. The proposal to stop population growth naturally aroused considerable opposition on religious, social, and economic grounds. The role of religion in determining attitudes toward population growth, as well as toward the environment and resource limitation, is discussed in more detail in Chapter 14.

The primary social argument that has been raised against halting U.S. population growth is that it would substantially change the nation's age composition.¹⁷ As the population stabilized, the median age would increase from about 28 to about 37. Less than 20 percent of the population would then be under 15, and about the same percentage would be over 65 years old. At present, about 25 percent of the population is under 15, and 11 percent is over 65. It is assumed that such an old population would present serious social problems. Figure 5-15 (Chapter 5) shows the age compositions of the U.S. in 1900 and 1970 and how it would look in a future stationary population.

It is true that old people tend to be more conservative than young people, and they seem to have difficulty adjusting to a fast-changing, complex world. In an older population there would be relatively less opportunity for advancement in authority (there would be nearly as many 60 year-olds as 30 year-olds—so the number of potential

¹⁴AID in an Interdependent World, *War on hunger* special supplement, June 1975; see Phyllis T. Piotrow, *World population crisis: The United States response* for an historical account of U.S. involvement in overseas population programs.

¹⁵*Population and the American future.*

¹⁶*Population and the American future.* By a "stabilized population," the Commission meant a stationary one.

¹⁷Ansley J. Coale, *Man and his environment*, *Science*, vol. 170, pp. 132-136 (9 Oct. 1970).

chiefs would be about the same as the number of Indians). There would also be many more retired people, a group already considered a burden on society.

But even those who raise this argument must realize its fundamental fallacy. In the relatively near future, growth of the human population *will* stop. It would be far better for it to stop gradually through birth limitation than by the premature deaths of billions of people. (In the latter case, there would be other, much more serious problems to worry about). Therefore, if this generation does not initiate population control, we simply will be postponing the age composition problems, leaving them to be dealt with by our grandchildren or great grandchildren. Our descendants will be forced to wrestle with these problems in a world even more overcrowded, resource-poor, and environmentally degraded than today's.

Moreover, the assumption that an older population must be much less desirable than a younger one is questionable in this society. Today, chronic underemployment and high unemployment are exacerbated by a labor pool constantly replenished by growing numbers of young people, which forces early retirement of the old, making them dependents on society. Many of our current social problems, including the recently skyrocketing crime rates and serious drug problems, are associated with the younger members of the population. If population growth stopped, the pressure of young people entering the labor pool would decline, while crime and unemployment problems could be expected to abate, as would the need for forced retirement of older workers.

Old people today are obsolete to a distressing degree. But this is the fault of our social structure and especially of our educational system. The problem with old people is not that there are or will be so many of them, but that they have been so neglected. If underemployment were reduced, outside interests encouraged during the middle years, and education continued throughout adult life (as suggested in Chapter 14), older people would be able to continue making valuable contributions to society well into their advanced years. Maintaining the habits of active interest in society and learning new, useful skills might effectively prevent obsolescence and the tendency to become conservative and inflexible with advancing age.

Thus, although there may be some disadvantages to an

older population, there are also some definite advantages. While the proportion of dependent retired people grew, that of young children would shrink. The ever-rising taxes demanded in recent decades to support expanding school systems and higher educational facilities would cease to be such a burden; indeed, that has begun to happen already. The same is true of resources now devoted to crime control and other problems primarily of young people. Some of that money could be diverted instead to programs to help the aged. Moreover, the growth in the proportion of senior citizens (the numbers will not change; they are already born) will be far more gradual than the decline in numbers of babies and small children that has already occurred, allowing ample time for society to adjust to the change.

In the meantime, if birth rates remain low, the overall dependency ratio of the population will decline. In 1970 there were 138 dependents for every 100 workers in the United States; by 1980 the ratio will drop to about 118 and may be 112 or less by 1990.¹⁸ Even after the numbers of the aged begin to rise in the population, the dependency ratio will remain relatively low. As Kingsley Davis pointed out, the highest proportion (about 75 percent) of people in productive ages (15–65) is found in a population that is making the transition from growth to ZPG. The proportion is nearly as high in a stationary population (about 63 percent).¹⁹ And if years of productivity were extended to 70 and beyond, the proportion would be even higher, of course. By contrast, in very rapidly growing LDC populations, the proportion of people in their productive years (15 to 65) can be 50 percent or less.

