

Beyond Family Planning

What further proposals have been made to "solve" the population problem, and how are they to be appraised?

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This article rests on four propositions: (i) among the great problems on the world agenda is the population problem; (ii) that problem is most urgent in the developing countries, where rapid population growth retards social and economic development; (iii) there is a time penalty on the problem in the sense that, other things being equal, anything not done sooner may be harder to do later, due to increased numbers; and accordingly (iv) everything that can properly be done to lower population growth rates should be done, now. The question is, what is to be done? There is a certain agreement on the general objective (that is, on the desirability of lowering birth rates, though not on how far and how fast), but there is disagreement as to means.

The first response to too high growth rates deriving from too high birth rates is to introduce voluntary contraception on a mass basis, or try to. Why is family planning the first step taken on the road to population control? Probably because, from a broad political standpoint, it is the most acceptable one; since it is closely tied to maternal and child care it can be perceived as a health measure beyond dispute, and since it is voluntary it can be justified as a contribution to the effective personal freedom of individual couples. On both scores, it ties into accepted values and thus achieves political viability. Moreover, it is a gradual effort and an inexpensive one, both of which features contribute to its political acceptability.

How effective have family-planning programs been as a means toward population control? There is currently some controversy among qualified observers as to its efficacy (1), and this is not the place to review that issue. There is agreement, however, that the problem is of such magnitude and consequence that additional efforts are needed to

reach a "solution," however that is responsibly defined.

For the purpose of this article, then, let us assume that today's national family-planning programs, mainly based on voluntary contraception, are not "enough"—where "enough" is defined not necessarily as achieving zero growth in some extended present but simply as lowering birth rates quickly and substantially. "Enough" begs the question of the ultimate goal and only asks that a faster decline in population growth rates be brought about than is presently being achieved or in prospect—and, within the range of the possible, the faster the better (2, 3). Just to indicate roughly the order of magnitude, let us say that the proximate goal is the halving of the birth rate in the developing countries in the next decade or two—from, say, over 40 births per thousand per year to 20 to 25 (4). For obvious reasons, both emigration and increased death rates are ruled out of consideration.

What is to be done to bring that reduction about, beyond present programs of voluntary family planning? I address that question in two ways: first, by listing the programs or policies more or less responsibly suggested in recent years for achieving this end; second, by reviewing the issues raised by the suggested approaches.

Proposals beyond Family Planning

Here is a listing of the several proposals, arranged in descriptive categories. The list includes both proposals for consideration and proposals for action.

A. Extensions of voluntary fertility control.

1) Institutionalization of maternal care in rural areas of developing countries: a feasibility study of what would

be required in order to bring some degree of modern medical or paramedical attention to every pregnant woman in the rural areas of five developing countries, with professional backup for difficult cases and with family-planning education and services a central component of the program, aimed particularly at women of low parity (5).

2) Liberalization of induced abortion (6; 7, p. 139; 8).

B. Establishment of involuntary fertility control.

1) Mass use of a "fertility control agent" by the government to regulate births at an acceptable level. The "fertility control agent," designed to lower fertility in the society to a level 5 to 75 percent below the present birth rate, as needed, would be a substance now unknown but believed to be available for field testing after 5 to 15 years of research work. It would be included in the water supply in urban areas and administered by "other methods" elsewhere (9). A related suggestion is the "addition of temporary sterilants to water supplies or staple food" (10).

2) "Marketable licenses to have children," given to women and perhaps men in "whatever number would ensure a reproduction rate of one" (say, 2.2 children per couple). For example, "the unit certificate might be the 'deci-child,' and accumulation of ten of these units, by purchase, inheritance or gift, would permit a woman in maturity to have one legal child" (11).

3) Temporary sterilization of all girls by means of time-capsule contraceptives, and of girls and women after each delivery, with reversibility allowed only upon governmental approval. Certificates of approval would be distributed according to national popular vote on desired population growth, and saleable on the open market (12).

4) Compulsory sterilization of men with three or more living children (13); a requirement of induced abortion for all illegitimate pregnancies (6).

C. Intensified educational campaigns.

1) Inclusion of educational materials on population in primary and secondary school systems (6, 14, 15).

2) Promotion of national satellite television systems for directly disseminating information on population and family planning and for indirectly pro-

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moting acceptance of modern attitudes and practices in general (7, p. 162; 16; 17, especially pp. 13–14; 18).

D. *Incentive programs.* As used here, the term *incentive programs* refers to payments, or their equivalent, made directly to couples who use contraceptives or to couples who do not have children for specified periods. It does *not* refer to payments to field workers, medical personnel, volunteers, and others, for securing acceptance of contraceptive practice.

1) Payment, or the equivalent (for example, the gift of a transistor radio), for accepting sterilization (6, 19–21) or for the effective practice of contraception (21–24).

2) A bonus for child spacing or non-pregnancy (25–28); a savings certificate to couples for each 12-month period in which no child is born (29); a lottery scheme for preventing illegitimate births among teenagers in a small country (30); “responsibility prizes” for each 5 years of childless marriage or for vasectomy before the birth of a third child, and special lotteries, with tickets available to the childless (7, p. 138).

E. *Tax and welfare benefits and penalties*—that is, a system of social services that would discourage child-bearing rather than encourage it, as present systems tend to do.

1) Withdrawal of maternity benefits, perhaps after the birth of N (?) children (6, 21, 26) or in cases where certain limiting conditions, such as adequate child spacing, knowledge of family planning, or attainment of a given level of income, have not been met (31, pp. 130–31).

2) Withdrawal of child or family allowances, perhaps after the birth of N children (6; 26; 31, pp. 131–36).

3) Levy of tax on births after the N th child (21; 26; 28, p. 30).

4) Limitation of governmentally provided medical treatment, housing, scholarships, loans, subsidies, and so on, to families with fewer than N children (6, 26).

5) Reversal of tax benefits, to favor the unmarried and the parents of fewer rather than more children (6; 7, pp. 136–37; 21; 26; 31, p. 137; 32).

6) Provision by the state of N years of free schooling, at all levels, to each family, to be allocated among the children as desired (33).

7) Pensions for poor parents with fewer than N children, as social security for their old age (21, 34, 35).

F. *Shifts in social and economic institutions*—that is, broad changes in

fundamental institutional arrangements that could have the effect of lowering fertility.

1) Raising the minimum age at marriage, through legislation or through imposition of a substantial fee for marriage licenses (6, 32); through direct payment of bonuses for delayed marriage (25); through payment of marriage benefits only to parents of brides over 21 years old (31, p. 130); through government loans for wedding ceremonies when the bride is over a given age, or with the interest rate inversely related to the bride's age (36); through a “governmental ‘first marriage grant’ . . . awarded each couple in which the age of both [sic] partners was 25 or more” (7, p. 138); or through establishment of a domestic “national service” program for all men for the appropriate 2-year period in order to develop social services, inculcate modern attitudes toward (among other matters) family planning and population control, and delay marriage (37).

2) Measures to promote or require the participation of women in the labor force (outside the home), in order to provide roles and interests for women that are alternative or supplementary to marriage (6, 32, 38).

3) “Direct manipulation of family structure itself—planned efforts at deflecting the family's socializing function . . . or introducing nonfamilial distractions . . . into people's lives,” specifically through employment of women outside the house (39); “selective restructuring of the family in relation to the rest of society” (6).

4) Promotion of “two types of marriage, one of them childless and readily dissolved, and the other licensed for children and designed to be stable”; marriages of the first type would have to constitute 20 to 40 percent of the total in order to allow free choice of family size for marriages of the second type (16, 40).

5) Encouragement of long-range social trends leading toward lower fertility—for example, “improved and universal general education, or new roads facilitating communication, or improved agricultural methods, or a new industry that would increase productivity, or other types of innovation that may break the ‘cake of custom’ and produce social foment” (41); improvement in the status of women (42).

