A STUDY OF
ECONOMIC EVALUATION PROCEDURES
FOR POPULATION-RELATED PROJECTS

A Report Prepared By:
WARREN C. ROBINSON
WAYNE A. SCHUTJER

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Introduction

This paper sets out a framework for applying economic analysis to evaluations of population-related projects. The economic justification of development projects is a standard procedure in many areas—agriculture, public infrastructure, natural resources, and industry, to name several. But such calculations are less common for so-called social projects, including those that are population-related. There are a variety of reasons for this, most particularly, the difficulty in defining benefits in quantifiable terms. But these problems are not insurmountable, and the economic evaluation of population-related projects is not only possible but highly useful. This paper reviews the problems involved and suggests workable operational approaches.

Conceptual Background: Cost-Benefit and Economic Evaluation

Any project involves costs, that is, "uses" resources in the form of capital, human resources, and other inputs. It also produces an outcome, or product, that is beneficial to the economy and society. For most developmental projects, the product is measurable in terms of changes in national output. Thus, a proposed irrigation project for agriculture will bring into cultivation a certain number of acres of land, each acre yielding a certain physical output, each unit of output selling for a certain price per unit. The total value of output from the irrigation project is fairly clear and straightforward. It may be some time before this output is produced, but once it begins to flow, it will continue thereafter. Simple economic common-sense suggests that delayed benefits are less valuable than immediate benefits. Economic analysis, therefore, "discounts," or reduces by some standard amount, future benefits. For example, $1,000 today is not equivalent to $1,000 next year. Using a 10 percent discount rate per year, the $1,000 received next year is worth $900 today. The stream of future benefits is thus further reduced or "discounted" the longer benefits are delayed. Or, put another way, the more long-run the benefits of a project, the smaller their immediate present value will seem.

Costs are likely to be high in the first few years, especially if substantial construction or other start-up costs are involved. Once a project is launched, its recurrent future costs may be only a small fraction of current expenditures.

An important result of such cost-benefit analysis is the simple, straightforward "decision rule:" If benefits exceed costs, the project is justified. When funds are scarce, the project that shows the highest ratio of current benefits to costs should be undertaken first. One reason cost-benefit analysis:
has gained so much favor in recent years is that it analyzes and compares alternative projects. The "internal rate of return" (IRR), a slight variation of this approach, calculates the discount rate that brings net present value of benefits to zero. By calculating the IRR, one can rank various projects according to their economic desirability. This approach does not require an objective discount rate but does involve a more complicated, iterative calculation procedure. (See AID Handbook, 3, Part I, Appendix 5G, for details on these procedures.)

It is clear, then, that the basic logic of cost-benefit analysis is straightforward and easy to grasp. In the application of the principle, however, the use of a discounting procedure tends to bias project selection in favor of those projects with a relatively quick pay-off or short-run benefits. This important fact must be kept in mind when considering the applicability of this economic approach to population-related projects, because in fact the benefits of population programs may be relatively long-run.

This cost-benefit framework is nothing more than the public-sector project equivalent of a private sector "profitability" test. If a population-related project is, indeed, justified, then its benefits must exceed its costs. The issue is not the applicability of the economic framework, but how to measure the social and economic benefits of population projects; how to measure the outputs of specific population projects; how to relate these specific outputs to fertility reduction and to economic and social benefits; how to decide what time horizon is appropriate for project cost analysis; and how to deal with the benefits of relatively distant but population-related projects such as education or land reform.

The balance of this paper will deal with each of these points. Our approach is illustrated in Figure 1. Project costs (A) yield, in the first instance, a measurable project output (B)—acceptors, clinics established, or educational materials distributed. These, in turn, affect the existing level of ongoing contraceptive activity by increasing the availability and efficiency of contraceptive practice (C1) and by increasing the knowledge of contraception by potential acceptors (C2). Finally, acceptors, their contraceptive practice, and their knowledge and motivation result in reduced fertility and population size (D). These demographic outcomes then stimulate the flow of economic benefits (E) that justify the initial costs invested in the project (A). A full cost-benefit analysis aims at comparing (E) to (A). More distant socioeconomic projects (F), such as land reform or compulsory education, affect the context in which family planning occurs, but they are not a part of the direct population project cost-output-to-benefit stream. This stream is relatively complex, and something less than a full cost-benefit analysis is often more practical and useful.

Social and Economic Benefits of Population Projects

In general, two procedures are used to assess the likely benefits of a population-related project. The first is a macro approach, which focuses on the program's impact on future population size and on the composition of
Figure 1

Population Project Costs

Project Outputs

G Non-project Inputs

Contraceptive Availability, Practice and Use-efficiency

C1 Knowledge of Contraception, Motivation

D Impact on Fertility and Population Size

E Social and Economic Benefits
the economy and society as a whole. The second is a micro approach, which centers on the program's impact on the specific target group of acceptors as new clients. The two approaches are not mutually exclusive but do require rather different types of data and analysis.

A. Macroeconomic Benefits

The literature on the social and economic benefits of reducing fertility is extensive (Robinson-Horlacher, 1969). Several large-scale cross-national programs (most recently, Project RAPID) have produced specific country case studies demonstrating these benefits. (See Appendix I.) Recently, the University of Chicago prepared illustrative functional projections for the years 1975-2000 for, among other sectors, population, labor force, family planning, and education. These were used to analyze the multi-sectional implications of population growth.

We will do no more here than repeat and summarize the underlying logic of these models. The chief cost to society of high fertility is represented by the resources required to support the added population. The benefit of population control is that consumption costs are not incurred because birth rates are lowered. However, these gross benefits must be netted against the stream of future outputs that extra births ultimately produce. If the analysis is limited to the short run, say, 20 years or less, preventing births today will have only a minimal effect on output because it takes 15 years for a birth cohort to reach working age. Even in the longer run, additional members of the labor force will add little to output if the marginal productivity of labor is very low, and future "returns" will be lost because births will have been prevented. Indeed, as long as additional persons produce over their entire lifetimes little more than what is required for subsistence, their net output (or net productivity) will remain zero. Furthermore, preventing their births will entail no loss of net output.

It can be argued that preventing births increases the ability of the economy to generate savings for capital formation, for as long as the marginal product per worker is below the average product per worker and both are falling, increasing the number of workers will decrease the average product (and income) per worker. To put it another way, if the optimum population (that is, a population level that given other factors, permits maximization of output per worker) has already been exceeded, any measures that prevent further population increase must result in income per capita that is higher than that otherwise generated. If savings are a function of per capita income, decreasing population will increase aggregate savings, even if total income remains unchanged.

These arguments focus on the relationship between per capita income and consumption. However, one can argue that income in most developing countries is a family-related variable. If the birth rate falls, family size is reduced, and since total consumable income (or subsistence output) per family does not change, at least in the short run, the consumption per family member rises. In other words, a falling birth rate may not only "free"
resources from consumption for investment, but also increase the existing population's consumption per capita. Since rising consumption per capita is likely to generate rising productivity per worker, the result may still be favorable to output.

As is well known, as the birth rate falls, the age distribution of the population shifts to reduce the proportion of non-producers. The requirements for many welfare (and social overhead) programs are directly related to the proportion of non-earners. Reducing the proportion of non-earners in the population thus reduces the share of any given amount of the total social investment funds available that must go to relatively unproductive relief and social welfare programs or be used to maintain a constant social overhead investment per capita. With a lower birth rate and a relative reduction in non-earners, a larger proportion of any investment funds available can go to directly productive investments in agriculture or industry and be used to increase the per capita level of social overhead investment (education, health, etc.).

In summary, the benefits of reducing fertility in developing societies (studies typically yield estimates of from two to three times the current per capita income) are based on some combinations of the following conditions:

--the marginal productivity of labor is low and falling, so that persons born today will consume at least as much as they produce;

--savings are a function of per capita income and inconsequence; other things being equal, the larger the population, the smaller the savings;

--the volume of social welfare services supplied by the government--education, health, housing, etc.--is related to the size, growth rate, and age distribution of the population in such a way that the higher the growth rate, the larger the absolute volume of such services that will be supplied; and,

--technological change is not related to population growth or pressure, so that future improvements in economic efficiency will flow mainly from current levels of capital investment.

The logic outlined above is very macro indeed. An effort to quantify the benefits of reduced fertility involves a set of economic-demographic projections based on alternative assumptions about fertility and population growth. Thus, data on current levels and growth rates for the major macro-economic magnitudes (e.g., Gross National Product, investment, savings, consumption, output per worker, and social welfare versus developmental expenditures) and on current population size, age-sex distribution, and alternative "scenarios" for future growth are needed. These data, which are available in almost all countries, can be used to determine macro-economic effects (future per capita incomes, per capita availability of social services,
per capita consumption, and, through investment, the future growth of output itself) of high rather than low fertility. This is the logic of all such projection efforts, including Project RAPID. (See Appendix I for the detailed methodology.)

In many countries in Latin America and the Caribbean, the increasing local capacity for economic and demographic analysis has also been applied to preparing macroeconomic-demographic projections specific to a given country. Where available, these should be used. To repeat, these benefits are societal and the models deal necessarily with average income, average consumption, and so on. They shed little light on the ways benefits are actually distributed among families or groups of families. For this reason, the assessment of micro-level benefits requires a different approach.

B. Microneconomic Economic and Social Benefits

There is a continuing debate in the professional literature on how one can best conceptualize the fertility decision of couples in the developing world. Economists frequently argue that even very high fertility may be a rational response to the objective circumstances in which couples find themselves. That is, for primitive labor-intensive agriculturalists, large families may be necessary. In the face of high infant mortality, a large number of births may be needed to ensure the parents long lives. Lacking access to modern consumer goods, poor families may also view children as a major source of pleasure and joy. Others maintain that under pre-modern conditions, fertility is essentially a biological process governed more by natural than by social forces.

The issue is not unimportant to the question of benefits of population projects. If couples have large families because they want them, motivation to practice contraception, even when it is available, will be low. Any perceived microscale benefits to potential users will be missing, no matter what the macroeconomic calculation of social benefits projects.

Cross-national surveys on fertility behavior indicate that hard-core non-acceptors appear to be an extremely small percentage of the population. This group, presumably, derives very high subjective, psychic returns from children or simply does not plan at all. It seems best to exclude this group, which constitutes no more than 5 or 10 percent of the population at risk, from programming considerations and calculations.

It is possible to calculate roughly the actual out-of-pocket cost to a typical family of each additional child. Assume that a child aged 0 to 4 consumes roughly one-quarter the average level of adults; children aged 5 to 9, about one-half; and children aged 10 to 14, about three-quarters. These relationships imply that a child from birth to age 15 consumes 7.5 times the average present adult consumption level. On the average, for the 15 years, the extra child "costs" one-half the present per capita adult consumption per year. Thus, each member of an existing family of four could have...
enjoyed a 10 percent or higher annual average increase in per capita consumption over the 15 years, if the extra child had not been born.