Economic objections to ZPG. The economic objections to ZPG are based upon the realization that a nongrowing population implies at least a much more slowly growing economy, if not a nongrowing one. This thought strikes fear in the breasts of most businessmen and economists, even though a perpetually growing economy is no more sustainable than a perpetually growing population. The implications of a steady-state economy are discussed in Chapter 14; here we limit

¹⁸U.S. Bureau of the Census, *Population of the United States: Trends and prospects 1950–1990*.

¹⁹Zero population growth: the goal and the means. no. 4, 1973, pp. 15–30.

ourselves to some of the aspects more obviously related to population growth.²⁰

In 1971, economist J. J. Spengler noted the economic advantages and disadvantages of ZPG.²¹ One of the advantages is increased productivity per person, partly because of greater capital available for investment, and partly because of a reduced dependency ratio. Other advantages include stabilized demand for goods and services; increased family stability as a result of there being fewer unwanted children; reduction of costs of environmental side effects; and opportunities to minimize the effects of population maldistribution. On the minus side, Spengler mentioned the problems associated with the changed age structure and pointed out that there would be a relative lack of mobility for workers and less flexibility in the economy because there would be fewer entrants into the labor force. He was also concerned that there might be a tendency toward inflation, due in part to increases in the service sector and in part to pressure to raise wages more than rising productivity justified. Recent events, as population growth has slowed (though there is not yet a decline in growth of the labor pool), suggest that Spengler may be right about the inflation pressures, although many other influences clearly are involved too. And certainly there are ways to compensate for those pressures.

The question of labor shortage for an expanding economy in a stationary population has also been raised. But, as economist Alan Sweezy has pointed out, workers (and their families) are the main consumers as well as the producers.²² And, as mentioned above, the productive portion of a population is largest in stationary and transitional populations.

There was speculation by economists during the 1930s and 1940s that consumption patterns would be drastically, and presumably adversely, changed if population growth stopped. But a recent study comparing consumption patterns in the U.S. population of 1960/1961 (when it was growing relatively fast) with those of a

projected stationary population indicated that the changes would be surprisingly minor.²³ The most notable difference was that there would be proportionally more households (called *spending units* by economists) in an older stationary population; families would be smaller but more numerous. Many of the changes in actual spending patterns would balance each other; in a stationary population there would be a greater demand for housing, for instance, but a lower demand for clothing and transportation. In no case were the changes more than a few percent.

Differential reproduction and genetic quality. A common concern about population control is that it will in some way lead to a reduction in the genetic quality of *Homo sapiens*.²⁴ This concern is often expressed in such questions as "if the smart and responsible people limit their families while the stupid and irresponsible do not, couldn't that lead to a decline of intelligence and responsibility in humanity as a whole?" The technically correct answer is "no one knows"; the practical answer is "there is no point in worrying."

No one knows, because it is not at all clear what, if any, portion of the variation in traits like "intelligence" or "responsibility" (however defined, and definition is difficult and controversial) is influenced by genetics. The most intensively studied example of such "mental" traits is performance on various so-called intelligence tests, and it has not been possible to demonstrate unambiguously that genes make any significant contribution to an individual's scores.²⁵

There is no point in worrying about it because, even if these traits had a substantial genetic component and people with "bad" genes greatly outproduced people with "good" ones, it would take a great many generations (hundreds of years at a minimum) for the differential reproduction to produce a socially significant effect. Moreover, if such an effect were discovered, it could then

²⁰For a further discussion, see U.S. Commission on Population Growth, *Population and the American future*, vol. 2.

²¹Economic growth in a stationary population, *PRB selection* no. 38, Population Reference Bureau, Inc., Washington, D.C., July 1971; see also Spengler, *Population and American future*.

²²Labor shortage and population policy.

²³D. Eilenstine and J. P. Cunningham, Projected consumption patterns for a stationary population.

²⁴For discussion of this question, see papers in C. J. Bajema (ed), *Natural selection in human populations*.

²⁵See especially Leon J. Kamin, *The science and politics of IQ* for a critique of the twin data on which most of the evidence for the heritability of IQ rests.

be reversed either by reversing the selective pressures (for example, encouraging reproduction of those with high IQ test scores) or, more likely, by modifying the social environment in order to improve the performance of those with poor scores ("bad" genes).