6) Efforts to lower death rates even further, particularly infant and child death rates, in the belief that lower birth rates will follow (43).

G. *Political channels and organizations.*

1) U.S. insistence on “population control as the price of food aid,” with highly selective assistance based thereon, and exertion of political pressures on governments or religious groups that impede “solution” of the population problem (7, pp. 161–66; 44).

2) Reorganization of national and international agencies to deal with the population problem: within the United States, “coordination by a powerful governmental agency, a Federal Department of Population and Environment . . . with the power to take whatever steps are necessary to establish a reasonable population size” (7, p. 138; 45); within India, creation of “a separate Ministry of Population Control” (46, p. 96); development of an “international specialized agency larger than WHO to operate programs for extending family limitation techniques to the world . . . charged with the responsibility of effecting the transfer to population equilibrium” (16).

3) Promotion of zero growth in population as the ultimate goal, and acceptance of this goal now in order to place intermediate goals of lowered fertility in proper context (6).

H. *Augmented research efforts.*

1) More research on social means for achieving necessary fertility goals (6).

2) Focused research on practical methods of sex determination (47).

3) Increased research directed toward improvement of the contraceptive technology (48).

Proposals: Review of the Issues

Here are 29 proposals beyond family planning for dealing with the problem of undue population growth in the developing world. Naturally I cannot claim that these are all the proposals that have been made more or less responsibly toward that end, but my guess is that there are not many more and that these proposals are a reasonably good sample of the total list.

Since several of the proposals tend in the same direction, it seems appropriate to review them against the criteria that any such proposals might be required to meet. What are such criteria? There are at least six: (i) scientific, medical, and technological readiness; (ii) political viability; (iii) administrative feasibility; (iv) economic capability; (v) moral, ethical, and philosophical acceptability; and (vi) presumed effec-

tiveness. In other words, the key questions are: Is the scientific, medical, technological base available or likely? Will governments approve? Can the proposal be administered? Can the society afford the proposal? Is it morally acceptable? And, finally, will it work?

Scientific, medical, technological readiness. Two questions are involved: (i) is the needed technology available? and (ii) are the medical or paramedical personnel needed in order to assure medical administration and safety available or readily trainable?

With regard to temporary contraception, sterilization, and abortion, not only is the needed technology available now, but it is being steadily improved and expanded. The intrauterine device (IUD) and the oral pill have been major contraceptive developments of the past decade, and several promising leads are now being followed up (49), though it cannot be said with much confidence that any of the efforts will produce measures suitable for mass use within the next few years (50). Improved technologies for sterilization, both male and female, are being worked on, and there has been a recent development in abortion technique, the so-called suction device.

However, neither Ehrlich's "temporary sterilants" nor Ketchel's "fertility control agent" (B-1) is now available or on the technological horizon, though that does not mean that the research task ought not to be pursued against a subsequent need, especially since any such substance could be administered to individuals on a voluntary basis as well as to the population as a whole on an involuntary basis. In the latter case, if administered through the water supply or a similar source, the substance would have to be medically safe and free of side effects for men and women, young and old, well and ill, physiologically normal and physiologically marginal, as well as for animals and perhaps plants. As some people have remarked, the proposal that such a substance be added to a water supply would face far greater difficulties of acceptance, simply on medical grounds, than the far milder proposals with regard to fluoridation to prevent tooth decay.

Though a substantial technology in fertility control does exist, that does not necessarily mean that the techniques can be applied where they are most needed; this is true partly because of limitations in the number of trained personnel. In general, the more the

technology requires the services of medical or paramedical personnel (or, what is much the same, is perceived as requiring them), the more difficult it is to administer in the developing countries. In the case of sterilization and abortion, the medical requirement becomes more severe. For example, when the policy of compulsory vasectomy of men with three or more children was first being considered in India (see 13), it was estimated that the policy would affect about 40 million males: "one thousand surgeons or parasurgeons each averaging 20 operations a day for five days a week would take eight years to cope with the existing candidates, and during this time of course a constant supply of new candidates would be coming along" (51)—at present birth rates, probably some 3.5 million a year. A program of large-scale abortion (provided such a program was legal and acceptable) might additionally require hospital beds, which are in particularly short supply in most developing countries. However, the newer abortion technique might not require hospitalization—theoretically, the abortion "camp" may be feasible, as the vasectomy "camp" was, though the problems are substantially greater.

In short, the technology is available for some but not for all current proposals, and the case is similar for properly trained personnel.

Political viability. The "population problem" has been increasingly recognized by national governments and international agencies over the past decade, and policies for dealing with it have been increasingly adopted: national family-planning programs in some 20 to 25 countries; positive resolutions and actions within the United Nations family; large programs of support by such developed countries as the United States and Sweden; the so-called World Leaders' Statement, in which 30 heads of governments endorsed efforts to limit population growth. There is no reason to think that the trend toward population limitation has run its course.

At the same time, the political picture is by no means unblemished. Some favorable policies are not strong enough to support a vigorous program, even one limited to family planning on health grounds; in national politics, "population control" can become a handy issue for a determined opposition; internal ethnic balances are sometimes delicately involved, with political ramifications; national size is often equated with national power, from the

standpoint of international relations and regional military balances; the motives behind the support and encouragement of population control by the developed countries are sometimes perceived as neocolonialist or neoimperialist; and on the international front, as represented by the United Nations, there is still considerable reluctance based on both religious and political considerations. In short, ambivalence on the part of the elite and recognition of the issue as a political liability are not absent even in the countries that favor population limitation.

Any social policy adopted by government rests on some minimum consensus concerning goals and means. They need not be the ultimate goals or the final means; the socioeconomic plans of developing countries are typically 5-year plans, not 20- or 40- or 100-year plans. Indeed, the ultimate goal of population policy—that is, zero growth—need not be agreed upon or even considered by officials who *can* agree upon the immediate goal of lowering growth by a specified amount or by "as much as possible" within a period of years. And since there are always goals beyond goals, one does not even need to know what the ultimate goal is—only the direction in which it will be found (which is usually more readily agreed upon). Would insistence *now* on the acknowledgment of an *ultimate* goal of zero growth advance the effort or change its direction?

To start with, the proposal of compulsory controls in India in 1967 (B-4) precipitated "a storm of questions in Parliament" (52); the proposal was withdrawn, and the issue resulted in a high-level shift of personnel within the family-planning organization. No other country has seriously entertained the idea. Other considerations aside, in many countries political instability would make implementation virtually impossible.

Social measures designed to affect the birth rate indirectly—for example, tax benefits, social security arrangements, and so on—have been proposed from time to time. In India there have been several such proposals: for example, by the United Nations mission (53, chap. 11), by the Small Family Norm Committee (26), by the Central Family Planning Council (54), and in almost every issue of such publications as *Family Planning News*, *Centre Calling*, and *Planned Parenthood*.

As Samuel reports, with accompanying documentation (21), "the desirabil-

ity of imposing a tax on births of fourth or higher order has been afloat for some time. However, time and again, the suggestion has been rejected by the Government of India." In some cases action has been taken either by the central government [for example, income tax "deductions for dependent children are given for the first and second child only" (53, p. 87)] or by certain states ["Maharashtra and Uttar Pradesh have decided to grant educational concessions and benefits only to those children whose parents restrict the size of their families" (55)]. Indicative of political sensitivity is the fact that an order withdrawing maternity leave for nonindustrial women employees with three or more living children—at best a tiny number of educated women—was revoked before it went into effect (56). There is a special political problem in many countries, in that economic constraints on fertility often turn out in practice to be selective on class, racial, or ethnic grounds, and thus exacerbate political tensions. Moreover, the promotion of female participation in the labor force runs up against the political problem that such employment would be competitive with men in situations of already high male unemployment and underemployment.