In practice, the growing body of evidence from the AID-sponsored Contraceptive Prevalence Surveys and from the World Fertility Survey confirms the micro-level perception of benefits of family planning. It is now possible to use these data (Brackett, 1978) to determine the number of currently married, fecund (at risk) females who indicate they desire no more children but are not using any contraceptive method or are using a relatively inefficient (unreliable) method. The figure for Colombia is 30 percent; for Panama, 19 percent; for Costa Rica, 12 percent; for the Dominican Republic, 23 percent.

These target groups are clearly potential beneficiaries of further project activity. In the most basic of perceptual human terms, such unsatisfied need for family planning services is the best justification for family planning. Undoubtedly, there are links between these micro needs and macro benefits. That is, females want no more children so that they can achieve for themselves and their present offspring better levels of health, education, consumption, and well-being.

Similarly, the relatively high incidence of high-risk illegal abortions in many Latin countries is clear evidence that for the females involved, there are benefits to be derived from not having another child. These benefits must be great enough to warrant the severe risks to life that such illegal, even self-induced, procedures entail.

In summary, the potential benefits of fertility reduction at the micro level are most obvious when there is a substantial unmet need, indicated as a difference between desired and actual (or likely potential) family size. At the macro level, societal benefits can be gained as long as there is a difference between actual fertility and ZPG or replacement levels.

Project Outputs

Output can be measured as the specific units—the number of clinics established, informational brochures printed, vehicles purchased, or medical personnel trained—generated by the program. These are so specific and narrow that they fail to indicate the impact of the outputs. Figure 1 suggests that there are two types of outputs: the outputs directly affecting (through availability and method efficiency) the practice of contraception (Box C2) and the outputs affecting target group awareness and attitudes about contraception and population (Box C1).

Presumably, the average acceptor begins in C1 and moves to C2. The ultimate target is to move 100 percent of the target population into C2. In practice, for ongoing programs, C1 appears to vary from 70 percent to 90 percent and C2 from 10 percent to 60 percent.
A. Direct Output (Services Used or Supplied)

One of the most widely used indices of total contraceptive impact of various project/program outputs is the "Couple Year of Protection" (CYP). This index was developed by Samuel M. Wishik (Wishik, 1973) for the family planning program in Pakistan. The logic is that projects and programs generate services to clients or acceptors. But the use of "acceptor" or "client" as an index ignores the very different type of service created by different methods. The CYP is thus a way of combining various contraceptive services generated in a standardized index of practice.

The method is to allow one CYP of protection for:

--every 12-month period lived by a fecund, currently married male or female who has been sterilized;

--every intrauterine device in place for one year; and,

--each total of barrier methods (condoms, foam, etc.), oral contraceptives, or injections distributed that, given coital frequency, is enough to provide contraceptive protection for one year.

Thus, to illustrate, for Guatemala (Corno, et al., 1979), the total number of years of protection is computed as follows:

<table>
<thead>
<tr>
<th>New Clinic-Based Acceptors</th>
<th>Assumed Couple-Years of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pills</td>
<td>2</td>
</tr>
<tr>
<td>IUD</td>
<td>3</td>
</tr>
<tr>
<td>Barrier Methods</td>
<td>1</td>
</tr>
<tr>
<td>Injections</td>
<td>2</td>
</tr>
<tr>
<td>Sterilization</td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>New Community-Based Delivery System Acceptors</th>
<th>Assumed Couple-Years of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pill</td>
<td>1.5</td>
</tr>
<tr>
<td>Condom</td>
<td>0.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Continuing Clinic-Based Acceptors</th>
<th>Assumed Couple-Years of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pill</td>
<td>1</td>
</tr>
<tr>
<td>IUD</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Continuing CBD-Based Acceptors</th>
<th>Assumed Couple-Years of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pill</td>
<td>0.75</td>
</tr>
<tr>
<td>Condom</td>
<td>0.75</td>
</tr>
</tbody>
</table>
Given program data on new and continuing acceptors in the two systems (clinical and community-based delivery system), the total number of CYPs produced by the entire project can be calculated. The index can also be determined for any given district or clinic and comparisons of levels of standardized output made. Furthermore, when combined with cost estimates, output per unit can be evaluated. Given the complexity of cost-benefit calculations, many evaluation experts prefer to rely on cost-effectiveness rather than cost-benefit. For example, in Guatemala, the CYP per unit cost approach yielded meaningful comparisons across a variety of population projects; the USAID mission was able to use these useful data to make management decisions. Cost-effectiveness should not be overlooked as an evaluation tool.

Another approach to the same calculation (one originally proposed by Wishik) takes as the specific outputs to be combined into CYPs the physical supplies distributed or used up during a given year. Thus, for Guatemala, this approach would be:

<table>
<thead>
<tr>
<th>Assumed Couple-Years of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Condoms Distributed</td>
</tr>
<tr>
<td>1 IUD Inserted</td>
</tr>
<tr>
<td>1 Sterilization Performed</td>
</tr>
<tr>
<td>13 Oral Pill Cycles Distributed</td>
</tr>
<tr>
<td>13 Injections Given</td>
</tr>
</tbody>
</table>

Given data on the number of condoms and pills used, injections given, sterilizations performed, and IUDs inserted, the CYP index can be calculated. (The further assumption of coital frequency of 100 per year is also needed.)

For these approaches, some country-specific data are needed on, for example, coital frequency per year; average number of years an intrauterine device is retained by a married, fecund female (allowing for reinsertions); and average number of fecund years remaining to a woman before she dies, is widowed, or reaches menopause, and after she or her husband has been sterilized. Given these parameters, both of the approaches outlined would reach the same total of CYPs produced in a year.

The CYP index is a measure of the current achievement of the program, including the achievement that will be realized in the future. It is not a measure of the current level of protection being afforded to the population; that must also take into account both the carryover of past achievement into the present and some part of the current achievement.
Current achievement measures change in prevalence during the period in question, and includes changes in future prevalence as well. The relationship between prevalence and achievement may be viewed conceptually as a matrix, with the time of insertion, sterilization, or contraceptive distribution along the vertical axis and the time during which the couple is protected along the horizontal axis. Summing the rows gives the achievement in each year (row), while summing the columns gives the prevalence of protection in each year (column). Thus, the achievement in Year 1 would include elements of protection extended through Years 1 to N, while prevalence in Year 3 would include some part of the achievements of Years 1-3. The achievement index suggested above measures future as well as current output and is thus more useful in assessing the cost per unit than a prevalence index, which would treat a sterilization the same as it would supplying a couple with condoms for a year. Because achievement is only partially realized, no easy comparison can be made using the total target population of the program. However, CYP prevalence can be expressed as a proportion of couple-years at risk in the current year.

When method-specific data required for calculating couple-years of protection (by either approach) are not available, some even more simple index, such as "clients" or "new acceptors," can be used to measure performance, though less precisely.

B. Indirect Output (Information and Education--I and E)

The second basic objective of many population-related projects is to disseminate information on contraception, the availability of services, and the benefits to acceptors of such practice. Such "information and education" (I and E) activity leads potential acceptors to the services being made available. It is a kind of outreach by the project to persons already motivated to use contraception. To this extent, the output is measured as part of the direct output--acceptors, couple-years of protection, etc.

But the I and E effort of most population projects also aims at motivating new acceptors by changing attitudes and norms. It raises the community's general level of awareness about contraception and population-related matters. It explains the benefits of reduced fertility and lowers the desired family size of the target population. An index of such an indirect attitudinal output is difficult, but not impossible, to construct.

For example, in any given country we are likely to have a series of surveys, such as a contraceptive prevalence study or World Fertility Survey, indicating the desired family size of females by age, parity, and duration of marriage. Suppose that as a result of intensive and successful I and E activities, the reported desired family size falls from five to four over a five-year period for a given age cohort of females (aged 20-24 in the first year and aged 25-29 in the fifth year). Suppose also that as a result of
of services being supplied, the actual family size was approaching desired family size. (Unmet needs, as that term is used in this paper, were modest.) Under these conditions, part of the decline in desired family size would be a clear output of the educational efforts. The births of children that women once wanted but now do not want were "birth-averted" just as surely as unwanted births are prevented by providing services. Furthermore, even if present actual births exceed desired births, if the educational program has lowered births desired, those "births potentially averted" (or "births probably averted") can legitimately be considered an output of the project. The calculation would be, for example:

<table>
<thead>
<tr>
<th>Births Desired</th>
<th>Year 1</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Females 20-24)</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>(Females 25-29)</td>
<td></td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual Births</th>
<th>Year</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Females 20-24)</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>(Females 25-29)</td>
<td></td>
<td>2.8</td>
</tr>
</tbody>
</table>

If the average number of females in the cohort (Year 1 plus Year 5) equals 50,000, then 50,000 times 0.5 births (3.5 - 3.0) per female, or 25,000 fewer births, are now desired than was the case before the project began.

A similar logic suggests that by using multi-round surveys, such as the World Fertility Survey, the percentage of the target population indicating knowledge and/or approval of family planning can be calculated and used as another indicator of the output of indirect I and E activities of a population project. If the target population of females is 125,000 in Year 1 and if 50 percent of these women has at least one reliable family planning method (and knows where to obtain the service), and if in Year 5, 75 percent of the target population has such information, then a legitimate measure of "persons reached" (or "persons informed") would be 25 percent of 125,000, or 31,250.

In summary, constructing some output index for the indirect I and E elements of a population project is somewhat more difficult, but not impossible. Output indices that can be related to the costs of such activities and to the ultimate social and economic benefits which these projects aim at achieving can be derived.

**Linking Project Outputs to Fertility Reduction**

**A. Short-Cut Methods**

The indices of project outputs--CYP, acceptors, clients, etc.--can be linked to the achievement of ultimate social and economic benefits through fertility reduction of births averted. As Figure 1 shows, the
project's outputs (Box B) either directly increase contraceptive use, as well as efficiency of use (Box C2) or indirectly affect such use by increasing general knowledge of contraception as an option to childbearing and by creating a positive response to this option (Box C1). As we have seen, the macroeconomic and societal benefits are usually connected to births averted or to the lower rather than higher fertility resulting from the project. Thus, the final links in the chain (sketched out in Figure 1) are between the specific output indices and births averted and the benefits per birth averted.

For most project purposes, births averted can be calculated using one of several short-cut methods. For example, if Couple Years of Protection have been determined from project data by either of the methods outlined above, only an estimate of the average number of years of exposure per female to result in a birth is needed to derive the births that do not occur because of any given number of CYPs. Suppose fertility data (WFS, etc.) for a country indicate that on the average, women begin exposure at age 15, end exposure at age 40 (before menopause because of secondary sterility, widowhood, marital disruption, and other biological and social factors), and produce eight live births. There would average one birth for every three years of exposure. Or, three years of protection from exposure (three CYPs) should prevent one birth.

The distinction between CYPs produced and prevalent in the current year and CYPs produced in the current year but stretched into the future because of a sterilization is relevant here. Births averted can also be for a single current year or over the longer-run.