Note that we have put quotation marks around "good" and "bad." It is common for nonbiologists to think that heredity is a fixed endowment that rigidly establishes or limits skills, abilities, attitudes, or even social class. In fact, heredity is at most one of two sets of interacting factors, the other being the cultural and physical environment. When heredity does play a significant role (and it often may not), it is the *product* of this interaction that is of interest, and that product may be modified very effectively by changing the environment.²⁶ There is therefore no need for deep concern about the possible genetic effects of population control.

Another related issue that seems to encourage a pronatalist attitude in many people is the question of the *differential reproduction* of social or ethnic groups. Many people seem to be possessed by fear that their group may be outbred by other groups. White Americans and South Africans are worried there will be too many blacks, and vice versa. The Jews in Israel are disturbed by the high birth rates of Israeli Arabs, Protestants are worried about Catholics, and Ibos about Hausas. Obviously, if everyone tries to outbreed everyone else, the result will be catastrophe for all. This is another case of the "tragedy of the commons," wherein the "commons" is the planet Earth.^{26a} Fortunately, it appears that, at least in the DCs, virtually all groups are exercising reproductive restraint.

For example, in the United States fertility in the black population has consistently been higher than white fertility (black mortality has also been higher). Since birth control materials and information began to be made available to low-income people in the late 1960s, black fertility has been declining even more rapidly than white fertility. By 1974, black women under 25 expected to have essentially the same number of children as white

women their age: an average of 2.2 (see Box 13-3).²⁷

The ideal situation, in our opinion, would be for all peoples to place a high value on diversity. The advantages of cultural diversity are discussed in Chapter 15; the reasons for avoiding a genetic monoculture in *Homo sapiens* are essentially the same as those for avoiding one in a crop plant—to maintain resistance to disease and a genetic reservoir for potential adaptation to changed environments in the future. The advantages also include the possibility of aesthetic enjoyment of physical diversity.²⁸ Some day we hope that whites will become distressed if blacks have too few children, and that, in general, humanity will strive to maximize its diversity while also maximizing the harmony in which diverse groups coexist.

Distribution and mobility. Obscuring the population controversy in the United States in the late 1960s was the tendency of some demographers and government officials to blame population-related problems on population maldistribution. The claim was that pollution and urban social problems are the result of an uneven distribution of people, that troubled cities may be overpopulated, while in other areas of the country the population has declined.²⁹ The cure promulgated in the 1960s was the creation of "new cities" to absorb the 80 million or so people then expected to be added to the U.S. population between 1970 and 2000.

It is of course true that there is a distribution problem in the United States. Some parts of the country are economically depressed and have been losing population—often the most talented, productive, and capable elements—while other areas have been growing so rapidly that they are nearly overwhelmed. Patterns of migration and settlement are such that residential areas have become racially and economically segregated to an

²⁶A detailed explanation for the layman of the complex issues of the inheritance of intelligence can be found in P. Ehrlich and S. Feldman, *Race bomb*. See also F. Osborn and C. J. Bajema, The eugenic hypothesis, for an optimistic evaluation of the genetic consequences of population control.

^{26a}Garrett Hardin, The tragedy of the commons.

²⁷Frederick S. Jaffe, Low-income families: fertility changes in the 1960s; Population Reference Bureau, Family Size and the Black American.

²⁸There is more genetic variation *within* groups of human beings than between them, but some of the inter-group variation may be biologically important (and is more widely recognized by lay persons).

²⁹For instance, demographer Conrad Taeuber, who supervised the 1970 U.S. Census, in a speech delivered at Mount Holyoke College in January 1971 (quoted in the *New York Times*, Jan. 14, 1971).

BOX 13-4 Abortion in the United States

Before 1967, abortion was illegal in the United States except when the mother's life was endangered by continuing the pregnancy. Only six years later, the situation had been completely reversed, legally if not everywhere in practice. Yet the change was not effected overnight; it was the result of changed public attitudes in response to a growing reform movement.