Whether programs for eliminating population growth are or are not politically acceptable appears to depend largely upon whether they are perceived as positive or negative; where "positive" means that they are seen as promoting not only population limitation but other social benefits as well, and where "negative" means that they are seen as limited to population control. For example, family planning programs, as noted above, are often rationalized as contributing to both maternal and child health and to the effective freedom of the individual family; a pension for the elderly would have social welfare benefits as well as indirect impact upon family size, in countries where a large family has been the traditional "social security system"; contraceptive programs in Latin America are promoted by the medical community as a medical and humanitarian answer not to the population problem but to the extensive illegal and dangerous practice of abortion. On the other hand, imposing tax liabilities or withdrawing benefits after the birth of the *N*th child, not to mention involuntary measures, can be attacked as punitive means whose only purpose is that of limiting population.

It would thus require great political courage, joined to very firm demographic convictions, for a national leader to move toward an unpopular and severe prescription designed to cure his country's population ills. Indeed, it is difficult to envisage such a political move in an open society where a political opposition could present a counter view and perhaps prevail.

The governmental decisions about measures to be taken to deal with undue population growth must be made mainly by the countries directly involved; after all, it is their people and their nation whose prospects are most centrally affected. But in an interconnected world, with peace and human welfare at issue, others are properly concerned, for reasons both of self-interest and of humanitarianism—other governments from the developed world, the international community, private groups. What of the political considerations in this connection?

A recommendation (G-1) that the United States exert strong political pressures to effect population control in developing countries seems more likely to generate political opposition abroad than acceptance. It is conceivable that such measures might be adopted here, but it is hardly conceivable that they would be agreed to by the proposed recipients. Such a policy seems likely to boomerang against its own objective, quite aside from ethical or political considerations.

The proposal (G-2) to create an international superagency seems more likely of success, but is not without its difficulties. The World Health Organization, UNICEF, and UNESCO have moved some distance toward family planning, if not population control, but only slowly and in the face of considerable political restraint on the international front (57). A new international agency would find the road easier only if its efforts were restricted to the convinced countries. Certainly the international organizations now concerned with this problem would not be expected to abdicate in favor of a new agency. If it could be brought into being and given a strong charter for action, then, almost by definition, the international political climate would be such as to favor action by the present agencies, and then efficiency and not political acceptability would be the issue.

Administrative feasibility. Given technical availability and political acceptability, what can actually be done? This is where several "good ideas" run into

difficulties in the developing world, in the translation of a theoretical idea into a practical program.

It is difficult to estimate the administrative feasibility of several of the proposals listed above, if for no other reason than that the proponents do not put forward the necessary organizational plans or details. How are "fertility control agents" or "sterilants" to be administered on an involuntary mass basis in the absence of a central water supply or a food-processing system? How are men with three or more children to be reliably identified in a peasant society and impelled to undergo sterilization against their will; and what is to be done if they decline, or if a fourth child is born? What is to be done with parents who evade the compulsory programs, or with the children born as a result of this evasion? How can an incentive system be honestly run in the absence of an organized network of offices positioned and staffed to carry out the regulatory activity? How can a system of social benefits and penalties, including incentives to postpone or forego marriage, be made to work in the absence of such a network?

These questions are meant only to suggest the kinds of difficulties that must be taken into account if proposals are to be translated into programs. It would seem desirable that every responsibly made proposal address itself to such administrative problems. Some proposals do move in that direction. The feasibility in administration, personnel, and costs of the plan (A-1) to institutionalize maternal care in rural areas, with family planning attached, is currently under study in several developing countries.

The plan (C-1) to include population as a subject in the school curriculum has been carried forward as far as the preparation of educational materials, and in a few cases beyond that (58). The plans for incentive programs sometimes come down to only the theoretical proposition that people will do anything for money (in this case refrain from having children), but in some cases the permissible payment is proposed on the basis of an economic analysis, and in a few cases an administrative means is also proposed (59). The plan for governmental wedding loans scaled to the bride's age recognizes that a birth-registration system might be needed to control against misreporting of age (6).

Thus the *why* of population control is easy, the *what* is not very hard, but

the *how* is difficult. We may know that the extension of popular education or an increase in the number of women in the labor force or a later age at marriage would all contribute to population control in a significant way. But there remains the administrative question of how to bring those developments about. In short, several proposals assume workability of a complicated scheme in a country that cannot now collect its own vital statistics in a reliable manner. Moreover, there is a limit to how much administrative burden the typical developing country can carry: it cannot manage many large-scale developmental efforts at a time, either within the field of population or overall. After all, population is not the only effort; agriculture, industry, education, health, communications, the military—all are important claimants. And, within the field of population, a country that finds it difficult to organize and run a family-planning program will find that harder when other programs are added. So, difficult administrative choices must be made.

Economic capability. From the standpoint of economic capability there are two questions: (i) is the program worthwhile when measured against the criterion of economic return, and (ii) if worthwhile, can it be afforded from present budgets?

Most of the proposals probably pass the second screen. If a fertility-control agent suitable for mass administration becomes available and politically and administratively acceptable, such a program would probably not be prohibitively expensive; incorporation of population materials into the school curriculum is not unduly expensive; imposing of taxes or withdrawing of benefits or increasing fees for marriage licenses might even return a net gain after administrative cost.

But a few proposals are costly in absolute if not relative terms. For example, the institutionalization of maternal care (proposal A-1) might cost some \$500 million for construction and \$200 million for annual operation in India, or, respectively, \$25 million and \$10 million in a country with population of 25 million (5) (although recent estimates are substantially lower). The plan for a "youth corps" in India would cost upward of \$450 million a year if the participants were paid only \$50 annually. The plan for payment of pensions to elderly fathers without sons could cost from \$400 million to \$1 billion a year, plus administrative costs

(35). The satellite television system for India would cost \$50 million for capital costs only, on a restricted project (17, p. 23), with at least another \$200 million needed for receiving sets, broadcast terminals, and programming costs if national coverage were to be secured. All of these proposals are intended to have beneficial consequences beyond population control and hence can be justified on multiple grounds, but they are still expensive in absolute amounts.

The broad social programs of popular education, improved methods of agriculture, and increased industrialization (F-5) already absorb even larger sums, and they could no doubt utilize even more. Here the question is a different one. At present, in such countries as India, Pakistan, South Korea, and Turkey, the funds allocated to family-planning programs constitute less than 1 percent—in most cases, much less—of the total funds devoted to economic development. Would that tiny proportion make a greater contribution to population control, over some specified period, if given over to education or industrialization or road-building than it makes when utilized directly for family planning (60)? From what we now know, the answer is certainly "No."

Beyond family planning, the situation is still less clear. On the assumption that some level of incentive or benefit would have a demographic impact, what would the level have to be to cut the birth rate by, say, 20 percent? We simply do not know: the necessary experiments on administration and effectiveness have not been carried out. Let us review what has been proposed with respect to incentives. On the ground that incentives for vasectomy are better than incentives for contraception—since vasectomy is a one-time procedure and is likely to be more effective in preventing births—Pohlman (20) proposes for India a range of money benefits depending upon parity and degree of acceptance—from \$7 to a father of four or more children if half the villagers in that category enter the program up to \$40 to a father of three children if 75 percent enter. If the 50-percent criterion were met in both categories throughout India, the current plan would cost on the order of \$260 million in incentives alone, apart from administrative costs. The decline in the birth rate would be slightly over a fourth, perhaps a third—roughly equivalent to \$35 to \$40 per prevented birth (61).