Another simple method relies on the general fertility rate (GFR) and estimates of the overall number of adoptors of contraceptive practices. Specifically, the number of births averted can be calculated as follows:

\[
\text{Births Averted} = \frac{C_1 \cdot \text{GFR}}{1000} + \frac{C_2 \cdot \text{GFR}}{1000} + \ldots + \frac{C_N \cdot \text{GFR}}{1000}
\]

where \(C_1\) equals the number of additional women contracepting in the first year of the project, \(C_2\) the number of additional women contracepting in the second year, and \(C_N\) the number of additional women contracepting in the last year of the project.

This procedure may lead to an overstatement of births averted for several reasons. First, it is not likely that data will be available to delete women who contracept in Year 1 but not in Year 2. Second, the use of a constant GFR does not allow for the fact that the program itself should result in reduced fertility. However, the logic of the approach permits the use of more complete data, such as age-specific fertility rates, and is an appropriate point at which to begin calculating the number of births averted.
B. Detailed Analytical Procedures

The short-cut methods suggested above ignore many problems, especially the differing use-effectiveness of various methods. In effect, the CYP procedures assume that all methods are 100 percent effective. The same is true of procedures for births averted based on CYPs or adoptors. In fact, truly precise estimates of the number of births averted from a contraceptive project require relatively complex statistical procedures and a considerable wealth of data on the acceptor population by age, parity method chosen, and continuation history after accepting the method. Country specific-estimates of the use-effectiveness of each method are also needed, as are data on the fertility patterns of the target, non-acceptor female population.

The procedure involves three basic steps: estimating "average length of effective usage" by method; estimating average number of years of marriage duration per potential birth; and dividing average effective use (in years) by average marriage years required per birth to yield estimated births averted. This calculation must be done for each age class.

The first step is the key. For IUDs, life-table techniques have been developed so that the average length of effective use can be predicted for any single acceptor. In the case of oral pills, similar approaches can be used. Both methods approach 100 percent in use-effectiveness. Sterilizations are also fairly straightforward because no contraceptive failure is possible. Diaphragms, condoms, and other "barrier" methods have a wide range of use-effectiveness and do not lend themselves well to life-table attrition-rate approaches. Therefore, the calculation of the average period of effective use for clients on these methods raises questions and problems that have not been answered or addressed definitively (Wolfers, 1976).

The second step, the calculation of mean marital duration per pregnancy, can proceed in either of two ways. First, direct birth interval data for married females in a specified age group can be derived from available existing data. If 1,000 females aged 30 in Year 1 have 2,000 live births in the next five years, the mean marital duration per birth is 2.5 (1,000 x 5 = 5,000 ÷ 2,000). This calculation requires the fertility histories of the females. Second, if we know the marital age-specific fertility rates (MASFR) for the female population, we also know the average length of time required per birth by age group. Thus, the MASFR equals: births to females aged 30-34 in Year 1 divided by total of married females aged 30-34 in Year 1. What we want is the opposite of this--total of married females aged 30-34 in Year 1, or woman-years per birth--so we can take the reciprocal of the MASFR for the various age classes.

The third step is simply the derivation of births averted from the "years of effective use" and mean marital duration per pregnancy (or exposure years per birth).

These procedures differ from the short-cut methods only in detail. There is considerable literature on these procedures because some tricky and challenging demographic and statistical problems are involved. (See U.N., 1979; Hermalin
and Chandrasekharan, 1976.) It is not clear that the gain in precision is worth the considerable extra computational effort.

Project Cost, Discounting, and Time Horizon

The list of inputs to a family planning project can be long and heterogeneous, including the time of highly-skilled medical people and top government administrators, the services of a semi-skilled jeep driver, the production cost of IUDs, the incentive payment paid to field workers, etc. Resources will flow into the program from non-AID donors--government and private--which may be added to AID and local expenditures. Similarly, the program will typically involve non-project local private groups--family planning associations, for example, as well as non-AID official operations. The national family planning budget may not include funds which are raised and spent entirely at the provincial or local level.

In some countries, family planning is merely part of a more general maternal and child health or rural public health program. In the latter case (and to some extent in the former), "joint-cost" problems arise. When field workers or clinics are doing family planning as well as general MCH work, some formula for dividing the cost of such workers and clinics among family planning and other tasks must be developed.

Similar problems arise for administrative and other overhead expenditures which support many programs, only one of which is family planning. Especially difficult is the handling of research and evaluation. Frequently, expensive, highly sophisticated research projects are undertaken in conjunction with a family planning action program. There are spillovers for the program, but the major output of the research spending may be a product called "research," not births averted. (The special problem of measuring outputs from I and E activities has already been discussed.)

In general, a single budget for the entire family planning (or population control) program must be prepared and adopted to control the activities. But the projects which make up the overall program must also be distinguished from one another. (The AID Handbook describes detailed procedures for administrative and financial reporting. For the purpose of economic analysis, the procedures can be easily related to one (or more) of the indices of output discussed earlier.) To repeat, over the long run, the program (or group of projects) yields the ultimate economic and social benefits; in the shorter run, each project yields specific outputs (CYPs, etc.) which can be used to justify (and analyze) the costs incurred.

As noted earlier, the logic of economic cost-benefit calculation argues that future benefits and costs must be reduced or discounted so that they can be summarized and compared to present costs. Inevitably, projects with relatively long pay-off periods are discriminated against. This is unfortunate because some vital projects, including population I and E projects, may have
long pay-out periods. Nevertheless, it is still necessary to use the discounting procedure, some finite time horizon beyond which benefits become irrelevant. Without it, we have no consistent way of choosing one project over another because any project can always claim that long-run benefits are not measurable at the present time.

The discount rate used is ordinarily taken as the prevailing market rate of interest, this being a market indicator of the premium attached to present as compared to future funds. Inflationary conditions complicate this because whatever the real interest rate (or present/future discount), the "money" rate of interest must allow for expected price changes and declines in the value of money. For example, if the price level rises 10 percent each year, a project which yields benefits two years from now must yield at least a 10 percent rate of return to break even. If the real rate of interest is set at 8 percent, projected future benefits must be reduced by 18 percent to arrive at their real present value.

The appropriate time horizon for planning population projects is almost certain to be dictated by administrative and budget and reporting considerations. The calculation of benefits and costs may tend to focus on a relatively short period—say, three to five years. While this may be inevitable, it is also dangerous, because the most important benefits at the macroeconomic or societal level are almost certain to be longer-run. Shorter-run indices of output, such as CYPs, acceptors, or in the case of indirect outputs, "persons reached," may be more useful as indicators of project accomplishments.

Other Population-Related Project Impacts

All the techniques reviewed above aim at reducing the various outputs of a project to a single index which can be used to measure the intermediate or final impact. "Births averted" is a common denominator for adding various disparate outputs—-IUDs inserted, clients reached, pills distributed—to achieve a single final result. These approaches implicitly argue that effective contraceptive usage is the only real final product of population-related projects.

This assumption creates problems for several reasons. Many vital projects do not directly increase the volume or even the accessibility of contraceptive services, though they do have an impact on motivation and ultimate acceptance of family planning. For example, it is often suggested that the concept of more equitable distribution of income or wealth must be based on the belief that such an economic factor has a favorable effect on motivation to actually use contraceptive services—in other words, on motivation and desired family size. Yet, it may be years before the ultimate effect on realized fertility is observed. Desired family size, use-efficiency, and realized fertility are all intertwined in a shifting pattern that cannot be broken down easily into
separate components. How can we evaluate the benefits of a qualitative, longer-run population-related project that has its greatest impact on motivation?

All that is left is, admittedly, a qualitative approach. Such population-related projects as land-reform, mass education, or public health can be evaluated, planned, and to some extent justified on the basis of their impact on family planning motivation and program efficiency, but not in terms of births averted. More concrete, defensible indicators (e.g., families resettled, pupils enrolled, patients under care) should be used. These indicators, at either the intermediate or final level, can supplement the more purely demographic indicators, which relate more directly to the supply of contraceptive services.

Thus, population-related social projects themselves have not only a specific, primary final impact, but also an incidental, secondary impact: improved motivation and prospects for success of population control. This is as far as one can take the approach. The linkages, though qualitative and intuitive, are real.

Summary and Conclusions

This paper has reviewed the conceptual, methodological, and operational bases for the economic evaluation of population-related development projects. The following conclusions and recommendations are offered:

1. The evaluation of the economic and social benefits or population projects is a relatively simple exercise in projection and can be undertaken using projections of the multi-sector financial impact of population growth. Models exist which can quantify the economic benefits to a society of reduced fertility. (See Appendix I.)

2. When a measure of specific output from a population project is required, the most reasonable approach is to use a more direct index, such as couple-years of protection, as the measure of achievement. For indirect outputs, such as I and E, other indices can be devised.

3. The link between various population-related projects and demographic impact differs widely. Thus, a direct contraceptive services-generated project can be directly related through CYPs or acceptors to births averted. I and E activities prevent births by increasing participation and by reducing desired family size. The reduction in desired births is a type of potential birth averted.

4. More indirect is the demographic effect of programs in nutrition, land reform, or education. To affect fertility, such programs must motivate prospective acceptors. In a real
sense, the final demographic impact will be a joint output of the service-generating and motivational projects.

5. At the project-specific level, the best measures of output are those most directly linked to the project itself. A target such as unmet need for contraception may be more important than births averted or the ultimate socioeconomic benefit. Clients, acceptors, and CYPs are also meaningful measures of program output.

6. Economic analyses are vital and must be undertaken routinely, using as much rigor and detail as data and time permit. However, qualitative, essentially non-economic indicators of impact or project performance are the best indices for most projects. These should not be rejected but viewed as supplements, not alternatives, to economic evaluation.
REFERENCES

This bibliography is designed to aid the preparation of an economic analysis of population projects and programs.

1. The Methodology of Cost-Benefit Analysis

2. Calculating Benefits of Population Projects
   h. David E. Horlacher, "Economic and Social Benefits of Family Planning in Guatemala," 1979. (Consultant report prepared for USAID under an agreement for the American Public Health Association.)
3. Costs of Population Programs


4. Births Averted and Couple Years of Protection


5. Links Between Project Outputs and Ultimate Benefits


6. **Data Source**


   b. U.S. HEW, Center for Disease Control, *Contraceptive Prevalence Surveys*. (Undertaken to date in Paraguay, Brazil, Panama, El Salvador, and Guatemala).

   c. Westinghouse Health Systems (Columbia, Maryland), *Contraceptive Prevalence Surveys*. (Undertaken to date in Mexico, Colombia, and Costa Rica; Honduras, Peru, and Barbados planned.)


   e. Community and Family Studies Center, University of Chicago, *Illustrative Functional Projections*. (Covers urbanization, education, labor force, marital status, health, food and family planning; prepared for all LAC countries, 1979.)

   f. The Futures Group, Inc., *Resources for Awareness of Population Impact on Development (RAPID)*. (Prepared for Honduras, Panama, Costa Rica, Bolivia, and Paraguay.)
PREFACE

The Futures Group, under contract to the United States Agency for International Development (AID), is undertaking analyses for a number of countries regarding the effects of population change on the efforts of these countries to achieve their economic and social goals. The project is named RAPID, which stands for Resources for Awareness of Population Impact on Development. These analyses are being carried out for several countries that have well-defined development programs and are seriously determined to make substantial economic and social progress. In each case, these analyses are offered to national leaders along with comparable research done by the country's own experts.
INTRODUCTION

The World Population Plan of Action, adopted by 136 countries at the World Population Conference in Bucharest in 1974, recognized as a principle that "population and development are interrelated: population measures should be integrated into comprehensive social and economic plans and programmes and this integration should be reflected in the goals, instrumentalities, and organizations for planning within the countries." (Paragraph 95)

Population is, of course, only one element to be considered in the development process. However, it has a very special importance since the ultimate purpose of economic development is not simply to increase the total goods and services produced — the Gross National Product (GNP) — but to increase the standard of living and quality of life of the individual, including the value of goods and services available per person, and to achieve a more equitable distribution of income among this people.