By the end of 1970, 15 of the 50 states had at least partially moderated their abortion laws. Most of these new laws permitted abortion only in cases where bearing the child presented a grave risk to the mental or physical health of the mother, where the pregnancy was a result of incest or rape, and where (except in California) there was a substantial likelihood that the child would be physically or mentally defective. To obtain an abortion, a woman usually had to submit her case to a hospital reviewing board of physicians, a time-consuming and expensive process. Although the laws ostensibly were relaxed to reduce the problem of illegal abortions, hospital boards at first interpreted the changes in the law so conservatively that they had little effect. The number of illegal abortions per year in the U.S. during the 1960s has been variously estimated at between 200,000 and 2 million, with 1 million being the most often quoted figure. This amounted to more than one abortion for every four births. At that time, there were estimated to be 120,000 illegal abortions per year in California; in the first year after the passage of California's "liberalized" law there were just over 2,000 legal ones. The figures were similar for the other states.

In 1970 Hawaii, Alaska, and New York passed new laws essentially permitting abortion on request, and Washington State legalized abortion on request not by legislation but by referendum. Meanwhile, several other states began to interpret their relatively restrictive laws much more liberally, and the legal abortion rate rose considerably. These changes in state laws were preceded and accompanied by an erosion of public opposition to abortion. Table 13-1 shows the changes in public disapproval as revealed in polls taken between 1962 and 1969 for demographer Judith Blake.

A poll taken early in 1970 asked: Should an abortion be available to any woman who requests one? In apparent contradiction to the earlier opinions, more than half of those interviewed said yes. Although most respondents did not approve of abortion except for the more serious reasons, the majority apparently felt that mothers should be free to make their own decisions.

Continuing this trend, a poll conducted in 1971 for the U.S. Commission on Population Growth and the American Future found that 50 percent of the adults interviewed felt that the decision to have an abortion should be made by the woman and her doctor, 41 percent would permit abortions under certain circumstances, and only 6 percent opposed abortion under all circumstances. Similar results have been obtained in subsequent surveys.^a

In January 1973, the U.S. Supreme Court announced its decision on an abortion case which in effect legalized abortion on request nationwide, at least for the first trimester (13 weeks), with restrictions on the second trimester being permitted in the interest of protecting women's health. Only in the last ten weeks of pregnancy, (when the child, if born, had a chance of survival) the court ruled, could states prohibit abortion except "to preserve the life or health of the mother."^b

The number of legal abortions performed in 1972 (before the Supreme Court decision) was about 600,000; in 1975 it was about one million—approximately the estimated previous number of illegal abortions. At least two-thirds of these abortions probably would have been obtained illegally if legal abortions had been unavailable.^c Nor had illegal abortions entirely disappeared—25 of the 47 deaths from abortions in 1973 were from illegal ones (those not performed under proper medical supervision)—although the incidence of such deaths clearly had been drastically reduced by 1975.^d

Yet, three years after the Supreme Court decision, there were still large discrepancies from one region to another and between medical facilities in providing abortion services. An ongoing national study by the Guttmacher Institute^e in 1975 concluded that between 260,000 and 770,000 women who needed abortions in 1975—20 to 40 percent of the women in need—

^aW. R. Arney and W. H. Trescher, Trends in Attitudes toward abortion, 1972–1975.

^bFor a lively account of the campaign to change U.S. abortion laws, see Lawrence Lader, *Abortion II: making the revolution*.

^cEdward Weinstock, et al., Legal abortions in the United States since the 1973 Supreme Court decisions; Abortion need and services in the United States, 1974–1975, *Family Planning Perspectives*, vol. 8, no. 2, March 1976.

^dRichard Lincoln, The Institute of Medicine reports on legalized abortion and the public health.

^ePart of the Planned Parenthood Federation of America. The 1976 Study was titled: *Provisional estimates of abortion need and services in the year following the Supreme Court decisions: United States, each state and metropolitan area*. The 1976 Study was *Abortion 1974–1975—need and services in the United States, each state and metropolitan area*.

were still unable to obtain them. More than half of all abortions after 1973 were carried out in specialized clinics, while public hospitals (which provide most medical services to the poor) were lagging even behind private hospitals in providing services. Only one in five U.S. public hospitals reported performing any abortions in 1975. Thus in many areas it was substantially more difficult for poor women to obtain abortions than for middle-class or wealthy women, even though government funds were available to cover the costs. Teenagers, who account for about one-third of the need for abortion services and for a large and growing portion of the illegitimate birth rate, also seem to have poor access to safe abortions. Finally, abortion services were found to be generally less available in the southern and central regions of the U.S. than on either coast.