Simon proposes an incentive of half the per capita income "each year to each fertile woman who does not get pregnant" (23). Here a special population arises. In a typical developing population of 1000, about 25 to 30 percent of the married women of reproductive age give birth each year: a population of 1000 means from 145 to 165 such women, and a birth rate of, say, 40. Thus, the incentives paid to about three-fourths of the married women of reproductive age would have no effect on the birth rate, since these women would not be having a child that year in any case; thus the cost could be three to four times the amount "needed" for a desired result. Even if the incentive were fully effective and really did prevent a birth, a cut of ten points in the Indian birth rate would cost on the order of \$250 million (or 5 million prevented births at \$50 each). The cost would be substantially larger if the women (including the nonfecund or the semi-fecund) who would not have had a child that year in any case, could not be screened out effectively.

But these and other possibilities are only speculations: to date we simply do not know whether incentives will lower a birth rate, or, rather, we do not know how large the incentives would have to be in order to do so. These illustrations show only that an incentive program could be expensive. In any case, incentive systems would require a good amount of supervision and record-keeping; and, presumably, the higher the incentive (and hence the greater the chance of impact), the greater the risk of false reporting and the greater the need of supervision—which is not only expensive but difficult administratively.

Moral, ethical, and philosophical acceptability. Next, is the proposal not only politically acceptable but considered right and proper—by the target population, government officials, professional or intellectual elites, and the outside agencies committed to aid in its administration?

Coale states (3, 62), "One reason the policy of seeking to make voluntary fertility universal is appealing—whether adequate or not—is that it is a natural extension of traditional democratic values: of providing each individual with the information he needs to make wise choices, and allowing the greatest freedom for each to work out his own destiny. The underlying rationale is that if every individual knowledgeably pursues his self-interest, the social interest

will best be served." But what if "stressing the right of parents to have the number of children they want . . . evades the basic question of population policy, which is how to give societies the number of children they need?" (6). The issue rests at the center of political philosophy: how best to reconcile individual and collective interests.

Today, most observers would acknowledge that having a child is theoretically a free choice of the individual couple. However, for many couples, particularly among the poor of the world, the choice is not effectively free in the sense that the individual couple does not have the information, services, and supplies needed to implement a free wish in this regard. Such couples are restrained by ignorance, not only of contraceptive practice but of the consequences of high fertility for themselves, their children, and their country; they are restrained by religious doctrine, even though they may not accept the doctrine; they are restrained legally, as in the case of people who would choose abortion if that course were open to them; they are restrained culturally, as in the case of women subject to a tradition that reserves for them only the childbearing and child-rearing roles. Hence effective freedom of choice in the matter of childbearing is by no means realized in the world today, as recent policy statements have remarked (63).

To what extent should a society be willing to compromise its ethical standards for the sake of solving a great social problem? Suppose a program for population control resulted in many more abortions in a society where abortion is morally repugnant and where, moreover, abortion by acceptable medical standards is widely unattainable; how much fertility decline would be "worth" the result? What of infanticide under the same conditions? How many innocent or unknowing men may be vasectomized for a fee (for themselves or for others who obtained their consent) before the practice calls for a moral restraint? How large an increase in the regulatory bureaucracy, or in systematic corruption through incentives, or in differential effect by social class to the disadvantage of the poor (64) is worth how much decrease in the birth rate? How much association of childbearing with monetary incentive is warranted before "bribing people not to have children" becomes contaminating, with adverse long-run ef-

fects on parental responsibility (65)? How much "immorality," locally defined as extramarital sex, outweighs the benefits of contraceptive practice (assuming that there is an association)? How much withholding of food aid is ethical, judged against degree of fertility decline? If it were possible to legislate a later age at marriage, would it be right to do so against the will of young women, in a society in which they have nothing else to do? In countries, like our own, where urbanization is a serious population problem, is it right to tell people *where* to live, or to impose heavy economic constraints that in effect "force" the desired migration? Is it right to withdraw educational benefits from children in "too large" families? Such withdrawal would not only be repressive from the standpoint of free education but in the long run would be unfortunate from the standpoint of fertility control. In the balance—and this is a question of great but neglected importance—what weight should be given the opportunities of future generations as against the ignorance, the prejudices, or the preferences of the present one?

Guidance on such ethical questions is needed. For further consideration, these propositions are put forward. (i) "An ideal policy would permit a maximum of individual freedom and diversity. It would not prescribe a precise number of children for each category of married couple, nor lay down a universal norm to which all couples should conform" (3). (ii) "An ideal program designed to affect the number of children people want would help promote other goals that are worth supporting on their own merits, or at least not conflict with such goals" (3). (iii) An ideal program would not burden the innocent in an attempt to penalize the guilty—for example, would not burden the *N*th child by denying him a free education simply because he was the *N*th child of irresponsible parents. (iv) An ideal program would not weigh heavily upon the already disadvantaged—for example, by withdrawing maternal or medical benefits or free education from large families, policies that would tend to further deprive the poor. (v) An ideal program would be comprehensible to those directly affected and hence subject to their response. (vi) An ideal program would respect present values concerning family and children, values which some people may not be willing to bargain away in a cost-benefit anal-

ysis. (vii) An ideal program would not rest upon the designation of population control as the final value justifying all others; "preoccupation with population growth should not serve to justify measures more dangerous or of higher social cost than population growth itself" (3).

Presumed effectiveness. If proposals are scientifically ready to be implemented, politically and morally acceptable, and administratively and financially feasible, to what extent will they actually work in bringing population growth under control? That is the final question.

To begin with, the compulsory measures would probably be quite effective in lowering fertility. Inevitably in such schemes, strongly motivated people are ingenious enough to find ways "to beat the system"; if such people were numerous enough the system could not be enforced except under conditions of severe political repression (66). Otherwise, if the scheme was workable, compulsion could have its effect.

What about the proposals for the extension of voluntary contraception? Institutionalizing maternal care in the rural areas, with family planning attached, does promise to be effective within, say, 5 to 10 years, particularly in its potential for reaching younger women and women of lower parity. The International Postpartum Program did have that effect in the urban areas (67), and presumably the impact would extend to the rural areas, though probably not to the same degree because of the somewhat greater sophistication and modernization of the cities.

A liberalized abortion system—again, if workable—could also be effective in preventing unwanted births, but it would probably have to be associated with a contraceptive effort; otherwise there might be too many abortions for the system, as well as for the individual woman (who might need three a year to remain without issue).

Free abortion in cases where contraception had failed would probably make for a decline in fertility, but how large a one would depend upon the quality of the contraceptive program. With modern contraception (the IUD and the pill) the failure rates are quite small, but women who only marginally tolerate these two methods could fall back on abortion. Free abortion has certainly lowered fertility in Japan and in certain countries of eastern Europe (68) and, where medically feasible,

would do so elsewhere as well; as a colleague observes, in this field one should not underestimate the attraction of a certainty as compared to a probability.

The large question of the impact of the various incentive and benefit or liability plans (D and E) simply cannot be answered: we have too little experience to know much about the conditions under which financial factors will affect childbearing to any substantial degree. Perhaps everyone has his price for everything; if so, we do not know what would have to be paid, directly or indirectly, to make people decide not to bear children.

Such as it is, the evidence from the pro-natalist side on the effectiveness of incentives is not encouraging. All the countries of Europe have family allowance programs of one kind or another (69), most of them legislated in the 1930's and 1940's to raise the birth rate; collectively Europe has the lowest birth rate of any continent. The consensus among demographers appears to be that such programs cannot be shown to have effected an upward trend in the birth rate where tried.

As in the case of abortion for illegitimate pregnancies, several of the benefit or liability proposals would affect only a trivial fraction of people in much of the developing world. However, because the impact of incentive and benefit or liability plans is uncertain and may become important, we need to become better informed on the possibilities and limitations, and this information can come only from experimentation under realistic circumstances and at realistic levels of payment.