GNP per capita can be raised by increasing the rate of production of goods and services, or by slowing the increase in population — or, most effectively, by doing both. Where there is a rapid increase in population and government attention is given only to increasing the output of goods and services, the increase in GNP per capita may be limited or even nonexistent, and attainment of goals for improving the quality of life of the individual citizen may be difficult and long-delayed. However, where attention is also given to slowing population growth, the effort to reach development goals for the welfare of the individual will generally be more successful.

Many countries have established national economic and social objectives. These objectives vary among countries but generally include increases in food production, provision of land through agrarian reform programs, assurance of large numbers of jobs, conservation of natural resources, provision of adequate housing, education for all children, and better health services for their citizens. The RAPID form of analysis computes the effects of a country's population dynamics and alternative fertility rates on the attainment of each such objective.
This presentation has been prepared especially for the International Conference of Parliamentarians on Population and Development. It is not an analysis for a single country; rather, it is a composite from several country-specific presentations and is intended to demonstrate both the impact of rapid population growth on social and economic development and to show the capabilities of the RAPID model. Illustrations are taken from countries of different regions and include:

- Population Dynamics - Egypt
- Water Availability and Requirements - Jordan
- Agricultural Production and Food Needs - Jordan
- Cereals Production and Import Requirements - Morocco
- Agrarian Reform and Land Requirements - Honduras
- Forest Resources - Honduras
- Labor Force and Jobs for Young People - Cameroon
- Gross National Product and Gross National Product Per Capita - Cameroon
- Education - Cameroon
- Health - Cameroon

The impact of extraordinary population growth on other sectors, such as housing or urban services, may also be examined with the RAPID model.

Data for developing countries tend to be imprecise. Information used in this paper is taken both from country-specific sources, including national censuses, and from data compiled by international organizations, including the United Nations, the International Bank for Reconstruction and Development (World Bank), the International Monetary Fund, and the Inter-American Development Bank.
Egypt

Population Dynamics

Birth Rates, Death Rates, and Population Growth Rates
Age Distribution and Child Dependency
The Momentum of Population Growth
Population Growth Under Different Fertility Assumptions
BIRTH RATES, DEATH RATES, AND POPULATION GROWTH RATES

In 1976, there were approximately 38,200,000 Egyptians, 36,800,000 living in Egypt. The total fertility rate (TFR), the average number of children born to each woman during her life, had been 7.2 in 1960 and reduced to 5.4 in 1976, a substantial improvement but still a very high rate.

Birth rate: Birth rates have been high in Egypt during recent decades. They have shown a decline and a recent increase.

The birth rate (births per 1,000 population) was about 45 in the 1950-1955 period, dropped to 34.6 in 1972 and rose to over 38 by 1979.

Death Rate: Public health measures over the last three decades have resulted in a large reduction in the death rate.

The death rate (deaths per 1,000 population) fell from 22 during the 1950-1955 period to about 15 in 1970 and 12 in 1976. It has dropped further to about 10 in 1980.

Life expectancy at birth rose from 42 years in 1950-1955 to about 55 years in 1976.

Population Growth Rate: High fertility combined with declining mortality has resulted in a high rate of population growth. In 1952, it was about 2.8 percent. In the early 1970s, reduced by the effects of two wars and emigration to oil producing countries, it dropped to around 2.3 percent. By 1976, it was about 2.6 percent and by 1979, about 2.8 percent. The estimated total in Egypt by 1980 will be 40,500,000.
Egypt

Birth Rates, Death Rates and Rates of Natural Increase, 1952 - 1978

Population Growth, 1976 - 2025
(assuming constant fertility)
AGE DISTRIBUTION AND CHILD DEPENDENCY RATIO

Because of high fertility, Egypt has a large percentage of children in its population. Approximately 42 percent of the populace is under the age of 15. Consequently, Egypt has a very high child dependency ratio (proportion of children under 15 to adults in the economically productive ages, 15-64).*

There are about 75 children to be supported and educated for every 100 adults of economically productive age.

By contrast, there are 30 to 35 children to be supported by each 100 adults in a modern industrial state.

Fertility levels will largely determine the child dependency ratio in future years. Consider the following:

If fertility remains constant to the year 2000, the child dependency ratio will remain approximately the same at 74 dependent children for every 100 adults in the economically productive ages.

A reduction in fertility to a 3-child family average by 2000 would lower the child dependency ratio to 51 children for every 100 adults.

A decline to a 2-child family average by 2000 would lower the child dependency ratio to 41 dependent children for every 100 adults.

The importance of these ratios varies according to the nature of the society. In a traditional peasant economy, a large number of children is economically beneficial to the rural family since it increases the number of available workers. As a nation develops socially and economically, however, a high child dependency ratio will strain the resources of individual households and may also affect social and economic development programs. With a large dependent population, a disproportionate share of public and private resources must be devoted to the needs of the young. Hence a significant reduction in the child dependency ratio would release substantial sums for investment in other development programs.

*The old-age dependency ratios are not as important as the child dependency ratios because changes in the former as a result of changes in fertility will take fifty years to have an effect on the proportion of people dependent on the economically productive age population.
For each dependent child in Egypt there are only 1.25 working-age adults.
For each dependent child in most industrialized countries, there are 2 to 3 working-age adults.
MOMENTUM OF POPULATION GROWTH

The size of the population is increasing rapidly, and it is virtually impossible to stop quickly.

If the present high level of fertility -- an average of 5.4 live births for each Egyptian woman during the course of her reproductive years (15-49) -- continues, very rapid population growth will ensue. Even if fertility levels should drop today to replacement levels, on an average of two children for each couple of reproductive age, the population would nevertheless continue to grow for about 40 years.

This is because, for the next 40 years, the number of young people entering their reproductive years substantially exceeds the number of people moving out of that period of life. Even with no more than a 2-child family average, the number of births each year would exceed the number of deaths. This phenomenon is often referred to as the "momentum of population growth."

Therefore programs to limit population growth must be started early, long before the population reaches or surpasses its desirable size.

Otherwise growth will continue beyond the size which can be supported by the available resources at a desirable standard of living.
Egypt
Momentum of Population Growth

Population Profile
1976

The number of people leaving their reproductive years is small compared to the number entering them.

The number of children is even larger.

Within 10 to 20 years today's children will be in their prime reproductive years and they will far outnumber the people who completed their reproductive years.

Thus, the population will continue to grow for at least 40 years even if fertility drops to replacement levels today because of the large number of future births to today's children.

Population Profile
1996
if Fertility Drops to Replacement Levels Today

Male Percent Female Male Percent Female

Population Profile
1996
if Fertility Drops to Replacement Levels Today

Male Percent Female
POPULATION GROWTH UNDER DIFFERENT FERTILITY ASSUMPTIONS

Egypt's built-in momentum of population growth will increase its future population. However, if the Government of Egypt quickly achieved full national commitment in its program to reduce the fertility rate, future population growth could be substantially reduced. This can be seen from projections based on three alternative fertility assumptions (each assumes an improvement in health and an increase in life expectancy to 65 years by 2000 and 70 years by 2025):

A. Present fertility of 5.38 births per woman continued. The 1976 population of 36.8 million would be 69.5 million by 2000, 89 percent larger than in 1976. By 2025 the population would increase to 143.4 million, nearly 4 times the 1976 figure, and would be growing at 3.0 percent per year, doubling in only 24 years.

B. An accelerated family planning effort started in 1980 and achieving a total fertility rate of 3 children per couple by 2000. The population would be 59.7 million by 2000, 62 percent larger than in 1976, and 87.6 million by 2025, when the population would be growing at 1.4 percent per year.

C. An accelerated population program started in 1980 and achieving a total fertility rate of 2 children per couple by 2000. The population would be 55.5 million by 2000, 51 percent larger than in 1976, and 68.1 million by 2025. The growth rate would decline to 0.56 percent per year by 2025, and a zero growth rate would be reached in 2040. Because of momentum, zero growth would not be reached until 40 years after attainment of a 2-child family average.

These three fertility assumptions are used throughout the analysis to show how the attainment of Egypt's development objectives will be affected by alternative fertility rates.
Egypt

Population Growth Under Different Fertility Assumptions,
1976 - 2025

A - Constant Fertility
B - 3-Child Family Average By 2000
C - 2-Child Family Average By 2000

(All projections assume increased life expectancies to 65 years by 2000.)
The following sectors will be considered in this presentation:

- Water Availability and Requirements—Jordan
- Agricultural Production and Food Needs—Jordan
- Cereals Production and Import Requirements—Morocco
- Agrarian Reform and Land Requirements—Honduras
- Forest Resources and Sawnwood Exports—Honduras
- Labor Force and Jobs for Young People—Cameroon
- Gross National Product and Gross National Product Per Capita—Cameroon
- Education—Cameroon
- Health—Cameroon
JORDAN

Birth Rates (Births per 1000 population)  
1950: 47.5  
1975: 50.0

Death Rates (Deaths per 1000 population)  
1950: 21  
1975: 15

Annual Rate of Natural Increase  
1950: 2.7 percent per year  
1975: 3.5 percent per year

Fertility Rate, 1975 (Number of live births per woman during her reproductive years): 6.7

Life Expectancy at Birth, 1975: 54 years

Infant Mortality Rate, 1972 (Deaths to infants under 1 year of age per 1000 live births): 97

Percentage of the Population Under 15 Years of Age, 1975: 50

Child Dependency Ratio, 1975 (Number of children under 15 years of age for every 100 adults of economically productive age, 15 to 64)

Population Projections, 1975-2025 (Millions)

<table>
<thead>
<tr>
<th></th>
<th>1975</th>
<th>2000</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>A= Constant Fertility</td>
<td>1.95</td>
<td>4.3</td>
<td>9.8</td>
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<tr>
<td>B= 3-Child Family Average by 2000</td>
<td>1.95</td>
<td>3.2</td>
<td>4.6</td>
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<tr>
<td>C= 2-Child Family Average by 2000</td>
<td>1.95</td>
<td>3.0</td>
<td>3.5</td>
</tr>
</tbody>
</table>
Jordan

Water Availability and Requirements

Agricultural Production and Food Needs
WATER AVAILABILITY AND REQUIREMENTS

Water is becoming a scarce resource in Jordan. Already the supply of water for municipal use in Amman meets only about one-third of the actual need. The demand for water to expand agricultural output, increase industrial production, and provide for the increased consumption of a growing population could easily exceed supply by 1990.