In the United States, the majority of abortion recipients are young and/or unmarried. There is some debate over the degree to which legal abortion has affected American fertility overall, but it seems to have had a significant effect on the rate of illegitimate births. In 1971 reductions in illegitimate births in states with legal abortion ranged as high as 19 percent, while in most states without legal abortion they continued to increase.^f Following the Supreme Court decision, the rising rate of illegitimacy halted briefly, then began again. The rise was accounted for by an increase in teenage pregnancy.

There is no evidence that abortion has replaced contraceptives to any significant degree, despite the apprehensions of antiabortion groups on this score. Most women seeking abortion have a history of little or no contraceptive practice, and many are essentially ignorant of other means of birth control. Those who return for subsequent abortions have been found to be still ignorant of facts of reproduction, using contraceptives improperly, or to have been poorly guided by their physicians.^g

Paralleling the trend toward liberalized abortion policies in the U.S. has been the growth of right-to-life groups who are adamantly opposed to abortion. These groups have lobbied actively against reform of state laws and, since the Supreme Court decision, have tried to persuade Congress to reimpose sanctions against abortion through Constitutional amendments. Under their pressure, Congress has removed funds for

TABLE 13-1
Change in Disapproval of Abortion (all white respondents)

Reason for abortion	Percentage of disapproval			
	1962	1965	1968	1969
Mother's health endangered	16	15	10	13
Child may be deformed	29	31	25	25
Can't afford child	74	74	72	68
No more children wanted	—	—	85	79

Source: Judith Blake, Abortion and public opinion.

abortion services from Foreign Aid grants to LDCs. In 1976, Congress also passed a law forbidding federal assistance for abortions in the U.S., a move that denies these services to low-income women—precisely the group whose chances for a decent and productive life are most likely to be jeopardized by an unwanted child. Whether the courts will consider such a discriminatory law constitutional is another question. Right-to-life groups have also played a part in harassing clinics, hospitals, and other organizations that provide abortion. This activity often embarrasses clients and possibly has also discouraged other institutions from providing abortion services.

Action by right-to-life groups in Boston resulted in the trial and conviction for manslaughter in early 1975 of physician Kenneth Edelin following a late-term abortion (about 20 weeks). The prosecution maintained that the fetus might have survived if given life-supporting treatment. (The conviction was overturned in December 1976 by the Massachusetts Supreme Judicial Court.)^h The consequence of the original verdict nevertheless was to discourage late second-trimester abortions (31 states already had laws against them except to protect the mother's life or health; in most states abortion by choice was available only through the 20th week). Unfortunately, this change also will affect mainly the poor and/or very young women, who through ignorance or fear are more likely to delay seeking an abortion until the second trimester.

In 1976, a Right-to-Life political party was formed, centering on the abortion issue. Its candidate, Ellen McCormack, entered primaries in several states, but never succeeded in winning more than 5 percent of the vote. Most Americans, it appears, accept the present legal situation at least as the lesser of evils.

^fJ. Sklar and B. Berkov, Abortion, illegitimacy, and the American birth rate.

^gBlame MD mismanagement for contraceptive failure, *Family Planning Perspectives*, vol. 8, no. 2, March/April 1976, pp. 72-76.

^h*Time* and *Newsweek*, March 3, 1975. Both magazines covered the trial and the issues it raised in some detail. See also Barbara Culliton's thoughtful article, Edelin trial; jury not persuaded, and Edelin conviction overturned, *Science*, vol. 195, January 7, 1977, pp. 36-37.

abortion on the grounds that it will encourage promiscuity—exactly the same reason given in Japan for banning the pill and the IUD. There is no evidence to support either point of view on promiscuity, but, even if there were an increase, it would seem a small price to pay for a chance to ameliorate the mass misery of unwanted pregnancies—especially since the main ostensible reason for social disapproval of promiscuity is the production of unwanted children.