A higher age at marriage and a greater participation of women in the labor force are generally credited with effecting fertility declines. In a recent Indian conference on raising the age at marriage, the specialists seemed to differ only on the magnitude of the fertility decline that would result: a decline of 30 percent in the birth rate in a generation of 28 years if the minimum age of the woman at marriage were raised to 20 (70), or a decline of not more than 15 percent in 10 years (71). I say "seemed to differ" since these figures are not necessarily incompatible. In either case, the decline is a valuable one. But an increase in the age at marriage is not easy to achieve, and that must come before the fertility effect.

Similarly, an increase in the proportion of working women would have its

demographic effect, but could probably come about only in conjunction with other broad social trends like education and industrialization, which themselves would powerfully affect fertility, just as a decline in fertility would assist importantly in bringing these trends about (72). Both compulsory education and restrictions on child labor would lower the economic value of children, hence tend to produce a decline in fertility. The question is, how are they to be brought about?

Finally, whether or not research would affect fertility trends depends of course upon its nature and outcome. Most observers believe that, under the typical conditions of the developing society, any improvement in contraceptive technology would lead toward the realization of present fertility goals and might help turn the spiral down. Indeed, several observers believe that this is the single most important desideratum, over the short run. Easy means of determining sex should have some effect upon the "need for sons" and thus cut family size to some extent. Research on the social-economic side would probably have to take effect through programs of the kinds discussed above.

The picture is not particularly encouraging. The measures that would work to sharply cut fertility are politically and morally unacceptable to the societies in question (as with coercion), and in any case unavailable; or they are difficult of attainment in any foreseeable future, as in the case of broad social trends or a shift in age at marriage. The measures that might possibly be tried in some settings, like some version of incentives or benefit or liability plans, give uncertain promise of results at the probable level of operation. Legalization of abortion, where the needed medical facilities are available, would almost certainly have a measurable effect, but acceptability is problematic.

Conclusion

This review leaves us with some conclusions concerning proposals that go beyond family planning.

1) There is no easy way to achieve population control. If this review has indicated nothing else, it has shown how many obstacles stand in the way of a solution to the population problem. Table 1 shows, by way of recapitulation, how the various proposals seem

to fit the several criteria (73). That is only one observer's judgment of the present situation, but, whatever appraisal is made of specific items, it would appear that the overall picture is mixed.

2) Family-planning programs do not compare unfavorably with other specific proposals, especially when one considers that any *actual* operating program is at a disadvantage when compared with any competitive *ideal* policy. Indeed, on this showing, if family-planning programs did not exist, they would have to be invented; it appears that they would be among the first proposals to be made and the first programs to be tried, given their generally acceptable characteristics.

In fact, when such proposals are made, it turns out that many of them call for *more* family planning, not less, but in a somewhat different form. In the present case, at least a third of the proposals listed above put forward, in effect, simply another approach to family planning, often accepting the existing motivation as to family size. In any case, family-planning programs are established, have some momentum, and, importantly, would be useful as the direct instrument through which other proposals would take effect. So, as a major critic (74) acknowledges (6), "there is no reason to abandon family-planning programs."

What is needed is the energetic and full implementation of present experience. Much more could be done on the informational side, on encouraging commercial distribution of contraceptives, on the use of paramedical personnel, on logistics and supply, on the training and supervision of field workers, on approaches to special groups of individuals, ranging from women after childbirth to young men drafted into the armed forces. If workers in this field did well what they know how to do, that in itself would in all likelihood make a measurable difference, competitive in magnitude with the probable effects of other specific proposals—not to mention the further impetus of an improved contraceptive technology.

3) Most of the proposed ideas are not new; they have been around for some time. So, if they are not being tried, it is not because they have not been known but because they have not been accepted—presumably, for reasons like those discussed above. In India, for example, several of the social measures being proposed have been, it would seem, under almost constant re-

view by one or another committee for the past 10 to 15 years. So it is not correct to imply that it is only new ideas that are needed; the ideas are there, but their political, economic, or administrative feasibility are problematic.

4) All of the proposers are dissatisfied to some degree with present family-planning efforts, but that does not mean that they agree with one another's schemes for doing better. Thus, Ohlin believes that "the demographic significance of such measures [maternity benefits and tax deductions for children] would be limited" (34). Ketchel eloquently opposes several "possible alternatives to fertility control agents" (9). Meier argues against the tax on children on both humanitarian and political grounds (16). The U.N. Advisory Mission to India comments (53, p. 87), "it is realised that no major demographic effects can be expected from measures of this kind [maternity benefits], particularly as only a small proportion of families are covered . . . but they could contribute, together with the family planning programme, to a general change in the social climate relating to childbearing." Earlier, in supporting a family-planning effort in India, Davis noted that "the reaction to the Sarda Act [the Child Marriage Restraint Act

of 1929] prohibiting female marriage [below age 14] shows the difficulty of trying to regulate the age of marriage by direct legislation" (75). Myrdal warns against cash payments to parents in this connection and supports social awards in kind to the children (76). Kirk believes that "it might prove to be the height of folly to undermine the existing family structure, which continues to be a crucial institution for stability and socialization in an increasingly mobile and revolutionary society" (77). Finally, Ehrlich is contemptuous of the professors whose "ideas of 'action' is to form a committee or to urge 'more research.' Both courses are actually substitutes for action" (7, p. 191).

5) In a rough way, there appears to be a progression in national efforts to deal with the problem of population control. The first step is the theoretical recognition that population growth may have something to do with the prospects for economic development. Then, typically, comes an expert mission from abroad to make a survey and report to the government, as has occurred in India, Pakistan, South Korea, Turkey, Iran, Tunisia, Morocco, and Kenya, among others. The first action program is in family planning, and most of the efforts are still at that level. Beyond that, it apparently takes (i) some degree

of discouragement about progress combined with (ii) some heightened awareness of the seriousness of the problem to move the effort forward. To date, those conditions have been most prominently present in India—and that is the country that has gone farthest in the use of incentives and in at least consideration of further steps along the lines mentioned above.

6) Proposals need to be specific—proposals both for action and for further research. It is perhaps too much to ask advocates to spell out all the administrative details of the way their plan is to operate in the face of obstacles and difficulties, or even to spell out how it is to get permission to operate; the situations, settings, opportunities, and personalities are too diverse for that. But it does seem proper to ask for the fullest possible specification of actual plans, under realistic conditions, in order to test out their feasibility and likely effectiveness. Similarly, advocates of further research ought to spell out not only what would be studied, and how, but also how the results might be applied in action programs to affect fertility. Social research is not always readily translated into action, especially into administrative action; and the thrust of research is toward refinement, subtlety, precision, and qualification,

Table 1. Illustrative appraisal of proposals, by criteria.

Proposal	Scientific readiness	Political viability	Administrative feasibility	Economic capability	Ethical acceptability	Presumed effectiveness
A. Extension of voluntary fertility control	High	High on maternal care, moderate-to-low on abortion	Uncertain in near future	Maternal care too costly for local budget, abortion feasible	High for maternal care, low for abortion	Moderately high
B. Establishment of involuntary fertility control	Low	Low	Low	High	Low	High
C. Intensified educational campaigns	High	Moderate-to-high	High	Probably high	Generally high	Moderate
D. Incentive programs	High	Moderately low	Low	Low-to-moderate	Low-to-high	Uncertain
E. Tax and welfare benefits and penalties	High	Moderately low	Low	Low-to-moderate	Low-to-moderate	Uncertain
F. Shifts in social and economic institutions	High	Generally high, but low on some specifics	Low	Generally low	Generally high, but uneven	High, over long run
G. Political channels and organizations	High	Low	Low	Moderate	Moderately low	Uncertain
H. Augmented research efforts	Moderate	High	Moderate-to-high	High	High	Uncertain
Family-planning programs	Generally high, but could use improved technology	Moderate-to-high	Moderate-to-high	High	Generally high, but uneven, on religious grounds	Moderately high

whereas the administrator must act in the large. Short of such specification, the field remains confronted with potentially good ideas, such as "raise the age at marriage" or "use incentives" or "substitute pension systems for male children," without being able to move very far toward implementation.