According to a recent study, the full utilization of all water resources in North Jordan (flood waters, rivers, springs, and underground water) would still provide only 700 million cubic meters of water per year. (Howard Humphreys and Sons. *Water Use Strategy: North Jordan*). However, with the expansion of industrial and agricultural production and domestic consumption, the demand for water could reach over 800 million cubic meters per year by 1990. If municipal needs are met first, the resulting shortage of water will seriously affect the agricultural sector. Similarly, if municipal demand is reduced with lower fertility, more water will be available for agriculture. For example:

If fertility drops to a 3-child family average by 2000, the municipal demand for water will be 10 percent less by 1990 than with continuing high fertility. By 2010, municipal demand will be 35 percent lower.

Even if it were possible to provide enough water to meet the country's future requirements, the costs for drilling, pipelines, and pumping, as well as for investment in new water-extraction technology, would be huge.

With constant fertility, the costs for supplying additional water for municipal needs alone will be about JD 110 million (U.S.$35.2 million by 2000).

With a 3-child family average by 2000, the costs for meeting new municipal demand will be JD 80 million (U.S.$26.5 million) by 2000, or a savings of JD 30 million (U.S.$9.6 million) over continuing high fertility.

With a 2-child family average by 2000, the costs of additional municipal water supply will be around JD 70 million (U.S. $22.4 million), or a savings of JD 40 million (U.S.$12.8 million) over constant fertility.
WATER AVAILABILITY AND REQUIREMENTS

MILLION CUBIC METERS PER YEAR

- TOTAL WATER SUPPLY
- MUNICIPAL DEMAND
- WATER AVAILABLE FOR AGRICULTURE
- UNSATISFIED AGRICULTURAL DEMAND

A = CONSTANT FERTILITY
B = 3-CHILD FAMILY
C = 2-CHILD FAMILY

AGRICULTURAL PRODUCTION AND FOOD NEEDS

Only 6 percent of the land area of the East Bank is arable. Jordan is already a net importer of food; nonetheless, food requirements will more than double by the year 2000 if the population continues to grow at its current rate. The impact of different rates of population growth on this situation may be seen in the changing ratio of land to people under the different fertility assumptions. In 1975, Jordan had 2.1 arable dunums* per person.

With continuing high fertility, Jordan will have 1 dunum of arable land per person in 2000 and only .4 dunums per person in 2025.

With a 3-child family average by 2000, Jordan will have 1.3 dunums of arable land per person in 2000 and .9 arable dunums per person in 2025.

With a 2-child family average by 2000, Jordan will have 1.4 arable dunums per person in 2000 and 1.2 arable dunums per person in 2025.

* A dunum, the unit of land measurement in Jordan, is equal to .1 hectare.
ARABLE LAND PER CAPITA
(DUNUMS PER CAPITA)

1975

2000

CONSTANT FERTILITY

2025

3-CHILD FAMILY AVERAGE BY 2000

2-CHILD FAMILY AVERAGE BY 2000

1.4

1.2

1.3

1.0

2.1

11a
Because agricultural production is severely limited by adverse climate and geography, a large portion of Jordan's total imports consists of foodstuffs to meet the requirements of a growing population. Between 1971 and 1976, foodstuffs accounted for 21 to 26 percent of total imports. One-third of all cereals were imported. Overall, in 1976 Dinars, food imports cost JD 20.1 million in 1971, JD 49.4 million in 1975, and JD 81.4 million in 1976. To improve this situation, the National Development Plan targeted growth of 7 percent per annum in agricultural output over a 5 year period, but lagging investments and inadequate water supplies have kept actual production below the goal.

If the population continues to grow at its current rate, food needs will more than double by the year 2000. Although improved technology will increase yields from both rain-fed and irrigated land, and will decrease the amount of water required for each dunum, the rapidly increasing demand for food and the diminishing supply of water available for agriculture will necessitate an increase in food imports by 180 percent in 2000 and by over 400 percent in 2010. A reduction in fertility, however, would decrease overall food imports.

With a 3-child family average by 2000, the demand for food will be 25 percent less in 2000 and the supply of water for agriculture will be over 10 percent greater. As a result, imports in 2000 will be about the same as today.

With a 2-child family average in 2000, net imports will be roughly half of what they are today, and in 2010 Jordan can be self-supporting in agriculture.
FOOD SUPPLY
DOMESTIC PRODUCTION AND IMPORTS REQUIRED TO MEET TOTAL DEMAND WITH CONSTANT PER CAPITA CONSUMPTION

INDEX
(1975 = 1.0)

- SQUARES: DOMESTIC PRODUCTION
- CIRCLES: IMPORTS
- A = CONSTANT FERTILITY
- B = 3-CHILD FAMILY
- C = 2-CHILD FAMILY

MOROCCO

The following statistics are estimates by The Futures Group, subject to revision by official Moroccan Government statistics.

**1975 Population:** 17.5 million

<table>
<thead>
<tr>
<th>Birth Rates (Births per 1000 population)</th>
<th>Death Rates (Deaths per 1000 population)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1977: 16</td>
</tr>
</tbody>
</table>

**Annual Rate of Natural Increase**

- 1950: 2 percent per year
- 1975: 3 percent per year

**Fertility Rate, 1975** (Number of live births per woman during her reproductive years): 6.5 - 7.4

**Life Expectancy at Birth, 1975:** 53 years

**Infant Mortality Rate, 1975** (Deaths to infants under 1 year of age per 1000 live births): 133

**Percentage of Population Under 15 Years of Age, 1975:** 47

**Child Dependency Ratio, 1975** (Number of children under 15 years of age for every 100 adults of economically productive age, 15 to 64): 95

**Population Projections, 1975-2025 (Millions)**

<table>
<thead>
<tr>
<th></th>
<th>1975</th>
<th>2000</th>
<th>2025</th>
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<tr>
<td>A = Constant Fertility</td>
<td>17.5</td>
<td>43.8</td>
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<tr>
<td>B = 3-Child Family Average by 2000</td>
<td>17.5</td>
<td>31.4</td>
<td>45.7</td>
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<td>C = 2-Child Family Average by 2000</td>
<td>17.5</td>
<td>28.7</td>
<td>34.6</td>
</tr>
</tbody>
</table>
Morocco

Cereals Production and Import Requirements
Cereal production in Morocco has increased very little in the last thirty years, although Morocco was a net exporter of cereals until the early 1960s. Since then, cereal imports have grown steadily, except in very productive years such as 1968. As a result, Morocco needs to increase the production of cereals. Cereals generally provide 70-80 percent of the average Moroccan's caloric intake. Couscous, the national dish, is made from durum wheat. Other cereals, including barley, corn, and soft wheat are important dietary ingredients.

Cereal imports accounted for 4 percent of total imports in 1970 and 9 percent in 1975. In 1970 cereal imports cost 130 million dirhams; in 1975 the cost was 960 million dirhams.

Cereal imports have increased because of rapid population growth. The rise in per capita income, coupled with higher per capita consumption, particularly in urban areas, has contributed to the increasing need for cereal imports. Even if domestic production increases by 2 percent per year and per capita consumption stays the same, the need for cereal imports will grow. Hence, an increased proportion of Morocco's limited foreign exchange will be required just to buy food for its growing population.

If fertility is constant, by 2000, domestic production will satisfy only 53 percent of domestic demand in that year, a decline from 80 percent in the 1973-1978 period. Cereal imports must increase from one million metric tons per year (the 1973-1978 average) to 6.7 million metric tons by 2000 — with a cost increase from approximately 960 million dirhams per year to 6.5 billion dirhams in 2000.

If a 3-child family average is attained by 2000, domestic consumption will satisfy 74 percent of domestic demand. Annual cereal imports of 2.7 million metric tons will be needed by that year at a cost of approximately 3.5 billion dirhams. The imports required to meet domestic demand will continue to increase, but at a much slower rate than if high fertility continues.

If a 2-child family average is attained by 2000, the situation will improve considerably. Domestic production will satisfy 83 percent of domestic demand. Cereal import requirements will be only 1.8 million metric tons at a cost of some 1.7 billion dirhams. After 2000, the need for cereal imports will begin to decline and domestic production will satisfy a growing proportion of domestic demand.
Domestic Production of Cereals and Domestic Demand
With Constant Per Capita Consumption

MILLIONS
OF METRIC TONS

A = COI
B = 3 –
C = 2 –


5.7 6.7 6.5 6.5 20.7

4.6 5.0 6.1 7.5 10.9

14.2 8.4 8.2 10.2 9.3

8.4 8.2 9.3

6.7 6.5 6.5

A B C

A B C

A B C
HONDURAS

1975 Population: 3.2 million

Birth Rates (Births per 1000 population)                   Death Rates (Deaths per 1000 population)

1950: 51                                             1950: 28
1978: 48                                             1978: 12

Annual Rate of Natural Increase

1950: 2.3 percent per year
1978: 3.6 percent per year

Fertility Rate, 1975 (Number of live births per woman during her reproductive years): 7.0

Life Expectancy at Birth, 1975 : 55 years

Infant Mortality Rate, 1974 (Deaths to infants under 1 year of age per 1000 live births): 103

Percentage of the Population Under 15 Years of Age, 1975: 50

Child Dependency Ratio, 1975 (Number of children under 15 years of age for every 100 adults: 97 of economically productive years)

Population Projections, 1975-2025 (Millions)

<table>
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<tr>
<th></th>
<th>1975</th>
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<td>5.4</td>
<td>6.5</td>
</tr>
</tbody>
</table>
Honduras

Agrarian Reform and Cultivated Land Requirements

Forest Resources and Forest Land Required for Farming

Sawnwood Exports
THE AGRARIAN REFORM

For centuries land has been the lifeblood of the Honduran campesino; however, rapid population growth tied with uneven land distribution patterns made land inaccessible to much of the rural population. By 1972, well over half of the rural families were landless or living on minifundia of less than 5 hectares. In an effort to solve the problem of inequitable land distribution, the Honduran government launched an ambitious Agrarian Reform in 1972 (later revised in 1975). The statutory basis for the program, Law 103, declares that each rural family unit will be provided not less than 5 hectares nor more than 10 hectares of irrigated land or the equivalent in other kinds of land. Ultimately, under the Agrarian Reform, farms of less than 5 hectares would be abolished.

Between 1972 and 1976, approximately 26,000 families were settled on 174,689 hectares, about 20 percent of the goal of resettling 120,000 families and 24 percent of the goal of resettling 600,000 hectares which had been set for the end of 1978.