Many Protestant theologians hold that the time when a child acquires a soul is unknown and perhaps unimportant. They see no difficulty in establishing it at the time of “quickening,” when movements of the fetus first become discernible to the mother; or at the time, around 28 weeks, when the infant, if prematurely born, might survive outside its mother’s body. To them, the evil of abortion is far outweighed by the evil of bringing into the world an unwanted child under less than ideal circumstances.

To a biologist the question of when life begins for a human child is almost meaningless, since life is continuous and has been since it first began on Earth several billion years ago. The precursors of the egg and sperm cells that create the next generation have been present in the parents since they were embryos themselves. To most biologists, an embryo or a fetus is no more a complete human being than a blueprint is a complete building.^{55a} The fetus, given the opportunity to develop properly before birth, and given the essential early socializing experiences and sufficient nourishing food during the crucial early years after birth, will ultimately develop into a human being. Where any of these is lacking, the resultant individual will be deficient in some respect. From this point of view, a fetus is only a potential human being, with no particular rights. Historically, the law has dated most rights and privileges from the moment of birth, and legal scholars generally agree that a fetus is not a “person” within the meaning of the U.S. Constitution until it is born and living independent of its mother.

From the standpoint of a terminated fetus, it makes no difference whether the mother had an induced or a spontaneous abortion. On the other hand, it subsequently makes a great deal of difference to the child if an abortion

is denied and the mother, contrary to her wishes, is forced to devote her body and life to the production and care of the child. In Sweden, a study was made to determine what eventually happened to children born to mothers whose requests for abortions had been turned down. When compared to a group of children from similar backgrounds who had been wanted, more than twice as many of the unwanted youngsters grew up in undesirable circumstances (illegitimate, in broken homes, or in institutions); more than twice as many had records of delinquency, or were deemed unfit for military service; almost twice as many had needed psychiatric care; and nearly five times as many had been on public assistance during their teens.⁵⁶

In a 1975 study in Czechoslovakia, nine-year old children whose mothers had been denied abortions were compared with carefully matched “controls.”⁵⁷ The unwanted children tended to have more problems of health and social adjustment and to perform less well in school than did their peers who had been wanted. Further, it appeared that the disadvantages of being unwanted—initially, at least—affected boys more strongly than girls.

There seems little doubt that the forced bearing of unwanted children has undesirable consequences not only for the children and their families, but for society as well, apart from the problems of overpopulation. The latter factor, however, adds further urgency to the need for alleviating the other situations. An abortion is clearly preferable to adding one more child to an overburdened family or an overburdened society, where the chances that it will realize its full potential are slight. The argument that a decision is being made for an unborn person who “has no say” is often raised by those opposing abortion. But unthinking actions of the very same people help to commit future unheard generations to misery and early death on an overcrowded planet. One can also challenge the notion that older men, be they medical doctors, legislators, or celibate clergymen, have the right to make decisions whose consequences are borne largely by young women and their families.

There are those who claim that free access to abortion

^{55a}Garrett Hardin, Abortion—compulsory pregnancy?

⁵⁶Lars Hultdt, Outcome of pregnancy when legal abortion is readily available.

⁵⁷Z. Dytrych, et al., Children born to women denied abortion.

will lead to genocide. It is hard to see how this could happen if the decision is left to the mother. A mother who takes the moral view that abortion is equivalent to murder is free to bear her child. If she cannot care for it, placement for adoption is still possible in most societies.

Few people would claim that abortion is preferable to contraception, not only because of moral questions, but also because the risk of subsequent health problems for the mother may be greater. Death rates for first-trimester, medically supervised abortions are a fraction of those for pregnancy and childbirth but considerably higher in later months.⁵⁸ Large and rapidly growing numbers of people nevertheless feel that abortion is vastly preferable to the births of unwanted children, especially in an overpopulated world. Until more effective forms of contraception than now exist are developed, and until people become more conscientious in use of contraceptives, abortion will remain a needed back-up method of birth control when contraception fails.

Attitudes on abortion have changed in most countries in recent years, and they can reasonably be expected to change more in the future. The female part of the world's population has long since cast its silent vote. Every year over one million women in the United States, and an estimated 30 to 55 million more elsewhere, have made their desires abundantly clear by seeking and obtaining abortions. Until the 1970s, these women were forced to seek their abortions more often than not in the face of their societies' disapproval and of very real dangers and difficulties. Millions still must do so.