7) Just as there is no easy way, there is no single way. Since population control will at best be difficult, it follows that every acceptable step that promises some measure of impact should be taken. The most likely prospect is that population control, to the degree it is realized, will be the result of a combination of efforts—economic, legal, social, medical—each of which has some effect but not an immediately overwhelming one (78). Accordingly, it is incumbent upon workers in the professional fields concerned to look hard at various approaches, including family planning itself, in order to screen out what is potentially useful for application. In doing so, it may be the path of wisdom to move with the "natural" progression. Some important proposals seem reasonably likely of adoption—institutionalization of maternal care, population study in the schools, the TV satellite system for disseminating information, a better contraceptive technology, perhaps even liberalization of abortion laws in some settings—and we need to know not only how effective such efforts will be but, beyond them, how large a money incentive would have to be to effect a given amount of fertility control and how effective those indirect social measures are that are morally acceptable and capable of realization. It may be that some of these measures would be both feasible and effective—many observers 15 years ago thought that family-planning programs were neither—and a genuine effort needs to be made. The "heavy" measures—involuntary measures and political pressures—may be put aside for the time being, if not forever.

8) In the last analysis, what will be scientifically available, politically acceptable, administratively feasible, economically justifiable, and morally tolerated depends upon people's perceptions of consequences. If "the population problem" is considered relatively unimportant or only moderately important, that judgment will not support much investment of effort. If it is considered urgent, much more can and will

be done. The fact is that, despite the large forward strides taken in international recognition of the problem in the 1960's, there still does not exist an informed, firm, and constant conviction in high circles that this is a matter with truly great implications for human welfare (79). Such convictions must be based on sound knowledge. Here it would appear that the demographers and economists have not sufficiently made their case to the world elite—or that, if made, the case has not sufficiently commanded their attention and support. Population pressures are not sharply visible on a day-to-day or even year-to-year basis, nor, short of major famine, do they show themselves in dramatic events. Moreover, the warnings of demographers are often dismissed, albeit unfairly and wrongly, on the basis of past forecasts that were not borne out (80). After all, only a generation ago we were being warned about a decline in population in the West. Asking government leaders to take steps toward population control is asking them to take very substantial steps indeed—substantial for their people as well as for their own political careers—hence the case must be virtually incontrovertible. Accordingly, the scientific base must be carefully prepared (and perhaps with some sense of humility about the ease of predicting or urging great events, for the record is not without blemishes). Greater measures to meet the problem—measures which exclude social repression and needless limitation of human freedom—must rely on heightened awareness of what is at stake, on the part of leaders and masses alike.

What is beyond family planning? Even if most of the specific plans are not particularly new, that in itself does not mean that they are to be disregarded. The questions are: Which plans can be effected, given such criteria? How can they be implemented? What will be the outcome?

This article is an effort to promote the discourse across the professional fields concerned with this important issue. Given the recent stress on family-planning programs as the "means of choice" in dealing with the problem, it is natural and desirable that counterpositions be put forward and reviewed. But that does not in itself settle the critical questions. What can we do now to advance the matter? Beyond family planning, what?

References and Notes

1. See, for example, K. Davis, *Science* **158**, 730 (1967); R. G. Potter, R. Freedman, L. P. Chow, *ibid.* **160**, 848 (1968); F. W. Notestein, "Population growth and its control," paper presented before the American Assembly on World Hunger, Fall 1968.
2. See, for example, the section on "Goals" in K. Davis, *Science* **158**, 730 (1967).
3. A. J. Coale, "Should the United States start a campaign for fewer births?," presidential address presented before the Population Association of America, 1968.
4. For current targets of some national family-planning programs, see B. Berelson, "National family planning programs: Where we stand," paper presented at the University of Michigan Sesquicentennial Celebration, November 1967; the paper concludes: "By and large, developing countries are now aiming at the birth rates of Western Europe 75 years ago or the United States 50 years ago."
5. H. C. Taylor, Jr., and B. Berelson, *Amer. J. Obstet. Gynecol.* **100**, 885 (1968).
6. K. Davis, *Science* **158**, 730 (1967).
7. P. R. Ehrlich, *The Population Bomb* (Ballantine, New York, 1968).
8. S. Chandrasekhar, *Population Rev.* **10**, 17 (1966).
9. M. M. Ketchel, *Perspect. Biol. Med.* **11**, 687 (1968); see also Ketchel's article in *Med. World News* (18 Oct. 1968), p. 66.
10. Ehrlich appears to dismiss the scheme as unworkable (7, p. 136), though two pages later he advocates "ample funds" to "promote intensive investigation of new techniques of birth control, possibly leading to the development of mass sterilizing agents such as were discussed above."
11. K. E. Boulding, *The Meaning of the Twentieth Century: The Great Transition* (Harper & Row, New York, 1964), pp. 135-36.
12. W. B. Shockley, in a lecture delivered at McMaster University, Hamilton, Ontario, December 1967.
13. S. Chandrasekhar, as reported in the *New York Times*, 24 July 1967. Just as the present article was being completed, Chandrasekhar proposed (*ibid.*, 21 Oct. 1968) "that every married couple in India deny themselves sexual intercourse for a year. . . . Abstinence for a year would do enormous good to the individual and the country." The reader may wish to consider this the 30th proposal and test it against the criteria that follow.
14. S. Wayland, in *Family Planning and Population Programs*, B. Berelson, R. K. Anderson, O. Harkavy, J. Maier, W. P. Mauldin, S. J. Segal, Eds. (Univ. of Chicago Press, Chicago, 1966), pp. 353-62; —, in "Family Planning Programs: Administration, Education, Evaluation," J. Ross and J. Friesen, Eds., in preparation; "Teaching Population Dynamics: An Instructional Unit for Secondary School Students" (Columbia University, New York, 1965); "Critical Stages in Reproduction: Instruction Materials in General Science and Biology" (Columbia University, New York, 1965). The two last-named publications are pamphlets prepared under Wayland's direction at Teachers College.
15. P. Visaria, *Economic Weekly* (8 Aug. 1964), p. 1343.
16. R. L. Meier and G. Meier, "New Directions: A Population Policy for the Future," unpublished manuscript.
17. *Preparatory Study of a Pilot Project in the Use of Satellite Communication for National Development Purposes in India* (UNESCO Expert Mission, 1968).
18. W. Schramm and L. Nelson, *Communication Satellite for Education and Development—The Case of India* (Stanford Research Institute, Stanford, Calif., 1968), pp. 63-66.
19. S. Chandrasekhar, as reported in the *New York Times*, 19 July 1967.
20. E. Pohlman (Central Family Planning Institute, India), "Incentives for 'Non-Maternity' Cannot 'Compete' with Incentives for Vasectomy," unpublished manuscript.
21. T. J. Samuel, *J. Family Welfare* **13**, 11 (1966).
22. J. Simon, "Money Incentives to Reduce Birth Rates in Low-Income Countries: A Proposal to Determine the Effect Experimentally," unpublished manuscript; "The Role of Bonuses