Although the land reform program has fallen substantially short of the 1978 goal, it did result in temporarily reducing the intensity of demand for land. However, at constant fertility levels, the number of landless families will continually increase and the pressure for more land will mount.

If the rural population continues to grow at its present rate and families continue to be settled on land under the Agrarian Reform as during the 1972-1976 period more than half the families living in Honduras' rural areas in the year 2000 could be landless or living on minifundia. The number of such families would be about 420,000, compared to the estimated 240,000 families who were landless or living on minifundia of less than 5 hectares in 1972.
The supply of arable land is assumed to increase to 2.5 million hectares by 2000, and the amount is calculated, in order to provide all rural families with a standard of living equivalent to that currently derived from a typical 5-hectare family farm.
Reduced population growth will make it possible to achieve eventually the purposes of the Agrarian Reform.

If the purpose of the Agrarian Reform is defined to be that of providing each rural family a farm income equivalent to that currently derived from a typical 5-hectare farm, then 2.7 million hectares of land would have to be cultivated by the year 2000 to meet this goal if high fertility continues. This is not feasible since there are no more than 2.5 million hectares of potentially arable land in the entire country. Uneconomical exploitation of ecologically fragile forestland, pastureland, or land needed for watershed would be the only way to expand the cultivated land base. Thus, aside from the distribution and settlement problems that would be encountered, the Agrarian Reform goal could not be realized for all rural families because of the physical limitation of arable land.

If a 3-child family average were attained by the year 2000, it would be possible to attain the Agrarian Reform objective for all rural families. Only 1.96 million hectares of total land would have to be cultivated to provide each rural family the same standard of living currently obtained from a typical 5-hectare farm.
FOREST RESOURCES

Forest land and land best suited for forestry represent about 66 percent of Honduras' total land area. The forestry-based sector has made significant contributions to the Honduran economy, and the country's future development prospects are intimately linked to this sector's performance. From 1970 to 1972, primary forest products contributed an annual average of about 59.8 million lempiras, or the equivalent of 4.6 percent of the total Gross Domestic Product.

Historically, wasteful exploitation practices have depleted Honduras' forest resources at a rapid rate. In 1974, major changes in public policy were announced to promote the rational exploitation of this important natural resource. Although significant progress has been achieved, it is too soon to be optimistic that the forestry programs will continue to be successful, especially if the population continues to grow at its present rate.

Rapid population growth has been a major contributing factor to the high rate of depletion and inappropriate use of the forests. Increases in rural population densities have strained the carrying capacity in many regions, often forcing campesinos to take up marginal farming on forest land.

To meet the Agrarian Reform objective, large tracts of forest land would have to be diverted from forestry to various farm uses (e.g. for pasture, house plots, farm buildings, or even cultivation). However, with reduced fertility, there will be fewer and smaller sized families, hence less land would have to be cultivated to provide a basic standard of living for each family than would be the case if current fertility levels continue. Likewise, smaller amounts of forest land would have to be diverted to farm uses.
If constant fertility levels continue, and a basic standard of living which is presently obtained from the income of a typical 5-hectare family farm is provided each rural family, 1.2 million hectares of forest land, or 24 percent of the total forested land, will have to be diverted to various farm uses by 2001.

If a 3-child family average were attained by 2000, just over half as much forestland (650,000 hectares) will have to be diverted to farm uses as will be required if constant fertility continues.

If a 2-child family average were achieved by 2000, only 530,000 hectares will have to be diverted to farming.

Although forest land that is used for farming has a certain productive value, this value is only a small fraction of the value that this same land might generate were it to be exploited for its wood products rather than for farming.

With constant fertility, the diversion of 1.2 million hectares of forest land to agriculture will result in a net loss in productive capacity of 3.1 billion lempiras (U.S.$1.55 billion) by 2000.

With a 3-child family average by 2000, the net loss will be 1.6 billion lempiras (U.S.$.8 billion), or a savings of 1.5 billion lempiras (U.S. $.75 billion) over constant fertility.
Forest Land Required for Farming,*
1980-2010

HECTARES (MILLIONS)

TOTAL FORESTED LAND

A. CONSTANT FERTILITY
B. 3-CHILD FAMILY
AVERAGE BY 2000
C. 2-CHILD FAMILY
AVERAGE BY 2000

YEAR

1980 1990 2000 2010

*All arable land is assumed fully exploited for cultivation or pasture
SAWNWOOD EXPORTS

The forestry sector is presently one of Honduras' most important sources of foreign exchange. Forest products (logs and timber) are the third largest export item by value, with gross foreign exchange earnings officially estimated at about 77 million lempiras for 1975. Future earnings from exported lumber will depend upon the amount available for cutting and the efficiency of converting roundwood into sawnwood. The amounts available for cutting will be reduced by three major factors: the amount of wood that will be consumed as fuel; the amount destroyed by farmers using slash and burn means of clearing forests; and domestic consumption of sawnwood. Each of these factors is intimately linked to population growth — the faster the population grows, the faster Honduras' forests will be depleted, and consequently, the less there will be for export.

It takes approximately 40 years for pine sawtimber to reach commercial size. At present cutting rates, the estimated pine sawtimber reserve will be depleted in 20 to 30 years. Honduras must make major reductions in present harvesting rates or the commercial pine will be gone well before rejuvenation can take place.

Two major projections may be considered in regard to harvesting the pine forests. One is based on cutting at an even flow for sustained yield. The other is based on an increase in the present level of cutting and a later substantial reduction. In either case, the continuation of population growth at the present rate will rapidly increase the quantity of sawnwood required for domestic use and reduce the amount available for export. A lower rate of population growth will leave much more available for export.
Even-flow cutting

Projections for even-flow cutting assume the harvesting of pine timber at an annual rate of 2,037,000 cubic meters per year. Present technology would allow the first year's cutting of roundwood to be converted to 631,000 cubic meters of sawnwood. Improvements in technology may increase the sawnwood to 1,222,000 cubic meters per year. Assuming the program begins in 1980:

With constant fertility, domestic consumption will rise from 181,000 cubic meters the first year to 834,000 cubic meters in 2020. The amount available for export in the first year will be 450,000 cubic meters, rising to 835,000 cubic meters in 2000 (with an export value of 167 million lempiras — U.S. $83.5 million) and falling to 388,000 cubic meters by 2020 (with an export value of 77.6 million lempiras — U.S. $38.8 million). The total export value over the 40 years will be on the order of 5.6 billion lempiras (U.S. $2.8 billion).

With a 3-child family average attained by 2000, domestic consumption will rise from 177,000 cubic meters the first year to 388,000 cubic meters in 2020. The amount available for export in the first year will be 454,000 cubic meters, rising to 940,000 cubic meters in 2000 (with an export value of 188 million lempiras — U.S. $94.0 million) and decreasing to 834,000 cubic meters by 2020 (with an export value of 166.8 million lempiras — U.S. $83.4 million). The total export value will be on the order of 6.8 billion lempiras (U.S.$3.4 billion).

With a 2-child family average attained by 2000, domestic consumption will rise from 176,000 cubic meters the first year to 304,000 cubic meters in 2020. The amount available for export in the first year will be 455,000 cubic meters, rising to 966,000 cubic meters in 2000 (with an export value of 193.2 million lempiras — U.S. $96.6 million) and decreasing to 918,000 cubic meters by 2020 (with an export value of 183.6 million lempiras — U.S. $91.8 million). The total export value over the 40 years will be on the order of 7.0 billion lempiras (U.S. $3.5 billion).

The increase in earnings from export sales with lowered fertility (3-child family average by 2000) would be approximately 1,200 million lempiras or U.S. $600 million.
Pine Sawnwood: Production, Domestic Use, Available for Export and Import Needs (40 Year Planning Period)
(Even-Flow Cutting Sustained Yield)

THOUSAND CUBIC METERS

<table>
<thead>
<tr>
<th>YEAR</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>181</td>
<td>177</td>
<td>176</td>
</tr>
<tr>
<td>1985</td>
<td>218</td>
<td>205</td>
<td>201</td>
</tr>
<tr>
<td>1990</td>
<td>264</td>
<td>232</td>
<td>225</td>
</tr>
<tr>
<td>1995</td>
<td>320</td>
<td>259</td>
<td>244</td>
</tr>
<tr>
<td>2000</td>
<td>387</td>
<td>282</td>
<td>255</td>
</tr>
<tr>
<td>2005</td>
<td>468</td>
<td>307</td>
<td>269</td>
</tr>
<tr>
<td>2010</td>
<td>567</td>
<td>334</td>
<td>283</td>
</tr>
<tr>
<td>2015</td>
<td>688</td>
<td>362</td>
<td>295</td>
</tr>
<tr>
<td>2020</td>
<td>834</td>
<td>388</td>
<td>304</td>
</tr>
</tbody>
</table>

- Wood available for export
- Domestic consumption
CAMEROON

1976 Population: 7.7 million

<table>
<thead>
<tr>
<th>Birth Rates (Births per 1000 population)</th>
<th>Death Rates (Deaths per 1000 population)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950: 44</td>
<td>1950: 29</td>
</tr>
<tr>
<td>1975: 44+</td>
<td>1975: 22</td>
</tr>
</tbody>
</table>

Annual Rate of Natural Increase

1950: 1.5 percent per year
1978: 2.3 percent per year

Fertility Rate, 1975 (Number of live births per woman during her reproductive years): 5.7

Life Expectancy at Birth: 1950: 33 years; 1975: 44 years

Infant Mortality Rate, 1975 (Deaths to infants under 1 year of age per 1000 live births): 137

Percentage of the Population Under 15 Years of Age, 1975: 43

Child Dependency Ratio, 1975 (Number of children under 15 years of age for every 100 adults of economically productive age, 15 to 64): 80

Population Projections, 1975-2025 (Millions)

<table>
<thead>
<tr>
<th></th>
<th>1975</th>
<th>2000</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>A= Constant Fertility</td>
<td>7.7</td>
<td>16.5</td>
<td>41.1</td>
</tr>
<tr>
<td>B= 3-Child Family Average by 2000</td>
<td>7.7</td>
<td>12.9</td>
<td>19.7</td>
</tr>
<tr>
<td>C= 2-Child Family Average by 2000</td>
<td>7.7</td>
<td>11.6</td>
<td>14.2</td>
</tr>
</tbody>
</table>
Cameroon

Labor Force and Jobs For Young People
Gross National Product and Gross National Product Per Capita
Education
Health
LABOR FORCE AND JOBS FOR YOUNG PEOPLE

Three important aspects of employment are affected by population size and growth rate: the size of the work force, the number of children dependent on the work force, and the number of new jobs required by young people entering the labor force.

In 1976, the labor force in Cameroon numbered about 2.7 million, representing about 66 percent of the population between 15 and 64 years of age.

If this percentage remains unchanged, the labor force will grow to almost 4 million by 1990. (This figure will not change with varying levels of fertility since all the children who will be entering the labor force in the next 15 years are born.)

Assuming constant fertility, the labor force will reach 5.4 million by 2000, and 7.7 million by 2010. With fertility reduced to a 3-child family average by 2000, the comparable figures would be 5.1 million and 6.4 million.