There is little question that legalized abortion can contribute to a reduction in birth rates. Wherever liberal laws have been enacted, they have been followed by lowered fertility. Longstanding evidence is available from Japan and Eastern Europe, where abortion was the primary effective form of birth control available for some years after liberalization, and where the decline in fertility was substantial. The extent of decline is bound to be related to the availability of other birth control methods; but even in the United States and England, where contraceptives have been widely available, the decline in fertility after reversal of abortion policies was significant.

⁵⁸Tietze and Murstein, Induced abortion.

According to at least one study, availability of abortion (legal or illegal) may be necessary in order for a population to reach and maintain fertility near replacement level, given current contraceptive technology and patterns of sexual behavior.⁵⁹ Liberalization of abortion policies in those countries where it is still largely or entirely illegal is therefore justifiable both on humanitarian and health grounds and as an aid to population control.

POPULATION POLICIES IN LESS DEVELOPED NATIONS

In response to rising alarm during the 1950s over the population explosion in less developed countries, both private and governmental organizations in the United States and other nations began to be involved in population research and overseas family planning programs. First among these, naturally, was the International Planned Parenthood Federation, which grew out of the established national groups. By 1975 there were Planned Parenthood organizations in 84 countries, supported by their own governments, private donations, government grants from developed countries, or some combination of these sources.⁶⁰

Various other private and governmental organizations followed Planned Parenthood into the field, including the Ford and Rockefeller Foundations, the Population Council, the U.S. Agency for International Development (AID), and agencies of several other DC governments. International organizations such as the World Bank and various UN agencies, particularly the UN Fund for Population Activities, had joined by 1970. The 1960s brought a great proliferation of family planning programs in LDCs, which were assisted or administered by one or another of these groups. Most assistance from DCs was provided through one of the international or private organizations. In 1960 some \$2 million was spent by developed countries (and the U.S. was not then among them) to assist LDC family planning programs; by 1974

⁵⁹C. Tietze and J. Bongaarts, Fertility rates and abortion rates: simulations of family limitation, *Studies in family planning*, vol. 6, no. 5, May 1975, p. 119.

⁶⁰Population Reference Bureau, *World population growth and response*, pp. 243-248.

TABLE 13-2
Family Planning in LDCs

<i>Population (millions, 1975)</i>	<i>Have an official policy to reduce population growth rate</i>	<i>Have official support of family planning for other reasons</i>	<i>Neither have policy nor support family planning</i>
400+	People's Republic of China (1962) India (1952, reorganized 1965)	—	—
100–400	Indonesia (1968)	Brazil (1974)	—
50–100	Mexico (1974) Pakistan (1960, reorganized 1965) Bangladesh (1971)	Nigeria (1970)	—
25–50	Turkey (1965) Egypt (1965) Iran (1967) Philippines (1970) Thailand (1970) South Korea (1961) Vietnam (1962 in North)	Zaire (1973)	Burma Ethiopia Argentina
15–25	Morocco (1968) Taiwan (1968) Colombia (1970)	Tanzania (1970) South Africa (1966) Afghanistan (1970) Sudan (1970) Algeria (1971)	North Korea Peru
10–15	Nepal (1966) Sri Lanka (Ceylon) (1965) Malaysia (1966) Kenya (1966)	Venezuela (1968) Chile (1966) Iraq (1972) Uganda (1972)	
Less than 10	Tunisia (1964) Barbados (1967) Dominican Republic (1968) Singapore (1965) Hong Kong (1973) Jamaica (1966) Trinidad and Tobago (1967) Laos (1972, possibly discontinued) Ghana (1969) Mauritius (1965) Puerto Rico (1970) Botswana (1970) Fiji (1962) El Salvador (1968) Gilbert and Ellice Islands (1970) Guatemala (1975) Grenada (1974) Bolivia (1968, reorganized 1973) Costa Rica (1968) El Salvador (1968)	Cuba (early 1960s) Nicaragua (1967) Syria (1974) Panama (1969) Honduras (1966) Dahomey (1969) Gambia (1969) Rhodesia (1968) Senegal (1970) Ecuador (1968) Honduras (1965) Benin (early 1970s) Haiti (1971) Papua-New Guinea (1969) Paraguay (1972) Liberia (1973) Lesotho (1974) Western Samoa (1971) Madagascar (1974) Sierra Leone (early 1970s) Swaziland (1969) Togo (early 1970s) Zambia (early 1970s) Cambodia (1972, possibly discontinued) Guyana (1975) Surinam (1974) Uruguay (1971) Other small Caribbean countries (1960s)	Cameroon Angola Malawi Jordan Lebanon Saudi Arabia Syria Yemen Mali Upper Volta Mozambique Burundi Central African Republic Chad Comoros Congo Equatorial Guinea Guinea-Bissau Ivory Coast Libya Mauritania Niger Rwanda Seychelles Somalia Namibia Israel