- and Persuasive Propaganda in the Reduction of Birth Rates," unpublished manuscript.
23. ———, "Family Planning Prospects in Less-Developed Countries, and a Cost-Benefit Analysis of Various Alternatives," unpublished manuscript.
 24. S. Enke, *Population Rev.* 4, 47 (1960).
 25. M. Young, "The Behavioral Sciences and Family Planning Programs: Report on a Conference," *Studies in Family Planning*, No. 23 (1967), p. 10.
 26. D. Bhatia, "Government of India Small Family Norm Committee Questionnaire," *Indian J. Med. Educ.* 6, 189 (1967). As the title indicates, this is not a proposal but a questionnaire soliciting opinions on various ideas put forward to promote "the small family norm."
 27. S. Enke, "The Gains to India from Population Control," *Rev. Econ. Statist.* 42, 179, 180 (1960).
 - 27a. J. W. Leasure, *Milbank Mem. Fund Quart.* 45, 417 (1967).
 28. J. J. Spengler, "Agricultural development is not enough," paper presented before the Conference on World Population Problems, Indiana University, May 1967.
 29. M. C. Balfour, "A Scheme for Rewarding Successful Family Planners," *Population Council Mem.* (1962).
 30. W. P. Mauldin, "Prevention of Illegitimate Births: A Bonus Scheme," *Population Council Mem.* (1967).
 31. R. M. Titmuss and B. Abel-Smith, *Social Policies and Population Growth in Mauritius* (Methuen, London, 1960).
 32. A. S. David, *National Development, Population and Family Planning in Nepal* (1968), pp. 53-54.
 33. J. Fawcett, personal communication.
 34. G. Ohlin, *Population Control and Economic Development* (Development Centre of the Organisation for Economic Co-operation and Development, New York, 1967), p. 104.
 35. W. P. Davison, personal communication. Davison suggests a good pension (perhaps \$400 a year) for men aged 60, married for at least 20 years, with no sons.
 36. K. Davis, personal communication.
 37. B. Berelson and A. Etzioni, brief formulations, 1962 and 1967, respectively.
 38. P. M. Hauser, in "The Behavioral Sciences and Family Planning Programs: Report on a Conference," *Studies in Family Planning*, No. 23 (1967), p. 9.
 39. J. Blake, in *Public Health and Population Change: Current Research Issues*, M. C. Sheps and J. C. Ridley, Eds. (Univ. of Pittsburgh Press, Pittsburgh, 1965), p. 62.
 40. For the initial formulation of the proposal, see R. L. Meier, *Modern Science and the Human Fertility Problem* (Wiley, New York, 1959), chap. 7.
 41. P. M. Hauser, *Demography* 4, 412 (1967).
 42. "Family Planning and the Status of Women: Interim Report of the Secretary-General" (United Nations Economic and Social Council, Commission on the Status of Women, New York, 1968), especially p. 17 ff.
 43. R. Revelle, quoted by M. Viorst, *Horizon* (summer 1968), p. 35; D. M. Heer and D. O. Smith, "Mortality level and desired family size," paper presented before the Population Association of America, April 1967.
 44. Ehrlich makes the same point in *New Scientist* (14 Dec. 1967), p. 655: "Refuse all foreign aid to any country with an increasing population which we believe is not making a maximum effort to limit its population. . . . The United States should use its power and prestige to bring extreme diplomatic and/or economic pressure on any country or organization (the Roman Catholic Church?) impeding a solution to the world's most pressing problem."
 45. In an earlier article Ehrlich calls for a "Federal Population Commission with a large budget for propaganda," presumably limited to the United States.
 46. S. Chandrasekhar, in *Asia's Population Problems*, S. Chandrasekhar, Ed. (Allen & Unwin, New York, 1967), p. 96; Chandrasekhar cites a suggestion made in 1961 by Julian Huxley.
 47. S. Polgar, in "The Behavioral Sciences and Family Planning Programs: Report on a Conference," *Studies in Family Planning*, No. 23 (1967), p. 10.
 48. *The Growth of World Population* (National Academy of Sciences, Committee on Science and Public Policy, Washington, D.C., 1963), pp. 5, 28-36. This recommendation has of course been made on several occasions by several people. For an imaginative account of the impact of biological developments, see P. C. Berry, appendix to *The Next Thirty-Four Years: A Context for Speculation* (Hudson Institute, Croton-on-Hudson, New York, 1966).
 49. See, for example, S. J. Segal, "Biological aspects of fertility regulation," paper presented at the University of Michigan Sesquicentennial Celebration, November 1967.
 50. It is worth noting that such expectations are not particularly reliable. For example, in 1952-53 a Working Group on Fertility Control was organized by the Conservation Foundation to review the most promising "leads to physiologic control of fertility," based on a survey conducted by Paul S. Henshaw and Kingsley Davis. This group did identify a "lead" that became the oral contraceptive (then already under investigation) but did not mention the intrauterine device. It was searching specifically for better ways to control fertility because of the population problem in the developing world, and considered the contraceptive approach essential to that end: "It thus appears imperative that an attempt be made to bring down fertility in overpopulated regions without waiting for a remote, hoped-for transformation of the entire society. . . . It seems plausible that acceptable birth control techniques might be found, and that the application of science to developing such techniques for peasant regions might yield revolutionary results" [*The Physiological Approach to Fertility Control, Report of the Working Group on Fertility Control* (Conservation Foundation, New York, 1953)].
 51. A. S. Parkes, *New Scientist* 35, 186 (1967).
 52. *New York Times* (17 Nov. 1967). The then Minister had earlier suggested a substantial bonus (100 rupees) for vasectomy, the funds to be taken from U.S. counterpart funds, "but both Governments are extremely sensitive in this area. Yet in a problem this crucial perhaps we need more action and less sensitivity" [S. Chandrasekhar (46)].
 53. *Report on the Family Planning Programme in India* (United Nations Advisory Mission, New York, 1966).
 54. *Implications of Raising the Female Age at Marriage in India* (Demographic Training and Research Centre, Chembur, India, 1968), p. 109; *Centre Calling* (May 1968), p. 4.
 55. *Planned Parenthood* (Mar. 1968), p. 3.
 56. *Ibid.* (Apr. 1968), p. 2.
 57. For a review of this development see R. Symonds and M. Carder, *International Organisations and Population Control (1947-67)* (Institute of Development Studies, Univ. of Sussex, Brighton, England, 1968).
 58. At present, population materials are being included in school programs in Pakistan, Iran, Taiwan, and elsewhere.
 59. See, for example, Balfour (29), Mauldin (30), and Pohlman (20) and, for the economic analysis, Enke (27) and Simon (22).
 60. For the negative answer, see Enke (27) and Simon (22). Data are from family-planning budgets and national development budgets contained in 5-year development plans.
 61. E. Pohlman, "Incentives in birth planning," in preparation.
 62. Coale, however, does point out that "it is clearly fallacious to accept as optimal a growth that continues until overcrowding makes additional births intolerably expensive."
 63. See, for example, the World Leaders' Statement [*Studies in Family Planning*, No. 26 (1968)] and the Resolution of the International Conference on Human Rights on "Human Rights Aspects of Family Planning," adopted 12 May 1968, reported in *Population Newsletter*, No. 2 (issued by the Population Division, United Nations) (1968), p. 21 ff. Incidentally, the issue of population policy was apparently a live one in classical times, and resolved by the great philosophers in ways not fully consonant with modern views. Plato, in the *Republic* (Modern Library edition, pp. 412, 414), says, "the number of weddings is a matter which must be left to the discretion of the rulers, whose aim will be to preserve the average of population and to prevent the State from becoming either too large or too small"—to which end certain marriages have "strict orders to prevent any embryo which may come into being from seeing the light; and if any force a way to the birth, the parents must understand that the offspring of such a union cannot be maintained, and arrange accordingly." Aristotle, in *Politics* (Modern Library edition, p. 316) says, "on the ground of an excess in the number of children, if the established customs of the state forbid this (for in our state population has a limit), no child is to be exposed, but when couples have children in excess, let abortion be procured before sense and life have begun. . . ."
 64. After noting that economic constraints have not been adopted in South Asia, though often proposed, Gunnar Myrdal continues: "The reason is not difficult to understand. Since having many children is a main cause of poverty, such measures would penalize the relatively poor and subsidize the relatively well off. Such a result would not only violate rules of equity but would be detrimental to the health of the poor families, and so of the growing generation" [*Asian Drama: An Inquiry into the Poverty of Nations* (Pantheon, New York, 1968), vol. 2, pp. 1502-03].
 65. F. W. Notestein, in *Family Planning and Population Programs*, Berelson et al., Eds. (Univ. of Chicago Press, Chicago, 1966), pp. 828-29: "There is a real danger that sanctions, for example through taxation, would affect adversely the welfare of the children. There is also danger that incentives through bonuses will put the whole matter of family planning in a grossly commercial light. It is quite possible that to poor and harassed people financial inducements will amount to coercion and not to an enlargement of their freedom of choice. Family planning must be, and must seem to be, an extension of personal and familial freedom of choice and thereby an enrichment of life, not coercion toward its restriction."
 66. In this connection see the novel by A. Burgess, *The Wanting Seed* (Ballantine, New York, 1963). At the same time, Myrdal, a long-time observer of social affairs, remarks that "the South Asian countries . . . can, to begin with, have no other principle than that of voluntary parenthood. . . . State direction by compulsion in these personal matters is not effective. . . ." [G. Myrdal, *Asian Drama: An Inquiry into the Poverty of Nations* (Pantheon, New York, 1968), p. 1501].
 67. G. I. Zatuchni, "International Postpartum Family Planning Program: Report on the First Year," *Studies in Family Planning*, No. 22 (1967), p. 14 ff.
 68. For example, the repeal of the free abortion law in Rumania resulted in an increase in the birth rate from 14 in the third quarter of 1966 to 38 in the third quarter of 1967. For an early report, see R. Pressat, *Population* 22, 1116 (1967).
 69. See *Social Security Programs Throughout the World, 1964* (U.S. Department of Health, Education, and Welfare, Washington, D.C., 1964).
 70. S. N. Agarwala in *Implications of Raising the Female Age at Marriage in India* (Demographic Training and Research Centre, Chembur, India, 1968), p. 21.
 71. V. C. Chidambaram, *ibid.*, p. 47.
 72. Actually, recent research is calling into question some of the received wisdom on the prior need of such broad institutional factors for fertility decline. If further study supports the new findings, that could have important implications for present strategy in the developing countries. See A. J. Coale, in *Proc. U.N. World Population Conf.* (1965), vol. 2, pp. 205-09, and ———, "The decline of fertility in Europe from the French Revolution to World War II," paper presented at the University of Michigan Sesquicentennial Celebration, 1967.
 73. As the roughest sort of summary of Table 1, if one assigns values from 5 for "high" to 1 for "low," the various proposals rank as follows: family-planning programs, 25; intensified educational campaigns, 25; augmented research efforts, 24; extension of voluntary fertility control, 20; shifts in social and economic institutions, 20; incentive programs, 14; tax and welfare benefits and