The number of children dependent on the labor force will be affected much more rapidly and dramatically by a reduction in fertility.

The labor force of 7.7 million in 2010 (assuming constant fertility) will have to support 11.3 million children under the age of 15. Every four workers will be supporting six children.

If fertility is reduced to a 3-child average, however, the labor force of 6.4 million in 2010 will be supporting only 5.1 million. Every four workers will be supporting only three children.

In the past there was an economic incentive for parents to have many children. At a very early age, children began to help with the work of the farm and the household, thus contributing to family income. Today, with over two-thirds of all primary school age children in school and an increasing percentage of the population living in urban areas, this is no longer the case. Children in school must be supported by the family until they complete their schooling. If the family lives in an urban area, such as Douala or Yaounde, a young person must find a money-paying job to contribute to family income, but jobs in urban areas have become increasingly difficult to find.
Cameroon
Labor Force and Child Dependents, 1975-2010
(With Two Fertility Assumptions)

Labor Force

- Constant Fertility
- 3-Child Family Average By 2000

<table>
<thead>
<tr>
<th>Year</th>
<th>Labor Force</th>
<th>Dependent Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>2.7</td>
<td>3.2</td>
</tr>
<tr>
<td>1990</td>
<td>3.9</td>
<td>5.4</td>
</tr>
<tr>
<td>2000</td>
<td>5.4</td>
<td>7.9</td>
</tr>
<tr>
<td>2010</td>
<td>7.7</td>
<td>11.3</td>
</tr>
</tbody>
</table>
The high proportion of young people in the population means that a large and rapidly increasing number of them will reach 15 each year and enter the labor force. Although some of them will fill jobs vacated by retirement, new jobs will have to be created for most of these young people. In the urban areas alone there will be 400,000 new job seekers during the period from 1976 to 1981. Today, about 12 percent of the urban work force is unemployed, and two-thirds of these are young people under 25.

Employment must be found for these young people. However, the capital required to create each new job is now on the order of 350,000 CFA francs (U.S. $1,330) and will almost certainly continue to grow yearly. At this rate, about 140,000 million CFA francs (U.S. $533 million) will be required during the next five years to create enough new jobs. Between now and 2010 approximately 1,750 billion CFA francs (U.S. $6.7 billion) will be needed to create jobs for the expanding labor force. Yet if employment is not found for these new entrants, they will swell the ranks of the underemployed and the unemployed. Distribution of national income will worsen, thus further aggravating social inequities and increasing the prospects for criminal acts and serious public disorder.

Some 60,000 new jobs for young people were needed in 1975. With high fertility continued, 166,000 will be needed in 2000 and 260,000 in 2010. A planned effort to reduce the rate of population growth, started now, could make a material difference in the number of young people for whom new jobs will be needed by the year 2000 and thereafter.

If a 3-child family average were reached by 2000, the requirements for new jobs would be reduced to 120,000 in 2000 and 135,000 in 2010, a reduction of about 25 percent with a savings of about 455,000 million CFA francs (U.S. $1,733 million).

If a 2-child family average were reached by 2000, the reduction will be 35 percent, or a savings of 625,000 million CFA francs (U.S. $2,381 million).
Cameroon
New Job Requirements, 1960-2025
(Thousands Per Year)

- Constant Fertility
- 3-Child Family Average By 2000
- 2-Child Family Average By 2000

Year
1960 1975 2000 2010 2025
Thousands/Year
0 100 200 300 400 500

- 60
- 110
- 135
- 130
- 120
- 166
- 260
- 450

- 40

24a
GROSS NATIONAL PRODUCT AND GNP PER CAPITA

During the Second Plan (1966 to 1971), the very high rate of increase in national income, averaging 7.4 percent per year, allowed a very satisfactory rate of increase in GNP per capita – an average of 5.9 percent annually. During the 1970s, however, with less favorable world market conditions, the rate of increase in national income dropped substantially, and the result was a far less satisfactory rate of increase in GNP per capita – an average of 0.5 percent annually.

During the period of the current development plan, Cameroon’s GDP is expected to grow 7.2 percent per year. If this very high rate of growth is attained, and the population continues to grow at only 2.3 percent per year, the annual rate of increase in GDP per capita will be 4.8 percent. Given current fertility rates and planned increases in life expectancy, however, the population growth rate will increase to over 3 percent per year, possibly becoming as high as 3.5 percent by 2000. Since growth in GNP per capita will occur only to the extent that GNP growth exceeds population growth, very high rates of GNP growth will have to be attained to achieve substantial growth in per capita income.

Since the size of the labor force will not be much different in 2000 or even 2010, regardless of high or low fertility, GNP growth will also be similar under both fertility assumptions. If the future population has substantially lower fertility, however, per capita income will be higher. In addition, the smaller dependent population resulting from reduced fertility will place less of a burden on the working age population. It will be easier to generate more domestic savings for investment in industry and agriculture.
Cameroon
Relationship of GNP and Population to GNP Per Capita, 1960-75

Index (1960 = 1.0)

Assuming GNP grows at just under 5 percent per year (the average growth rate for the last decade), GNP will increase to 2400 billion CFA francs at 1975 prices (U.S. $9.14 billion) by 2010 with constant fertility. With fertility reduced to a 3-child family average by 2000, the Gross National Product will be only slightly lower. GNP per capita, however, will vary significantly.

With constant fertility, GNP per capita will reach about 100,000 CFA francs (U.S. $381) by 2010.

With a 3-child family average by 2000, GNP per capita will reach about 150,000 CFA francs (U.S. $571), or about 50 percent higher than with constant fertility.
Cameroon
Gross National Product and Gross National Product Per Capita
(Under Two Fertility Assumptions 1975-2010)

**GNP, 1975-2010**

- **Constant Fertility**
- **3-Child Family**
  Average By 2000

**GNP Per Capita, 1975-2010**

- **Constant Fertility**
- **3-Child Family**
  Average By 2000

Added Income 550,000 CFA Francs
In 1976, approximately 1.8 million children, or 23 percent of the population, were of primary age, 6 to 14. Approximately 68 percent of these children were enrolled in primary schools, ranging from a low of 18 percent in the rural North to close to 100 percent in the major urban centers. Secondary school enrollment was 8 percent of the eligible group; vocational school enrollment was 2 percent.

During the current Fourth Plan, the primary school enrollment will increase about 11 percent, or 210,000 students. Enrollments in urban areas will increase by about 40 percent. Five percent of the investments under the Fourth Plan are intended for education, primarily to provide over 10,000 new primary school classrooms and secondarily to increase the primary school enrollment ratio to 80 percent of those eligible. If present fertility levels continue, the number of children of primary age will expand at an accelerating rate and reach 4.2 million in 2000. This would more than double the 2 million expected in 1981.

Under these circumstances, the annual cost of providing an elementary education for 80 percent of those eligible will rise from about 8,300 million CFA francs (U.S. $31.6 million) in 1977 to 18,000 million CFA francs (U.S. $68.6 million) in 2000. This does not allow for reducing the very high pupil/teacher ratio of 48/1 or improving quality in other ways. Moreover, the number of children not in school would grow from 400,000 in 1981 to 840,000 in the year 2000. To provide schooling for all primary age children in 2000 would require an additional 50,000 million CFA francs (U.S. $190 million), and yearly expenditures by the government would increase to 23,000 million CFA francs (U.S. $87.6 million) in 2000.

If, however, a program were initiated soon to reach a 3-child family average by 2000, the total number of primary school aged children would be 2.8 million by 2000, instead of the 4.2 million now projected. Expenditures required to maintain 80 percent enrollment would also be one-third less by 2000. By spending the same amount previously required to maintain 80 percent enrollment, 100 percent enrollment could be achieved by the mid 1990s. Savings thereafter could be used to reduce pupil/teacher ratios or increase secondary school enrollment to 80 percent by 2025.
Cameroon

Children of Primary School Age, 1975-2000
(Constant Fertility)

Children of Primary School Age, 1975-2000
(Constant Fertility and 3-Child Family Average By 2000)

Total Children:
- Constant Fertility
- 3-Child Family Average by 2000

Total Children (6-14)

Not in School
80% Enrolled

80% Enrolled with Reduced Fertility
80% Enrolled with Constant Fertility

Savings
All in School by this Date with Reduced Fertility

Year
1975 1990 2000

Year
1975 1990 2000

Millions
0 1 2 3 4 5

Millions
0 1 2 3 4 5
A majority of the population of Cameroon does not have access to government health services, and many people suffer from diseases related to contaminated water, poor sanitation, and inadequate immunization. Recent studies have found a 100 percent parasitic infection rate, with an average of three different parasites per individual. Schistomiasis affects up to 90 percent of the population in some areas. Malaria, veneral disease, and goiter also are widespread. These debilitating diseases sap the energy of workers and represent a great economic loss in terms of lost working days and low productivity.

The government is acting to improve the health system by implementing programs of both curative and preventive medicine. These programs constitute about 7 percent of the national budget and almost 2 percent (12,000 million CFA francs, or U.S.$45.7 million) of the investment expenditures under the Fourth Plan. The programs for preventive care are aimed at providing rural health centers and maternal and child welfare centers.

The rapidly expanding population will make it difficult to meet the health needs of the population, particularly the needs of mothers and young children. About 3.2 million Cameroonians are under 5 — the segment of the population with the highest rates of sickness and death.

With constant fertility, the size of this age group will increase to 6.7 million by 2000. By 2025, it will amount to 17 million.

If fertility is reduced to a 3-child family average by 2000, however, the size of the group will be only 4.9 million by 2000. By 2025, it will reach only 7 million, 60 percent less than with constant fertility.

Thus, a reduction in fertility would significantly reduce the growth of the population at highest risk, greatly reducing the difficulties of providing adequate health care to the population.
Cameroon
Population at High Health Risk, 1975-2025
(Women 15-44 and Children Under 5)

1975
3.2 Million

Constant Fertility
2000
6.7 Million
3-Child Family Average By 2000
4.9 Million

1 Million Women Aged 15-44
1 Million Children Under the Age of 5

2025
17 Million
3-Child Family Average By 2000
7 Million
MATERNAL HEALTH

High fertility, combined with poor nutrition, is a major cause of maternal illness and death. A mother's needs for proper nutrition increase, and she becomes more vulnerable to the complications of pregnancy and other health hazards. The mortality risk among women using no fertility control method is 5 to 30 times higher than among women using modern fertility control methods. A 1973 World Health Organization study on morbidity found complications of pregnancy and childbirth to be the fifth most prevalent medical problem in Cameroon.