Sources: Berelson, Population control programs; Nortman, Population and family planning programs, 1975; Population Reference Bureau, *World population growth and response*.

At the other extreme, Brazil and Argentina have policies generally promoting growth. Brazil does permit private family planning groups to operate, however, especially in the poverty-stricken Northeast. Argentina, having a relatively low birth rate and feeling threatened by rapidly growing Brazil, in 1974 banned dissemination of birth control information and closed family planning clinics. Since the practice of birth control is well established in the Argentine population, the action is not likely to have great effect except perhaps to raise the already high abortion rate, mostly illegal.

Asia. Asia includes over half of the human population and is growing at about 2.3 percent per year. Both mortality and birth rates are generally lower than those in Africa, and both have been declining in several countries.

Asia presents a widely varied picture in regard to population policies. At one extreme, China, India, Thailand, Indonesia, Sri Lanka, Hong Kong, Singapore, Taiwan, and South Korea are pursuing strong family planning policies, in several cases reinforced by social and economic measures, some of which are described below. All of these countries have recorded declines in birth rates, some of them quite substantial. Family planning programs have also been established in Pakistan, Bangladesh, Nepal, Malaysia, and the Philippines, but the impact, if any, on birth rates is negligible so far.

A few rapidly growing countries, notably Cambodia and Burma, currently are pursuing pronatalist population policies, although family planning is privately available in the latter country. Other "centrally planned" countries in Southeast Asia seem to be following China's example in population policies; North Vietnam has had a family planning program for some time, which presumably was extended to South Vietnam when the nation was unified. Policies in North Korea are unknown.

Middle Eastern nations are still largely pronatalist in their outlook, with the exceptions of Turkey and Iran which have national family planning programs. Several countries, including Afghanistan, Bahrain, Cyprus, Iraq, Jordan, Lebanon, and Syria, are interested in establishing family planning services for health and welfare reasons. The remaining countries favor continued growth, although they may tolerate family planning

activity in the private sector. Among these is Israel, for obvious reasons. At the furthest extreme is Saudi Arabia, which has outlawed importation of contraceptives. Nearly all Middle Eastern countries are growing rapidly with relatively high, although declining death rates.

The United Nations. For many years, the United Nations limited its participation in population policies to the gathering of demographic data. This, however, was instrumental in developing awareness of the need for population policies, especially among LDCs, whose governments often had no other information about their population growth. Since the late 1960s the UN has taken an active role in coordinating assistance for and directly participating in family planning programs of various member nations, while continuing the demographic studies. A special body, the UN Fund for Population Activities (UNFPA), advises governments on policies and programs, coordinates private donors and contributions from DC governments, and sometimes directly provides supplies, equipment, and personnel through other UN agencies.

In 1967 the UN Declaration on Social Progress and Development stated that "parents have the exclusive right to determine freely and responsibly the number and spacing of their children."⁶⁷ The statement affirmed the UN's increasing involvement in making family planning available to all peoples everywhere and contained an implicit criticism of any government policy that might deny family planning to people who wanted it. The statement has sometimes been interpreted as a stand against compulsory governmental policies to control births; however, the right to choose whether or not to have children is specifically limited to "responsible" choices. Thus, the Declaration also provides governments with the right to control irresponsible choices.

In 1974 the United Nations' World Population Conference, the first worldwide, government-participating forum on the subject, was convened in Bucharest. Publicity attending the event gave an impression of enormous disagreement among participating groups. But in fact it provided a valuable forum for an exchange of

⁶⁷Declaration on Population, Teheran, 1968, *Studies in Family Planning*, no. 16, January, 1967.