penalties, 14; political channels and organizations, 14; establishment of involuntary fertility control, 14.

74. Davis was a strong advocate of family planning in India, and quite optimistic about its prospects even in the pre-IUD or pre-pill era. See K. Davis, in *The Interrelations of Demographic, Economic, and Social Problems in Selected Underdeveloped Areas* (Milbank Memorial Fund, New York, 1954). Davis concludes (pp. 87-88): "Although India is already well-launched in the rapid-growth phase of the demographic transition, there is no inherent reason why she should long continue in this phase. She need not necessarily wait patiently while the forces of urbanization, class mobility, and industrial development gradually build up to the point where parents are forced to limit their offspring on their own initiative and without help, perhaps even in the face of official opposition. . . . Realistically appraising her situation, India has a chance to be the first country to achieve a major revolution in human life—

the planned diffusion of fertility control in a peasant population prior to, and for the benefit of, the urban-industrial transition."

75. K. Davis, in *The Interrelations of Demographic, Economic, and Social Problems in Selected Underdeveloped Areas* (Milbank Memorial Fund, New York, 1954), p. 86.

76. G. Myrdal, *Asian Drama: An Inquiry into the Poverty of Nations* (Pantheon, New York, 1968), p. 1503.

77. D. Kirk, "Population research in relation to population policy and national family planning programs," paper presented before the American Sociological Association, August 1968.

78. It begins to appear that the prospects for fertility control may be improving over the decades. Kirk, after reviewing several factors that "favor a much more rapid [demographic] transition than occurred in the West"—changed climate of opinion, religious doctrine, decline of infant mortality, modernization, fertility differentials, grass-roots concern, and improved contraceptive technology—

shows, in a remarkable tabulation, that the later a country began the reduction of its birth rate from 35 to 20 births per thousand, the shorter the time it took to achieve this reduction: from 73 years (average) for the period 1831-60, for example, to 21 years after 1951; the trend has been consistently downward for over a century [D. Kirk, "Natality in the developing countries: recent trends and prospects," paper presented at the University of Michigan Sesquicentennial Celebration, 1967].

79. Nor, often, does such a conviction exist among the general public. For example, in midsummer of 1968 a national sample of adults was asked in a Gallup poll, "What do you think is the most important problem facing this country today?" Less than 1 percent mentioned population growth (Gallup release, 3 Aug. 1968, and personal communication).

80. For an old but enlightening review, see H. Dorn, *J. Amer. Statist. Ass.* 45, 311 (1950).

Development of Specific Neuronal Connections

Marcus Jacobson

We generally conceive of the nervous system as an association of uniquely determined neurons, each possessing an essential nature of its own. One of the main expressions of the neuron's uniqueness is the formation of highly specific synaptic connections. Although this has been recognized for at least 50 years, almost nothing is known about the physicochemical basis of neuronal specificity or about the mechanisms of formation of specific synaptic connections. Therefore, the term *neuronal specificity* is not used here in any explanatory sense but is merely a convenient expression indicative of the unique properties of the neuron which result in the formation of specific connections.

There are many possible mechanisms that might be involved in the development of neuronal connections and in their maintenance and plasticity. We would like to discover the roles of genetic control mechanisms, metabolic control systems, and cellular interactions of various kinds, including intercellular transmission of molecules. Unfortunately, at present there is no direct evidence implicating even one of

these mechanisms in the formation of neuronal connections.

Here I give evidence in support of a theory in which neuronal connectivity is regarded primarily from an ontogenetic point of view. According to this theory some neurons are highly specified and all their connections are fully determined, but there are also some incompletely specified neurons with relatively indeterminate connections. During ontogeny there is a tendency for neuronal specificity to increase and for connections to become more highly determined, but the developmental stage at which these changes occur, as well as their extent and duration, varies for different neurons. This theory takes into account the evidence of invariance and stability of the highly determined kinds of synapses, but it assigns the adaptive and plastic properties to the kinds of synapses that are not fully determined.

Variability of Neuronal Connections

Developing neurons sprout slender processes, their axons and dendrites, which in some cases grow to relatively

great lengths to form connections with other neurons. The direction of growth of these processes and the targets on which they terminate appear to be constant in all individuals of the same species. Anatomical and physiological methods have shown the remarkable invariance of neuronal circuits and have given no evidence of random connectivity. A distinguished neuroanatomist has recently written (1), "The nervous system is not a random net. Its units are not redundant. Its organization is highly specific, not merely in terms of the connections between particular neurons, but also in terms of the number, style, and location of terminals upon different parts of the same cell and the precise distribution of terminals arising from that cell." This is a fair summary of what might be called the *deterministic*, as opposed to the *probabilistic*, theory of neuronal connectivity. According to the probabilistic theory, only statistical properties of the nervous system can be formulated, not the detailed properties or behavior of individual neurons or their connections.

It is easy to cite evidence of selective localization of synapses on neurons at constant positions in the nervous system, and difficult to find any evidence of nonselectivity. Perhaps this is because far more attention has been given to recording the invariant features of neuronal connections than to obtaining a measure of their variability.

There is ample evidence of specific synaptic patterns on neurons in invertebrates (2) as well as on vertebrate neurons—for example, Mauthner's neuron,

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