Family planning services to enable couples to space or limit births are one of the most important health measures for women. The World Health Organization urged that these services become an essential part of any national health program. The benefits of family planning as a health measure alone more than repay its cost, and the additional benefits it provides to the rest of the economy are worth many times the cost.
Cameroon
Maternal Health
Under Two Fertility Assumptions

<table>
<thead>
<tr>
<th>At Present Mortality Rates in Cameroon, About 220 of Every 1000 Women Die During their Childbearing Years. With the Current High Fertility Rate, Approximately 30 of These Deaths, 14 Percent, Are Due to Childbirth.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>The Use of Modern Contraceptives to Limit Births to 3 Per Woman Would Reduce the Number of Deaths Associated With Childbearing to About 15 Per 1000 Women.</th>
</tr>
</thead>
</table>
CHILD HEALTH

High fertility is also a major cause of child health problems. Before birth, insufficient calories in the diet of the mother will affect children. After birth, with a large number of children in the family, fewer resources are available for the care and development of each child. Malnutrition in the early years of a child's life sometimes produces mental and physical handicaps. According to the 1973 World Health Organization study, malnutrition is the seventh most prevalent medical problem for children in Cameroon.

Reduced fertility allows the family to invest more of its time and money in the care of each child. A number of studies have shown that infant and child mortality is significantly lower in families with three or fewer children than in families with more than three children.
Cameroon
Child Health
Under Two Fertility Assumptions

With Current High Fertility in Cameroon
About 4 Out of Every 20 Children Die
Before Reaching the Age of 5.

Data from Several Countries Indicate that
Children from Small Families Have a
Better Chance of Survival than Children
from Large Families. These Data
Indicate that in Cameroon Families with 3
or Less Children Only About 2 Children
Out of Every 20 Would Die Before
Reaching the Age of 5.
Effects of Population Programs

- The Impact of Population/Family Planning Programs on Fertility Decline

- Effects of a Delay in Starting a Family Planning Program to Reduce Fertility
INTENTIONALLY
LEFT BLANK
Effects of Population/Family Planning Efforts on Birth Rates
Decline in the Birth Rate from 1965 to 1975 Among Developing Countries with Relatively Advanced Economic and Social Settings

- **Strong family planning efforts**
- **Moderate family planning efforts**
- **Weak family planning efforts**
- **No family planning efforts**

Percent

Singapore  Hong Kong  South Korea  Barbados  Taiwan  Mauritius  Costa Rica  Fiji  Jamaica  Cuba  Chile  Trinidad & Tobago  Colombia  Panama  Venezuela  Brazil  Mexico  Paraguay  North Korea  Kuwait  Peru  Lebanon  Jordan  Libya
The same pattern prevailed among countries with a more moderate social and economic setting. While birth rates declined 10 percent between 1965 and 1975 among these countries, they dropped an average of 19 percent in nations with a strong or moderate family planning program; 6 percent in those countries with a weak program; and 2 percent in countries with no population/family planning program. Even in countries with less advanced social and economic settings, the existence of a population/family planning program resulted in greater fertility declines during the 1965-75 period.

One study is not conclusive evidence; nonetheless, the emerging consensus is that population/family planning programs have an independent effect in reducing fertility in all social settings, but especially when they exist in tandem with a strong economic and social development effort.
Effects of Population/Family Planning Efforts on Birth Rates
Decline in the Birth Rate from 1965 to 1975 Among Developing Countries with Moderate Economic and Social Settings

Strong family planning efforts
Moderate family planning efforts
Weak family planning efforts
No family planning efforts

Percent

China
Malaysia
Tunisia
Thailand
Dominican Republic
Philippines
Sri Lanka
El Salvador
Iran
Egypt
Turkey
Honduras
Nicaragua
Zaire
Algeria
Guatemala
Morocco
Ghana
Ecuador
Iraq
Mongolia
Syria
Zambia
Congo
EFFECTS OF A DELAY IN STARTING A PROGRAM TO REDUCE FERTILITY

Once a country decides to undertake a population policy and program to reduce fertility and slow population growth, it must consider the advantages and disadvantages of starting its program immediately. Because population growth expands so rapidly, and because of the irresistible momentum of population growth, any significant delay in reducing the rate of population growth will seriously affect the size of the future population and cause a large burden to be placed on a country's resources. If a country with a population of about 3.5 million has a fertility rate of 7 children born per woman, this country will need a strong policy to institute changes in the fertility rate to reach a 3-child family average in 20 years. The demographic effects of a delay in starting such a program may be illustrated as follows:

- If the program begins in 1980, the population in 2000 will be 6.2 million and in 2025 it will be 9.2 million.
- If the program begins in 1985, the population in 2000 will be 6.9 million, and in 2025 it will be 10.5 million. The five year delay will make a difference of 1.3 million people by 2025.
- If the program begins in 1990, the population will be 7.5 million in 2000, and in 2025 it will be 11.8 million. As a consequence of the ten year delay, the country will have 2.6 million additional people in 2025, an increase of nearly 30 percent.
Effects of a Delay in Starting a Program to Reduce Fertility

Program to Reach a 3-Child Family Average in 20 Years

Millions

30

25

20

15

10

5

0

1960 1975 2000 2025

Year

34a
SUMMARY

The illustrations used in this demonstration show that in a variety of developing countries the continuation of the present high levels of fertility will make it difficult or impossible for them to attain their major economic and social goals. On the other hand, serious efforts to reduce fertility will make many of these goals possible.

As the population dynamics of many countries show, rapid population growth is the result of a country's success in reducing death rates while making little change in birth rates. High fertility has resulted in large proportions of young people in the populations. As a result, such countries have a powerful built-in momentum of population growth. Countries that continue their present fertility will double their populations in two to three decades. Even those that take measures to reduce their fertility will continue to grow for 40 years or more after they reach a 2-child family average. Nevertheless, a reduction in the fertility rate can have a large effect on reducing population growth, and on reaching many economic and social objectives. For example:

If present fertility levels continue, countries whose arable land per capita has been reduced by half in the past quarter century will see it reduced by half again during the coming quarter century. Even with an annual increase in food production per hectare, the food production per capita for most countries will decrease significantly by 2000. Import requirements for developing countries as a whole will increase three to four times.Aside from the greatly increased cost of imported food, there may develop a serious logistical problem in moving unprecedented
volumes of grains from the few exporting countries to the importing countries. Reductions in fertility to a 3-child family average by 2000 would make it possible for many countries to feed themselves, or at least, to reduce their import requirements to manageable levels.

Unfortunately, many countries that have undertaken programs to distribute farm land to rural families will find that the growing number of rural families (despite migration to the cities) will surpass both their administrative capacities to distribute the land, and the amount of available arable land itself. They will have to choose between curtailing their distribution programs or using forest lands. Even when the trees are removed, and the land farmed, erosion causes problems. With reduced fertility, most countries will be able to supply land to a less rapidly increasing number of rural families for several decades.

Finding suitable employment for the vast number of young people entering the labor market each year is already a primary economic and social necessity and problem for most developing countries. The children who will enter the labor market over the next 15 years are already born. In many countries, it may already be impossible to provide adequate employment for all of them. If high fertility continues, even for a few years, the problems of employment and of child dependency may become catastrophic in two or three decades. A reduction in fertility will make it possible to ease these future problems, although the reduction would not entirely solve them.
The Gross National Product (GNP) will not be affected by continuing present high fertility or by reducing fertility for the next three decades. GNP per capita, however, may increase only slightly or remain fixed if present high fertility continues. A reduction in fertility can make a noticeable increase in GNP per capita in just two decades and an increase of 50 percent or more in three decades.

In most developing countries the large number of children reaching primary school age each year under present conditions of high fertility will make it impossible for countries to attain goals of full enrollment of these children in the near future. In fact, in most countries, even where there are increasing enrollments, the numbers of children not in school are increasing every year. With a reduction in fertility to a 3-child family average by the year 2000, all children of primary school age could be enrolled sometime before 2000 at the same cost of maintaining the lower percentage of enrollments under the assumption of constant fertility.

With continuing high fertility, the number of people, and especially the high risk populations of women aged 15 to 44 and children under 5, will increase more rapidly in some countries than the speed at which present levels of health care can be extended to them. In a typical developing country with high fertility, about 5 out of every 20 women die during their childbearing years. About 4 children out of every 20 will die before the age of 5. In countries where births can be spaced and limited to an average of three per woman, the number of women dying during their childbearing years is about 1 out of every 20. The number of children dying before the age of 5 is about 2 out of every 20.
If a country decides as a matter of national policy to undertake a program to reduce fertility, it appears to be desirable to combine the population/family planning program with a strong economic and social development effort. It also is important to initiate the population program as early as possible. For example, a delay from 1980 to 1990 in starting a program to reach a 3-child average by 2000 will increase the population of that country by 20 percent by 2000 and over 25 percent by 2025.
APPENDIX I

GLOSSARY OF DEMOGRAPHIC TERMS

The following are definitions of terms used in the text and the tables of this report.

Age-Sex Composition - Refers to the distribution of the population by age and sex, usually in terms of five year age groups. The age-sex structure of a population at any given time is the result of past trends in fertility, mortality and migration. In turn, the age-sex composition affects current population change because births, deaths, and migration occur at different rates for different ages.

Age-Specific Fertility Rate - The number of births to women in a given age group per 1,000 women in the same age group in a given year. It is usually calculated for five-year age groups. For example, the estimated age-specific fertility rate for Honduran women ages 20-24 in 1974 was 323, but for women aged 45-49 it was only 17.

Child Dependency Ratio - The ratio of the child population (0-14) to the population aged 15-64 times 100. This measure is frequently used to indicate the burden that must be born by the productive population.

Crude Birth Rate or Birth Rate - The number of live births per 1,000 persons of the midyear population. This measure indicates the contribution of fertility to the growth rate, but since it is affected by the age-sex structure and marital composition of the population, it is not always a good index for comparing fertility levels.

Crude Death Rate or Death Rate - The number of deaths per year per 1,000 persons of the midyear population. This measure is also affected by the age-sex structure of the population and is not necessarily a good one for comparing mortality levels between countries or over time.

Life Expectancy at Birth - The average number of years expected to be lived by children born in a certain year if mortality rates for each age-sex group remain constant in the future. Life expectancy at birth is not affected by the age-sex structure of the population and is therefore a better measure than the death rate for comparing mortality levels between countries or over time.

Population Growth Rate - The rate of natural increase adjusted for net migration into or out of the country.
Population Momentum - This is a critically important concept that is frequently misunderstood. Just as a speeding automobile cannot be brought to an immediate halt, so, too, a population that has recently experienced rapid growth will contain many young couples and will continue to grow for between 40 and 70 years after those couples lower their fertility to a 2-child average.

Rate of Natural Increase - The rate at which the population grows each year expressed as a percentage of the base population. Rate of natural increase is equal to the crude birth rate minus the crude death rate with no adjustment of net migration.

Replacement Level Fertility - That level of fertility which, if continued, will eventually result in zero population growth. Replacement level fertility is approximately a 2-child family average.

Total Fertility Rate or Fertility Rate - The average number of children that would be born per woman if she were to live to the end of her childbearing years and bear children according to a given set of age-specific fertility rates. The total fertility rate is often used as an estimate of the average number of children per family. Because this measure is not sensitive to changes in the age structure of the population, it is a better measure than the crude birth rate for comparing fertility levels among countries and over time.